

DISASTER

Governance in India

SERIES-7



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National Academy of Administration

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MESSAGE

Due to its unique geographical and geological conditions, India is vulnerable to various natural disasters. In India, the incidents of flood, drought and other natural disasters are on the rise and pose a tremendous challenge to the society in general and administration in particular. Each disaster heightens the sense of urgency to equip ourselves better in coping and managing them. In this context, the training of civil servant in Disaster Management assumes critical significance.

The recurring incidence of such disasters necessitates learning from our own experience as well as the best practices adopted all over the world in the field of disaster management. Well documented best practices that can be circulated widely for creation of awareness at all levels of administration play important role in such a context.

It gives me immense pleasure to note that Centre for Disaster Management, LBSNAA is bringing out an edited case studies series “Disaster Governance in India” Series 7, for the year 2020-21 under the project “Capacity Building on Disaster Management for IAS/Central Civil Services Officers” sponsored by National Disaster Management Authority (NDMA, Government of India. This is a compilation of case studies, learnings and experiences of the officer trainees, as part of their district training.

I hope this will be useful for both the trainees and the administrators in handling disasters and emergency situations across the country. It can also serve as a good reference material for ATIs and CTIs for their in-house courses.



(Abhiram G. Sankar)

CONTENTS

S. no.	Title	Name & Address of the Authors	Page no.
	DIRECTOR'S MESSAGE		iii
1	Jala-Andolana: A Case Study of a People's Movement for Better Water Management	Dr. Mamatha B. R. IAS <i>Additional Mission Director-1, Sakala Mission, Department of Personnel and Administrative Reforms (e-Governance), Government of Karnataka, Bengaluru</i> Smita Mutt <i>Development Consultant</i>	1
2	Stranded Mahalaxmi Express Train on Flooded Grounds- A Case study on the Role of Relief and Rehabilitation Department for Disaster Management	Arun B. Unhale IAS <i>Managing Director-Maharashtra State Co-Operative Cotton Grower's Marketing Federation Limited, Mumbai & Former Joint Secretary, Relief and Rehabilitation Department (R&R), Government of Maharashtra</i>	14
3	Gopalganj Floods 2020 - in COVID-19 Era Preparedness, Response, Assessment & Lesson Learnt	Dr. Nawal Kishor Choudhary IAS <i>Collector & District Magistrate, Gopalganj district, Government of Bihar</i>	22
4	Time, Space & Speed: A Study on Governance for Effective Disaster Response in Uttarakhand	S.A. Murugesan, IAS <i>Secretary (I/C), Department of Disaster Management, Government of Uttarakhand</i> Binaya Bhusan Gadnayak <i>Specialist (IRS-T), Uttarakhand State Disaster Management Authority</i>	36
5	Disaster Risk Reduction and Role of Capacity Building – An Administrator's Perspective	Saurabh Bhaghat, IAS <i>Director General, Jammu & Kashmir Institute of Management, Public Administration & Rural Development, Srinagar, Kashmir, 190001</i>	53
6	An Early Warning System and Inter-Agency Coordination Framework for Better Preparedness and Prevention of Heat-related Illnesses in Urban India: Development and Implementation of Nagpur Heat Action Plan	Dr. Mahaveer Golechha, Priyanka Shah and Dileep Mavalankar <i>Health Systems and Health Policy, Indian Institute of Public Health-Gandhinagar, Gujarat, India</i> Sonalini Khetrpal <i>Social Sector, Asian Development Bank, 6 ADB Avenue, Mandaluyong, Metro Manila, Philippines</i>	66
7	Disability Inclusive Disaster Resilient Infrastructure in Public Buildings - A Case Study	Dr. Ashok Sanganal <i>Senior Faculty and Head, Centre for Disaster Management, Administrative Training Institute, Mysuru</i> Shreyas M T <i>Research and Training Associate, Centre for Disaster Management, Administrative Training Institute, Mysuru</i>	83
8	Best Practices Related to Disaster Management	Manish Kumar Sharma <i>Deputy Superintendent of Police, (Ops), District Poonch, Jammu & Kashmir Police, Government of Jammu and Kashmir</i>	94

Jala-Andolana: A Case Study of a People's Movement for Better Water Management

Dr. Mamatha B. R., IAS* and Smita Mutt**

Overview

This paper examines the experience of a multi-stakeholder, drought mitigation and water management programme initiated in Ramanagar district between 2016 and 2018. By analysing the steps taken by the District Administration, we observe that strong public messaging, technical expertise and revitalisation of collection and recharge structures helped change the pattern of water usage in the district. With the involvement of farmers, school children, frontline workers, communities and local industries as partners, the message of this campaign permeated across the district and became a point of local pride. Moreover, the creation of assets desired by the community and handed over to local self-government bodies ensured that this went far beyond a momentary fad and instead created lasting change. We believe that this case study provides lessons for policymakers seeking to implement similar programmes aimed at drought preparedness, reducing environmental impact and equitable distribution of natural resources.

Introduction

In September 2016, Ramanagara district was hit by severe shortage of water and experienced the worst drought since Independence. Nine consecutive years of low rainfall had taken its toll on the district. Land across the district was parched as the entire district had suffered an average 81% rainfall deficit in the last two months (Customised Rainfall Information System, Hydromet Division, Indian Meteorological Department).

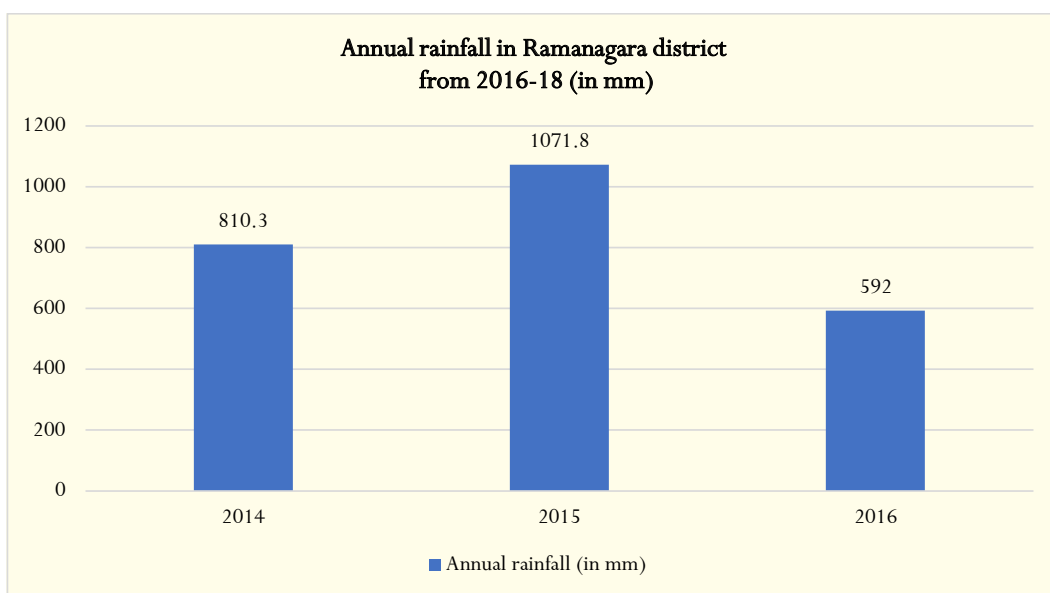
Table 1: Taluka wise Average rainfall (in mm)

S. no	Taluka	1990 - 1999	2000 - 2009	2010 - 2014	Average of 1990 to 2014
1	Channapatna	903.3	934.2	733.4	857
2	Kanakpura	827.4	839.7	773.4	813.5
3	Magadi	892.4	929.3	828	883.3

S. no	Taluka	1990 - 1999	2000 - 2009	2010 - 2014	Average of 1990 to 2014
4	Ramanagara	999.5	915.4	847.8	920.9
	Average	905.7	904.7	795.7	868.7

Source: KSNDMC; District Irrigation Plan, Ramanagara District (2016)

The district administration had put the crop loss at nearly 90%. Despite average annual rainfall in South Interior Karnataka being 1,126 mm, 2016 was on track to receive barely half that amount. People were selling off their cattle in a final effort to save water usage and there was mass exodus to the nearby city of Bengaluru.



Source: Customised Rainfall Information System, Hydromet Division, Indian Meteorological Department

Figure 1: Annual Rainfall from stations across Ramanagara district from 2014 to 2016 (in mm)

The Deputy Commissioner was faced with serious problems of providing water, fodder and employment to prevent people from migrating. The District Administration struggled and effectively managed the crisis. The month of October brought in unseasonal rainfall and ushered in some water into the lakes, water bodies and borewells. People started to flood irrigate their mulberry farms and life went on as before for a month. But then rains failed again and people were back to fighting water shortage. This has been the challenge faced by all Deputy Commissioners of the district as the district has no surface water and is totally dependent on rains and groundwater. The Deputy Commissioner was faced with the challenge of finding a permanent solution to this perpetual ongoing cycle from scarcity to plenty and back to scarcity again.

In this situation, District Administration, Ramanagara sought to devise a collaborative, multi-stakeholder strategy that would focus on long-term change in public attitudes and behaviours. Through engagement of local industries, prominent ambassadors and local self-government, a streamlined and goal-oriented three-year programme was outlined, beginning in the latter half of 2016-17. The programme worked to mitigate contributory factors to the lengthy drought, including (i) deforestation and eroding topsoil, (ii) irresponsible patterns of water use and (iii) lack of focused water harvesting and recharge efforts. Now, nearly five years later, we take a look at this broad-based and participatory campaign by examining its main pillars and review the results. With the increase in programmes centering around comprehensive water management, including the pan-India National Water Mission and Jal Shakti Abhiyan, this Jalaandolana in Ramanagara district may be of interest to policymakers across India and worldwide.

Background

Ramanagara district, where the famous film Sholay was shot, was carved out of the erstwhile Bengaluru Rural district on 23 August 2007, comprising Ramanagara, Channapatna, Kanakapura and Magadi taluks (Ramanagara District website). Ramanagara is a town and a city municipal council in the Indian state of Karnataka. It is also the headquarters of Ramanagara district. The town was known as Shamsarabad at the ruling time of Tippu Sultan. It was then called Closepet, after Sir Barry Close (1756-1813) in pre-Independence times. It was renamed Ramanagara by the former chief minister of Karnataka state **Mr. Kengal Hanumanthayya**.

Table 2: Source-wise Area under irrigation in Ramanagara district in 2016

(Area in hectares)

S. no	Taluka	Canals	Tanks		Open Wells		Tube/Bore Wells		Lift irrigation		Total	
			Net area	Nos	Net area	Nos	Net area	Nos	Net area	Nos	Net area	Area
												Gross
1	Channapatna	1490	115	165	2086	0	11420	7226	1	162	10099	9043
2	Kanakapura	5062	239	875	3456	0	12374	9625	1	219	18092	15781
3	Magadi	835	348	582	4221	0	7486	3486	1	67	5812	4970
4	Ramanagara	742	106	266	2560	0	6779	5520	1	0	7299	6528
Total		8129	808	1888	12323	0	38059	25857	4	448	41302	36322

Source: Karnataka Department of Economics and Statistics, District Irrigation Plan, Ramanagara District (2016)

The district has extremely limited surface water and depends heavily on ground water and rainwater. Groundwater depletion has reached such alarming

proportions in the semi-arid and arid regions, despite huge investments in watershed development programmes by the state and central governments and the international donor community.

A close look at the groundwater availability in the talukas of Ramanagara district shows that in 2016, over 70% of the area within two blocks was identified as over exploited and 90% of a third was tagged as semi-critical with respect to groundwater availability. One of the stated aims of these programmes is to mitigate drought and ensure water availability throughout the year. However, the ground water must be extracted from deeper and deeper levels to cope with recurring droughts.

Table 3: Taluka-wise status of groundwater availability in 2016

Taluka	Status of Block as per Central Ground Water Board Notification			
	Safe	Semi-Critical	Critical	Over Exploited
Channapatna	10 %	90 %	-	-
Kanakpura	-	30 %	-	70 %
Magadi	5 %	20 %	-	75 %
Ramanagara	35 %	30 %	-	35 %

Source: District Irrigation Plan, Ramanagara District (2016)

Increase in the area under irrigation has often been achieved through a dramatic increase in the number and depth of tube wells, accompanied by a decrease in the area irrigated by each well. The trend of chasing ground water table without a proper management system has devastated hundreds of farming communities.

While water shortage and drought are caused by a combination of factors, some of the main reasons for the crisis is the lack of control over water use, lack of attention on ground water recharge, ignoring reuse of water and rain water harvesting. In government the concentration is on quantum of water utilisation; equitable and sustainable sharing of water between different user groups and uses had thus far been neglected. Research has shown that those who lost out as a result of inappropriate water harvesting structures, were often poor households who use water for domestic and other non-irrigation purposes such as livestock rearing, fishing, or washing. The tendency to prioritise irrigation has neglected other water uses, including domestic water supplies and environmental sanitation. Also, not much attention is given to eliciting user's full-hearted participation in the water usage planning. It has been proven time and again that nothing can be achieved with the complete participation of all stakeholders when it comes to Natural Resources Management.

Creating a Multi-Stakeholder Engagement Strategy

By August 2016, the Deputy Commissioner setup a think tank for Water and conducted a massive public meeting on water issues and possible solutions. Recognizing that the first step was engaging multiple segments of the public, the Deputy Commissioner of Ramanagar decided to launch “Jalaandolana” – an initiative to mobilize, enable and empower people to take on the responsibility of water management in the district. The ambitious programme ‘Jalaandolana’ (Jala meaning water and Andolana meaning Fight) – a People’s Movement for Better Water management’ was launched with the earnest hope that it would become a Jan-andolana for water. From the outset, this programme was goal-oriented and aimed at mitigating the drought conditions faced in Ramanagara as well as promoting a massive sense of individual responsibility for equitable, responsible and sustainable water usage. As community participation was sought to ideate various levers of the programme, the underlying question was ‘*What can I do to reduce water distress in Ramanagara district?*’.

As a result of this public engagement, the following objectives were laid out for the Jalaandolana:

- To create **mass awareness** among all stakeholder groups about water conservation, recycle or reuse of water, groundwater recharge,
- To build **technical understanding** of methods and practices to ensure more sustainable and efficient water use,
- To facilitate **community ownership** of implementing a participatory watershed management initiative



Figure 2: Design of the Ramanagara Jal-andolana programme

Process

1. Series of Water Sensitisation workshops and events

A district-wide campaign was launched for spreading the message of water conservation and efficient water management including Recycle, Reuse and Reduce to every individual, house, habitat, institution and organization. CSR support from Bosch India Foundation, Bidadi Industries Association and Rotary Silk City was taken to accomplish this mission. Several NGOs and associations joined hands with the district administration for conducting a series of events such as:

- Madhyama Jalaandolana - Seminars for the media fraternity of Ramanagara under the auspices of Karnataka Madhyama Academy,
- Krishi Jalaandolana – Workshops for 2000 progressive farmers/ eminent leaders/opinion leaders from farming community and officers of departments of agriculture, horticulture and sericulture,
- Mahila Jalaandolana – Orientation workshops for officers of Women and Child department Development Department, Office Bearers of Zilla Panchayat, Taluk Panchayat and Gram Panchayat, District Federation of SHGs, Anganawadi supervisors, ASHA (Accredited Social Health Activists) Workers,
- Shikshana Jalaandolana – workshops for school and colleges, jathas by all school children, various competitions for schools and colleges,
- Kigarika Jalaandoolana – workshops for industries, business houses and shops and establishments,
- Yuva Jalaandolana – As one more step to sensitize & educate large number of public in a big way, the Ramanagara Marathon-2017 was organized on 26-02-2017, by the district administration in association with The Yellow and Red Foundation of Ramanagara. Individuals and organizations from all walks of life such as Bosch India Foundation, Bidadi Industries Association, Transytem, Elliott Ebara, GAIL, Rotary Club, Impana, Hospital, BGS Group, and many more joined hands to make this a grand success. Over 2000 runners from all the country participated in this event.

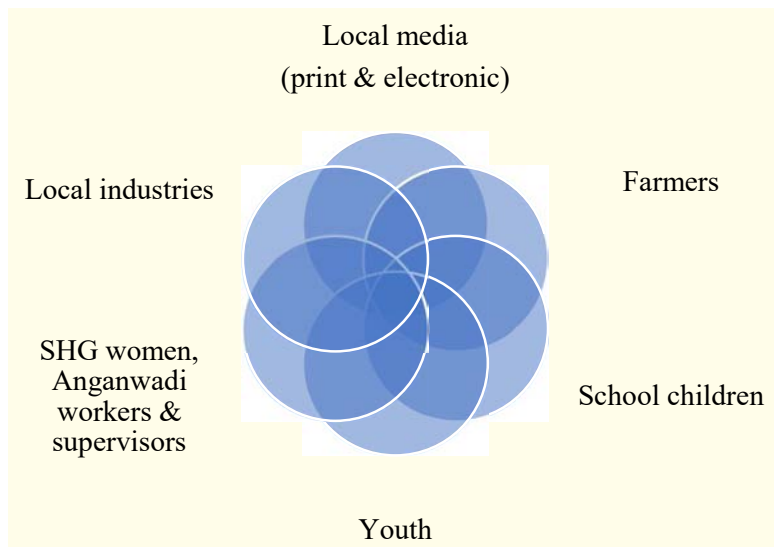


Figure 3: Stakeholders engaged through awareness workshops

A wide media campaign was run using media such as TV, radio, press, leaflets, posters and advertising on buses. The campaign was effective in

ensuring that all people of the district were aware of Water Management Methods.

- **Education:** The approach to education was two-fold. Initially the focus was on helping users to make changes in their own dwelling through adopting water efficient practices and technologies. The initiative was then extended to schools to ensure that children were actively engaged with the concept of cutting water wastage.
- **Farmers in drought- prone areas** were encouraged to adopt drip irrigation on a large scale and put an end to flood irrigation. After the programme, there was a 68 per cent increase in drip usage.
- **Consumer Options:** The campaign engaged with commercial sellers of water products, for example bathroom or kitchen suppliers. These businesses were encouraged to stock a wider range of water-saving alternatives, therefore allowing the newly educated consumer to have the option to choose a more water efficient product.
- **Business Engagement:** As part of the second stage of the project, a '50 Good Practices' guide was developed. This evaluated the use of water technology and behaviours in gardens, parks, buildings and industry. It provided businesses with a reference model for identifying effective methods of improving water efficiency.
- At the end of the campaign, almost 60 per cent of homes in Ramanagar had water harvesting and water recharge structures and had become habituated to recycling water.

On the Kannada New Year Day, the Deputy Commissioner went on a door-to-door campaign spreading the message of water conservation in Krishnapura Doddi village in Ramanagar district and launched the door-to-door campaign in which hundreds of college students participated. The district administration went on to make water conservation a household buzzword.

2. Targeted technical training and field exposure

In addition to individual and household level choices that could be exercised by citizens, emphasis was placed on building a technical understanding of new practices and technologies that would save water. Eminent resource persons such as B. V. Jayashree, Aiyappa Masagi, Water Resources Expert Radhakrishna Bhadti and progressive farmer Mr. Lakshme Gowda anchored sessions unveiling the various dimensions of water shortage crisis, rainwater harvesting, efficient utilization of rain water, reutilization of used water, simple methods of groundwater recharging etc.

The first emphasis was on promoting domestic rainwater harvesting structures and soak-pits. Under the leadership of the District Administration, 80% of

homes with a cement roof began implementing rainwater harvesting. Individual Household Latrines (IHHL) and Community toilets being constructed under the Swacch Bharat Mission were encouraged to have an accompanying soak-pit. Any lightly-used water that had been used to wash dishes, clothes or clean floors was directed to be disposed of in kitchen gardens or otherwise allowed to percolate into the ground. The message was spread that for every one litre of water used, eight litres of water recharge should be done.

Aiyappa Masagi, the founder and director of the Water Literacy Foundation led a field visit to his farm in Bangalore Rural district to build exposure to traditional, less water-intensive agricultural practices. A strong element of this training was to reduce dependence on tube wells that were being dug deeper and deeper in order to maintain a steady supply of water.

3. Creation of Community Watershed Assets

Community-level assessments of tube wells and water tanks that were not in use revealed that due to a build-up of silt, they were not effective recharge bodies. Through public meetings and convergence of funds under MNREGA and through CSR, many were identified to be completely revitalised.

In three villages in Bidadi Hobali (Hejjala, Ankanahalli and Bannikuppe villages), under the guidance of the CEO, ZP and community members, a participatory watershed programme was initiated. Through surveys and mapping of waterbodies, three tanks and 400 tube wells were shortlisted, all of which had long since dried up. Nearly five million rupees were mobilised from CSR budgets as well as through MNREGA in order to revitalise these water sources. The rejuvenation plan was designed by technical advisors in close collaboration with the Gram Sabhas and district officials in order to ensure that there was constant community buy-in and a willingness to maintain these waterbodies in the coming years. Members of the community were mobilised to volunteer their time and labour in order to remove the silt that had built up in these tube wells and the larger tanks and they were trained in how to conduct annual cleaning before the monsoon in order to increase water table recharge. These efforts would satisfy greater groundwater demand in coming years, but decreased rainfall and surface level run-off were still a threat.

Working with the community members in these three villages, a second phase was outlined for the programme in which 150,000 saplings would be planted, nearly all of which were fruit-bearing trees. Villagers were activated to protect the saplings and prevent anyone from cutting them down. These trees were planted along sloped areas to hold loose top soil in place and improve percolation. Through the advice of the District Administration, farmers identified empty field before the next monsoon and planted grass, which

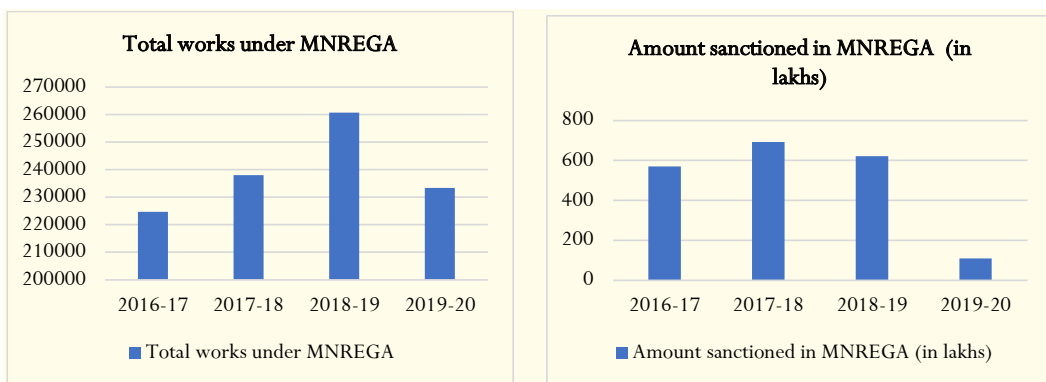
would have the added benefit of providing fodder for livestock. To reduce the communities' carbon footprint, 10 biogas units would be installed. In all, 2000 households surrounding the shortlisted waterbodies were expected to gain additional sources of water and more than 4000 households would receive additional benefits through the broader programme.

As the work was slated to begin, stakeholders contributed in a variety of ways. Karseva was emphasised and local farmers arranged JCBs and tractors as well as providing labour for the desilting process. Public representatives motivated the public to imagine a broader scope of impact and commit further resources. Through the District Administration and technical partners, plans were drawn up to strengthen the tank bunds, clean feeder canals and ensure adequate fencing for the project.

Once the public had been mobilised to take part in this mission, community members led counselling efforts to build a sense of collective ownership and stewardship of the scarce natural resource itself. They convinced friends and neighbours who were using water in inefficient or wasteful ways to use less in that year and instead to invest in increasing the quantum of water collected for the next season. This was often difficult but they trained themselves to think in terms of efficient and equitable utilisation across multiple years.

Convergence with MNREGA

MNREGA was designed with the vision to not just combat rural unemployment but also to create assets to support natural resource management and overall community development. However, utilisation of funds and completion of work undertaken remains a challenge. One component of the Jalaandolana was to increase sanctioned projects within the 'Drought-proofing' category.



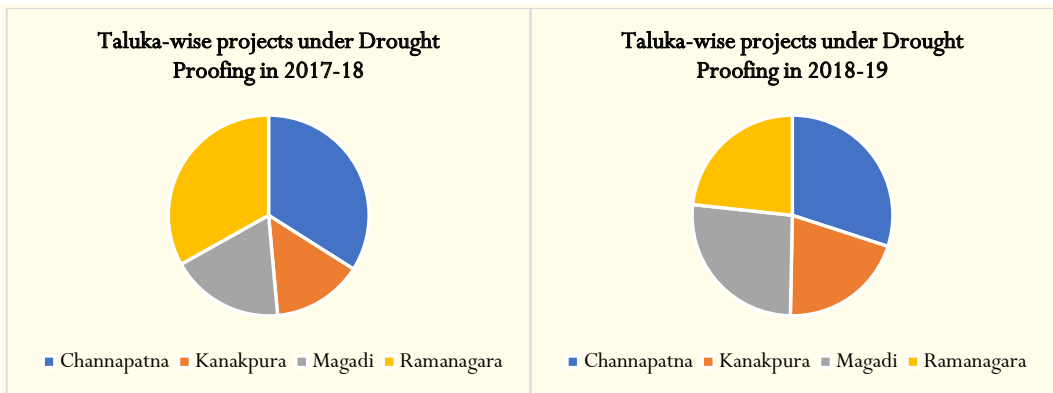
Source: MGNREGA Public Data Portal

Figures 4 & 5: Graphs showing total works and funds sanctioned under MNREGA between 2016-17 and 2019-20

Through these multi-stakeholder efforts, the total number of MNREGA projects in Ramanagara district increased from 2,24,664 in 2016-17 to 2,37,987 in 2017-18 and 2,60,737 in 2018-19, or an approximately 7.75 per cent average increase per year. The funds sanctioned for these projects rose between 2016-17 and 2017-18 from 56.95 million rupees to 69.27 million rupees. There was a slight reduction in sanctioned funds in 2018-19 before a larger decrease in 2019-20, presumably due to COVID-19 and the pan-India lockdown during the summer. At the same time, the number of projects in the 'Drought proofing' category continued to rise steadily in Ramanagara district from 1,291 in 2016-17 to 4,307 in 2019-20.

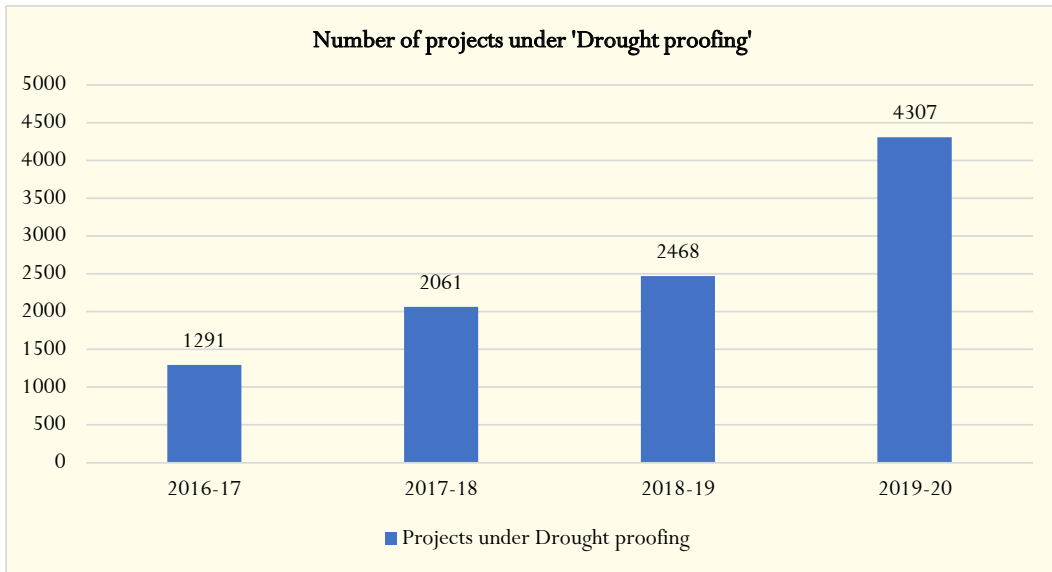
Drought-proofing projects included multi-arch check dams, new water tanks, borewell recharge structures, trench-cum-bunds and others. In the first year of the Jalaandolana, three out of four talukas in Ramanagara district increased the number of drought-proofing projects, with Magadi taluka going from 378 in 2016-17 to 651 the next year.

Thus, the creation and revitalisation of community watershed structures was successful due to the engagement of different stakeholders and adoption of a broad perspective to address the root causes of the long-standing drought.



Source: MGNREGA Public Data Portal

Figures 6 & 7: Taluka-wise MNREGA projects under Drought proofing in Ramanagara district in 2017-18 and 2018-19



Source: MGNREGA Public Data Portal

Figure 8: Number of MNREGA projects in 'Drought proofing' category between 2016-17 to 2019-20

Table 4: Projects under Drought Proofing

Taluka Name	Projects under Drought Proofing in 2017-18	Projects under Drought Proofing in 2018-19
Channapatna	700	740
Kanakpura	301	502
Magadi	378	651
Ramanagara	682	575

Source: MGNREGA Public Data Portal

Outcomes

Through the Jalaandolana campaign, the district administration went on to make water conservation a buzzword among various segments of society.

- 168 educational establishments, 428 teachers and 70,000 students directly participated in the campaign's educational programme.
- Over 140 establishments selling products related to domestic water consumption were involved with the campaign. This helped increase the sales of water efficient fixtures; with one bathroom retailer reported a 58% rise in sales of automatic taps.
- All the gardens and nurseries in the district participated through the '50 Good Practices' stage.

District Administration, Ramanagara and prominent CSR partners were invited to present their experience leading the Jalaandolana at the United Nations Global Compact's (UNGC) 2nd Sustainable Development Goals (SDGs) Summit on the theme of "Leveraging CSR for Sustainable Development Goals" in December 2017. The model was appreciated by participants for its community mobilisation, building of collaborative corporate-government-community partnerships and wide-ranging impact.

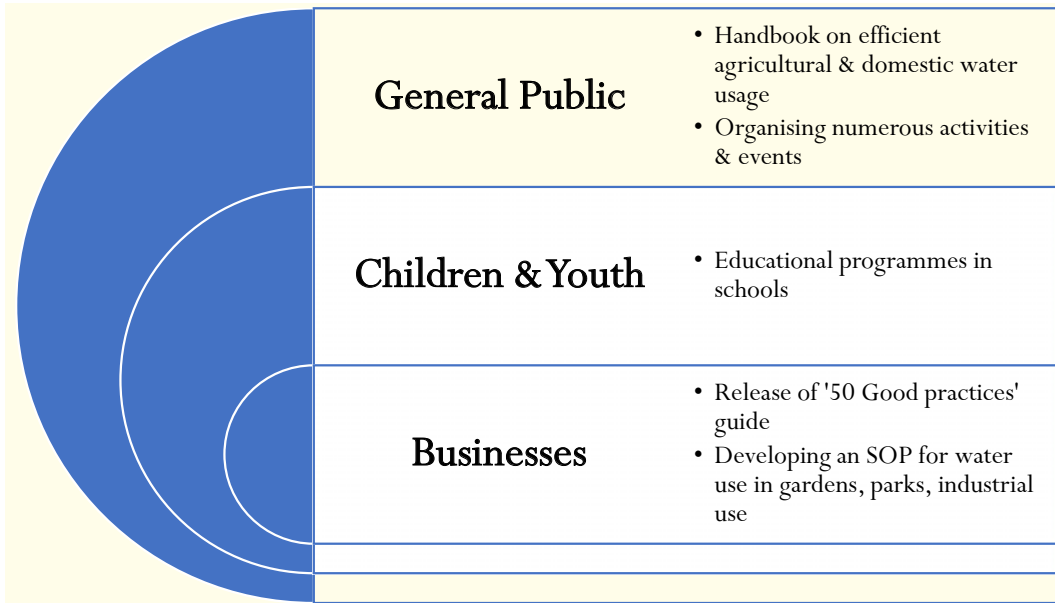


Figure 9: Public Engagement strategies implemented across Jalaandolana

However, the key outcome was that after 2017 the population of Ramanagara district increased by over 3 per cent, yet daily water use reduced from 848,000m³ to 615,000m³ in the same period. Surveys revealed that per capita use reduced from 150 litres/day in 2016 to 99 litres/day in 2018. In 2019, Mr. R V Deshpande, the Revenue Minister of Karnataka stated that due to severe drought, tankers had to be supplied in all districts except Ramanagar, Gadag, Chamarajanagar, Udipi and Dharwad (Times of India, 2019). During 2016, 650 villages of Ramanagar were supplied with water by water tankers. In 2018, not a single village required water supplied through tankers which was no mean achievement.

Conclusion

This project reveals the potential impact of engaging diverse strands of the public towards a common goal. Once common citizens began to accept their stake in conserving and ensuring optimum utilisation of scarce, natural resources, the results can be staggering. During the campaign, it was

discussed that human beings typically only harvest 4 – 10% of rainwater. If this amount can be increased to even 25% in a concentrated manner, then the majority of areas that are dependent on rain and facing constant droughts may see a massive change in their agricultural and industrial patterns as well as quality of life. In such campaigns, the government is only one stakeholder and success or failure is largely dependent on how much public action can be generated.

In 2016, all four blocks of Ramanagara district were under drought. However, in 2017, only one out of the four blocks remained under drought and over 80% of households with cement roofs had introduced rainwater harvesting. The water savings delivered through the project have been sustained and have created a genuine water saving culture. It is heartening to note that the Government of Karnataka has prioritised public drought preparedness strategies with the launch of 'Jalamrutha' and Government of India has launched 'Jala Sakthi' on 1st July 2019 on the same lines.

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Stranded Mahalaxmi Express Train on Flooded Grounds- A Case study on the Role of Relief and Rehabilitation Department for Disaster Management

Arun B. Unhale, IAS*

Overview

This Case Study summarized the disaster management preparedness and response during heavy rainfall, landslide and flood situation in India (27 July 2019). The case study is outcome of first-hand experience from the former Joint Secretary of Relief and Rehabilitation Department, Government of Maharashtra to make you acquaint with the kind of strategies adopted to deal with the disaster. The case study concludes by discussing the various dynamics action taken during an unprecedented disaster.

Introduction

Disasters are inevitable truth of our life, preventable but completely unavoidable and they are part of our living in this complex globalised, industrialized and civilized world. As per The Disaster Management Act, 2005 of India Disaster is defined as “a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or be 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”.

Ministry of Home Affairs, Government of India and UNDP in association with the State Government are implementing the Disaster Risk Management [DRM] programme in 169 districts across 17 States. In Maharashtra, the programme is being implemented in 14 districts namely Mumbai City, Mumbai Suburb, Kolhapur, Pune, etc. The Relief and Rehabilitation Department, Government of Maharashtra is the nodal agency for disaster management in the State and also the nodal department for implementation of the DRM programmes in the Maharashtra.

Though there is a recent paradigm shift in Disaster Management as prevention, preparedness and mitigation are being given more importance compared to the traditional rescue, relief and rehabilitation, there are still certain situation where rescue, relief and rehabilitation plays a critical role. One classic example of such incident is Heavy rainfall, landslide and flood situation in India (27 July 2019) in Maharashtra.

The Flood Situation

Maharashtra witnessed heavy rainfall on last Friday 26/07/2019 and the situation leading to flood and landslides in Mumbai and Pune area. This particular situation arose when the water level at Ulas river and outflow of Barvi dam led to water rising in the area, ultimately waterlogged the railway tracks. It was when the train crossed Badlapur, where it does not halt, that all of a sudden, the loco pilot found the tracks submerged and the engine was ploughing through high water. The train came to a halt at Chamtoli village. 1052 passengers were onboard on the train, this included 9 pregnant women, ladies, children, senior citizen and others. The train halted at 12:05 am and was trapped for next 15 hours till the rescue was completed. All the passengers were asleep and were made aware about the situation at dawn around 5am. Heavy rains during the operation was an additional factor to tackle during the logistics and safety of the teams and passengers.



Figure 1: Mahalaxmi Express train marooned in floodwaters in Badlapur, in the western Indian state of Maharashtra, Saturday, July 27, 2019.

Preparedness

In order to make citizens acquaint about the disaster, The India Meteorological Department (IMD) has been issuing regular weather warning bulletin and

alerts. National Disaster Management Authority (NDMA) also issued Do's and Don'ts during flood, landslide were disseminated to public through social media. NDRF teams were instructed to prepare themselves with incorporation of deep divers, nursing specialists, boat drivers. All the state and local authorities include Relief and Rehabilitation Department officials, state task forces and local administration were informed to be prepared.

Response

Considering the heavy rainfall, state government declared holiday for the schools and colleges. 11 flights, train services were cancelled due to heavy rains. However, Mahalakshmi Express (Mumbai to Kolhapur) allowed by the Central Railway to move, which got stuck between Vangani and Badlapur (100 Km far from Mumbai) with 1052 passengers. Similarly, numbers of people were also stuck in other areas of Badlapur including 45 persons in River Wing Resort and 70 persons at Kamba Petrol Pump.

The challenge of disaster management is reducing the harm disasters causes to society, the economy and most importantly the lives of individuals and communities. That task requires disaster managers to reduce uncertainty, to calculate and compare costs and benefits and to manage resources, often on a much larger scale and at a much faster pace than are supported by methods and means for solving ordinary problems.

Optimum resource management could only be possible when the decision maker is fully aware the availability of resources. During July 2019 rainfall the responses was only possible when decision makers fully understand the situation, allocate the resources and alter the strategies as per the ground realities.





Figure 2 & 3: Rescue Operation from Mahalakshmi Express Train



Figure 4: Passengers stranded in the Mahalaxmi Express on the flooded railway tracks at Vangani being rescued

The summary of action taken by the relief and rehabilitation department of Maharashtra government could be summarized under the following series of events.

- On 27th July 2019 at 5:25 am Central Railway reported to the Mantralaya control room that is up to 1052 people were stranded in Mahalakshmi Express at Vangani-Badlapur.
- At 5:30 am the information of disaster is communicated to State Disaster Unit and District Disaster Management, Thane.
- Immediately after receipt of information State Emergency Management Team, Maharashtra started urgent planning further action.
- State Disaster Management Department informed that Army, Air force, Navy, National Disaster Response Force to start the action.
- Thane Disaster Response Force reached to the disaster venue at 9:15 am.
- Regular announcements were made to reassure the passengers about the rescue team arrival. Food (Milk, Poha, fruits) & clean water was arranged and supplied with the help of local villages, so no panic was created at the site.
- Andheri Squad of NDRF reached to the venue at 9:30 am with 6 boats.
- NDRF with local police, Kalyan Dombivali Mahanagarपालिका, firefighters, Tehsildar, and local administration immediately started the rescue operation.
- State emergency operation centre deployed Navy, Air force to the location
- 50 people rescued by NDRF at 11:00 am.
- Navy further deployed eight rescue teams. These teams include flood relief teams and specialist divers. These teams moved by road, in addition of one Helicopter was also launched with special equipment for clearance divers to be dropped close to train for assistance and situation assessment.
- Along with TDRF (Local task Force), Navy and NDRF works. One Army Column has been moved to Location.
- 2 units of Army along with 130 trained staff, food packages, water and rescue material were moved. CO/15AD Kalina had moved with air force for arial survey.
- NDRF reported that till 11:50, there are 117 people were rescued by them.
- NDRF reported that the total 500 passengers have been rescued till 1:00 pm.
- Air force reported that the helicopter has been launched to location near Kalyan.

- Air force reported that IAF helicopter at site and dropping ladder for rescue
- Air force reported that IAF that 9 people have been rescued by IAF helicopter and heading that Air Force
- GoM provided food packets to evacuated people along with blankets and first aid.
- 1052 plus people rescued by NDRF so far including 9 pregnant women. Not a single casualty was encountered during this operation.
- Ambulances with 27 doctors with gynaecologists deployed for emergency
- Necessary arrangement like food, etc. made at Sahyadri Mangal Karyalaya, Badlapur
- 14 buses, 3 tempos arranged for further movement up till Badlapur
- Teams of NDRF, Indian Navy, Air Force, Railways, State Administration have safely rescued all the 1052 passengers stranded in Mahalakshmi Express. The operation was successfully completed at 3pm without any casualty or loss.
- The Special train has been arranged for passengers from other routes available
- Disaster Management cell, Government of Maharashtra was closely monitoring & co-ordinating the entire operation.

Conclusion

In response to a natural disaster, it is highly essential remain informed about the situation, availability of resources, pressure management with high emotional quotient, micro-level planning and high motivation to ground workers. Overall appreciation poured from the citizen and dignitaries including Amitabh Bachchan who were aware about the situation from the media updates.

** Managing Director-Maharashtra State Co-Operative Cotton Grower's Marketing Federation Limited, Mumbai & Former Joint Secretary, Relief and Rehabilitation Department (R&R), Government of Maharashtra*

Gopalganj Floods 2020 - in COVID-19 Era Preparedness, Response, Assessment & Lesson Learnt

Dr. Nawal Kishor Choudhary, IAS*

Background

Gopalganj District is one of the flood prone districts of 28 districts of Bihar. It was established in 02-10-1973. Geographically it is located between 83.54° - 85.56° latitude and 26.12° - 26.39° north longitude. In the north-west of this District East Champaran district and Kushinagar district of UP State are located, In the south of this district Siwan and Saran districts are located, In the east of this district Muzaffarpur district is located and to west of this Deoria district of UP is located. According to the 2011 census total population of this area is 2558037 people. Density of population is 1260 and Gender ratio is 1021. Out of total population, 6.35% of population lives in Urban area and 93.65% lives in Rural area. Gopalganj district covers 2,033 square kilometres (785 sq mi) in area and ranks as the 26th largest district in the state of Bihar.

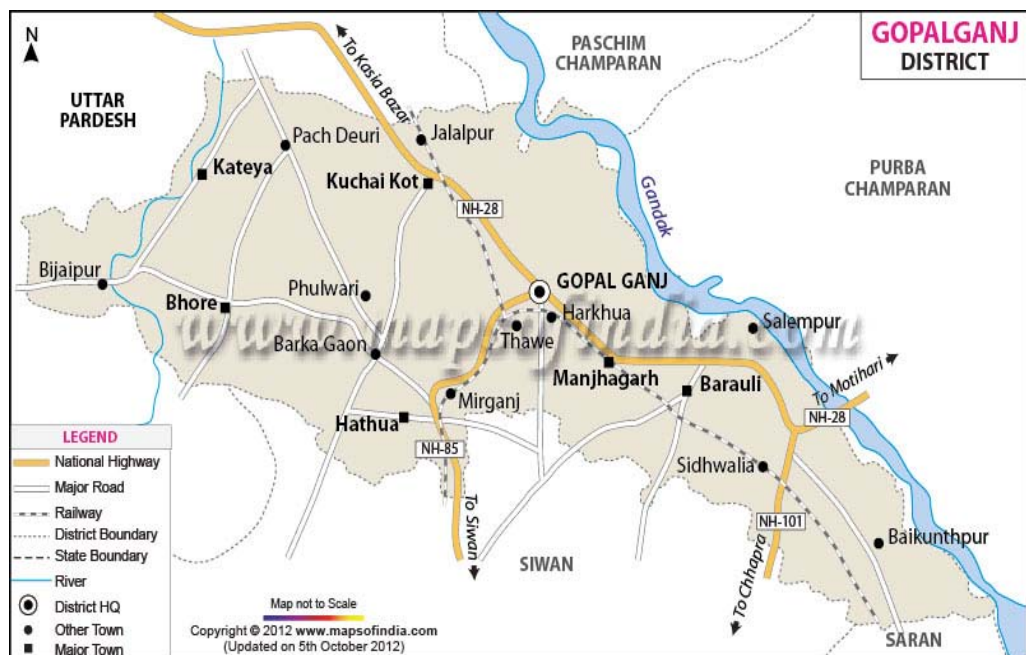


Figure 1: Map of Gopalganj

The Gandak river enters the district from northern and covers and affects six blocks, Kuchaikote, Gopalganj, Sidhwalia, Barauli, Manjha and Baikunthpur. The Gandak river supported by tributaries like Jharahi, Khanwa, Daha, Dhanahi etc., give a big status of river. To stop the vagaries of the river 160.72km Saran embankment was constructed. Parallel to Saran embankment Jamidari embankment and many Chharki were also constructed which protect river water to safeguard of saran embankment. The unique geo-physical settings of the district make it one of the most vulnerable areas to floods of the state.

S.no.	Name of Embankment	Length (in kilometer)
1	Saran	72.00
2	Chharkis	80.22
3	Kala Matihiniya Embankment	8.50
Total		160.72

Administrative Setup

Gopalganj district has two subdivision including the Sadar Division and 14 Revenue Circles & blocks (Bainkuthpur, Sidhwalia, Barauli, Manjha, Gopalganj, Kuchaikote, Thewe, Hathua, Uchkagaon, Kateya, Bhore, Panchveri, Vijaipur) and 18 Police Stations (Bainkuthpur, Sidhwalia, Barauli, Manjha, Gopalganj, Kuchaikote, Thewe, Hathua, Uchkagaon, Kateya, Bhore, Panchveri, Vijaipur, Yadopur, Gopalpur, Bishambharpur, Mohammadpur).

Cause of Flood & Background of the incident

Gopalganj has long history of flooding. Floods in the district are linked to the river Gandak. The river Gandak enter Gopalganj in Kuchaikote block originated from Nepal Bed slope of this rivers is very sharp in Nepal. Due to heavy rain in Nepal Gandak barrage get heavy pressure. From Gandak barrage large amount of water released and flooded the Gopalganj. Saran embankment not made for water discharge more than 6 lac cusec. This year water flow exceeds more than 8 lac cusecs. the water flow exceeds the capacity of river resulting to flooding in the whole area. Floods have occurred at regular interval; the flood of 2020 is most devastating breaking all the previous records. In broader aspects, we can divide the cause of this flood in two categories.

Natural

- Excessive water in channel due to release of water from Balmiki Nagar barrage.
- Breaching of embankment.
- Bank erosion and silting.
- Aggravation of river bed.

Man Made

- Indiscriminate encroachment
- Increasing economic and development activities in flood plain.
- Inadequate maintenance

Consequences of flood - 2020

Due to large amount of discharge of water from Balmiki Nagar Barage two wave of destructive flood affected the Gopalganj in 2020. This was one of the most severe floods in the Gopalganj history. Out of 14 circle 5 are hit badly. Baikunthpur Barauli and Sidhwaliya are worst affected circle of the district.

➤ First wave

The first wave of flood started its chaos on mid-July, 2020 by affecting 415376 people of 201 village of 64 panchayat of Gopalganj Sadar, Baikunthpur, Manjha, Sidhwaliya and Barauli circle of the district. This was most distractive wave; it has breaches embankment at 11 places.

S. no.	Block/Village	Breach Points	Length (in meter)
1	Barauli/Devapur	2.40 Km of Bhaisahi Puraina Chharki	256-00
2	Barauli/Devapur	124.80 km of Saran Embankment Near Devapur Village	188-00
3	Barauli/Devapur	125.70 km of Saran Embankment Near Devapur Village	50.00
4	Baikunthpur/Paknha	4.0 Km of Bandhouli Shitalpur Fajullahpur Jamindari Embankment	300.00
5	Baikunthpur/Bangara	87.25 km of Saran Embankment Near Bangara Village	111-00
6	Baikunthpur/Chiutahan	91.50 km of Saran Embankment Near Chiutahan Village	38-00
7	Baikunthpur/Sonwaliya	5.10 km of Baikunthpur Retire line Near Sonwaliya Village	38-00
8	Baikunthpur/Sonwaliya	5.20 km of Baikunthpur Retire line Near Sonwaliya Village	39-00
9	Baikunthpur/Marwan Dhala	5.70 km of Baikunthpur Retire line Near Marwan Dhala.	49-00
10	Baikunthpur/Bangara	5.70 km of Baikunthpur Retire line Near Bangara Village	68-00
11	Baikunthpur/Munja	8.50 km of Baikunthpur Retire line Near Munja Village	47-00

➤ Second Phase

The flood wave was again repeated in September and simultaneously, compounded the problem. From September 26, the second wave affected 49750 people of 83 village of Baikunthpur, Barauli and Sidhwaliya circle of the district. It was most distractive because the restoration and rehabilitation process have just started in few places. Flood 2020 makes a break from the past in terms of its intensity, unpredictability and its un-seasonality.

Flood Management (Preparedness & Response): An Integrated Approach

In Covid-19 like pandemic situation it is very challenging task to manage the flood like situation. Simultaneous increase of infection and increased distress due to flooding, resulting from overlapping hazards could result in an unprecedented disaster. Our entire planning execution & monitoring take care of Covid-19 protocols. Therefore, we decide maximum utilization of technology and community-based approach. We divide flood management 2020 in three categories. Pre flood management, during flood and post flood management.

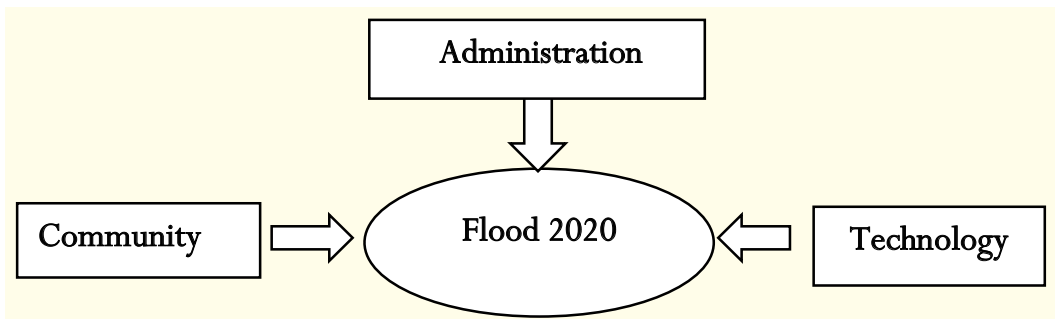


Figure 2: Flood Management

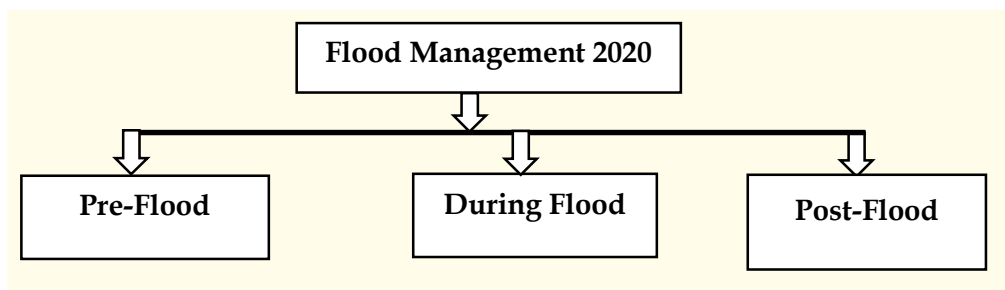


Figure 3: Flood Management 2020

There was a fear that the flood hazard will collide with the Covid-19 pandemic and amplify it in a manner that emergency responses to both will get disrupted. The district administration's strategy to mitigate the effects of flooding needs to be updated in light of the deadly pandemic.

a) Pre-Flood Management: Preparedness

Pre-Planning for flood management focuses on plans to respond to a threat or occurrence of flooding in Gopalganj district. It takes into account an estimation of emergency needs and identifies the resources to meet these needs. It also involves the preparation of well-designed plans to structure the entire post-flooding response, and familiarizing the stakeholders, particularly the

communities through training and simulation exercises. This phase included taking all necessary measures for planning, capacity building and other preparedness so as to be in a state of readiness to respond, in the event of flooding. This Stage will also include development of identification of teams for maintaining the drains and roads, mobilization of resources and taking measures in terms of equipping, providing training, conducting exercises for prevention of water logging/ inundation etc. The various measure undertaken by Gopalganj administration for flood preparedness before the onset of monsoon season 2020 are summarized below.

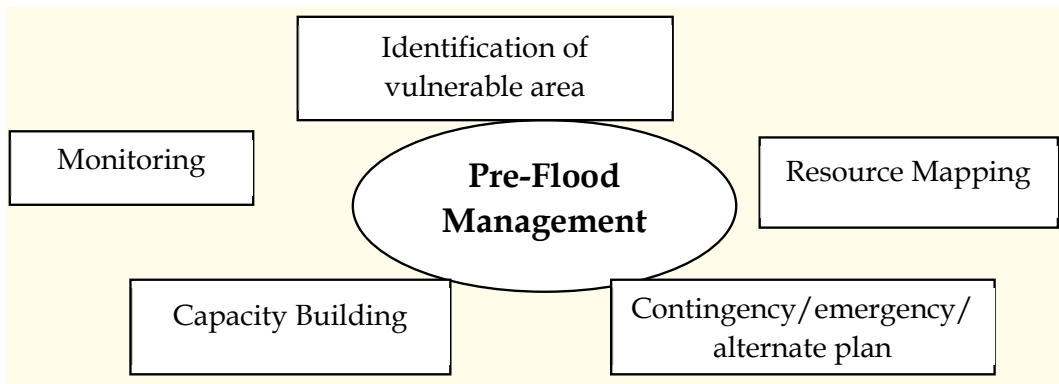


Figure 4: Pre-Flood management

- *Repairing rain gage and sharing the rain gage data*
- *Identification of vulnerable area:*
 - Identification of vulnerable people of the society in flood prone areas.
 - Identification of rats hole and others for Protection of Embankments.
- *Information and Communication Dissemination*
- *Resource Mapping*
 - Identification of Relief shelter/community kitchen and assuring basic facilities in the shelter
 - Availability of Country Boats / motorboats / tent/ Large Nets (Mahajal) for rescue operation.
 - Polythene sheets and basic food materials.
 - Procurement of Generator Set, Petromax, etc., for lighting.
 - Arrangement of Fodder and Medicine for domestic animals.
 - Temporary go down to be identified for storage of food grains in pre-flood period to ensure availability of food grains during flood period.
 - Mobile medical Team & medical camp

- Arrangement of Portable Drinking water with installation of hand pumps at elevated areas of flood prone villages
- *Contingency Plan for deployment of Lifejackets/Boats/Motorboats & Medicine for Humans*
- *Alternate plan for transportation and communication.*
- *Capacity Building:*
 - Training of divers / Community
 - Setting up of Relief and Rescue Team
 - Mock Exercise / Mock drills
- *Monitoring:*
 - Nodal Officer Nomination and District Level task Force Constitution.
 - Deployment of JE/home guards on each kilometer of Embankment.
 - Regular visit of district administration on embankment.

b) Flood Management during Flood: Rescue and Response

The district administration mounted an all-out effort to meet this challenge on a war footing. Working day and night, the officials were utilizing all possible means to reach the flood affected families and provide them relief. The following were some of the immediate relief measures taken by the District Administration in order provide succor to the affected people.

➤ *Early warning*

When department received the early warning from the **Bihar Water Resource Department** the information disseminated to each surrounded village by using the miking and social media.

➤ *Deployment of Board/motor board/SDRF/NDRF & Evacuation of People*

To evacuation of people and cattle total 71 Boats 24 motor boat and one team of SDRF and 2 team of NDRF deployed and total 1.9 lakh people evocated safely and shifted to predefined disaster relief camp and other high places.

➤ *Started Disaster relief Camp and Community kitchen*

Setting up safe shelters for flood victims and ensuring of social distancing needs to be followed in the relief camps was the big challenge for us .For stay of flood affected people total 11 flood relief camps were started immediately and ensure all facilities like food, drinking water and sanitation etc. those who have not come to disaster relief camp, 273 community kitchen started .To maintained the Covid-19 protocol the District Administration decided to start

community kitchen at ward level. The entire community kitchen operated by local community and monitored by administration

Rescue Teams	No of Team	Appointed people
NDRE/ SDRF	04	120

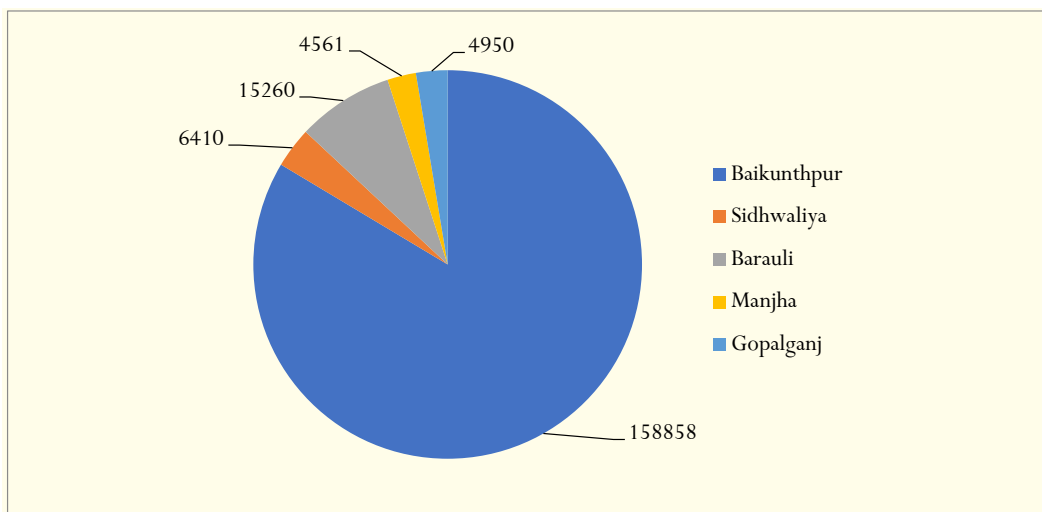


Figure 5: Evacuation of people

➤ **Food Packet Distribution**

As per the requirement of affected people food distribution strategy employed. District administration start food packed distribution by boat/ motorboat and air dropping. Number of critical areas, that were difficult to reach by boats, were served by dropping off of food packets with the help of four Air Force choppers for about five days, dropping about 7288 food packets.

No of Flood relief Camps	No of People in Relief Camps	Total no of Community Kitchen	No of Meals provided in community Kitchen
11	112373	273	2724942

➤ **Human Health**

To provide medical assistant for flood affected people and prevent COVID-19, 390 Medical Camps had organized and ensured COVID-19 test facilities. More than 30 medical teams were farmed. Medical teams visited at different places and distributed 9079 halogen tablets. 2168 kg of bleaching powder fogged in different places. District administration also identify pregnant woman and new born baby provide medical and food assistance.

➤ *Animal Husbandry*

Animal, husbandry department immediately started 10 medical relief camp near disaster relief center for treatment of affected animal. Medical staff daily visited many villages and organized more than 70 medical camp at different places and provide medical assistance for more than 7000 animals. To prevent from different disease animal husbandry department had also organized vaccination camp at different places. They distributed 129 quintal fodder for food of animals.

➤ *Law and order*

Maintaining the law and order is very challenging task during the flood and COVID-19 era. Its observed people block the road. Frequently supply chain get badly affected hence to maintain the law-and-order district administration identifies the vulnerable area and deploy police and Nodal Officer. Nodal Officer was in touch with local representative and maintains the law and order.

➤ *Restoration of necessary services*

Due to flood all necessary services like lighting, Telecommunication, Water supply etc. Get badly affected. District administration immediately communicate with concern department and try to restore the necessary services within one week we are able to restore necessary services in many areas.

➤ *Distribution of gratuity relief*

To provide immediate relief district administration has used the prepared data base (Before flood timing). When an area has declared as flood effected area gratuity relief (GR) distribution started immediately on those area.

➤ *Public Grievance and Media management*

To address the public grievances block level and District level Control Room activated and the complains of public directly sent to the concern person/ Department. To stop rumours district administration daily briefs the media about current situation of floods.

Post Flood management 2020

There must be a realization that minimizing the risk and damage from floods may be possible by adopting a multi-pronged strategy with a mix of structural and non-structural measures and three level of planning that is short term, medium term and long term.

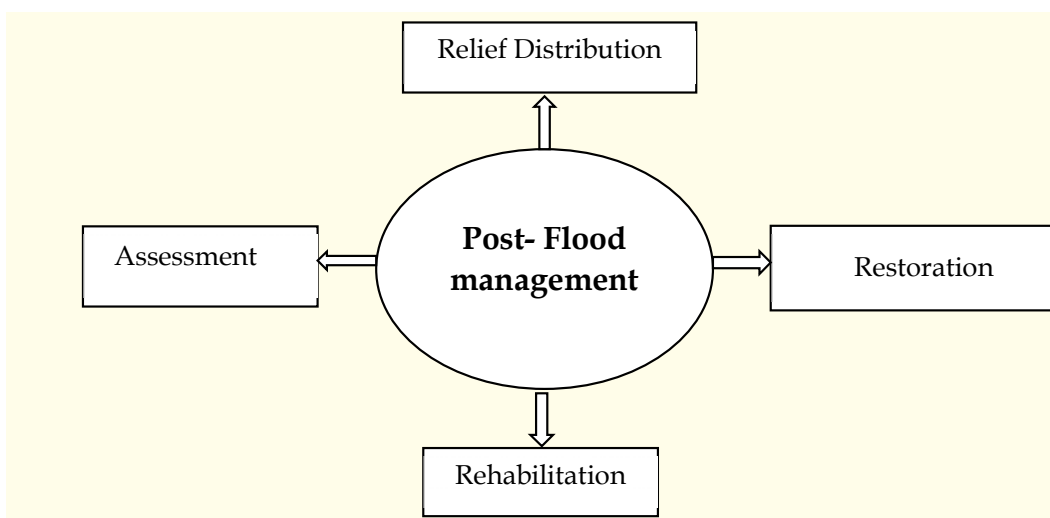


Figure 6: Post flood Management

a) Relief Distribution

➤ *Cash Support*

Rs.58.39 Lakh are still distributed through RTGS until the report is compiled. Circle wise distribution given below:

Name of Circle	No of family	Payment (in RS)
Baikunthpur	36577	21946200
Barauli	28140	16884000
Gopalganj	3685	2211000
Manjha	6838	4102800
Sidhwalia	22091	13254600
Total	97331	58398600

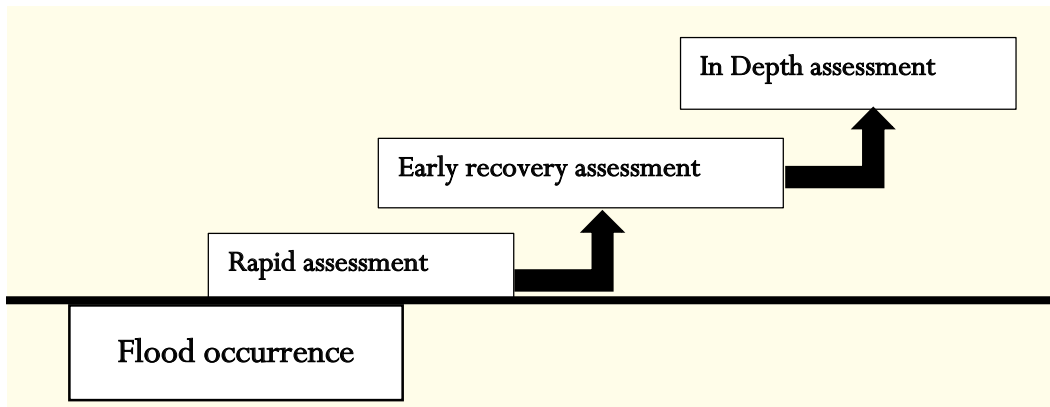
➤ *Food Grain Support*

As stated above, about 4.5 lakh people had been affected which would roughly mean that 1.12 lakh families require the relief support. The district administration ensured that it was mitigated to a considerable level by providing food grain per family. Through free price shop district administration provide extra food grain to affected people. About 3000 of food packet had been distributed.

b) Assessment

During flood emergencies, assessment of losses and resultant needs of the affected communities is important for flood relief management. The importance of assessing potential flood losses becomes evident when policy makers try to strike an optimal balance between the development needs of a specific area and therefore the level of flood risk society is willing to simply

accept. Three level of assessment conducted. Circle officer assess the losses and reported to the district. District team also visited for assessment. A central team also visited for assessment. We follow the three-step approach for assessment. Rapid assessment just after flood occurred and after that early recovery and in-depth assessment.



c) Restoration

➤ *Restoration of Embankments*

The floods breached embankments at 11 points and their immediate restoration required. Water resource department working at war level to restore the normal condition. Work is already in progress.

➤ *House*

This was the second biggest need of the poor, who suffer the most on this count. District administration proposed that these houses be redone with pucca construction using PMGY scheme for flood affected victim. The survey of destroyed and damaged houses had already completed.

➤ *Highways and Rural Roads*

Unprecedented floods also caused extensive damage State highways and a large network of rural roads. Above the topping of these roads in various places have led to erosion, violations of other damages several miles. Besides, a number of bridges and culverts had been extensively damaged; in some cases, even washed off. The road department assessed the losses and after getting fund from department they have restored many roadways with greater elevation.

➤ *Other Sectors*

PHED irrigation and other department have assessed the losses. And prepared a plan to restore the damaged and lost facilities. PHED assessed that damage

to its rural piped water schemes, hand pumps, and other related works and install the more than 100 pumps in different area.

➤ *Health*

Experiences abound that in the aftermath of a massive flood, peoples' sufferings can increase manifold. Health Department was actively working on this, by ensuring a wide scale campaign for disinfection. Treatment and provisions of medicines for diseases likely to occur, diarrhea, skin infections etc. were made by the district administration new medical center get identified.

d) Rehabilitation

Over 4.5 lakh people are displaced from their homes, caused by one of the worst floods ever been seen in over a decade. Several people who have been directly affected are in need for refuge and rehabilitation facilities in order to restore their lives. District administration completed the rehabilitation process to safely send the affected people in his/ her houses. Many government schemes are accelerated to provide rehabilitation of people and community.

e) Coordinating Emergency Response and Relief Operations

The Disaster Management Department had been working continuously to ensure effective coordination and synergy of efforts between multiple sector departments, district administration, the NDRF, community, and the NGOs. District emergency operation center working 24*7*365 days for prompt response and coordination between departments & resolve public grievances.

Impacts of the Flood

2020 floods which is considered as one of the worst floods in district in a decade. The flood during the year showed no signs of abating and prolonged for a considerable long time. The flood imposes heavy losses. Although the loss of lives are not very high but it have significant impact on people, society and economy. The flood affected 5 blocks out 14 blocks in the district. The overall flood situation in District continued to be grim for more than 2 months. Severely affecting about 4.5 lakh people. The worst affected blocks are Baikunthpur, Barauli and Sidhwaliya, Manjha. Floods caused extensive damages to agricultural crop human habitation and infrastructure sector. Some of these are summarized below.

a) Impacts on Human and livestock

Due to effective micro planning of evacuation, early warning and quick response not a single death of human reported. But we are not able to save 17 animal lives.

Total no of Human lost: 0

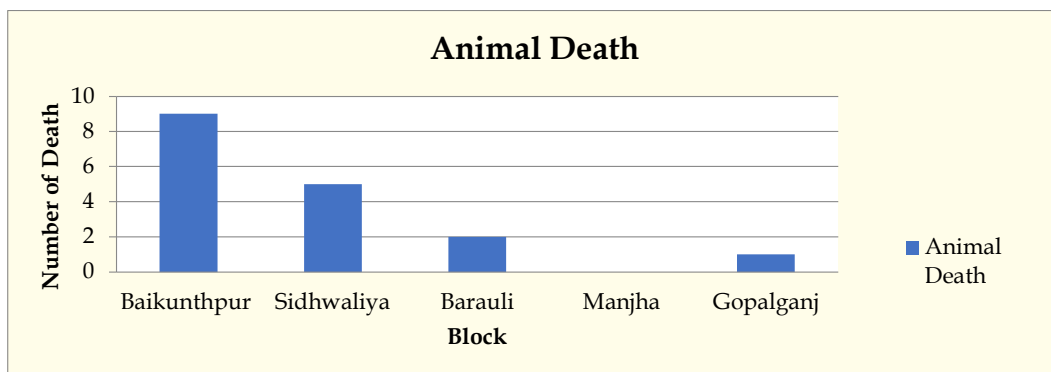


Figure 7: Animal deaths

b) Impacts on Infrastructure

The flooding caused damages to business and infrastructure, such as transport or utilities like electricity and water supply. It has significant destructive impact on local and regional economy. People lost his houses huts and animal sheds.

➤ Houses

Flood 2020 destroys large number of houses and animal sheds. Rural poor, mostly live in the kuchha houses in the comparatively low-lying areas in their villages, and bear the maximum brunt of floods by way of losing their homesteads. The estimated losses are described in below table.

➤ Roadways

Most of the road was severely damaged including the state highways, RCD and RWD roads due to the waterlogging and inundation. Approximately 200 road damaged in many places.

S. no.	Name of Block	Pucca House		Kaccha House		Huts	Animal sheds	Estimated damaged house cost (in lakh)
		fully	Partially	fully	Partially			
1	Baikunthpur	157	210	68	92	325	115	644.692
2	Sidhwaliya	0	239	0	0	1012	125	70.69
3	Barauli	0	108	0	20	456	42	25.808
4	Manjha	2	44	1	14	320	10	15.439
5	Gopalganj	0	0	0	0	223	2	11.15
Total		159	601	69	126	2336	294	767.779

c) Impacts on Agriculture

Agriculture is the main source of income and employment of this area. A large number of agriculture land has been inundated in the district and remain inundated even after 2-3 months of the flooding. Kharif crops in 32827-

hectare land have been damaged. Additionally, million7051.34hectares under sugarcane plantation have also been damaged. There is extensive damage to other perennial and horticultural activity like Banana, Litchies, Mangoes and Vegetables. Coupled with massive losses of seedlings of various crops for coming Rabi season.

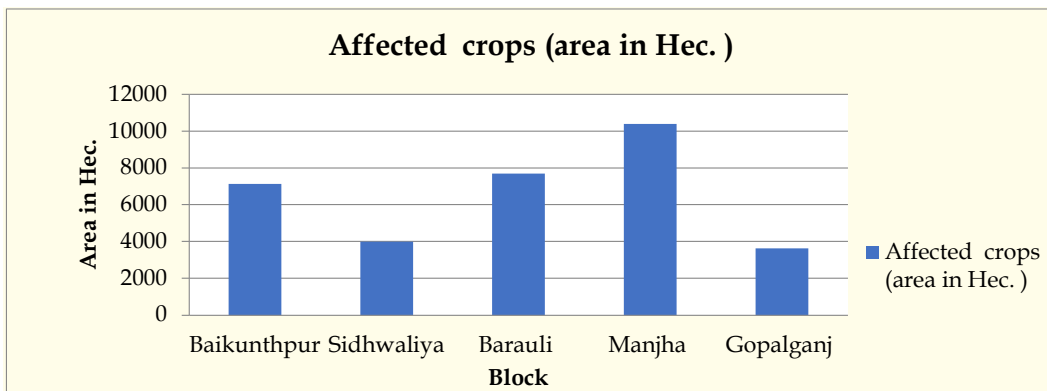


Figure 8: Affected crops

Conclusion, Lesson Learnt & Way forward

We need an hour to receive an integrated, high-risk, multi-stakeholder approach, to emphasize disaster risk reduction, readiness, simplification of aid distribution system, with emphasis social independence to support local resources and practices. Among other things, the Government must make the following non-structural, structures measures to manage flooding in a holistic manner.

➤ **Strengthening of Embankments:**

Floods in Gopalganj are caused primarily from the generation of high flows in upper catchments of rivers on account of extremely high rains and steep gradients. And resulting of breaching of Embankments and long-term solution to the problem, therefore, lies in controlling and regulating. The flow of rivers by providing a number of reservoirs in the upper reaches of the main rivers and construction of pakka embankment. To control the high volume of river flow we need strengthening of embankment. There is also a need for putting in place mechanism of community involvement in maintenance of embankments for effective implementation in the pre monsoon seasons itself.

➤ **Satellite Survey to find the probable (damaged) part**

For more than 100 km length of embankment, it is very tough task to find the damaged and weaker section of embankment. To find the probable damaged and weaker part we can use satellite survey of embankment.

➤ **Pattern Study of River Path**

Every year river Gandak flooded the Gopalganj and this river is known for changing of his flow path. For flood management it is necessary to know the flow of river pattern and plan the flood management accordingly. Study of flow pattern gives us exact flow path during the monsoon season. and we are able to focus on these area.

➤ **Desiltation Strategies & Dredging Operation**

In the case of river Gandak in Gopalganj, mud is a big deal and a major cause of flooding. A Desiltation technique should be used at important sites. With help of Desiltation work 4 km long channel had constructed in Gopalganj block and we have observed we are able to divert the flow of river and protect the Gopalganj block. Desiltation work will provide clear path for water flow and reduces the losses.

➤ **Mitigation Measures**

Mitigation measures to be properly disseminated at each village/ and panchayat. We can apply different technology (like social media, geo informatics system etc.) and community involvement to disseminate mitigation measure at village and panchayat level. In flood 2020 Gram Raksha Samiti paly important role in minimization of losses.

➤ **Afforestation & Flood Resistant Crops**

It has been realized that climate changes is causing significant impact on the hydrological system and increasing the risk and vulnerability to flooding. There has been a loss of forest cover over the years in wetlands. Concerted action is required to be taken so as to restore the eroded green cover of the catchments areas of rivers to regulate water flows. To reduce the losses in agriculture, flood resistant Crops Should be developed which are and therefore, a system should be developed for changing cropping patterns by farness of such flood resistant varieties by adopting agriculture practices.

➤ **Risk Mapping at Village Level**

Risk identification, risk analysis, and risk mapping should be done at the village level to determine the risks that may affect the community. The capacity of local communities to respond to disasters should also be determined as well as spatial assessment and additional capacity building needs in terms of emergency pools, medical / emergency personnel, communication systems, resources and equipment etc. Based on the analysis of the evaluation study, a number of recommendations have been identified to scale up and further improve the flood management in Gopalganj.

** Collector & District Magistrate, Gopalganj district, Government of Bihar.*

Time, Space & Speed: A Study on Governance for Effective Disaster Response in Uttarakhand

S.A. Murugesan, IAS* and Binaya Bhusan Gadnayak**

Overview

“Time, Space & Speed” is a research document which offers a wealth of idea to help the decision makers, policy makers, officers directly involved with disaster response management of the state government and district administration and other stakeholders to understand the factors leading to organise the administrative machinery in a most critical situation implementing Incident Response System at state, district and subdivision level of Government of Uttarakhand. Out of many stakeholders, the bureaucracy played an important, impressive and imperative role during disaster response in India. The disaster management act, 2005 encourages and empowers the state government and district administration to take appropriate action for disaster response, mitigation and management. In this study, the authors have discussed various parameters which have been considered by the state Government to organise the administrative machinery which is functioning at village level and is spread right from subdivision to district, and state level in Uttarakhand. The factors of “time, space and speed related to organise and responding the disaster situation by the civil administration has been taken care during implementation of IRS at various level of administration of state government”. The study has also discussed various factors which contribute to act within the limit of time, space and speed such as; a) identification of suitable officer to men various positions in Incident Response Team (IRT) as per Incident Response System (IRS) (Adapted version of Incident Command System), b) smooth multi-agency coordination with role clarity during response, c) establishing mechanism for smooth on-site management, involving outside agencies with effective command and control, d) resource management specially prepositioning of resource (to speed up response with appropriate time) and procedures for mobilisation of resource (space) (some of resource are not under direct command and control of civil administration) and e) development of mechanism to sustain the capacity building of the administrative machinery, NGO, Community and Media for effective and swift disaster response as per IRS. During conduct of the study,

a methodological review of the scant, but widening, pool of research literature directly related to the disaster response was also conducted to find relevance of Incident Response System with time, space and speed to reach at the affected communities.

Introduction

To Einstein, time is the “fourth dimension.” Space is described as a three-dimensional arena, which provides a traveller with coordinates – such as length, width and height – showing its location. Speed defined as the rate of change of position of an object in any direction. Einstein’s theory of special relativity says that time slows down or speeds up depending on how fast you move relative to something else. pertaining to the above statement it has been observed that during disaster response, especially deployment of resource, coordination with responding departments/ agencies, managing command and control during reinforcing the resource and demobilising resources to save the lives and property of people, the principles of “time, space and speed” equally played an important role. This indicates that how/ when you collect/ receive information (TIME), when you respond the situation and the level of preparedness (SPACE) and finally how you respond that particular situation (SPEED). The objective of the study is to measure relevance of principles of Incident Response System for effective response during a crisis situation within the limit of “time, space and speed”.

The year 2013 was one of the turning points in the history of disaster management of Government of Uttarakhand. Beyond the challenges, complications and compulsions during implementation of IRS in Uttarakhand, this study reflects recommendations and suggestions to manage the unpredictable situations as per “time, space and speed” by the civil administration involving a number of participating agencies and sustainability of conduct of IRS training and Mock Exercises at subdivision, district and state level.

The Uttarakhand has a total geographic area of 53,483 km of which 86% is mountainous and 65% is covered by forest having about 10.08 million populations. Most of the northern part of the state is part of Greater Himalaya ranges, covered by the high Himalayan peaks and glaciers. The unique Himalayan ecosystem plays host to a large number of animals (including bharal, snow leopards, leopards and tigers), plants and rare herbs. Two of India’s mightiest rivers, the Ganges and the Yamuna take birth in the glaciers of Uttarakhand, and are fed by myriad lakes, glacial melts and streams in the region. The Uttarakhand has been divided in to two administrative regions known as Kumaon and Garhwal, has 13 districts and 79 subdivisions.

The Government administrative machinery of Uttarakhand is a bureaucratic organization and is spread out from right up to the state to village level. Officers of various departments of Government such as 1) Health; a) medical officer, b) ANM, c) ASHA workers, d) Anganwadi workers, 2) Revenue; a) Patwari, 3) Home; a) Police b) Fire & Emergency Service, c) Gram Rakshi, 4) Panchayati Raj; a) Gram Panchayat Adhikari, b) Ward Member, c) Sarpanch, 5) Food and civil supply; a) Public Distribution System (PDS) outlet owners, 6) Public Works Department, 7) Jal Sansthan (Drinking water), 8) Road & Transport, 9) Rural Works Department, 10) Education, 11) Irrigation, and 12) Power etc. are available at the village or Panchayat level (excluding few departments) and their higher formations are spread right up to subdivision, district, state and central Government. These departments are primarily responsible to cater for various essential services to the people of Uttarakhand.

In this research it has been found that the IRT which is a part of the bureaucratic system and a combination of various Government departments having different chain of command and control is better organised to respond extreme conditions due to role clarity among all stakeholders and policy support from the highest authority of the state and central Government.

Hypothesis & Structure of the Research

Hypothesis

Organising State Administrative Machinery for Swift Disaster Response
Implementing Incident Response System in Uttarakhand.

IRS & its Brief History in India

The Incident Response System (IRS) was adapted from Incident Command System (ICS) which was originally developed through a cooperative effort among a number of federal states and local governmental agencies in response to the harmful disorder that occurred among various organizations (e.g., Municipal and County Fire Departments, the California Department of Forestry, and state and federal governments) attempting to suppress massive wild land fires in California during the 1970s.

The three-tier system: In India there are three tier administrative arrangements that are; a) central Government, b) state Government and c) district administration which coordinate with each other for functioning of day-to-day business. Again, the district administration is also having its own three tiers system that is a) district, b) subdivision and c) tehsil or block administration. It has also been observed that in every 40 kilometres of diameter (wherever habitation is available) in India, one can get district, subdivision, tehsil or block Headquarters. In some places three establishments are also found. Each administrative jurisdiction will be having about 30 to 60 officers of

different level belonging to different departments of state Government which varies from jurisdiction to jurisdiction. Therefore, the principle of ICS after adaptation which is known as IRS in India has been super imposed on various administrative jurisdictions (state, district and subdivision of Uttarakhand) to keep them under one command and control for disaster response. This has been done to organise the traditional bureaucratic organisation that is the administrative machinery for disaster response and to successfully manage the unpredictable disaster situations. The IRS organisation which is known as Incident Response Team (IRT) is given at Fig: 1 (adapted by Government of Uttarakhand). This organisation (Figure 1) is available at state, district and subdivision level of Government of Uttarakhand to respond disaster of any kind and type.

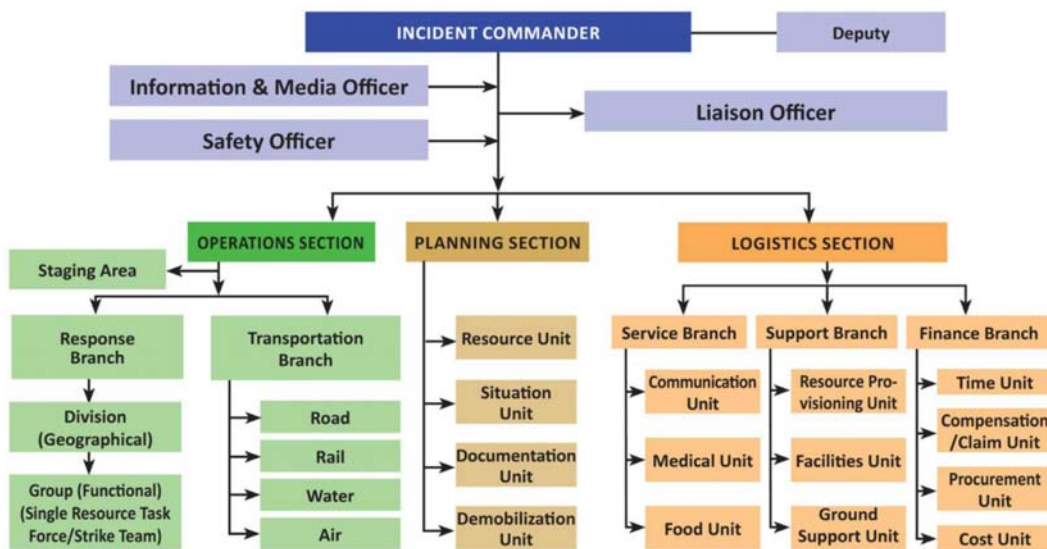


Figure 1: IRS Organisation or IRT

The IRT, as given in Figure 1, is available at various level of administration with an objective to coordinate various activities and respond in small, medium, large, complex, and dynamic emergency / disaster situations in Uttarakhand. The IRS is the official management tool for managing the disaster response activities in Government of Uttarakhand, India. It helps to assemble and unite officers from different departments of civil administration, uniformed services, corporates, NGOs and communities at large and organise them as a team known as IRT. Again, this IRT has been divided in two layers, command staff and general staff for effective command, control, planning, monitoring, mobilisation, deployment and demobilisation of resources for disaster response. The detail structure of the IRT in government of Uttarakhand is discussed in the subsequent chapter.

IRS Structure

The basic structure of a complete IRS organisation which is required to be activated for large-scale disasters response management, such as massive landslide, flood, earthquakes and cloud burst etc. affecting in any administrative jurisdiction of Government of Uttarakhand is shown in Figure 1. Keeping the principles of flexibility of IRS in mind, the state Government of Uttarakhand is also implementing it for response of small disasters. The objective of doing so is to put the system in place and to keep on practicing the process and procedures of IRS to manage the bigger disaster in case it occurs.

In general, the IRS is constructed to be vigilant around five major functions such as; a) Responsible Officer, b) Command, c) Planning, d) Operations and e) Logistics & Finance. These building blocks presumably apply in non-routine situations and for IRS structures of all sizes. According to IRS logic, even when the IRT is very small at the initial level involving as few as two officers, all five elements are likely to be relevant to some extent. However, when the system is at the initial stage, one person may be able to manage all the five elements altogether. This has been decided as per span of control principles of IRS. Large-scale incidents usually require that components be relegated to their own “sections” where different individuals can manage each one separately. In addition, the sections may be divided into smaller functions as needed. The descriptions of five major functions of IRS are as follows;

- The Responsible Officer (RO) is the highest-ranking position in the IRS organisation in the Government of Uttarakhand. In Uttarakhand the position of RO has been established at state and district level. At state level, the RO is the chief secretary and at district level the RO is the district magistrate. The officer occupying this position is of the highest administrative position of the state Government and district administration and he /she is ultimately responsible for overall management of disaster response activity supported by command and general staff of IRS organisation or IRT.
- The Incident Commander (IC) is the one functional position that is always filled. Up to three sections such as operations, planning and logistic and finance report directly to the IC and RO. At the section level, the officer in charge is designated as Chief.
- The Operations Section (OSC) is responsible for the development and execution of all tactical operations directly related to the achievement of primary goals, objectives and Incident Action Plan (IAP) of the IRS. The OSC activates and supervises resources in accordance with the IAP developed by the planning section.

- The Planning Section develops the IAP to accomplish the system's objectives. It collects, evaluates, and disseminates information about the development of the incident and status of resources. Information is needed to understand the situation, predict probable courses of events and prepare alternative strategies which are performed by this section.
- The Logistics & Finance Section provides facilities and services (by providing resource) including monitors costs related to the disaster response and it provides accounting, procurement and cost analysis to support IRS organisation or IRT personnel.
- In addition, to the primary incident response activities of operations, planning and logistics & finance, the RO has responsibility for conducting and providing several other important services, depending on the size and type of disaster. The RO may find it necessary to delegate authority for performing these functions to other officers. These officers constitute the Command Staff such as the a) Information and Media Officer who is responsible for the formulation and release of information about the incident to the news media and other agencies seeking information about the incident, b) the Safety Officer⁷ who monitors and assesses safety conditions and develops measures to ensure the safety of all personnel/responders and community and c) the Liaison Officer who is the point of contact for the assisting and cooperating agencies. Other major structural components employed as needed are shown in Figure 1.

Research

Dharchula is a subdivision of district Pithoragarh of Uttarakhand (India) is an ancient trading town for the trans-Himalayan trade routes. It is surrounded by high mountains and is situated in a valley, on the banks of the Kali river at 915 m (3,002 ft) elevation. It lies about 83 km (52 mi) in north of Pithoragarh along the route of the Kailash-Mansarovar pilgrimage tour. The name of the town originates from the Hindi words for "mountain peak" (dhar) and "stove" (chulha) because the valley in which it lies resembles a stove. Dharchula is cold during winters, but it usually does not get snow. Summer temperature is pleasant. Nepal has a town with a similar name, Darchula, across the river Mahakali - which acts as the natural border between India and Nepal over a long stretch. People of both towns have similar traditions, culture, and lifestyle and move across the border without hindrance and without passport or visa. The area has a mixture of Kumaoni and Tibetan language, traditions and culture.

The Dharchula Subdivision (affected site: Malpa and Mangti Nala) is served as the research site for this study. The district administration serves about 485993 populations out of which the sub division jurisdictional area (Dharchula)

serves about 58650 populations. Natural hazards like earthquake, avalanches, cloudburst, hailstorms, flash flood, lighting forest fire etc. have been known to cause major loss of life, property and ecosystem.

The cloud burst which took place at about 2.45 pm on 12th August, 2017 was one of the medium level cloudbursts yet it led to worst case scenario. Cloud burst was followed by continuous rain fall for about 04 days associated with landslides which affected 50 per cent of the village of Malpa in the Pithoragarh district (Dharchula subdivision) of Uttarakhand. In this incident almost all people of Malpa village were affected. This scenario also emerged associated with road block, collapse of utility lines and bad weather. It diverted attention of administration due to occurrence of small and medium level disasters in other area of the district which created a big hindrance for disaster response. The rock fall started on 12th August bringing down drastic boulders killing 09 persons, 28 domestic animals including mules, and 18 people were found missing. A total of 221 people were affected in this incident. The rock fall continued for full eight days i.e., till 19th August 2017. The history of the cloudburst in Uttarakhand since 2002 to 2017 is given in Table - 1 for reference.

Table 1: History of the cloudburst in Uttarakhand

Year	Locations	Human loss
2002	Khetgaon	04 people died
2004	Ranikhet (Almora)	01 person died
2007	Pithoragarh & Chamoli	23 person died
2008	Pithorargh	01 person died
2009	Pithoragarh (Munsiyari)	43 person died
2010	Bageswar (Kapkot)	18 school children were buried alive and 08 injured
2010	Almora	36 person died
2012	Rudraprayag (Chavanni, Mangoli and Kiman Village)	Inundated 04 villages and eroded 02 more villages
2017	Pithoragarh (Malpa and Mangti Nalla)	09 people died and 18 people were missing

Source: State Disaster Management Authority, Government of Uttarakhand.

Data Collection

Data collection took place in two phases at the district and subdivisional headquarters through interviews with personnel who had participated in the response activity, having considerable training in IRS. Through this sampling strategy, the system in action, under different types of performances and conditions was observed. The initial focus of research was quite broad. The main intention was to see and understand how district and subdivision administration, which is situated about 133 kilometres at distance from each other organise, coordinate and function involving officers from traditional

bureaucratic organisations of state and central Government by implementing IRS in various unpredictable disaster situations. As the research progressed, it increasingly focused on the specific factors leading to organised and adaptive functioning of the IRS.

Phase-1 involved collection of data through unobtrusive observation, unstructured interviews and reviews of various types of written material specially IRS forms and formats used by different stakeholders of IRTs or IRS organisations i.e., *Responsible officer, Incident Commander, Planning Section Chief, Operations Section Chief, Logistic & Finance Section Chief* and their subordinate staff.

During Phase 2, data was collected from the actual site of the incident through semi structured interviews conducted privately and face-to-face. It was observed that a wide range of perspectives on the IRS were represented during the Phase 2 interview stage. The main intention of this phase was to interview officers of; a) civil administration who had performed as IC, section chiefs, unit leaders at district and subdivisional IRT (Incident Response Team) and b) officers who had managed various facilities in the field that is Staging Area Manager, Site Chief, who was responsible for effective supervision and function of task force or strike team in the actual site and c) frontline responders (Operations Section) such as; officers from various Government departments; i) Revenue, ii) Police, iii) Fire and Emergency, iv) Medical, v) Civil Supplies, vi) Public Works Department, vii) Road, viii) Water, x) Irrigation, and ix) *Panchayati Raj* Institutions etc.

These interviews were tape recorded, and their average length was approximately 20 minutes to one hour. Participants were first provided demographic information and brief professional training on IRS, current post holding in the state Government and district administration and actual position holding in IRT. Then, they were asked to describe situations that they were involved with where the IRS functioned particularly well. Based on a participant's answer to this question, a series of queries followed intending to elicit responses helping further to identify and clarify factors that either helped or hindered effective functioning of IRT. Next, responders were asked to describe a situation in which the IRS organisation did not perform well.

Result & Discussion

In order to understand the organising capability of IRS organisation through IRT, the research followed a *grounded theory methodology*. In doing so, the researchers fully transcribed the data collected in Phase 1 and 2. Transcripts were analysed in detail and archival material was carried out both during and after each phase of the data collection effort.

Throughout the process of data collection, the study provisionally identified concepts and relationships from the data that seemed pertinent to the IRS organisation and its function. The process of data collection also examined that how the civil administration and participating agencies (Uniform service, NGOs and other private stakeholders) organised in to a temporary organisation having officers from different organisation with different chain of command and hierarchy which is known as IRT function seamlessly under a variety of emergency conditions. The contributing factor which led to “organising the administrative machinery” of Government of *Uttarakhand* also identified and compared with literature and data that was collected during phase - 1 and 2 to determine whether initial inferences should be retained, modified, or dropped. Similarly, the researchers kept, revised or discarded concepts coming out of the literature depending on whether and to what extent it supports the data.

Factors leading to organize the administrative machinery at district and subdivision level in district *Pithoragarh* and its subdivision *Dharchula*.

- Organising IRT and providing a rational response to a disaster situation, such as at *Pithoragarh* (Location *Dharachula* subdivision – site of incident: *Malpa* and *Mangti Nala*) of *Uttarakhand*, represents a considerable accomplishment. The function of civil administration implementing IRS was able to constantly map different requirements under variety of dynamic situations to fulfil their demand in an organised manner. The actual system of civil administration as an IRT in use was able to expand and contrast, change strategic orientation and modify as incident unfolded.
- The unpredictable task contingencies had been previously experienced by the civil administration or predicted through conducting table top and mock exercises during peace time. Furthermore, system and task complexities coupled with the need for immediate local adjustments did not preclude the possibility of sufficient or timely direction from superior hierarchical positions due to; a) formation of IRT and its activation at local level (subdivision), b) involvement of Government officers at grass root level and communities in the IRT, c) encouraging preparation of Incident Action Plan (IAP) at local level (subdivision IRT) and d) practicing the system of reinforce of resource and other support from district administration as per local IAP. During the conduct of mock exercise many or most officers from different agencies and communities had worked together as an IRT and had the realistic expectation from each other of working together this played an important role.
- Almost from the outset of the study, the IRS and its practice by the district magistrate and his team through conducting mock exercise in peace time

came into view as a primary tool through which the civil administration manages various organizational issues during disaster response. Consequently, a considerable portion of our data collection and analysis work centred on; a) the identification of factors contributing to flexible and adaptive response to emergency situations b) training of officers on IRS. The data analysis pertinent to this research yielded to major conceptual categories; leading to organise administrative machinery to perform under dynamic emergency situations is based on *structuring mechanisms*, to understand that how the civil administration of *Pithoragarh* district and *Dharchula* subdivision rapidly alter in an organisation known as IRT and function without any confusion are as follows.

- **Structuring Mechanisms:** The implementation of IRS in cloudburst scenario at District *Pithoragarh*- Subdivision *Dharchula*, Government of *Uttarakhand* had studied, keeping three basic processes for rapidly altering organizational structure in to IRT. These three basic processes are; a) *structure elaborating*, b) *role switching*, and c) *authority migrating*. These concepts are used for analysis of the study. These processes are contingent in nature, their appropriate use being largely a function of the task requirements confronting the IRS-based organization known as IRT at any critical time. During the analysis it has been observed that when these processes are aptly applied, they function to organise the administrative machinery in a systematic manner. In addition, the role clarity as per IRS among the offices excels the process of structuring mechanism.
- **Structure Mlaborating:** Structure elaborating denotes the fundamental processes of organization construction. It has been observed that the IRS for several reasons plays an important role in organising a variety of Government departments. For instance, disaster response management systems were typically assembled at various locations such as; a) EOC Command Post, b) Incident Command Post (Subdivision level), c) Staging Area and d) Site Chief Coordination Centre (designed for on-scene management). This process was found more capable in rapidly organizing a few positions to entire IRS organisation or IRT which led a big number (above 200) of responders under demanding circumstances. The structure elaboration process was highly developed with the initial construction of IRT. For example, it has been observed that in *Dharchula* subdivision, there are About 53 food outlets (PDS), 19 medical sub centres, 13 police out posts, 53 ward members (representatives

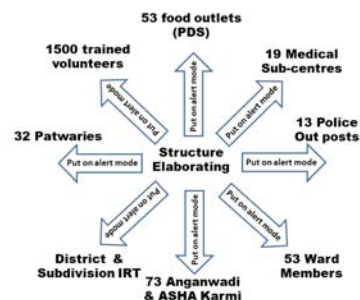


Fig-2 - Structure elaborating

of *Panchayati Raj* Institutions), 78 *Anganwadi* and ASHA workers, 32 *Patwaris*, about 7000 trained volunteers are working in various villages of *Dharchula* Subdivisions were put on alert mode. These agencies are most important departments of the civil administration of the Government of *Uttarakhand* for disaster response. This preparedness helps to elaborate the IRT for quick and effective response.

- **Role switching:** Role switching compliments the structure elaboration processes. As described above, IRS positions were activated and role relationships were established in accordance with the functional requirements of the situation as assessed by the Responsible Officer (District Magistrate) of *Pithoragarh* and Incident Commander (Sub-divisional Magistrate) of *Dharchula* subdivision. IRS positions are deactivated when goals and plans are no longer required. *Role switching* involves the assignment and re-assignment of personnel or equipment or both to different positions or locations within the functional jurisdiction of IRT or IRS organization. Whenever objectives of a disaster situation change, personnel of IRT were either moved into newly created roles or discharged which has been found very prominently through various IRS forms and formats.
- **Authority migrating:** Critical expertise for solving problems associated with a particular situation is often distributed within IRS. For instance, certain officers of IRT may have specialized training such as; a) management of staging area, b) management of site chief coordination centre which is specially designed for management of on-site, c) conduct of search & rescue, d) providing medical care and others may have considerable knowledge in areas as; i) handling of specialised equipment, ii) documentation, iii) making communication plan, iv) community management by virtue of holding second jobs. Respondents repeatedly suggested that while formal authority relationships are fixed, informal decision-making authority, especially at the operations level can become explicitly de-coupled from the official hierarchy and migrate quickly among IRS positions to the officers who possess the expertise to solve particular problems in the field. They also suggested that the IRS works better when “site chief” (a designation designed to manage the on-scene in the operations section), RO and IC permit to use the concept and direct the stakeholder concerned for *authority migration*. This process makes the response management smooth at scene.
- The concept *structure elaborating, role switching and authority migrating* was visible during analysis of data and interaction with officers of the IRS organisation of district *Pithoragarh* and *Dharchula* (Subdivision) of Government of *Uttarakhand*.

Table 2: Prepositioning of resource and action taken

Sl.	Resource prepositioned and action taken targeting 20 minutes as the response time
a.	Search & Rescue teams were prepositioned at various places;
b.	Community volunteers were deployed;
c.	Village level Government officers such as; <i>ASHA</i> worker, <i>Anganwadi</i> worker, <i>Patwaris</i> (Officers of revenue department), representatives of <i>Panchayati Raj Institutions</i> , Teachers, <i>Gram Vikas Adhikari</i> etc. were alerted;
d.	Equipment such as bulldozer, JCB's including sufficient manpower prepositioned;
e.	Equipment and men power for restoration of power and water supply prepositioned;
f.	Ambulances and required vehicles were prepositioned for transportation of victims, old women and men, pregnant and lactating women, and mentally retarded people;
g.	Cooking gas, petrol, oil and lubricant tankers, tents, food items, drinking water, medicines including medical officers and paramedics were also prepositioned at various strategic locations at the vulnerable area; and
h.	Appropriate coordination mechanism geared up with Government service providing departments including armed forces and enough supplies were ensured to face any kind and type of situation.

- During analysis, the study found that the IRS is highly formalized, characterized by extensive rules, procedures, policies, and instructions. Jobs within the IRS organisation or IRT are specialized, IRS positions are arranged hierarchically and job defined considering the actual job of an officer in civil administration of Government of Uttarakhand in normal time so that confusion on performance may be deleted. All positions of IRS organisation are related to one another on the basis of formal authority.
- During the interaction with the officers in the field, it had been noted that there is a difference between functioning of Government departments in normal time and during the disaster response situation. The flexibility of functioning of IRT, role clarity among various officers of civil administration, integration of different Government departments in the IRS organisation and implementation of disaster management policy by the state Government and district administration for smooth disaster response empowered officers to perform various duties with zero confusion and prevent delay to provide response.
- It has been found that; a) the implementation of IRS encourages Government officers from various departments to structure and restructure themselves on a moment-to-moment basis, b) providing opportunities with means to oscillate or fluctuate effectively with in various pre-planned organizational solutions to the more predictable aspects of a disaster scenario and c)

improvisation for the unforeseen and novel complications which may arise during response.

- The IRS forms and formats used during the disaster response were also analysed and it was found that as the incident evolved, the dimensionality and uncertainty of the task environment increased substantially. The response measures such as search and rescue of victims, providing shelter and other basic services to the affected people were organised with an objective to get zero causality, was the main focus in the Incident Action Plan (IAP). The IAP was prepared by the district IRT and was implemented by the subdivision IRT. The flow of information from the subdivision IRT to District IRT as per IRS form 001 was quite visible. Other operational imperatives rapidly emerged, including medical aid and residential evacuation of certain targeted areas was also visible in the revised IAP. Moreover, personnel from a large number of Government departments having different organisational culture, hierarchy, command and control such as Revenue, Police, Medical, Food and Civil Supply, Public Works Department, Border Road Organisations, Red Cross, Irrigation, Forest, *Nagar Nigam*, Civil aviation, SDRF, NDRE, Army, SSB, ITBP, CRPF (Central Reserve Paramilitary Force) etc., were involved in the disaster response management and successfully worked as an Incident Response Team was found in various IRS forms and formats.
- The officers available at state, district, subdivision and village level of Government of *Uttarakhand* had been identified to perform various roles as per IRS. During conduct of this exercise by the state Government and district administration, the actual role assigned to the officers as per their charter of duty had been taken as a parameter for selection of various positions of IRS organisation or IRT so that officers may not take it as an additional burden for them and could perform easily and without confusion during any emergency situation. Accordingly, officers were trained on IRS and mock exercises were conducted during peace time. It has been observed that training activities and conduct of mock exercise helped the officers of civil administration, agencies of central Government, *NGOs* and communities to visualise different types of scenario that can occur in actual situation and encourage them to function as an IRT with role clarity irrespective of their departments.
- The research underscores the importance of identifying officers in the civil administration which are transferable and promotional in nature. It has also been felt by the state Government that continuous training on IRS is an essential factor which maintained the capability of officers to respond and empowered them for quick assimilation in the IRT. For achievement of this capability, the civil administration provided numerous IRS training,

ranging from classroom lectures to simulating experiences to their officers. While going through the correspondence of the state Government with other organisations it has been found that IRS has also been incorporated at State Administrative Training Institution for providing training to the administrative officers of the state Government for its continuation and sustainability of training activity. During conduct of IRS training and conduct of mock exercise at different districts by the Uttarakhand State Disaster Management Authority, Government of *Uttarakhand*, and National Disaster Management Authority, Government of India identified about 138 field level administrative officers and trained them as ToT for continuation of the training activity in the field as a routine work in peace time. Today all the 13 districts and about 83 Subdivisions are using IRS for disaster response in *Uttarakhand* irrespective of their size and kind. Finally, it has been found that the IRS is a cornerstone of State Disaster Management Authority and District Disaster Management Authority for disaster response and multi-agency coordination in Government of *Uttarakhand*. The indicators were prepared by the state Government for implementation of IRS to respond disaster of any kind and type were also observed which is given at Table 3.

Table 3: Indicators Vs. Achievements

Indicators	Achievement
IRT formed at state, district and subdivision level;	72 IRT were formed
Officers at state, districts and subdivisions are trained on IRS;	600 state level, 1728 district level and 3080 subdistrict level officers were trained;
IRS capsule course for all officers of IRT is prepared;	Prepared and published;
IRS capsule course incorporated in the training syllabus of Administrative Training Institution;	Incorporated;
State level master trainers are identified and trained	138 officers from state, districts and subdivision were identified and trained;
State Disaster Response Manual - Check List is prepared and circulated;	Prepared and time to time circulated among stakeholders;
IRS APP launched for use of all stakeholders;	Prepared and launched (Google Play Store-Type - IRS Uttarakhand and download);
Coffee Table Book released as a reference text for conduct of Mock Exercise; and	Prepared and released; and
Mock Exercise Conducted during peace time;	Earthquake: 121 Land Slide: 38 Flood (district level): 18 Chemical: 07 Forest Fire: 06

- A consultation process was followed for preparation of materials on IRS by the State Disaster Management Authority, Government of *Uttarakhand*. During preparation State Disaster Response Manual as a Check list for the officers involved in the IRT and IRS capsule course (a two days training module), views and experience of field officers of the state Government and district administration were seriously taken in to consideration. These materials were also prepared in cognizance with IRS guidelines issued by NDMA, Government of India and Disaster Management Act, 2005 (India) which was clearly visible during analysis of the study.
- Healthy centre-state relationship had been found during the data analysis and while going through various IRS training and reference materials prepared by SDMA, government of *Uttarakhand* it had been found that time to time NDMA, Government of India had apprised on activities conducted for successful implementation of IRS by the Government of *Uttarakhand* and appropriate support was provided by the NDMA to the state Government.
- During the study it was found that there are three important aspects of IRS which needs to be taken care for successful disaster response. These aspects are; 1) management of site-by-site chief, 2) management of staging area and 3) management of Emergency Operations Centre (EOC Command Post at state and districts) or Incident Command Post at Subdivision Level.

Management of site-by-site chief

It was observed that the field officers available at various locations of civil administration of government of Uttarakhand need to be designated as site chief for management of affected site. Officers like Junior Engineers, Assistant Engineers, and Executive engineers of departments like Power, PWD, PMGSY, Pay Jal, Irrigation are most suitable for it. These officers are also connected with ground level workers such as *ASHA Karmi, Anganwadi Worker, Patwari, Gram Rakhi, Ward Member, Gram Vikash Adhikari*, etc. for support.

Suggestions & Conclusion

- This research plugs to a number of suggestions for developing the organising capability to command, control, and manage different agencies through IRS organisation or IRT with zero confusion. This may be useful for; a) managing extremely demanding situational contingencies, b) quickly assembled to perform as per demand of the situation, c) quick resource mobilisation and its deployment, d) effective structure elaborating, e) role switching and f) authority migrating.
- The concept known as; a) effective structure elaborating, b) role switching and c) authority migrating may be sustained through continuous practice by conducting IRS training followed by table top and mock

exercise in peace time by the IRTs established at various levels of Government of *Uttarakhand*. This is important because the nature of job of civil administration is transferable and promotional. Once an officer is trained and transferred to another place or promoted to higher level or simultaneously if the new incumbent who will join in the place of old one is not trained and mechanism is not established to provide training on IRS by the state Government, it may lead to confusion and chaos during disaster response.

- Resource management is an important component of response management. Therefore, time to time, updating resource mapping of civil administration and participating agencies is an essential work. This effort may be shared with each other on yearly basis and may be discussed in the civil-military coordination conference.
- “IRS Checklist” which is known as state disaster response manual is prepared for all the officers of the IRTs by the Government of *Uttarakhand*, it may be revised as per introduction of new technology and situation created from time to time.
- The protocol for VIP visit to the affected site may be prepared and the response arrangement made by the state Government needs to be briefed to the VIPs and VVIPs. This will give a clear picture among the VIPs and VVIPs regarding do’s and don’ts during their visit to the affected site.
- The IRS organization as we have studied conducts extensive formal assessments of organizational operation after conducting each Mock exercise that is thrice in a year by state, districts and subdivisions. Therefore, organising the administrative machinery is enhanced to the extent that major organizing problems are identified and appropriate changes are made in guidelines, procedures, forms and formats, training programs, and so on.
- The IRS is designed to integrate resources not only within the civil administration, but also among participating agencies. Benefits may accrue to Government departments to establish inter-organizational IRS-type framework for disaster response. These activities must be conducted on regular basis.
- The system we have studied has achieved its remarkable response potential. During the study, several activities that seem crucial to the proper functioning of IRT in the Government of *Uttarakhand* were identified. Certain changes had been identified in the IRS organisations such as; a) “site chief coordination centre” was introduced for effective management of multiple agencies at on-site, b) a new unit was introduced in the service branch of Logistics & finance section known as “restoration unit”. This has been done to organise various departments that were involved for

restoration activities and put them under one command in the logistics section for effective resource management, c) IRS forms were suitably adapted as per requirement, process and procedure of state Government, d) conduct of IRS training programs from state to subdivision level was observed to enhance organizing competence of various members of IRT, and e) to conduct assessment implementation of IRS after completion of response activities and sharing learning of a particular district with the rest of district of Government of *Uttarakhand* for improvisation.

- However, it has been observed that the temporary organisation which has emerged from the permanent structure of civil administration is specially designed to organise the responders from a variety of Government departments to respond to any disaster or crisis in future is as per the “time, space and speed”.

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Disaster Risk Reduction and Role of Capacity Building – An Administrator’s Perspective

Saurabh Bhaghat, IAS*

Overview

Disaster Management over the last three decades has gained tremendous attention all over the globe which has resulted in enhancing the capacities of different stakeholders to minimise losses on account of lives and damages to infrastructure both public and private. The international strategies like the Hyogo Framework for Action and the Sendai Framework for DRR both have helped nations to create an enabling environment with regard to risk reduction. In the Indian context, the strong legal back up in the form of the National Disaster Management Act- 2005, and of late the Prime Minister’s 10 Point Agenda on DRR have significantly contributed towards reducing disaster risk. However, the key to success has been the training and capacity building of the stakeholders in the broader phases of the Disaster Management Cycle- the Pre- disaster and the Post- disaster Phase. The establishment of the National Institute of Disaster Management as an arm of the Govt. at the national level and the Disaster Management Centres in the ATIs at the state level ,has definitely helped in the efforts to build the capacities of different agencies/ stakeholders but given the disaster vulnerability of the different states/UTs, there is a dire need to upgrade the Disaster Management Centres in the ATIs as Centres of Excellence in Disaster Management.

Introduction

Disasters whether Natural or Human-Induced strike both developed and developing countries, resulting in enormous devastation and miseries and impacting national economies negatively . Since diverse geo-climatic conditions prevail in different parts of the world, so do different types of natural disasters including earthquakes, floods, droughts, snowstorms and avalanches, cyclones, landslides, volcanoes, etc. strike in accordance with the vulnerability of a particular region .

“Globally, 4.1 billion people were potentially exposed to natural disasters in 2019. When compared side by side, the figures of population potentially exposed (PPE) to certain types of disasters present great differences in size. For example, floods and storm can affect wide areas of land, potentially

reaching 2.9 and 1.9 billion people in the world respectively while earthquakes (142.9 million PPE) and wildfires (91 million PPE) tend to affect more specific regions.

However, given the limitations the world is experiencing for the last two years fighting COVID-19 Pandemic, there is a dire need to ponder and workout strategies at all levels to fight out the unprecedented disaster in view of its changing colours.

The World Conference on Disaster Risk Reduction held at, Kobe, Hyogo, Japan in 2005 is considered to be the turning point in the worldwide resolve to implement a strategy exclusively focusing on Disaster Risk Reduction. Adoption of the Hyogo Framework for Action 2005-2015 by the 168 member States attending the Conference committed to Build Resilience of Nations and Communities to Disasters and was unanimously endorsed by the UN General Assembly by a resolution.

The Hyogo Framework recognized five specific areas for action by regional bodies to be addressed in such strategies: The Hyogo Framework for Action (HFA) was the global blueprint for disaster risk reduction efforts between 2005 and 2015. Its prime goal was to systematically and substantially reduce disaster losses by 2015 - in lives, and in the social, economic and environmental assets of communities and countries across the globe.

The Hyogo Framework for Action identified five priorities for action viz:

- Ensuring that disaster risk reduction (DRR) is a national and a local priority with a strong institutional basis for implementation.
- Identification , assessment and monitoring of disaster risks and enhancing early warning systems.
- Use of knowledge, innovation and education to build a culture of safety and resilience at all levels.
- Reduction in the underlying risk factors.
- Strengthening disaster preparedness for effective response at multiple levels.

The adoption and implementation of HFA marked a milestone in catalysing national and local Disaster Risk Reduction efforts and in strengthening international cooperation through the development of regional strategies, plans and policies. The HFA drove significant progress in developing institutions, policies, and legislation for disaster risk reduction. Stakeholders at all levels, strengthened their capacities for risk assessment and identification, disaster preparedness, response and early warning.

At the end of the HFA implementation, Member States recognized that efforts had not led to reduced physical losses and economic impacts. They concluded that the focus of national and international attention must shift from protecting social and economic development against external shocks, to transforming growth and development to manage risks, in a holistic manner.

This conclusion formed the basis for the development of the Sendai Framework, the successor instrument to the HFA, which was adopted in 2015.

The Sendai Framework for Disaster Risk Reduction 2015–2030 was adopted at the Third United Nations World Conference on Disaster Risk Reduction, held from 14 to 18 March 2015 in Sendai, Miyagi, Japan, which represented a unique opportunity for countries:

- (a) To adopt a concise, focused, forward-looking and action-oriented post 2015 framework for disaster risk reduction;
- (b) To complete the assessment and review of the implementation of the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters;
- (c) To consider the experience gained through the regional and national strategies/ institutions and plans for disaster risk reduction and their recommendations, as well as relevant regional agreements for the implementation of the Hyogo Framework for Action;
- (d) To identify modalities of cooperation based on commitments to implement a post 2015 framework for disaster risk reduction;
- (e) To determine modalities for the periodic review of the implementation of a post 2015 framework for disaster risk reduction.

The Sendai Framework for Disaster Risk Reduction 2015-2030 outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks:

- (i) Understanding disaster risk;
- (ii) Strengthening disaster risk governance to manage disaster risk;
- (iii) Investing in disaster reduction for resilience and;
- (iv) Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction.

Over the last decade, China, United States, India, Indonesia, and Philippines constitute the top five countries that are most frequently hit by natural disasters. In 2016, with 34 natural disasters reported, China experienced its fifth highest number of natural disasters of the last decade, 15.3% above its 2006- 2015 annual average of 29.5. Amongst the top ten countries for disaster mortality in 2016, six are classified as low- income or lower-middle income economies, and

accounted for 23.9% of global reported disaster mortality (Centre for Research on the Epidemiology of Disasters, 2015). The major categories of disasters include natural (earthquake landslides, tsunami), biological (epidemic disease, infestations of pests), technological (chemical substance, radiological agents, transport crashes), and societal (conflict, stampedes, acts of terrorism). Globally, there has been an increase in the frequency and intensity of disasters with low and middle-income countries tending to be more affected. Consequently, disaster risk reduction has been advocated as a global priority.

The Indian Context

As per the High Powered Committee which was constituted by the Government of India in 1999, the country can witness more than 30 different types of disasters under five broad categories which include:

- a) Geological related Disasters
- b) Water and Climate related or Hydro Meteorological Disasters
- c) Nuclear, Industrial and Chemical related Disasters
- d) Accident related Disasters
- e) Biological related Disasters

India has always been committed to the resolve to minimise losses on account of life and destruction of property by sticking to the different international strategies on DRR. Be it the International Decade for Natural Disaster Reduction (IDNDR-1990-1999) or the Yokohama Strategy, HFA or the Sendai Framework for DRR, India has always acted in the endeavour to mitigate the sufferings of disaster victims and at the same time doubled its efforts to reduce disaster risks by taking several bold steps including strong legislations like the National Disaster Management Act-2005. The latest initiative in this direction is the PM's 10 Point Agenda on DRR.

Prime Minister's 10 Point Agenda for Disaster Risk Reduction

India hosted its 2nd Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR), and the first after the international policy of Sendai Framework for Disaster Risk Reduction (DRR) in November 2016 at New Delhi, with participation of more than 4500 experts, practitioners and official delegates from across the Asia Pacific. After the adoption of Sendai Framework, the international community adopted two other major frameworks to shape the future of humanity, namely, the Sustainable Development Goals and the Paris Agreement on Climate Change in 2015. Disaster Risk Reduction has a pivotal role in supporting adaptation to climate change as well as sustainable development. Inaugurating the 7th AMCDRR, Shri Narendra Modi, Prime Minister of India, highlighted a 10- Point Agenda on Disaster Risk Reduction,

that encompassed tools and approaches to address critical challenges in achieving sustainable development objectives and renewed efforts towards DRR.

PM's 10 Point Agenda for DRR

1. *All development sectors must imbibe the principles of disaster risk management*
2. *Risk coverage must include all , starting from poor households to SMEs to multinational corporations to nation states*
3. *Women's leadership and greater involvement should be central to disaster risk management*
4. *Invest in risk mapping globally to improve global understanding of Nature and disaster risks*
5. *Leverage technology to enhance the efficiency of disaster risk management efforts*
6. *Develop a network of universities to work on disaster related issues*
7. *Utilise the opportunities provided by social media and mobile technologies for disaster risk reduction*
8. *Build on local capacity and initiative to enhance disaster risk reduction*
9. *Make use of every opportunity to learn from disasters and, to achieve that, there must be studies on the lessons after every disaster*
10. *Bring about greater cohesion in international response to disasters*

Paradigm Shift in Disaster Management

The Disaster Management Cycle can broadly be divided into 2 major phases, the proactive, predisaster phase (Prevention, Mitigation and Preparedness), and the recovery, post- disaster phase (Response, Rehabilitation and Reconstruction). The saying “ A stitch in time saves nine” holds true of the paradigm shift in Disaster Management which is seen from a reactive and relief centric approach to a more holistic and integrated proactive approach that puts emphasis on preparedness , with the main goal of safeguarding developmental gains and simultaneously minimizing losses to lives, livelihoods and property. It is also known as a shift from three R s to three P s where the 3 R s stand for Relief, Rehabilitation and Reconstruction while as the 3 P s stand for Prevention, Preparedness and Planning .The paradigm shift from relief centric to prevention and preparedness centric focuses on the establishment of a sustainable long term Capacity Building Process.

Capacity Development for Disaster Management

No country of the world can be categorised as totally free from disasters although vulnerabilities to disasters vary from region to region. Capacity development is the foundation necessary for a proactive strategy starting with the creation of awareness about risks and their prevention, knowledge about threats, potential dangers and their mitigation and appropriate expertise of the stakeholders in different sectors including of course, the community at large to respond to and deal with disasters.

Disaster Management and Role of Capacity Building

The previous decade has witnessed increasing global emissions of Green House Gases (GHGs) and more extreme weather events than ever before with its associated impact on human livelihoods. Disasters, both natural and human-induced are increasing, as conflicts on land use, stress of increasing population pressure and competition for resources. Disaster risk reduction coupled with robust development planning is crucial in adapting to the increasing risks associated with climate change and dealing with natural hazards, such as earthquakes, cyclones, floods, etc. that trigger disasters and setback years of development work. This is particularly important in the face of increasing vulnerability to natural hazards, as reflected for example, in increasing number of people affected and growing levels of economic damage. Capacity development is considered as an investment for future, because it is a prerequisite for adaptation to the changing environment and for being prepared to deal with challenges prompted by a disruption of the normal way of living. It gives us the knowledge about what, how and when to do.

Focus areas of Capacity Development

- Awareness building among all levels of stakeholders especially with emphasis on community centred risk identification and community driven response measures,
- Build up networking, cooperation and communication among different stakeholders and institutions at the National, State, District and community levels,
- Support institutional mechanisms, capacities and skills to facilitate adopting and mainstreaming an interdisciplinary approach to planning for incorporating disaster management especially mitigation into development planning,
- Find appropriate solutions for given problems, using past initiatives, internationally recognised best practices / technologies / techniques,
- Reinforce state of the art technical knowledge and skills of professionals in the institutions dealing with Disaster Management,

- Build up administrative capabilities in coordination, mediation and facilitation by training in enforcing the institutional techno-legal framework in order to create and preserve the integrity of an enabling regulatory environment and compliance regime,
- Reinforce teamwork (through exercises like mock drills) for rapid and coordinated response in practical situations,
- Support information flows and knowledge management, linking various databases and information resources at national and international levels, and
- Support the formulation of policies and stimulating the development of vision and corporate identities for the network of institutions on Disaster Management.

Capacity Building Components

There are ideally four components of capacity building:

1. **Training:** A learning process that involves the acquisition of knowledge, sharpening of skills, concepts, rules, change of attitude and behaviour to enhance the performance of individuals associated with different departments and institutions.
2. **Education:** Amidst changes of the past decades, education sector, the most discussed topics of national importance, is planning for more contextual, practical and application oriented curriculum for students at different levels .
3. **Research:** Research is an organised and systematic way of finding answers to questions.
4. **Awareness:** Awareness is generally defined as knowledge created through interaction between an agent and its environment. It cannot be simply referred to as “knowing what is going on.” This concept of awareness involves state of knowledge as well as dynamic processes of perception and action.

The Present Scenario

The growing importance and value of training to individuals and organizations has resulted in augmenting and pooling of different resources both human and financial for training and capacity building of different stakeholders throughout the length and breadth of the country. Capacity building has been acknowledged to imbibe a culture of safety and a major boost to the outcomes of the programmes and policies implemented in disaster risk reduction in the country.

Disaster Management Training in India

At the national level, the National Institute of Disaster Management (NIDM) is the apex training and capacity arm of the Government of India under the Ministry of Home Affairs. Similarly, the states have Disaster Management Cells in the State Administrative Training Institutes performing the function of capacity building for effective and efficient disaster management. There are a number of other training institutes which are engaged in training and capacity building in the area of disaster management and impart both theoretical and practical training. These include NDRF, CAPF, NCDRC, NFC, SPNPA, SDRF etc. In addition there are a number of organisations both at the national and state/UT level which are involved with training and capacity building of various stakeholders including the community. Ranging from universities, national institutions, International Institutions and NGOs and National and local NGOs, CBOs and Civil Society Organisations, every agency has been contributing towards Disaster Risk Reduction in one way or the other.

Training and Capacity Building in Disaster Management in Jammu and Kashmir

There are multiple agencies involved in training and capacity building in Disaster Risk Reduction in Jammu and Kashmir. Starting from the Centre for Disaster Management & Environmental Studies of the Administrative Training Institute of Jammu & Kashmir (J&K IMPA&RD), SDRF, SEOC, Universities, Colleges and Schools, Health and Medical Education, Police, Red Cross, Civil Society, CBOs and NGOs etc., all have been contributing towards DRR in one way or the other. However, a look at the policy guidelines and the position on ground deserves a thought.

J&K State Institute of Disaster Management

The Jammu & Kashmir Disaster Management Policy (2017) envisages that the existing Centre for Disaster Management at J&K Institute of Management , Public Administration and Rural Development (J&K IMPA) shall be upgraded to fulfil the needs of capacity-building in the domain of DRR, which shall function as a nodal technical, planning, analysis and training wing of the State Disaster Management Authority as the 'State Institute of Disaster Management' (SIDM). The Institute shall be responsible for:

1. Capacity building, research and documentation.
2. Development of state level information base.
3. Development of strategy for state-specific prevention and mitigation measures.
4. Generation of technical data-banks.

5. Carrying out hazard, vulnerability and risk assessment studies.
6. Imparting appropriate training to the State-and district-level personnel.

This Institute would promote sharing and dissemination of specialized knowledge related to disaster management among various governmental agencies, NGOs, public/private sector and the community at large. Institutional linkages for research-based resources, particularly in aspects like mitigation and adaptation shall be established. Research shall be an important activity of the Institute to develop risk reduction strategy. J&K IMPA has been organising training programmes for senior and middle level officers of the State Government, as well as other organisations including community members. The Revenue Training Institutes (RTI) at Srinagar and Jammu also shall be roped-in for providing trainings for junior and middle level officials, besides technical trainings etc., so as to cover trainings at all levels. These Institutes shall be provided appropriate technical, professional staff, besides other functionaries, infrastructure and funds.

Disaster Management Centre in Jammu & Kashmir Institute of Management, Public Administration, and Rural Development (IMPA) Srinagar.

The J&K Institute of Management, Public Administration and Rural Development (IMPA) is the apex Training Institute of the erstwhile State which was established in the year 1982 as the Administrative Training Institute of the state. Subsequently, the State Institute of Rural Development was also created within IMPA to cater to the training and capacity building requirements of Rural Development and Panchayati Raj functionaries. The Institute recruited its own faculty in 1986 and as on date has faculties in the disciplines of Rural Development, Public Administration, Communication and Behavioral Sciences, Financial Management, Industrial Management, Social Sciences and last but not the least Disaster Management. These faculties have now been renamed and clubbed into five centres including the Centre for Disaster Management & Environmental Studies. The Institute has been conducting Training Programmes/Seminars/Workshops/Conferences on almost all aspects of the training requirements of the administrative machinery of the State. The Foundation and the Induction Training Courses for the Combined Civil Services of the State are a regular activity in the Campus. The Secretariat Assistants Training Course (SATC) for Senior and Junior Assistants is a regular training activity assigned to the institute. In addition awareness camps, sensitization workshops etc. are a recurrent feature of the day to day activities at the Campus as well as off Campus.

Most of the facilities required for a training institute have been provided to the Institute by the State as well as the Central Govt. for its two Campuses at

Srinagar and Jammu. The Hostel facility for out- station participants as well as trainees of longer duration including the JKAS has the capacity to accommodate around 150 participants together at Srinagar and Jammu.

As an initiative by the Govt. of India under a Centrally Sponsored Scheme the Institute was identified for hosting the **Disaster Management Centre** in the State way back in 1997-98. However, the activities viz-a-viz training in Disaster Management took off in 2001 when the State Govt. got the proposal for creating of the DM Centre in the Institute approved from the NDM Division of the Ministry of Agriculture (the then nodal agency at the Centre). In order to ensure the reach and quality of trainings so far as capacity building in Disaster Management is concerned , the government has made its commitment to scale up the activities by creating the State Institute of Disaster Management in IMPA itself.

Since Jammu & Kashmir is a **multi-hazard prone region**, it is crucial to have all the stake holders, the Govt. Agencies, the NGOs, the donor agencies and the general masses, sensitized to various issues of Disaster Management. **The UT falls in Seismic Zone IV with most parts of Kashmir Valley falling in Zone V (Very High Damage Risk Zone)**. This warrants that there is an urgent need to evaluate the risks and make a **Vulnerability Assessment** within Jammu and Kashmir in general and the most densely populated **urban centres** in particular. The Institute organizes a number of training programmes, workshops, seminars and conferences in collaboration with other agencies – both local and national. The objective is to propagate and build a state of preparedness and mitigation to make Jammu and Kashmir a disaster resilient and safe place to live.

A glimpse of the training activities of the Centre for Disaster Management & Environmental Studies within IMPARD.



Training Sessions for different stakeholders in progress



Demo of Search & Rescue Equipment of F&ES in a training programme at IMPA



Hands on training on CPR by SDRF

With regard to Training and Capacity Building of different stakeholders both within the government as well as outside the government, many organisations including SDRF, EOC, Red Cross Society, Universities, Colleges, Schools, NGOs and Civil Society Organisations have been conducting various events in the shape of Seminars, Workshops, Training programmes and other activities in different parts of the Jammu and Kashmir. However, given the vulnerability of Jammu and Kashmir, Training and Capacity Building especially on Community Based Disaster Preparedness will have to be launched in a mission mode and as a priority. In this direction, strengthening the capacity of the agencies/ institutions involved in Disaster Management Training deserves attention of those who are at the helm of affairs.

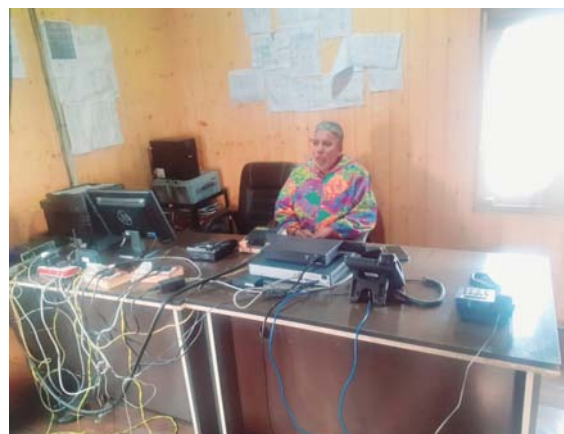
However, given the disaster vulnerability of Jammu and Kashmir, apart from strengthening the Response Mechanism with men and machinery, the need to strengthen and establish the J&K Institute of Disaster Management as a Centre of Excellence within IMPA is being felt seriously now more than ever before. The following areas of intervention through training and capacity building in disaster management can largely support in achieving the goal of a Disaster Resilient Jammu and Kashmir:

- a) First Aid, Triage, Search & Rescue
- b) Preparation and Updation of DM Plans at different levels
- c) School Safety Programmes
- d) Crowd/Yatra Management
- e) RVS and Retrofitting
- f) Flood Risk Mitigation
- g) Earthquake Risk Mitigation

- h) Avalanche and Landslide Risk Mitigation
- i) Disaster Resistant Constructions
- j) Community Based Disaster Preparedness
- k) Orientation Programmes for JKAS, Police, Civil Defence, SDRF, NSS, PRIs, ULBs etc.
- l) Hospital Safety, Mass Casualty Care & Management
- m) Fire Safety/ Safety Audit
- n) Damage and Loss Assessment
- o) Disaster Mitigation & Climate Change Adaptation.
- p) Others

Some latest interventions in Jammu and Kashmir to improve Disaster Preparedness Capacity

Keeping in view the disaster vulnerability which have a recurrent phenomenon and cause loss of lives, damage to property, infrastructure and public utilities, J&K has already adopted the State Disaster Management Plan and State Disaster Management Policy, which among other things envisage establishment of Emergency Operation Centres (EOCs) at State level, as well as at district levels. In line with these requirements, the State Emergency Operation Centre (SEOC) has been temporarily established at Gogo, Budgam in a prefabricated hut with human resource support deputed from State Disaster Response Force and Relief Commissioner's Office (Migrants). However, for establishing a permanent SEOC the site has been identified at Ompura, Budgam, where construction is in progress and has been undertaken under the World Bank funded Jhelum and Tawi Flood Recovery Project (JTFRP) – a unit of the Jammu and Kashmir Economic Reconstruction Agency.



Basic facilities at the Emergency Operation Centre at Gogo, Budgam

Recently, Divisional level EOC has also been established at Hari Niwas (Srinagar) for effective response to COVID-19 and to monitor the water levels of river Jhelum and Dal Lake.

For the functioning of EOCs at Hari Niwas, Srinagar and Gogo, Humhama (Budgam), CCTVs have been installed at appropriate locations to monitor the water levels of Jhelum and Dal Lake at critical locations and to check other activities as well. Both the EOCs at Gogo and Hari Niwas are facilitated with LED TVs and other Human Resource support as well as equipment.



Emergency Operation Centre fitted with CCTVs at Gogo and Hari Niwas, Srinagar

Conclusion

There is no denying the fact that lot many initiatives have been launched in the country in general as a follow up to the international strategies like the HFA or the Sendai Framework for DRR , the DM Act and the Prime Minister’s 10 point Agenda on DRR, yet given the size and the disaster vulnerability of the country there is a long way to go to achieve the desired results. On the same analogy, at the UT level, Jammu and Kashmir needs to have a robust institutional mechanism in place in the form of a Centre of Excellence as the Jammu & Kashmir State Institute of Disaster Management to organise and coordinate different training and capacity building activities in order to realise the dream of a disaster resilient safe Jammu and Kashmir. In spite of the fact that few initiatives in the right direction have already been launched in the UT of Jammu and Kashmir, however, much more needs to be done.

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An Early Warning System and Inter-Agency Coordination Framework for Better Preparedness and Prevention of Heat-related Illnesses in Urban India: Development and Implementation of Nagpur Heat Action Plan

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Overview

Climate change is influencing temperatures higher as well as increasing the frequency and severity of heat waves in India. Heat wave is also called a “silent disaster” as it develops slowly and kills and injures humans and animals nationwide. Extreme heat can lead to more serious, even fatal, health risks, including heat stress and heat stroke, and can exacerbate chronic cardiovascular and respiratory diseases. The increase in heat wave events and other climate change episodes calls for urgent action for preventing and controlling impact on health at state and national level. In this case study, we have documented an early warning system and inter-agency coordination framework implemented in the city of Nagpur, India.

Introduction

Climate change has been widely acknowledged as the greatest global threat of the 21st century. The Intergovernmental Panel on Climate Change (IPCC) has anticipated that extreme temperature events will become more frequent and intense as the global average temperature rises (IPCC, 2018). These risks are of particular interest to low-middle-income economies with limited public health resources and an urban sprawl population (Geirinhas et al., 2020). Climate change leads to changes in temperature and humidity, impacting living and working conditions. Climate change has a number of direct adverse effects on both working and non-working populations, such as heat exhaustion and heat stroke. Changes in weather patterns are associated with alterations in the geographic range, seasonality and transmission frequency of selected climate-sensitive infectious diseases, and increased morbidity and mortality are associated with extreme weather and climate events.

A heat wave is a prolonged period of unusually and excessively hot weather, sometimes accompanied by high humidity. Heatwaves can have a significant impact on the health of the population, in particular mortality, and morbidity has been documented in many epidemiologic studies. Extended periods of extreme heat, typically defined as heat waves, have been associated with

a significant increase in mortality, and specific events have been found as public health disasters. Heat also has a significantly impacts on the natural habitat.

Tackling climate change could be the greatest global health opportunity of the 21st century (Watts et al., 2015). Hundreds of lives have been claimed by past heat waves, and they brace for dangerously hot periods. Simultaneously, the detrimental effect of the coronavirus pandemic on mortality and economic consequences demands that society give priority to public health as never before.

Assessments of the mortality-temperature relationship are used to generate forecasts of future climate change impacts on mortality rates across the globe. High emissions result in a significant rise in excess deaths due to Indian temperature. As per WHO (2014) report the global estimate for increases in heat-related deaths (annual estimate) is 92,207 (64,458–12,1464) additional deaths in 2030 and 255 486 (19,1816–36,4 002) additional deaths in 2050 (assuming no adaptation).

Heat wave in India

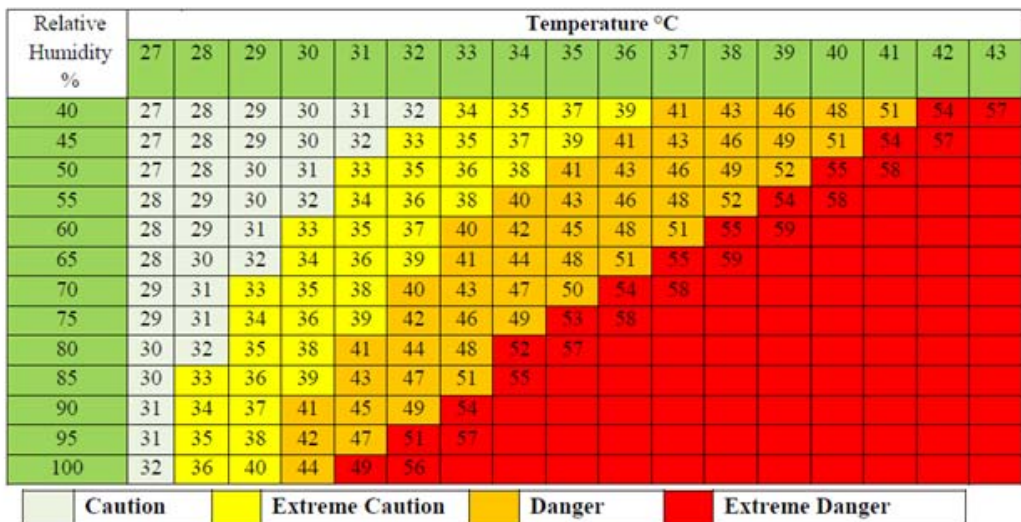
Even when heat waves may not cause significant damage to natural, social and physical assets in the way other climate stressors, such as floods and droughts, are one of the deadliest natural disasters. As per IMD, in India, heat waves are described when the actual maximum temperature of a station reaches a certain threshold and is above the normal value of temperature by a certain magnitude. Heat wave is regarded if a station's peak temperature for Plains is at least 40° C, 37° C in coastal areas and 30° C for Hilly regions. Once these thresholds are reached, it is called Heat Wave (HW) when actual maximum temperature $\geq 45^\circ \text{C}$; and Severe Heat Wave (SHW) when actual maximum temperature $\geq 47^\circ \text{C}$, irrespective of deviation from normal.

Human-induced warming reached approximately 1°C (between 0.8°C and 1.2°C) above pre-industrial levels in 2017, increasing at 0.2°C (between 0.1°C and 0.3°C) per decade. Warming greater than the global average has already been experienced in many regions and seasons, with higher average warming over land than over the ocean.

India's temperatures also displayed a significant warming trend. The Indian Meteorological Department's annual climate report on India (IMD) shows that the country's average annual land surface air temperature has risen at a rate of 0.66° C per 100 years over the past 117 years, with a significant increase in the maximum temperature trend of 1.06 ° C/100 years.

The India Meteorological Department (IMD) has predicted that heatwave conditions are likely to be severe in 2020. In Churu, Rajasthan, the maximum temperatures were up to 50.8° C (123.4° F) recorded last year. In previous year, the heatwave has been classified as 32 days, making it the second longest ever recorded. India, which routinely faces warm temperatures throughout most of the year, saw a heat wave in May 2010 that caused an excess of 1,344 deaths in the city of Ahmedabad.

There are many different factors that affect climate around the world. Increased anthropogenic activities causing increased greenhouse gas emissions show that heat waves will be more severe. Higher temperatures are also projected to result in a large reduction in agricultural yield and livestock production. The research sheds light on factors that modulate urban climate variability and posits that cities experience higher levels of heat exposure than the surrounding suburban and rural areas because of the Urban Heat Island (UHI) effect. Due to the urban heat island effect cities and urban areas experience higher levels of heat exposure than surrounding rural areas, whereby temperatures in urban areas are on average 3.5-12°C higher than the country sides. Studies on spatial distributions of simulated surface air maximum temperatures for the month of May over India revealed three distinct maxima (heat wave conditions), one over Northwest desert India, one over North Madhya Pradesh and Southwest Uttar Pradesh and another over East Maharashtra.



Source: Calculated °F to °C from NOAA's National Weather Service.

(Source: Calculated °F to °C from NOAA's National Weather Service.)

Figure 1: Temperature/ Humidity Index

It is thus imperative that Governments and communities need to prepare systematically and proactively to respond to and adapt to climate hazards. The struggle against heat waves and climate change is a major social challenge and will involve both the rapid mitigation of carbon emissions and the widespread implementation of urban climate adaptation policies. The heat index is essential to the development of an efficient adaptation plan based on an early alert/warning system. The index essentially shows us what the temperature of the human body feels when the temperature feels like to the human body when relative humidity is combined with the air temperature (see Figure 1).

Heat waves scenario in Nagpur

Heat waves killed about 6,167 people in India over eight years to 2018. Of that, government records show, 34% (2,081 deaths) were in 2015. In the future, however, as per the Intergovernmental Panel on Climate Change (IPCC), more frequent and intense heat waves in Asia (including India) will negatively impact vulnerable communities and increase mortality.

Nagpur is the third largest city of state of Maharashtra, with a population of 46,53,570 covering an area of 227.36 km² (87.78 sq. mi) (Census, 2011). It is located in the hot and arid eastern region of Vidarbha, at 21.15 latitude and 79.08 longitude and elevation 319 meters above sea level. Nagpur has a tropical savannah climate with dry conditions prevailing for most of the year. Summer season lasts from March to May and relatively low humidity is reported. We also included June month temperature data in the present case study as hot weather generally continues in this month in India. Nagpur registered yearly highest temperatures of 47.8° C in 1954, 47.7°C in 2003 and 47.6° C in 2005 (IMD). In 2018, the highest temperature recorded in the month of May in Nagpur was 48°C, and temperatures in the following years have been seen to be higher (see Figure 2). Therefore, the risk associated with human life due to heat stress in the city cannot be underestimated.

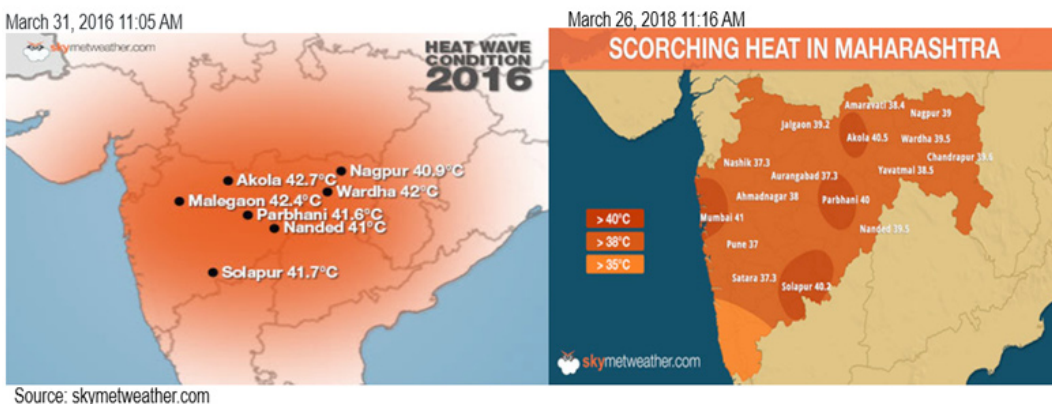


Figure 2: Scorching heat in Maharashtra

Situational analysis of temperature in Nagpur city

The average maximum temperature for 2001 was 38.21 ± 4.51 in and for 2009 was 41.61 ± 3.39 , which were lowest and highest mean temperature respectively. Days with a maximum temperature of 40°C and above were considered as summer days. Of the so calculated 1,183 summer days, 781 days had humidity $\geq 50\%$.

Here, we have analyzed heat wave pattern occurred in 2003, 2010, 2014, 2016 and in 2018 in Nagpur city and Heat wave duration for this respective years were, 30th May - 6th June, 2003 (8 days), 24th May - 3rd June, 2010 (11 days), 5th - 11th June, 2014 (7 days), 13th- 19th May, 2016 (7 days) and 5th - 12th May, 2018 (8 days) were recorded. All these heatwave years have shown increase in daily average mortality during heat wave period, 50%, 70%, 70%, 75%, and 60% respectively (see Figure 3).

To establish the relationship between all-cause mortality with temperature, deaths on each day in 2010 was considered and compared to mean of all-cause death counts from corresponding days in May from 2009 and May 2011 (see Figure 4). The average daily mortality during the heat wave days was estimated at 81.06 ± 28.97 , significantly higher than the average of 62.39 ± 7.09 for the reference period (2009 and 2011). The comparison analysis of maximum temperature of 2010 and average temperature of 2009 and 2011 were depicted in Figure 4. Highest maximum temperature was reported on May 24, 2010 and highest all-cause mortality was 168 deaths/ day recorded on May 26 2010. Also, we found that increase in all-cause mortality was not a single day effect but cumulative effect of previous week sustained high maximum temperature (maximum temperature: 17 May- 46.2°C , 18 May- 46.1°C , 19 May- 46.2°C , 20 May- 44°C , 21 May- 42.3°C , 22 May- 40°C , 23 May- 41.7°C , 24 May- 44.6°C , 25 May- 47.2°C) (see Figure 5). We also noted that, May 2010 measured highest heat wave days ($T_{\text{max}} \geq 45^\circ\text{C}$) of 19 out of 31 days during the study period.

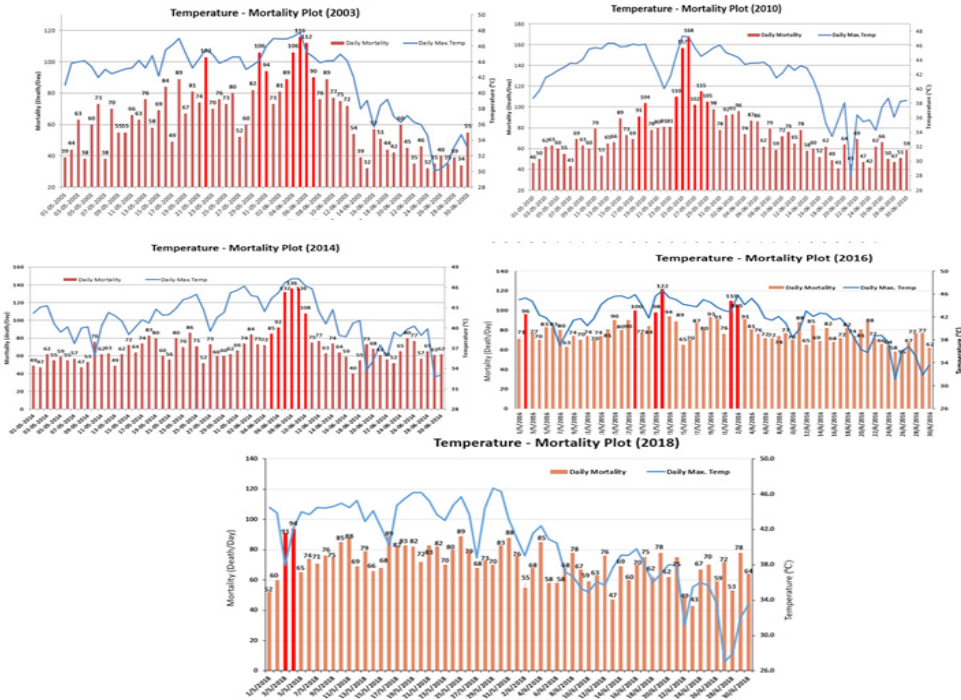


Figure 3: Temperature and mortality relation profile in Heatwave years (a) 2003, (b) 2010, (c) 2014, (d) 2016 and (e) 2018.

The average summer (March to June) temperature is $39.83 \pm 4.23^\circ\text{C}$ recorded for the study period. Further, monthly average maximum temperature for April was $41.07 \pm 2.71^\circ\text{C}$, 27.0-47.1 (minimum-maximum) range and interquartile range 3.4 reported. For May month average maximum temperature was $43.46 \pm 2.10^\circ\text{C}$, 35.7-47.9 (minimum-maximum) range and interquartile range 2.80 observed. Both are the hottest months for the Nagpur city (see Figure 5).

As shown in the Figure 6, total all-cause deaths between March to June registered in 2010, 2015, 2016 and in 2018 and mean deaths per day for summer (March-June) was also highest in the same years, i.e., 2010 (65.26 ± 18.24), 2015 (66.07 ± 10.84), 2016 (79.02 ± 12.20), 2018 (70.72 ± 10.54) (see Figure 6).

An increasing trend in deaths is also seen during summer months in Nagpur. Daily deaths during March and June is 53 and 56 respectively as compared to hotter months of April and May when the daily deaths spike up to 54 and 61 respectively. Figure 7, also shown the trend of increase in deaths during the hottest month of May as compared to other summer months (see Figure 7).

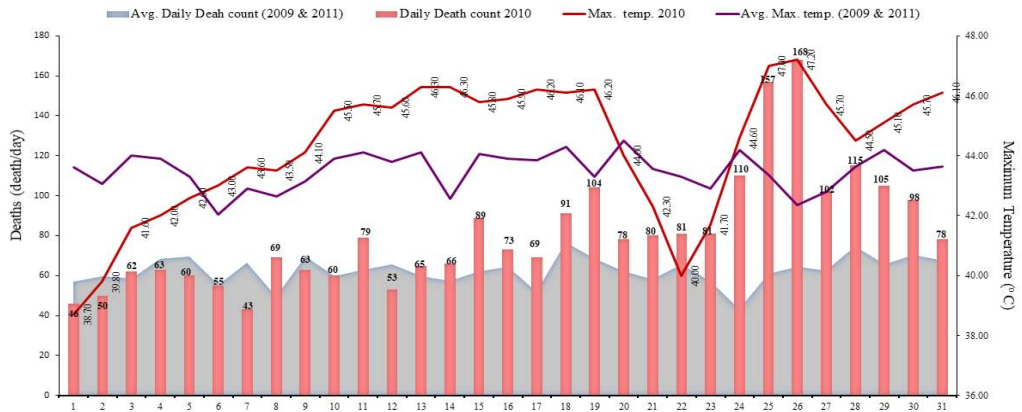


Figure 4: Nagpur city temperature and mortality profile for May month (2009-2011)

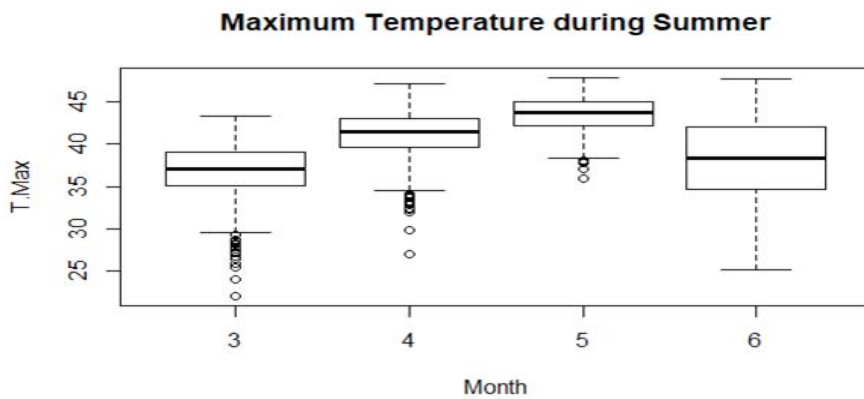


Figure 5: Month wise Daily Maximum Temperature situation of summer (March, April, May and June) in Nagpur during 2001 to 2018

As temperatures rise and climate variability increases, most of the world is expected to experience increased impacts from heat extremes, even while taking into account gradual acclimatization to higher temperatures—both physiological adjustment and deliberate adaptation interventions. Strong calls have been made to develop and implement climate change mitigation and adaptation strategies to protect health. A few of the expected health risks will be reduced by general public health improvements in accordance with the Millennium Development Goals (MDGs). Some risks are managed through ‘adaptation policies and actions,’ the success of which will rely on the speed and extent of climate change and the level of global cooperation to implement measures to support and protect vulnerable regions and populations.

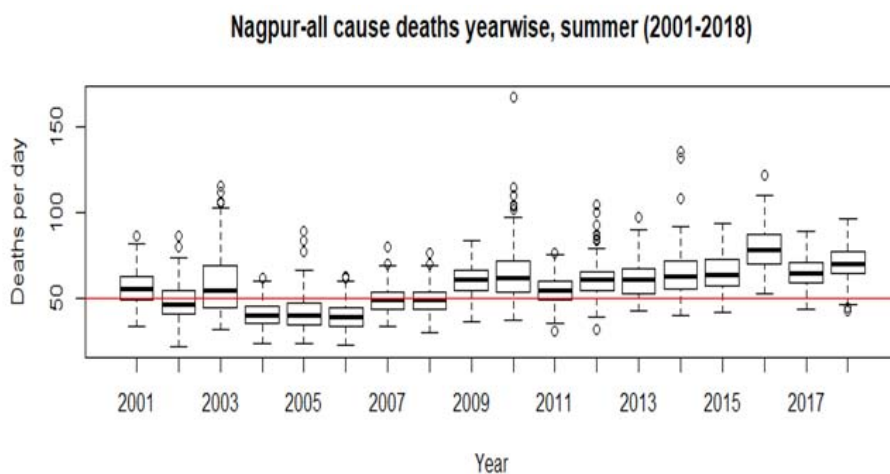


Figure 6: Daily Deaths during summer in Nagpur city (between 2001 to 2018)



Figure 7: Month wise daily deaths situation during summer in Nagpur (2001-2018)

Heat Action Plan (HAP)

The HAP has been developed as a public health policy mechanism to recognize the city's heat emergency levels and to illustrate the activities and standard protocols for the various line departments of the city administration. The HAP was developed to incorporate guiding principles from different countries, strategies and a robust community outreach campaign (Knowlton et al., 2014). Temperature thresholds activate HAP heat alerts, with flexibility in temperature forecast data source along with four different colour signals corresponding to various levels of heat-health alerts and temperature thresholds. Identification of the most vulnerable to extreme heat, including their places of residence and work, and recognition and standardization policies and programs to address current and future projections health risks have been incorporated.

The heat alerts based on thresholds determined by the IMD using the following color signal system was issued (see Figure 8). For Nagpur city red alert should be declared when temperature raise above 46°C. These thresholds were chosen based on their capacity, defined as the sensitivity and the specificity, to identify periods of excess mortality.

Heat-Health Temperature Warning for Nagpur city		
Yellow alert	Hot day advisory	41°C
Orange alert	Heat alert day	43°C
Red alert	Extreme heat alert day	Above 46°C

Figure 8: Heat Alert Thresholds for Nagpur City (source: NDMA)

Table 1 display 75th, 85th and 95th percentile values of maximum temperature to determine thresholds for summer months of April, May and June (see Table 1).

Table 1: Month-wise and seasonal Thresholds for Heat wave warning for Nagpur.

		Yellow alert (75% percentile)	Orange alert (Heat alert day) (85% percentile)	Red alert (Extreme heat alert day) (95% percentile)
Nagpur	April	43.0	43.8	44.6
	May	45.0	45.6	46.6
	June	42.0	43.2	45.2
	Common seasonal threshold for entire summer (March to June) months			
		75% percentile	85% percentile	95% percentile
	43.1	44.2	45.6	

Heat Action Plan Purpose, Aims, Strategies and Activities

Purpose of the Action Plan: Nagpur Action Plan for Prevention and Mitigation of Heat Waves aims to provide a framework for the implementation, coordination, and evaluation of extreme heat response activities in Nagpur city that reduce the negative health impacts of extreme heat. The primary objective of the Program is to inform those populations that are most at risk of heat-related disease and to take appropriate administrative as well as preventive action to deal with extreme heat events. This plan will also lay down the role and responsibility of various departments to various alert signs and the action plans to follow.

Aims of the Action Plan: The Nagpur City Action Plan for Heat Wave Prevention and Mitigation aims to minimize severe heat impacts on vulnerable people such as infants, pregnant women and the elderly with early warning systems and coordinated collaboration with the agencies concerned.

1. To incorporate the Prevention and Mitigation measures against Heat Wave.
2. To establish coordination and integration of all the concerned agencies from early warning to implementation of Action Plan.
3. To map potential heat island area and affected people and to make city more resilient against extreme heat wave.
4. To build a capacity of concerned professional and agencies.
5. To make more use of adaptation and mitigation tools for reducing heat waves, and
6. To help the heat wave affected people in distress through proper medical aid.
7. Availability of safe drinking water at all prominent places.



Figure 9: Heat Action Plan components

Key Components of Action Plan: (see Figure 9)

- To monitoring climate conditions and implementing an early warning system and collaboration between agencies to alert stakeholders to forecast high and extreme temperatures.
- Creating public awareness and expanded community outreach to communicate heat wave threats and to introduce activities to avoid heat-related deaths and illnesses.

Key Strategies of Action Plan: (see Figure 9)

- **Building Public Awareness and Community Outreach** to communicate the risks of heat waves and implement practices to prevent heat-related deaths and illnesses. Disseminating public messages on how to protect people against extreme heat through media outlets and informational materials such as pamphlets and advertisements on heat stress prevention. Efforts also include the use of social media such as SMS, text messages, email,

radio and mobile applications such as WhatsApp. Special efforts are made to reach vulnerable populations through inter-personal communication as well as other outreach methods.

- **Utilizing an Early Warning System and Inter-Agency Coordination** to alert residents of predicted high and extreme temperatures. The Indian Meteorological Department shares a five-day forecast with the Heat Action Plan Nodal Officer during the heat season. The RMC will create formal communication channels to alert governmental agencies, the Met Centre, health officials and hospitals, emergency responders, local community groups, and media outlets of forecasted extreme temperatures.
- **Capacity Building Among Health Care Professionals** to recognize and respond to heat-related illnesses, particularly during extreme heat events. Such trainings focus on primary medical officers and other paramedical staff, and community health staff so they can effectively prevent and manage heat-related cases so as to reduce mortality and morbidity (see Figure 10).



Figure 10 : Capacity Building and sensitization workshop at Nagpur Municipal Corporation

- **Reducing Heat Exposure and Promoting Adaptive Measures** by undertaking new efforts including mapping of high-risk areas of the city, increasing outreach and communication on prevention methods, improve water delivery systems in public areas and cooling spaces during extreme heat days. Collaboration with non-governmental organizations is also identified as a means to expand outreach and communication with the city's most at-risk communities.

There are five reasons why the Heat Action Plan works and saves lives and why it can be role action plan for low middle-income countries (Ahmedabad Heat Action Plan, 2019):

- **Simplicity:** The Heat Action Plan uses a simple, color-coded, early warning “heat alert” system that alerts residents and city offices of predicted high and extreme temperatures.

- Partnership: The partnership between HAP development agencies, implementing agencies (city administration and health system), and IMD for heat alerts is the base of the plan. This coordination lead Nagpur Municipal Corporation (NMC) to deploy Nodal officer and create formal communication channels to alert governmental agencies, the Met Centre, health officials and hospitals, emergency responders, local community groups, and media outlets of forecasted extreme temperatures and the most sensitive areas.
- Communication: Direct communication-focused on behavior change-is at the heart of saving lives through the heat action plan. Building public awareness and community outreach is vital to communicating the risks of heat waves and implementing practices to prevent heat-related deaths and illnesses. HAP used print, electric and social media to release heat alerts.
- Innovation: An early warning system for extreme heat events to protect population was first of its kind.
- Leadership: Strong local government leadership enables the highly effective implementation of the heat action plan.

Implementation of Heat Action Plan

The checklist for various coordinating agencies are given ahead to make them alert for heat wave preparedness and suggesting them need to be performed.

Checklist for Nodal Officer at Municipal Corporation

Phase 1 (Pre-Heat Season January through March)

- Convene meetings with key agency leaders and involved them in response mechanism to Heat waves to review the action plan periodically.
- Create a list of the high-risk areas of the city vulnerable to heat waves for more focused activities on heat prevention.
- Reengage state and local agencies to facilitate internal communications.
- Organize preventative training and outreach efforts for health workers, link workers, school children, and the local community with the Health Department.
- Distribute multilingual pamphlets and posters with tips to prevent heat stress to hospitals, schools, and professional associations (see pamphlets attached).
- Establish Heat Wave Action Web Page on Disaster Management / District Web site.

Phase 2 (During the Heat Season March through July)

- Activate a **heat alert** and the local response citywide when extreme heat events are forecast by notifying the key agency leaders, NMC Deputy Municipal Commissioners and the Nagpur state agencies in accordance with the Communication Plan above.
- To ensure that communication channels with all Stakeholders are functional and operating.
- Monitor and increase the **heat alert** level when necessary to match the severity of the forecast and threshold established, and have the Municipal Commissioner convene a special meeting with key agency leaders.
- Communicate locations of emergency facilities and cooling centers / shaded areas with each Department / Organization.
- Expand access to shaded areas for outdoor workers, slum communities, and other vulnerable populations. For example, confirm that night shelters stay open all day for migratory populations during a **heat alert**.
- Hold a frequent, possibly daily, conference call to discuss reports and breaking developments during a **heat alert**, and ensure that communication channels remain operational.
- Identify and set up public displays of temperature and forecasts, such as LED electronic scrolling boards.
- Continue surveillance of temperature data and forecasts.
- Instruct water department or local municipal department to ensure availability of staff and clean drinking water during **Heat alert**.
- Inform power supply, Companies to prioritize maintaining power to critical facilities (such as hospitals and Urban Health Centers).
- Notify the Steering Committee and relevant agencies when the **heat alert** is over.

Phase 3 (Post-Heat Season July through September)

- Organize an annual Heat Action Plan evaluation meeting with key agency leaders and relevant stakeholders.
- Review of quantitative and qualitative data for process evaluation and improvements.
- Evaluate the reach and impact of the Plan and revise accordingly. Revision of Plan basing on the performance feedback
- Build on the “Green Cover” activity to establish tree-plantation campaign in hotspot areas such as roadsides and during plantation festival in June. Incorporate student volunteers or incentivize builders to plant trees to help effect this effort.

- Discuss establishing cooling center facilities in high-risk areas around city.

NMC Health Department and Medical Professionals

Phase 1 (Pre-Heat Season January through March)

- Improve targeted training programmes, capacity building activities and coordination on heat disease for medical staff in local hospitals and urban health centers (UHCs), based on the NMC Medical Professionals and Health Workers system. These efforts should include nursing staff, paramedics, field staff and link workers, and consider the susceptibility of particular wards.
- Have hospitals update their admissions and emergency case records to track heat-related morbidity and mortality. Train hospitals to make documentation of the cause of death certificates more expedient. Explore the development of quick, user-friendly means for monitoring daily heat-related data and impacts of behavioural change. The training could also include recording information education & communication (IEC) efforts.
- Adopt heat-focused examination procedures at local hospitals and urban health centers.
- Purchase and distribute reusable soft plastic ice packs for the citywide UHCs, 108 and 102 emergency centers, ambulances and hospitals.
- Explore the establishment of ice pack dispensaries to increase access to vulnerable communities.

To provide following services through 108 / 102 Emergency Service

- Create displays on ambulances during local events to build public awareness.
- Organize training on recording information education & communication (IEC) efforts.
- Identifying routes to high-risk areas and to reach vulnerable sections of population in shortest time possible by utilizing the list of high-risk areas.
- Prepare handouts for paramedics about heat related illness.

Phase 2 (During the Heat Season March through July)

- Post heat-related illness prevention tips and how to stay cool around hospitals and UHCs.
- Ensure adequate medical supplies available.
- Produce weekly reports of the public health impact for Municipal Corporation Nodal Officer during a **heat alert**.
- Deploy additional staff at hospitals and UHCs to attend to the influx of

patients during a **heat alert**, if feasible.

- Increase outreach of community health workers in at-risk neighbourhoods during a **heat alert**, if feasible.
- Have zonal health officer visit UHCs to confirm proper preparation has been made for heat-related illness and conduct case audits during heat season.

Ensure that 108 /102 Emergency Service:

- Activate dynamic strategic deployment plan for ambulances.
- Ensure adequate supply of ice packs, IV fluids and medicines.
- Disseminate SMS text messages to warn local residents during a **heat alert**.

Phase 3 (Post-Heat Season July through September)

- Post heat-related illness prevention tips and how to stay cool around hospitals and UHCs.
- Ensure adequate medical supplies available.
- Produce weekly reports of the public health impact for NMC Nodal Officer during a **heat alert**.
- Deploy additional staff at hospitals and UHCs to attend to the influx of patients during a **heat alert**, if feasible.
- Increase outreach of community health workers in at-risk neighbourhoods during a **heat alert**, if feasible.
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Ensure that 108 /102 Emergency Service:

- Activate dynamic strategic deployment plan for ambulances.
- Ensure adequate supply of ice packs, IV fluids and medicines.
- Disseminate SMS text messages to warn local residents during a **heat alert**.

The various activities implemented by various line departments as per inter-agency coordination framework (see Figure 11).

Impact of the Heat Action Plan (HAP)

IIPH-Gandhinagar and other supporting agencies implemented HAP in the city of Nagpur. The plan piloted an early warning system and interagency disaster risk reduction coordination framework to prevent population from the risk of extreme heat events. This plan provides a framework for the emulation and protection of other Indian cities from extreme heat. In addition

to providing early warnings and interventions when heat waves strike, building awareness of and training medical workers, municipal agencies and vulnerable communities for extreme heat threats to health may have already saved lives in Nagpur.

Recommendations

The government should invest in improving availability of health-related data like IMD is providing climatic data. This would improve understanding about impact of heat waves on morbidity and mortality and will also help in developing city specific threshold and heat stress index. New thresholds for issuing heat-related warnings could incorporate information based on temperature-humidity combinations. Further, scientific efforts should be targeted towards developing India specific Heat Stress Index.

At every municipal corporation or city level, there should be a nodal person trained in Environment Public Health for coordinating various activities of heat action plan with line departments. As effective and efficient implementation of HAP require multi-stakeholder collaboration and coordination. The cities should monitor and evaluate heat-action plans. Successful plans require constant monitoring and evaluation for processes as well as outcomes. Each year plan should be updated. The government should scale up heat-warning systems in rural areas for protecting communities, livestock and rural economies from extreme heat events.

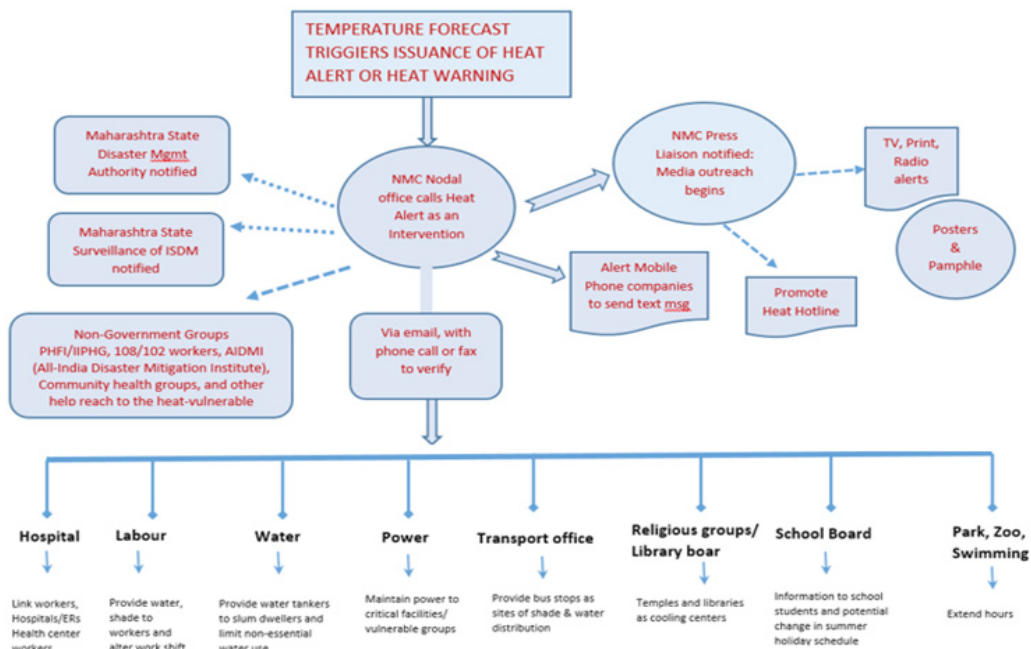


Figure 11: Inter-agency coordination framework

Conclusion

India is already experiencing warmer summers because of climate change. In this decade (post 2000), 16 of the 18 hottest summers recorded over the past 100 years have occurred. It is expected that each consecutive year will be warmer than last year. Although the heat-related mortality and reporting precision are affected by inaccuracy for instance, few causes of deaths and deaths among homeless are not recorded. The heat action plan is comprehensive and involve early warning system used during heat waves, health education and promotion of vulnerable community about prevention from heat related illnesses, awareness programs in schools, inter-departmental coordination to alert citizens of predicted high temperatures, training for health care professionals to prevent and treat heat-related illnesses and death, developing innovative IEC material in local language and mapping of high-risk areas and community. The Nagpur Heat Action Plan (HAP) was first of its kind in the Maharashtra. A combination of public awareness campaigns, training for medical staff and simple and easy policy changes have prevented thousands of mortalities at low price. The case study provides an evidence-based guide to public health policymakers across globally for improving resilience of communities against extreme heat events and for prevention and management of heat related illnesses.

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Disability Inclusive Disaster Resilient Infrastructure in Public Buildings - A Case Study

Dr. Ashok Sanganal* and Shreyas M T**

Overview

It is observed that a majority of the officers lack understanding of the needs and amenities for the persons with different disabilities. It may be due to the fact that there is little or no awareness about the difficulties faced by this community. It seems that only after the training a majority of the officers could able to grasp and realise the issues and problems. The persons with disabilities (PWD) have always been found to be the most affected during disasters like tsunami, building fire, earthquake, flood and recent pandemic. This case study is taken up to identify the problems and issues faced by the persons with disabilities during disaster. Based on the study in the selected public spaces an attempt has been made to suggest recommendations to improve the amenities to make their life ease with accessibility. This vulnerable community often experiences helplessness to access the emergency facilities including basic infrastructure like ramps, lifts, wheelchair, telephones, door latches, toilet and its accessories during disasters. Instances of negligence and discrimination by the establishments have led to their isolation and poor health care leading to increased risk. Disasters have caused injuries, deaths and increased impairment to the persons with disabilities due to improper planning & implementation of schemes and projects. The experiences show that the recent pandemic pushed them to suffer even more severely as a result of series of lockdowns which resulted into poor incomes and loss of employment of this community in particular and their family members in general. Even the public on the street were unwilling to extend support to disabled persons to cross the roads due to the fear of COVID-19 pandemic. We have seen disabled persons receiving relief materials like ration and medicines, struggling in the same queue alongside others in the relief shelters.

Introduction

Past studies revealed that PwDs have two to four times more mortality rate than the general public during the disaster. It is always seen that the needs

of the persons with disabilities are not understood by the establishments as a result of their non-participation in the disaster management. Generally, there is no representation of members from PwDs in the disaster management committees, neither the authorities pay attention to include them in planning.

Persons with Disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others. This includes aged persons since the aging process not only deteriorates the existing health status but also aggravates the disabilities.

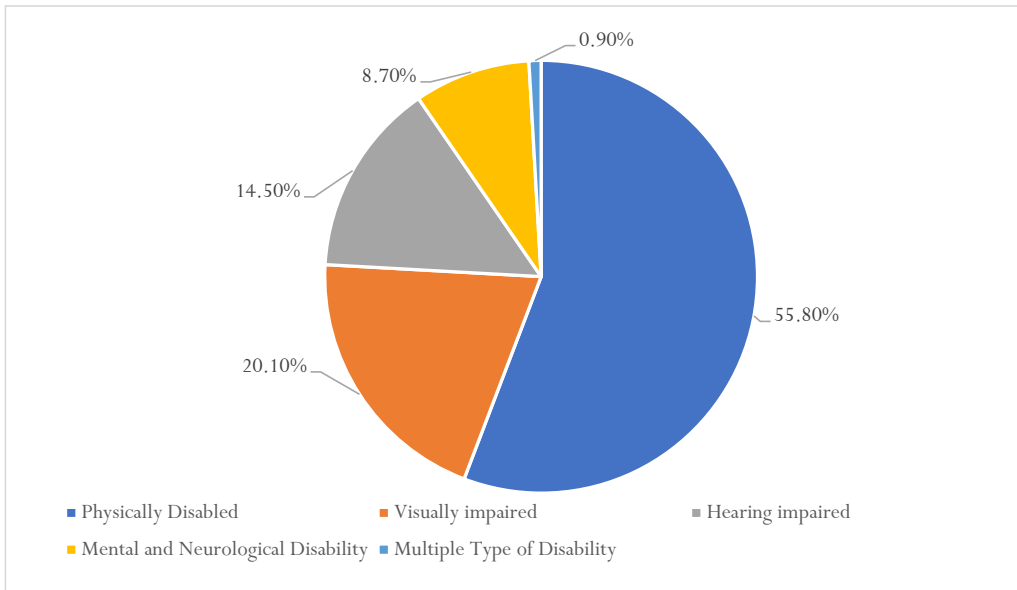
The United Nations International Strategy for Disaster Reduction in its study on disaster and disabilities reveals that 72.9% of the persons with disabilities have no personal preparedness plans. As per WHO and World Bank, a billion of the world's population live with some form of disability. According to the 2011 census India has 2.68 crore (2.1% of population) persons with disabilities in which 20.3% of people have movement disabilities, 18.9% have hearing impairments and 18.8% have visual impairments. Karnataka State has 13.24 lakhs persons with different disabilities which constitutes 2.17% of the total population of the state. Among the persons with disabilities in the state 54.86% are male and 45.14% are female.

It is seen from the Table-1 that under five categories of disability a total of 14280 persons with disabilities have been identified in Mysuru city alone in the year 2017, although the figures for the subsequent years have not yet been compiled.

Table-1: Disability count in Mysore City

Sl.no.	Type of disability	Male	Female	Total
1.	Physically Disabled	4625	3341	7966
2.	Visually impaired	1657	1217	2874
3.	Hearing impaired	1091	979	2070
4.	Mental and Neurological Disability	689	556	1245
5.	Multiple Type of Disability	68	57	125
	Total	8130	6150	14280

Source: District Disability Office, Mysuru



Source: District Disability Office, Mysuru

Figure 1: Disability percentage in Mysore City

Methodology

Data is collected primarily from the field by observation and sample survey in the selected public spaces and buildings in Mysuru city. The public spaces and buildings selected for the study are- Heritage Market, City Bus Terminal and an Educational Institution. A checklist and structured questionnaires were framed to review the problems of accessibility. The study includes physical characters of pedestrian facilities such as surface, width, obstructions, encroachments and continuity. Based on the analysis of field data and secondary information, recommendations have been proposed.

1. Case study of Heritage Market

The Heritage Market complex built in 1886 is located at the heart of Mysore city. It is one of the ancient monuments and is having a palatial outlook with beautiful ornamental frontages. The area of the site is approximately 3.2 acres. This market is renowned for its vegetable, fruit and flower stalls, as well as the small shops selling traditional ingredients attracting thousands of local residents and tourists. Festivals like Dasara make this market over crowded with increased disaster risk.

Barriers in the Market: It is observed that the entrance gates on all four directions have been blocked by erecting post stones as protective barriers to control entry of cattle preventing free movement of disabled persons. In the event of disaster PwDs are bound to get trapped inside the market

complex. The entire market area did not have a ramp. The photos shown in Fig.1 to Fig.4 reveal the inadequacy of the market accessibility for PwDs.



Figure 2: Stone posts on East gate toward Sayaji Rao Road



Figure 3: Stone posts on West gate



Figure 4: Stone posts on gate towards Dufferin Clock Tower



Figure 5: Steps without ramp on gate towards Dufferin Clock Tower

The floor surfaces inside the market are made up of concrete and stone slabs (Figure 6 and Figure 7). Uneven and undulated floor surfaces were observed inside the market which may restrict the movement of persons using wheelchairs and white cane.



Figure 6: Narrow uneven ramp along the pedestrian way



Figure 7: Uneven surface along the pedestrian way

Narrow lanes inside the market with reduced passage width (Figure.8) have restricted the movement of persons with disabilities. The internal circulation area is also congested during peak hours due to narrow widths of the passageway. Encroachment of passages as shown in Figure.9 by the shop owners has reduced the width of the lane by making it difficult for persons with disability to move freely. It also causes obstacles for the movement of PwDs during the time of emergencies.



Figure 8: Narrow lane inside the market



Figure 9: Encroachment of Shops towards pedestrian way

No signage boards indicating the direction of exit were observed inside the market, this may put hurdles to PwDs to exit quickly during disasters like fire. Interviews and field investigations were carried out through formal and informal focused discussions with the shop owners and visitors. Over 90% of respondents expressed that they have seen persons with disabilities visiting the market face difficulties in their movement. Among the persons with disabilities visiting the market it was found that more number of persons with visual impermanent and locomotive impairment visit the market. When asked whether they have complained to concerned authorities about problems faced by persons with disabilities, the shop owners and visitors told that no such complaints have been reported to concerned authorities. Respondents said that persons with disabilities were accompanied with others to assist them.

Recommendations: Public spaces like markets should be made accessible for Persons with Disabilities. Walkways should be stable, level, non-slippery and surface should not have any undulations. Walkways should be free from obstructions like stone posts, steps and encroachment. Irregular surfaces laid with stone slabs at different levels cause bumpy rides for wheelchair users and should be replaced by even surface flooring without steps. Ramps are to be added wherever steps are already provided.

Minimum width of the walkway for two-way traffic should be 1800mm. But in exceptional case where there are obstructions like trees or poles the width may

be reduced to 1500mm. Tactile pavers should be provided for persons with vision impairment by means of guiding blocks and warning blocks. Gratings and manholes shall be avoided in the walkway. Signage in contrast colours and large font size shall be provided for ramps, gradient change, emergency exit, etc.

2. Case study of City Bus Terminal

City Bus Terminal is located adjacent to Mysuru Place towards K. R. Circle in Mysuru city. It is one of the important transportation hubs in the city. The bus terminal provides bus services to different parts of the city and close by rural areas. The accessibility of the bus terminal for persons with disabilities was studied and following observations were recorded.

Field Observations: The main entrance of the city bus terminal (see Figure.10) is from the side of K.R. Circle. The main entrance had steps and there were no ramps provided. It was difficult for persons with disabilities to access the bus terminal from the main entrance since there were no ramps and handrails.



Figure 10: City Bus Terminal, Main Entrance



Figure 11: Subway at City Bus Terminal

The entrance from the main gate of the City Bus Terminal leads to the subway through which different bays of the terminals can be accessed. The approach to the Subway (see Figure 11) was by steps and there were no ramps or lifts to access the subway. It was difficult for persons with disabilities to move from one bay to another bay without any ramps or lifts to access the subway.

It is difficult for persons with vision impairment to move safely with ease in the bus terminal as there is no Tactile Paving provided on the bus bays of the terminal (see Figure 12). Tactile paving is a system of textured ground surface indicators which is provided on footpaths, stairs and platforms to assist vision impaired persons using white cane. It was observed that the ramp provided

to the Bus Bay from the Albert Victor Road side as shown in Figure 13 didn't have any handrails.



Figure 12: Bus Bay at City Bus Terminal



Figure 13: Ramp provided for bus bay

Findings from Sample Survey: It was noted that the bus terminal didn't have sufficient number of ramps with handrails and lifts for access to persons with disabilities. The new busses of air condition class had inbuilt foldable ramps for persons using wheelchair to facilitate accessing the bus. But the old buses didn't have any ramp arrangements for persons with disabilities. Bus conductors responded that they see persons with locomotive and visual impairment often visiting the bus stand. The entrance/exit of the Bus Terminal should be accessible for persons with disabilities by means of Ramps or lifts. Level differences in floor if any should be accompanied by both steps and ramp with handrails on both the sides. Stairs should not be the only means of access to the subway. Along the bus bays and route connecting the entire bus terminal, a tactile floor guidance path for independent movement of persons with visual impairments should be provided.

3. Case study of an Educational Institution at Mysuru

A case study was conducted at an educational institution in Mysuru city to study the accessibility of the institution by persons with disabilities during disasters and following observations were made. The main gate of the institution had no obstructions that hinder the movement of persons with disability. The institution building consisted of two stories. The ground floor of the institution was provided with steps and ramp side by side. But there were no ramps or lift provided for the first floor. The library (Figure 14) located in the ground floor with book shelves and furniture as shown in Figure 15 didn't have sufficient space under the table for wheelchair users.

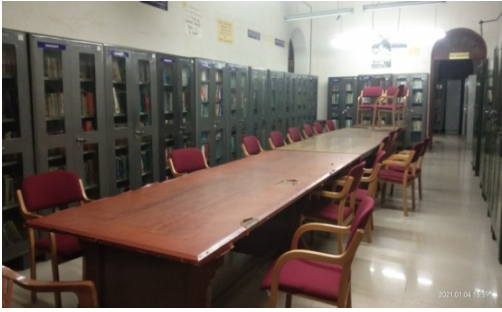


Figure 14: Library Room



Figure 15: Furniture at Library

The doors of some of the classrooms and laboratories had door sills as shown in Figure 16 which restricted the movement of people using wheelchair, therefore door sills in the public buildings should either be avoided or provided with ramp. The width of the corridors was measured to be not less than 1.5m and was sufficient for the persons with disabilities for free movement in the corridor (see Figure 17).



*Figure 16:
Door with
Door Sill*



*Figure 17:
Corridor at the
Institution*



*Figure 18: Toilet
with steps at
entrance*



*Figure 19:
Drinking water
facility*

There were no accessible toilets for persons with disabilities provided in the institution. The entry to some of the toilets had steps as shown in Figure 18 which exclude the wheel chair users and other persons with disabilities from using them. Drinking water taps (see Figure 19) with press and operate type were provided and are not easily usable. It is suggested to use taps with long lever handles that can be easily manoeuvred by a person with poor hand function.

There was no designated parking facility for persons with disability in the institution campus. It is suggested to provide a designated parking facility for PwD near the entrance of the institution. All lecture halls, administrative rooms and common areas should be accessible to persons with disabilities.

At least one accessible toilet should be provided on each floor. In Library, all open book stacks and other library facilities should be made easily accessible to the persons with disabilities.

Suggestions on the lines of National Building Code 2016: There shall be no obstructions under a counter or table which prevent wheelchair users to get close to it. Necessary space has to be provided under a counter for wheelchair users as shown in Figure 20.

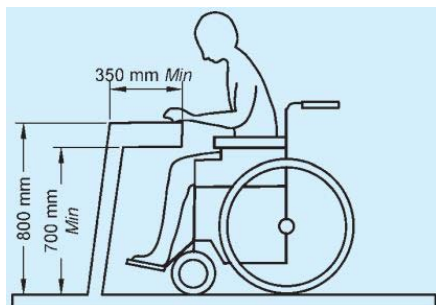


Figure 20: Necessary space under a counter for wheelchair users.

Source: NBC (2016)

Tactile guiding blocks indicate a correct path/ route to follow for a person with visual impairment. Tactile ground surface indicators shall be installed at an entrance/exit to a ramp, staircase (see Figure 21), pathway and platforms.



Figure 21: Example of Placement of warning blocks for steps



Figure 22: Platform chair lift and Platform lift.

Source: Harmonised Guidelines and Space standards for Barrier Free Environment for Persons with Disabilities

When it is impractical to provide a lift or a ramp due to shortage of space, a wheelchair stair-lift or platform lift should be considered as a reasonable alternative. Figure 22 shows a typical platform chair lift and platform lift. Handrails on both the sides shall be provided for stepped path, stairs and ramps.

A designated accessible parking space should be provided near the main entrance of the public buildings. The distance between accessible parking and the lift shall not be more than 30 meters. If the access is through lift then the parking is to be located within 30 meters of the lift lobby. Space should be provided for passenger drop-off for taxis and other vehicles near the main accessible entrance.

A visual emergency alarm shall be provided to alert people who are deaf or hard of hearing in the event of any disasters. Accessible toilets shall be provided with an assistance alarm which has to be connected to an emergency help point. Toilet seat shall be provided with on and off loading/shifting facility for persons with locomotive disability.

The public infrastructure should ensure that the physical environment is barrier-free by providing ramps, lifts, braille/engraved signage and by providing information in accessible formats. The “National Building Code of India-2016” and “Harmonised Guidelines and Space standards for Barrier Free Environment for Persons with Disabilities” specify standards for barrier free environment. These Guidelines explicitly cover universal accessibility standards and respond to the varying needs of all users including those with reduced mobility.

Legal framework: Section 46 of the RPwD Act 2016 makes it mandatory for all the public and private buildings to make them accessible as per the guidelines issued by Ministry of Urban Development, Government of India. Section 16 of the RPwD Act 2016 makes it compulsory for all educational institutions to make their buildings provided with facilities accessible to PwD.

The persons with disabilities shall have equal protection and safety in situations of risk, armed conflict, humanitarian emergencies and natural disasters. The National Disaster Management Authority and the State Disaster Management Authority shall take appropriate measures to ensure inclusion of persons with disabilities in its disaster management activities as defined under clause (e) of section 2 of the Disaster Management Act, 2005 for the safety and protection of persons with disabilities. The District Disaster Management Authority constituted under section 25 of the Disaster Management Act, 2005 shall maintain record of details of persons with disabilities in the district and take suitable measures to inform such persons of any situations of risk so as to enhance disaster preparedness. The authorities engaged in reconstruction activities subsequent to any situation of risk, shall undertake such activities, in consultation with the concerned State Commissioner, in accordance with the accessibility requirements of persons with disabilities.

It is reported that in the relief shelters provided for the disaster affected communities, complaints of discriminations were raised by some sections of the society. It is to be informed that Section 61 of the Disaster Management Act 2005 and Section 3 of the RPwD Act 2016 prohibit all forms of discrimination—be it based on sex, caste, community, descent or religion – in any activities related to disaster risk reduction, disaster relief or humanitarian assistance to the affected people. Ministry of Social Justice and Empowerment issued orders during COVID-19 outbreak, to address these discriminations.

Conclusion

The case studies of these three public spaces provided sufficient evidence to prove that the need for accessibility is yet to be fully understood by the authorities and establishments. We have identified problems of barriers and obstructions in all the three spaces. Therefore, the planning and implementing agencies namely municipalities, government departments, private establishments, educational institutions including all public spaces must have necessary facilities to ensure accessibility. It recommended that the establishments must plan and implement barrier free and accessible facilities. Almost all old buildings need to be modified with the accessible amenities as PwDs have been experiencing difficulties and often are physically hoisted leading to a feeling of loss of dignity. At the same time all new buildings and housing projects planned by private and government agencies must compulsorily incorporate disability friendly facilities as per NBC 2016. These agencies shall not demand extra cost from the beneficiaries.

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Best Practices Related to Disaster Management

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Overview

Disasters besides being natural or technological can occur because of anthropogenic activities. They happen when an extreme natural or technological event coincides with vulnerable human settlements. Disaster Management is the discipline of dealing with planning and processes of prevention, reduction, responding to and building back better on all types of assessed threats. The novel corona virus disease (COVID -19) crisis has significantly redefined the humanitarian emergency paradigm, improved our understanding of disaster management and reaffirmed the need for multi-dimensional and holistic disaster management in several ways. Most of the countries were unprepared to combat the Pandemic and suffered heavy losses. Apart from structural measures lack of implementation of non-structural mitigation activities contributed towards it. This paper highlights strengthening of non-structural mitigation measures.

Introduction

Disasters besides being natural or technological can occur because of anthropogenic activities. They happen when an extreme natural or technological event coincides with vulnerable human settlements. It is defined as a serious disruption of the functioning of a community or society causing widespread human, material, economic or environmental losses that exceed the ability of the affected community to cope using its own resources. Disaster events are dynamic and continuously unfold situations marked by changes in urgency, scope, impact, responder's and affected community needs. In essence, a disaster inappropriately affects the normalcy or functionality of any community or country affected. It usually leads to widespread destruction of lives and property with adverse economic implications.

COVID 19- Pandemic- A Disaster of Century

The effect of the disaster can be immediate and localize, but is often widespread and could last for a long period of time. The impact and the area of influence depend on type and intensity of the hazard and varies with the vulnerability and exposure on ground. In COVID like situation the crisis is not limited by a

geographic area or a cluster or physically defined areas in which the disease spread as in the case of an earthquake, flood or cyclone but quickly transmitted throughout the region and spread to other regions too.

This Pandemic in initial stage was not like any other disaster where effective implementation of mitigation activities was possible. Though cause identified as new kind of Corona virus, however, the impact of the disaster though quite significant in the initial stage its virulence or potency was underestimated. Earlier, epidemics like SARS (Severe Acute Respiratory Syndrome) and those due to bird flu and Ebola had a relatively lower geographical influence, but the speed of transmission and virulence of COVID-19 has posed an entirely new challenge. The New Normal emerged to prevent spread of disease, which was contradictory to the universally accepted principle of globalisation. A recognised concept of “Development results in to Disaster and Disaster results in to Development” has been demonstrated during the peak of Pandemics. While human society worldwide is under severe stress due to lockdowns, we are witnessing an altogether cleaner and more vibrant environment both in urban and rural habitats.

Nonetheless, what began as a health crisis and mitigation activities undertaken as anticipated secondary hazards sprang up to include economic and social probably caused ironically, by some of the very steps that were taken by public authorities to prevent further spread. Though till date several industrialized nations are still struggling to contain the levels of infection and fatality rates in their populations. Indian cities characterised by high population densities and impossibility of physical distancing in small housing units in slums, lack of running water and toilets, shortage of hygiene materials and personal protective equipment can exacerbate infection rates in several clusters that then become hot spots or red zones for the pandemic.

Though disaster management is complex, its mission is clear: to mitigate the harmful effects of disaster. A key component of mitigating the harmful effects of any hazard is to put in place mechanism, system and processes for holistic management of disaster risks in the given geographical area by ensuring preparedness for multi-hazard eventuality and scalable plan that optimizes the available workforce and can be implemented when disaster strikes to ensure sustainable socio- economic development.

Changing Scenario of Disasters

With the unplanned development assisting and degradation of environment has resulted in the temperature rise worldwide with increasing intensity and

unpredictable nature of disasters, changing constantly. The unpredictability and speed of disaster onset, despite our access to the most advanced and sophisticated information and early warning systems has resulted in increased vulnerability of mankind. We have seen in recent disasters the inability to predict the incidence of mudslides or the amount of water to be held or released in dams during heavy rains- weather in Bombay, Kerala or Chennai in recent years and in J&K in the year 2014. The ferocity of volcanic discharges recently in the Philippines and New Zealand surprised many scientists and earthquakes continue to surprise us with their relative unpredictability.

The imbalance in the environment due to human intervention with the nature around us has increased vulnerability in all sectors. Water from melting glaciers or rising ocean levels is resulting in more catastrophic hazardous events, Human and livestock losses due to Lightning incidents has assumed more alarming proportions and is going to increase in the coming days. The ability of disaster management authorities to reasonably predict or anticipate would be put to test in the days to come. One of the issues that came to the forefront in the COVID-19 crisis in India was the seeming inability of governments to anticipate the impact of the suddenness of the lockdown on migrant labourers in various parts of the country. One question that we need to ask in this, did we respond fast enough?. The speed of response need to be gauged not only how quickly we enforced physical distancing and lockdowns, but also in the speed and reach of preventive messaging. There is also an urgent need to be “smart”, in our response. In the COVID -19 crisis, several Government’s took calculated risks as part of their responses for instance, Sweden chooses not to impose physical restrictions on citizen, others continued with a certain degree of economic activity with very limited restrictions on mobility. While the COVID journey is still out on, the efficacy of each of these strategies in their specific contexts differs, the key learning is that we should not lose sight of our strategic and tactical response while implementing steps to mitigate the crisis.

Combating Future Disasters- Holistic Strategy

➤ **Importance of Socio-Economic Impact Assessment** - quick transition of a health crisis into a social and economic crisis of frightening dimensions during COVID 19 and such like disasters in India clearly brought to fore the need for rapid analysis of the impact on vulnerable population and need to develop an assessment tool for quick decision making and effective management of the socio-economic crisis. This hopefully would also

result in disaster risk reduction and reducing vulnerability of vulnerable population and also build resilience of vulnerable population. To this effect the recommended strategies to be implemented across the country to reduce the impact of future disasters can be flood proofing areas prone to annual flooding, creating infrastructure for community disaster response plans, draught proofing in arid areas by implementing ever-greening strategies combining decentralized, appropriate agriculture choices and agro-forestry with active encouragement by local, central and state governments.

➤ **Coordination Key for Inclusive Disaster Management-** A major lesson emerges from management of recent disasters is that of coordination between the various stakeholders. This has become even more critical during multi-hazard scenario as experienced during Pandemic period when Cyclone Amphan created havoc in the middle of the COVID-19 crisis. This requires a certain degree of ongoing investment in proactive preparedness at the community level, recognizing the need for all players to actively collaborate to build a certain degree of disaster resilience.

➤ **Good governance-** responsive administration and active coordination should be non-negotiable features of dynamic process that is driven by transparency and accountability on the part of public officials. Finally, our responses have to be humane and people-centric.

➤ **Sensitised Community towards Disasters-** Often, those infected or at the risk of exposure, including healthcare workers, were treated as criminals-denied entry or asked to summarily leave their houses. The images of some of these incidents only bring home, rather poignantly, the fact that the biggest lesson that COVID-19 has taught people is that we have to be genuinely concerned about the condition of our poor, and that the bulk of us have to overcome several fault lines in our minds before we can even think in building an inclusive, just and caring society in the near future.

➤ **Risk to Resilience Approach-** paradigm shift in our approach to Disaster Management focused on Pre-Disaster Preparedness than Relief and Rehabilitation. In this process we moved from Disaster Risk Management to Disaster Risk Reduction. Disaster mitigation strategies are the best and cost-effective methods of dealing with disaster over the long term. Mitigation involves a combination of strategies including physical/structural arrangements, adherence to rules, byelaws, generating awareness about risks amongst the community, strengthening their capacities and so on. Incorporating disaster risk reduction strategies in development planning activities ensures sustainable development.

Non-Structural Mitigation Strategy- Stakeholder Ownership

Disaster mitigation is a complex process and a challenging task. In this regard, structural infrastructure helps a lot in mitigation but is not sufficient to meet all the requirements of disaster-affected population/ area. There is a need also for non-structural approach which is flexible, innovative and even dedicated to meeting the needs of disaster-affected population/area. There is need of strengthening or reinforcing buildings and physical infra-structure to make them more resilient and resistant to disaster. Non-structural approach should encompass those measures that attempt to bring about all-inclusive approach by having effective coordination and of efforts of all government and non-government organizations during all phases of disaster management to include integrated training, preparing of action plans and public awareness related to legislation, policies.

Recommended non-structural mitigation measures are

- **Legal framework:** In some of the disasters like flood, cyclone, earthquake etc., more casualties occur because people either live in low flood plains or not follow building code made for the highly seismic zones or vulnerable cyclone areas. The provisions of Disaster Management Act 2005 makes it mandatory for all stakeholders to abide by the policies, acts, guidelines on the subject and also makes authorities at District level for its implementation. There are provisions in the Act for allocating funds for the same and at the same time spells out offences and punishments in case of non-implementation. This needs to be enforced at field level to ensure that people are made to follow safe principles, byelaws and construction on unsafe areas is restricted, the impact disasters can be mitigated.
- **Incentives:** In most of the States incentives are applicable for initiating structural/non-structural mitigation measures at individual and community level like solid waste management at local level, rain water harvesting, use of solar energy etc. Notwithstanding there is a need to identify areas where such incentives are possible and wide publicity for the same should be done so that people should be encouraged to adopt safe measures. For instance, in higher seismic zones, if some incentives can be provided to construct earthquake resistant houses in the form of grant or subsidy, people will adopt such mitigation measures. The incentives can also be in terms of tax exemptions or providing material required in earthquake-proof construction.
- **Insurance:** Though government has introduced number of schemes but still the people opting for such schemes are much below desired level.

There is a need for better awareness generation mechanism at grass root level, use of NGOs and CBOs in this initiative can be beneficial to spread message. Insurance of crops, buildings and other infrastructure in disaster-prone area is another measure. Insurance companies may provide soft loans for disaster-resistant structures and buildings. Alternately, the insurance premium for houses in unsafe or less safe areas could be kept high. The Eleventh Finance Commission proposed extending the National Agricultural Insurance Scheme to all States.

- ***Training, Education and Public Awareness:*** Training of the public officials at different levels is an essential part of disaster management. Separate training for technical people, and NGO is also required for specific disaster mitigation. The general public should be made aware and kept informed about the nature of hazards to which they are exposed, their vulnerability and available protection measures. Training and education need to target various categories of personnel including school children, crafts persons, technical personnel etc. There is need to orient not only about the various facts of disaster management, but also about the link between disaster management and development.
- ***Institutional Capacity Building:*** There is a need to streamline the existing institutional capacity as well as enhance the capacity considering the developing disaster management scenario all over the world. Government bodies, departments, NGOs and people should be careful to avoid actions that will further increase a society's vulnerability. By increasing self-sufficiency, agencies may improve the ability of individuals, families and communities to cope with disaster. The strengthening of a country's and community's institutional capacity can be done through three possible ways. First, through institution building, organizations that serve as coping instruments can be identified and strengthened. A deliberate effort can be made to increase their institutional capacities and skills thus enhancing their ability to deal with a crisis. Second, through increasing the number of coping mechanisms within a country or community, Third, through encouraging actions that promote cooperation among different groups within society.
- ***Warning systems:*** The importance of effective early warning system was demonstrated by Indian Meteorological Department through Cyclone EW system. In 1999 Orissa Super Cyclone the number of deaths was in thousands but after commissioning of Doppler based EW system the losses have come down to two figures. A reliable and timely warning of disasters can save lot of human lives. However, having a EW system may not be

sufficient unless all the stake holders to include government agencies and community are sensitised and action plan is in place for its mitigation. With fast developing changes in the probability, intensity and frequency of disaster events, climate change impact resulting in unpredictability has posed new challenges. There is a need for study, research and continuous up gradation of our existing EW system. For reducing the overall impact substantial attention must be paid during response to reduce future potential losses from disasters.

- **Sustainable Development** with the increasing intensity and unpredictability of disasters the losses physical, structural or socio-economic damages incurred are increasing in proportion day by day. The national policies, guidelines must recognize that natural disasters are recurrent events in natural ecological cycles and thus impose limits on redevelopment. There should be a general pre, during and post disaster management preparedness for to minimizing the loss of life and property.
- **Response Mechanism-** Disaster Management Act 2005 mandates integrated response to any crisis at District level. District administration is the focal point for the preparation of Response plan at the district level as it is the point of public service delivery responsible for directing, supervising and monitoring response and relief measures during disasters. District Disaster Management Authority is expected to adopt all hazard approach to develop disaster management plan for the District Inputs could be taken from the local defence forces units in preparation of these plans. As mandated in the DM Act all departments and local authorities are required to develop disaster management plans for their respective jurisdiction which need to be integrated in overall district disaster management plan. These plans will be then approved by the state government. They should lay down specific action points, key personnel and contact points. Moreover, plans should be periodically reviewed and updated in the light of lessons learnt in dealing with calamities from time to time and the technological advancements. This period of review should be one year.
- **Implementation of Provisions of Disaster Management Act 2005-** Act identifies District Disaster Management Authority as focal point for conduct, coordination and implementation of all the activities involved in Disaster Management, as defined in the act, it encompasses risk assessment, prevention/mitigation measure, preparedness, response and recovery. DDMA also need to develop an actionable disaster management plan integrating plans of other stakeholders. Most importantly, DDMA need to ensure effective implementation of planned mitigation activities

and for its efficient execution DM Act vested legal powers with DDMA for seamless execution. As a deterrent measure, there are offences and punishments specified in the Act which needs to be brought in to regular practice

- **Relief Mechanism during Disasters-** The relief paradigm encompasses reducing hardships to affected population by ensuring early recovery of lifeline services as well as basic needs of community as well as livestock. Recent disasters have brought to fore the requirement of environmental preservation. There are number of recommended policies, guidelines and initiatives which need to be strictly adhered to and brought in to purview of Disaster Management Act. This needs all-inclusive participation and most importantly community and hence the need to adopt bottom-up approach and efforts need to be made develop an holistic and implementable relief plan for specific areas. A district relief committee consisting of official and non-official members including the local legislations and the members of panchayats in each District should be setup to review and develop local level relief plan.
- **Coordination Mechanism:** The resources within the district like the police, fire brigade, medical aid etc. should respond to all situations as per their capabilities and must be incorporated in the plan. under the plan, the district collector is supposed to maintain close liaison with the central government authorities in the district. The coordination with voluntary help and channelizing the nongovernment organizations has now become very importance. In a country like India, where the help form state is often late in reaching victims, these sources have been rather prompt. Realizing their importance, the district administration in each district should enlisted them in the plan. The plan must contain the list of other implementing agencies and their communication pattern with the district administration, Moreover the district administration is required to furnish information on a daily basis to the state Relief commissioner on the implementation of rescue and relief measure. This is important as it helps the concerned state as well as the central government in assessing the requirements of the area and victims, which is a part of their respective plans.

Conclusion

Awakening after the UNs first intervention to reduce the impact of disasters by declaring 1990-99 as International Natural Disaster Risk Reduction Decade and there after India appointing High Power Committee and their recommendations leading to DM Act 2005, brought in a Paradigm

shift in our approach to disaster management. The HPC also identified and recommended some of the best practices followed by other countries like, Emergency Operation Centre, Incident Response System, Emergency Support Functions, and Supply Change Management etc. Indian government have adopted these practices and number of guidelines exists on the subject. However, there is a little effort seen at local level for its adaptation. It is prudent to say that though the structural measures greatly help in reducing the impact of disasters but at the same time non adherence to Non-Structural measures significantly increase community vulnerability and consequently the losses. It is therefore essential that merely developing non-structural mitigation strategy is not going to help in Disaster Risk Reduction but strengthening capacity of government authorities and community and its implementation will ensure a resilient community and sustainable development.

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Centre for Disaster Management

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