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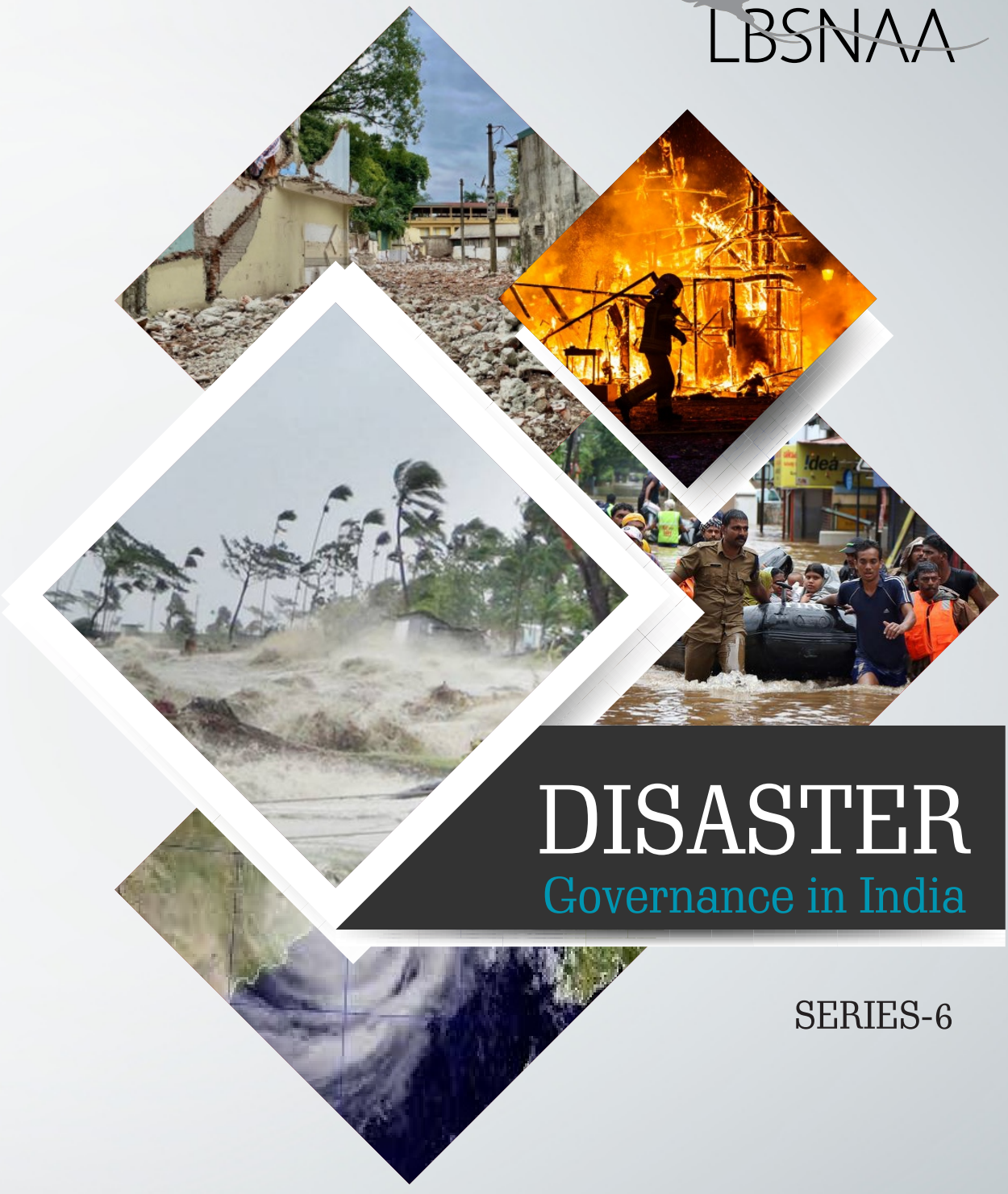

DISASTER
Governance in India

SERIES-6

cdm

CENTRE FOR DISASTER MANAGEMENT

Lal Bahadur Shastri National Academy of Administration, Mussoorie

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DIRECTOR'S MESSAGE

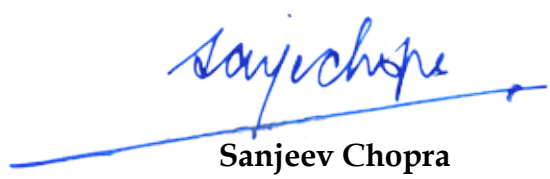
Sanjeev Chopra IAS,
Director,
Lal Bahadur Shastri National Academy of Administration, Mussoorie

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 6, for the year 2019-20 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 officers trainees and the administrators in handling in handling disasters and emergency situations across the country.



Sanjeev Chopra

PREFACE

Disasters have adversely affected human civilization since the drawn of our existence. Natural disasters have increased both in frequency and fury over the years. India has suffered enormously, in terms of loss in lives and livelihoods and damage to both public and private property due to recurrence of major natural and human induced disasters. In response various strategies have been formulated and implemented with regards to mitigation, prevention, response, rehabilitation and reconstructions during pre-disaster periods. All these efforts have the same underlying goal; Disaster Management and Disaster Governance.

No administrator can afford the luxury of waiting for a disaster to happen in his or her jurisdiction to learn from it. It is therefore imperative to be able to convey the experiences of practitioners to each other, in an effort to educate about the variety and intensity of challenges faced in this dynamic field. The responses might not have been the best in all cases-but they would certainly be elucidating some aspect of disaster resilience to discerning eye.

By virtue of the Disaster Management Act, 2005 Disaster Magistrate/ Divisional Commissioner are pivotal role of the District Disaster Management Authority (DDMA) and hence, it is essential that he should be well versed in various aspect of Disaster Management.

In continuation to the successful publication of the fifth issues of "Disaster Governance in India" by the Centre for Disaster Management, it is our privilege to publish the sixth series- for the year 2019-20. The book will be useful to administrators, at various levels, who are handling Disaster Management. It can also serve as a good reference material for ATIs and CTIs for their in-house courses.

The book "Disaster Governance in India- Series Six" will derive into the Emergency Management and Disaster Governance issues in various districts of India on the subject of Disaster Management.

C. Sridhar, IAS
Deputy Director (Sr.) & Director
CDM, LBSNAA

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Case Study from Nagapattinum : Cyclone 'GAJA' – Response & Beyond

Praveen P Nair, IAS

Focus of the Case Study:

- *The Case Study highlights some of the disaster relief, response and rehabilitation measures undertaken by the District of Nagapattinum, Government of Tamilnadu in the aftermath of the "Gaja" Cyclone.*

1. Background

The District of Nagapattinam came into existence in the year 1991. It is situated in the deltaic region of the river Cauvery and has a population of 16,16,450 (Census 2011). As per the Hazard Risk Vulnerability Analysis (HRVA) of India, India's east coast is one of the six most cyclone prone areas of the world. The District of Nagapattinam, located in east coast falls under very high-risk zone as per HVRA.

The District Administration of Nagapattinum, headed by the District Collector Thiru. Dr. S. Suresh Kumar I.A.S., received the cyclonic warning from the Indian Meteorological Department (IMD) pertaining to the 'Gaja' Cyclone with a possible landfall on 15th November 2018. A bulletin stating that the "Gaja" cyclone would take its path between Cuddalore District and Pamban Bay on 15.11.2018 was issued. With reference to the IMD bulletin, the State Government provided necessary instructions to the District Administration to respond adequately and appropriately to the cyclone to ensure minimum impact on the target population. As soon as the Alert was received, the District Collector triggered the District Administrative Machinery instantly and several preventive activities were taken to manage and mitigate the critical situation arising due to cyclone.

2. Preventive Measures before the onset of the Cyclone

The District Administration had taken various preventive and preparedness measures to avoid serious consequences of human lives and loss to material assets in the aftermath of the cyclone. A District Level Core Committee was formed comprising of Deputy Collectors, Joint Directors, Assistant Directors & Deputy Directors from Forest, Fire, PWD and Highways Departments. **Inter-Departmental**

Zonal Teams were identified who regularly alerted the Administrative Machinery about the movement of the cyclone. All the District functionaries were sensitized about the measures to be taken for effective preparedness and response with respect to the said cyclone.

These Measures included the following:

- Weather Warnings were regularly disseminated to Fishermen in Local language through Newspapers, Loud Speakers, WhatsApp Messages and local media.
- Disaster Management Teams ensured the readiness of the Multipurpose Evacuation Shelters and Cyclone Shelters with respect to availability of water, electricity and sanitation facilities.
- Multipurpose evacuation shelters were also augmented with Generator sets with essential backup services. 690 Nos. of Schools and 222 Nos. of Community/ Marriage halls were also identified as '**Additional Evacuation Centres'** in the district.
- The District Administration was ready with 34050 filled sand bags and 185000 empty sand bags at 6 places in the district to meet out any unforeseen situation.
- In each Taluka, monitoring officers in the cadre of Deputy Collectors, were positioned to monitor the cyclone situation round the clock.
- A total of 4464 First Responders pooled from all Revenue Villages, were sensitized about the cyclone and were given instructions to co-ordinate with District Administration for Cyclone preparedness. The National Disaster Response Force (NDRF) also deployed its teams for rescue and relief.

3. Cyclone & Aftermath

As per early warning, the 'GAJA' cyclone crossed the coast between Nagapattinam and Vedaranyam Talukas, in Nagapattinam District between 12:20 a.m. and 2:30 a.m. on 16.11.2018 at an overwhelming speed of 120 kms/hr, stalling the basic livelihood of the residing communities.

Prompt Assessment with respect to loss of human lives and damage to assets was done by the Revenue Department functionaries and it was found that a total of 151 Revenue Villages out of 523 were majorly affected. Since the Cyclone crossed the south shore of Nagapattinam town, the greater part of the towns south of Velankanni, for example, Seruthur, Kameshwaram, Vizhunthamavadi, Vettaikkaraniruppu, Vellapallam, Vananvanmahadevi, Naluvedhapathi, Pushpavanam, Arcottuthurai, Thoputhurai, Vedaranyam towns and Block, Kodiyakkarai also bore the brunt of flooding on account of nearby water sources. Further, right from from Velankanni to Kodiyakarai, in towns and residences at Thalainayar, Koilpathu region, Voimedu towards Muthupettai and Thiruthuraipoondi in Thiruvarur, had additionally been severely affected.

Due to the periodic alerts issued by the State and District Administrations, the local people residing in the low-lying areas were evacuated to the **Relief Centers**. 415 Relief Centers were operational in the entire district during the cyclone period. 77,319 families (a total of 3,62,786 people) were evacuated to the relief centers consisting of 1,09,480 men, 1,29,924 women and 46,063 children. Basic amenities like food and water were provided to these affected families at the centers.

On account of Gaja Cyclone, around 1, 11,132 houses were impacted, which included 22,224 partly damaged huts, 77,796 fully damaged huts and 11,112 damaged pucca houses. There was vital need for supporting families who were severely impacted by the cyclone especially in terms of their basic survival requirements including food. A total of 21002 livestock animals which included 10129 goats, 1361 cows (including calves), 4 Bullocks and 9508 poultry animals, were lost.

In the Coastal region, close to 857 country & 9 motorized boats were completely damaged, 1913 country boats and 906 motorized boats were partly damaged and 4611 engines were partly damaged. Around 1100 shrimp ranches, 402 dry fish processors and boat yards as well as 6009 fishing nets were also impacted.

Around 3886 hectares of coconut and 223 hectares of banana plantations were uprooted which led to permanent loss of livelihood to many affected families. 49,500 electric poles including 592 transformers were damaged making muddy roads inaccessible. Power supply was suspended for over 25 days. Supply of drinking water was additionally disrupted. The Agricultural land was rendered uncultivable due to surge of storm water from the sea. 4000 hectares of paddy and other standing crops were extensively damaged.

4. Post Cyclone Response Measures

The District Administration promptly assessed the total human loss and disbursed the relief amount to the affected families of the deceased individuals as per State Government's Directives. Accordingly, a sum of Rs. 80,00,000/- were disbursed to families of 8 deceased individuals and a sum of Rs.1,00,000/- for 2 severely injured persons.

The district medical teams took all necessary steps to prevent spread of any kind of epidemic. A total of 4600 **Temporary Medical Camps** and 544 **Static Medical Camps** were established in the entire district which benefitted close to 1,97,570 people. More than 25,000 Electricity personnel were deployed from the other districts for the transformer and pole restoration work. 13296 affected service lines were restored. 592 damaged transformers were restored. 49500 damaged EB poles and All 30 sub-stations were restored. Local bodies provided sufficient water supply to relief camps and households.

The District Administration deployed personnel from PWD, Highways and Agriculture Engineering Departments to clear the uprooted and fallen trees. 225 JCBs and 185 Power Saws were deployed to perform the task. In addition, to remove the tree branches and debris, 65 tractors with trailers are engaged. Around 1,78,315 fallen trees were removed and the road blocks were cleared for smooth passage. 350 Feeding centers operated in the affected areas for regular provision of food to the affected families.

Rural Development and Panchayat Raj Departments mobilized officers and engineers from other districts and formed self-contained Teams headed by Project Directors and Executive Engineers, supported by 94 officers in various cadres. To ensure uninterrupted water supply, 295 Gensets with operators, 82 tanker lorries, and 62 tractors with tankers were mobilized from nearby districts. More than 50,000 workers were engaged to clean the roads, streets, public buildings, school buildings and in spraying bleaching powder and chlorinating the drinking water sources.

The Navy personnel stationed at Nagapattinam were deployed to assess the extent of damage with respect to agricultural and horticultural crops. They joined the State authorities, NDRF and the community to clear public buildings and roads. 5 NDRF teams consisting of 120 Personnel and 15 SDRF Teams consisting of 300 Personnel were deployed in various rescue operations.

5. Post Cyclone Rehabilitation and Recovery Measures

The District Administration took a number of rehabilitation and recovery initiatives post the cyclone which are briefly summarized below:

5.1 Centralized Data Entry Hub

A Centralized Data Entry Hub was installed to ensure the speedy up-dation of data enumerated for affected huts / tiled houses in digital format, for prompt delivery of the relief material and funds to the affected families, since the Government had decided to transfer the relief amount directly to the respective beneficiary account (ECS Method: Electronic Clearing System).

a) Purpose of the initiative:

Village wise enumeration was done by Village Administrative Officers who collected the data from the affected villages (Ration card, Aadhaar Card, Bank details) where they faced many hurdles in updating the data in excel sheet. Numerous individual rounds of enumeration had to be done in each village, for eg., hut damage enumeration, cattle loss, agricultural loss, horticultural loss etc.,

by the same Village Administrative officers. In the absence of complete data, the relief amount could not be sent to the affected families with respect to restoration/ repair of the damaged dwelling. Converting the collected data into excel sheet was needed to transfer the relief amount to the beneficiary and to kick start the rehabilitation work.

b) Strategies adopted:

- Centralized Data Entry hub was arranged at E.G.S Pillai College in Nagapattinam, where 90 Data entry operators were deployed round the clock on shift basis to convert the collected data into Excel sheet.
- Village Administrative Officers sent the collected data to the Centralized Data Entry Hub where the Collectorate officials received the data and assisted the data entry operators in updating the data in standard format for ECS payment.
- District Revenue Officer headed the entire team duly assisted by nodal officials, who were of Deputy Collector and Tahsildar cadre, to ensure the smooth functioning of the Data Entry process.
- Excel sheet data verification and removal of duplicate information were performed by the e-District Managers (e-DM).

c) Benefits:

The installation of the Central Data Entry Hub led to improvement in delivery time of services. By adopting the above strategy, the data conversion was completed in a very short span of time and the relief amount was disbursed to the affected families with great ease which helped the affected families to restore or repair their damaged houses.

5.2 Centralized Kitchen

Centralized kitchen was established mainly to address the food shortage issue in some of the affected areas in Nagapattinam division during the Gaja Cyclone. Around 2,00,000 individuals stayed at the Relief Centre during the cyclone period and providing them with food and other basic amenities was a challenge for the District Administration. Through the **Centralized Kitchen**, the district administration was able to feed all the inmates in the relief set ups.

a) Strategies adopted:

- The Centralized kitchen was strategically chosen at three locations.

- Food was prepared at the Centralised Kitchen and supplied to the requested areas.
- The Individual had to reach the destination and obtain food by just giving the attendance proof of the relief centre or any regularisation letter from the village people who were in need of food.
- Vehicle arrangement was also provided by the District Administration for immediate movement of food to needy people.

b) ***Benefits:***

By adopting the above strategy, the issue related with food shortage was sorted out in a timely manner and regular supply of food to the affected individuals also paved way for undertaking other restoration activities. The initiative of Centralized Kitchen was well appreciated by His Excellency, The Governor of Tamil Nadu and other senior officers of the Indian Administrative Service who were monitoring the relief measures.

5.3 Reception Centre for Relief Materials

Contributions from Non-Governmental Organizations/Corporate Companies/ Philanthropists were substantial during the post cyclone period. The items contributed by them played a vital role in addressing the immediate and short term needs of the affected population. Dedicated reception centres were established to streamline the process of receipt and disbursement of the said relief material.

a) Strategies adopted:

The Reception Centres operated from three strategic locations viz. Tamil Nadu Warehousing Corporation, Amirthanandamayi School and Government Higher Secondary School, Kurukatthi, from where the relief materials donated by all the NGOs /Corporate Companies/Philanthropists were received and distributed to the affected families under police protection. An officer in the cadre of Project Director was made in-charge for the entire operations.

b) Benefits:

The Relief Centre served as an '**One Stop Centre'** for the NGOs to contribute the materials which in turn enabled the District Administration to distribute the materials to the needy in the quickest time possible.

6. Conclusion

Despite heavy downpour for three days in the aftermath of the "Gaja' Cyclone, the District Administration took various prompt relief and response measures as indicated above, to ensure timely delivery of essential services to the affected families in the district

GLIMPSES OF THE REHABILITATION EFFORTS

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நாகப்பட்டினம் மாவட்ட ஆட்சியர் அலுவலகத்தில் "கஜா" புயல் பாதித்த பகுதிகளில் மேற்கொள்ளப்பட்டு வரும் சீரமைப்பு பணிகளை துரிதப்படுத்துதல் மற்றும் உணவு, குடிநீர், மற்றும் மின்சாரம் சீராக வழங்குதல் தொடர்பான ஆய்வுக்கூட்டம் மாண்புமிகு வனத்துறை மற்றும் துணிநலத்துறை அமைச்சர் திரு.டாக்டர்.மணிகண்டன், இ.ஆ.ப., மாண்புமிகு வனத்துறை அமைச்சர் திருதிண்டுக்கல் சீ.சீனிவாசன் அவர்கள், மாண்புமிகு மின்சாரம், மதுவிலக்கு மற்றும் ஆயத்தீர்வைத் துறை அமைச்சர் திரு.தங்கமணி அவர்கள், நகராட்சி நிர்வாகம், ஊரக வளர்ச்சி மற்றும் சிறப்புத் திட்டங்கள் செயலாக்கத்துறை அமைச்சர் திரு.எஸ்.பி.வேலுமணி அவர்கள், மாண்புமிகு தொழில்துறை அமைச்சர் திரு.எம்.சி.சம்பத் அவர்கள் முன்னிலையில் இன்று(18.11.2018) நடைபெற்ற உடன் மாவட்ட கண்காணிப்பு அலுவலர் மற்றும் வேளாண்மைத்துறை முதன்மைச் செயலாளர் மற்றும் வேளாண்மை உற்பத்தித்துறை ஆணையர் திருகாகர்தீப் சிங் பேடி,இ.ஆ.ப., கோழி கால்நடை மற்றும் மீன்வளத்துறை முதன்மைச் செயலாளர் திரு.தேவேந்திரகுமார் ஜாஜு, இ.ஆ.ப., ஊரக வளர்ச்சி மற்றும் ஊராட்சிகள் துறை இயக்குநர் திருகபாலசுந்தரராஜ்,இ.ஆ.ப., மாவட்ட ஆட்சித் தலைவர் முனைவர்.சீ.அமிர்தஜோதி,இ.ஆ.ப., ஆகியோர் உள்ளனர்.

District Collector, Nagapattinam, Tamil Nadu

Fire Risk in India : Emerging Challenges

Paras Nath Rai, IPS (Retd.)

Focus of the Case Study:

The said study highlights the need to address the issue of fire safety and risk management in a holistic manner.

1. Background:

Even though fire is a major hazard, fire safety issues remain in the background. While there is a paradigm shift in disaster management in the country from relief centric mode to preparedness, prevention & mitigation one, fire safety remains response driven. Therefore, there is very limited focus on fire engineering and other fire risk management measures such as audit, awareness, capacity building & technology application. There is more focus on fire-fighting rather than fire risk management.

2. Risk everywhere

Fire emergencies are very common. They are usually human-made and hence can be prevented and mitigated. Fire emergencies in urban areas happen primarily due to electrical faults. However, it is getting prominence in upcoming townships and the fast expanding cities now. People moving to cities mostly create habitations in the peri urban areas. The developments in those areas rarely include establishment of fire stations. Unfortunately, most of the new settlements in those peri-urban areas are poorly governed with respect to safety norms. Thus, the peri-urban areas are going to pose a greater risk for fire emergencies in future.

Fire safety has always been looked as an urban phenomenon. But how about the rural areas? Are they not prone to fire risk? The villagers are losing their yearly earnings whenever fire destroys their standing crop or the one harvested and kept on ground.

3. Synergy between stakeholders

Fire safety management requires coordinated action among several departments and agencies involved -in approval, enforcement, capacity building & implementation of fire safety regulations. Municipal authorities approve building

plans after obtaining no objection from fire service departments. Departments and agencies such as public works, energy, urban development, water supply, home, etc. are involved in fire safety activities. There is distinct absence of coordinated action among them. In the process, there is less vigilance after approval and even when audit takes place, the violator goes unpunished, many a times.

4. Fire safety – Demand driven Vs Supply driven

Fire safety today is more supply driven than demand driven because there is huge deficit of knowledge of prevailing regulations including Nation Building Code, State/Municipal-regulations/byelaws and fire safety rules among departments/ agencies responsible for giving approval for construction of building. Builders/ architects/engineers and users, the people are unaware of the safety norms.

The result is everyday new fire risks are introduced into our lives e.g. new furnishing, leaking transformers, electrical appliances increase the fire risk. While more importance is given to the interior decoration and beautification of the house, the consumer is almost unaware of the level of fire risk in each of the materials used. This needs to change with fire safety becoming more demand-driven with a more alert consumer who is aware of safety norms, building codes, material used etc.

With fire safety being more supply-driven, the onus of fire management largely lies on the government agencies. But, often, the fire management agencies do not have enough capacity for approval or enforcement of basic fire safety norms. Also, once the approvals are issued, there are no further audits done to ensure proper maintenance of fire safety indicators, exacerbating the risk more.

5. Urbanization

The rapid urbanization in the country and that too in an unplanned manner, has increased fire risk in urban & semi-urban areas as there is less of regulation in new areas. The old parts of cities are extremely vulnerable and pose very big challenge to fire risk management. First, these lanes are highly populated making it high risk for human casualty. In case of fire, the narrow and congested lanes make it difficult for fire tenders to enter. In case of rural fire, the absence of supply of water makes it difficult to douse fire.

6. Capacity of fire services

The capacity of fire services to address disaster risk reduction is very limited. Hence capacity building needs to be specifically undertaken for existing and emerging challenges on fire emergencies. The capacity to audit risk needs to be strengthened, network of fire stations needs to be expanded and community-level awareness should be given top priority.

7. Preventive Fire Management – fire engineering

We need to focus on preventive fire management, specifically on fire engineering methods which are largely neglected. Fire engineering implies that the building itself has all the features that is required for fire safety. Fire engineering includes fire prevention engineering and fire safety engineering. It includes uses of technological knowledge to prevent loss of life and property in case of fire.

Fire safety engineers are required to be part of projects as well as the fire services. The fire engineers create an infrastructure that is safe and at the same time meets the requirement of clients, architects and the authority. Neither government departments nor private players encourage this aspect of safety.

Another aspect of preventive fire management is audit of building in respect of fire fighting systems. The authority responsible for giving the approval and authorities in fire services need to develop capacity for audit of building on regular basis so that the safety systems remain operational and people are aware of safety requirements. Some cities / states have taken the help of private consultants / auditors, empanelled them to address this aspect of fire safety.

An important aspect of preventive fire management is energy audit i.e. ensuring that the building, small or big has energy consumption as per the load authorised to it. The builder could have taken electrical connection for a certain energy load. However as years go by, individuals and organisations keep on adding electrical equipment in the houses or establishment asper increased requirements. This has caused great concern because the electrical system fails to take the load of additional equipments, putting a strain on the electrical system and fire.

Another aspect of the preventive fire management is awareness among people including authorities that are responsible for approval as well as compliance of fire safety measures by builders, engineers, institutions and residents of the building. It is commonly known that the community is victim as well as first responder therefore a well aware resident is best responder during such incidents.

There has been tremendous amount of technological innovation in fire safety. However not much is being used by the fire services. The fire services are generally not exposed to new technology. Same is the case with the consumers. Some of the technology could be the self illuminating energy sign, home fire sprinkler, smoke & fire alarm and water supply system. There has been development in micro electronics and sensors to improve home alarm system. Still most homes are not equipped with automatic sprinkler systems which are seen in hotel and business houses.

Most public, residential and commercial buildings/complexes have centralised AC. Everyone needs to know that there are systems built-in AC system that ensure that there is auto shut-down if there is fire in the building. Thus there are several

components of preventive fire management that need to be adopted to ensure that there is effective fire risk reduction in buildings.

8. New challenges

The Central Government's drive to provide affordable housing to weaker sections is a novel initiative. However, such houses will be high density, the presence of all kinds of electrical equipments in a small area will create greater risk for the inmates, provided the safety norms are not taken care of.

Another flagship program of Government with respect to providing gas cylinder to poor is a great programme to alleviate health hazards and environmental damage but again the presence of gas cylinders in slum areas increases the risk. The petroleum companies supposed to do the capacity building of those using such cylinders, need to take up the challenge.

The changing climate also increases probability of fire in rural areas -fire in agricultural lands/ grasslands.

There are large numbers of petrol pumps, gas filling stations that were installed many years ago when the area had no or less population. However, with expanding cities, these petrol pumps are now surrounded by high density population including commercial installations. Any mishap in such petrol pumps would cause tremendous damage including loss of life. In 2016, when fire broke out in Maurya Complex shopping mall in Patna ,the fire services had great difficulty in protecting a petrol filling station next to the building because the flames and the splinters from the fire were reaching the petrol pump also. Similar scenario exists with respect to the presence of explosives, LPG stores in populated areas. There is urgent need to shift such petrol pumps to safer places.

9. New areas of risk

- Modernisation of cities has included mass transportation systems including metro rail. Most of it is underground. Hence Metro Tunnel fires are a real challenge that all the fire services and the metro rail authorities need to take care of.
- The world is in process of switching to electric cars. They need charging stations at homes, offices and other places. This presents new set of challenges for fire safety.
- Traffic congestion is a quite dangerous risk affecting fire-fighting operations adversely. The manifold growth in number of vehicles plying on the already crowded roads are making things worse.

10. Climate change

Now we are witnessing disasters due to climate change and extreme weather conditions. It is accepted that climate change will add to the severity, frequency

and complexity of climate related hazards.

Global warming and consequent rising temperature have adversely affected fire safety. In peri-urban areas, heat islands are being created due to concretization and unplanned urbanization. Disappearing water bodies due to encroachment by residential buildings, construction of roads, have made things worse.

Increasing temperatures force people to use ACs for longer duration and, of course, the increasing prosperity has helped people lead more luxurious lives which include ACs in cars/offices/residences. The increasing use of AC has again contributed significantly to the heat island syndrome in cities.

In rural areas too, the high temperature combined with dry winds in May & June and disappearing water bodies have caused large number of fires in village farms and *khalihans* of harvested crops, resulting in big losses to the farmers. Acres and acres of standing crops are destroyed every year.

11. Availability of water a serious challenge

Effective fire management and response is highly dependent on adequate and appropriately located water sources. But unfortunately, the fire services are handicapped due to absence of water sources close to fire site resulting in fire incident becoming serious. This issue poses serious threat to fire safety. This needs to be addressed /specially in view of newer risks being talked about. The State of Bihar has addressed this problem through mainstreaming fire safety in '*Har Ghar Jal programme*' being implemented in Bihar which has addressed the challenge of water problem.

Member, Bihar State Disaster Management Authority, Patna, Bihar

Cyclone 'Fani': India Sets Global Benchmark on Disaster Response Preparedness

Sushil Kumar, IAS

Focus of the Case Study:

Compared to devastating 1999 Super-cyclone and 2013 Cyclone 'Phailin', dissemination of early warnings to the communities and dedicated investments made in the last two decades in disaster preparedness by Government of Odisha could limit number of human casualties only to 64 during Cyclone 'Fani'. Although economic losses of Fani exceeded that of Phailin, the entire world applauded India's disaster preparedness efforts especially with respect to saving vital human lives both during "Phailin' & 'Fani'.

1. Introduction

There was only a slight difference of time-frame in Indian Meteorological Department's (IMD) dissemination of Early Warning (EW) alerts about Type IV Super-cyclone -Fani (2019) compared to devastated super cyclones of 1999 and 2013 (Phailin). Fani battered Odisha's coast on 3rd May 2019. It was only second such cyclone since 1891 to occur in May as most occur during Oct-Nov. EW alerts about Fani were initiated well over a week before whereas in two previous cyclones in Odisha, they were disseminated about five days before. While 1999 super cyclone (Cyclone O5B-JWTC; BOB 06 -IMD), caused unprecedented damage to life (official death toll above ten thousand) and property (over Rs.1800 crores), only 45 lives in Odisha were lost during Phailin but total losses exceeded Rs 42.4 billion.

The last two decades have witnessed a steady investment in disaster prevention, mitigation and preparedness efforts in India. Post 1999 tragedy, the country and in particular cyclone prone states take all the EW alerts very seriously and the administrative machinery is pressed into action immediately after the receipt of the 1st EW alert on the advent of any cyclonic activity.

Even the World Bank had applauded India's prevention, mitigation and preparedness efforts (http://www.worldbank.org/en/news/feature/2013/10/17/india-cyclone-phailin-destruction-preparation) in intervening fifteen years -post 1999 super cyclone- that helped in mitigating such severe hydro metrological disasters.

2. Disaster response and preparedness measures during Cyclone 'Fani'

The loss of lives of only 64 people during Fani is similar to Phailin though people impacted are still over 1.5 crores (1.2 crores during Phailin) in 14 districts. In fact, the response and preparedness measures while addressing Phailin validated their value and virtually became the Standard Operating Procedures (Protocols) worthy of replication while facing similar cyclonic threats.

Efforts undertaken to ensure prompt disaster response during Cyclone 'Fani' included the following:

1. The evacuation of nearly one and half million people (about 1.56 million during Fani) to safer places was a virtual repeat action (1.1 million during Phailin)
2. Effective dissemination of Early Warning alerts to vulnerable local community ('last mile connectivity') was ensured through cable television networks, loudspeakers, mass print/ social media campaigns, telecommunication including cellular network (virtually nil cell-tele density in 1999 compared to over 77% currently in Odisha) – these multiple communication channels with in built redundancies weren't in place in 1999
3. Political and administrative ownership in ensuring evacuation of vulnerable population to designated shelters for both people and animals (The Hon'ble Chief Minister of Odisha – Shri Naveen Patnaik, personally monitored response and preparedness efforts during Phailin and Fani)
4. Elaborate advance preparedness (contingency planning) across all departments of the government machinery to restore essential services including road communication through well-equipped trained teams (Task Forces) at local level (during 1999 road communication and power supply wasn't restored for days); not only enhancing the numbers of pre-designated shelters (over 850 with 50 volunteers and 1000 people in each of the said shelters) for evacuated people but to also provide for emergency feeding
5. Community based disaster management plans at village levels weren't only prepared but active participation of elected Panchayat representatives and even NGOs participation was ensured;
6. One of the critical elements with respect to political decisions, was the declaration of the goal of zero human casualty in natural disasters by the Chief Minister and administrative action was monitored at multiple levels.

3. Relief & Rehabilitation measures post 'Fani':

With respect to post 'Fani' response, the Government of Odisha has been very prompt to undertake rapid damage assessment to extend immediate relief measures. It also initiated the exercise to complete detailed damage and need assessment of the affected districts. Simultaneously, it took steps for immediate restoration of power, drinking water supplies, mobile and tele-communication systems. Within 36 hours, it was able to clear all road blockades on highways. Besides normal

relief distribution, Chief Minister Relief Package on cash, rice and additional cash components for elders reduced public outcry against administration. OSDMA was also circulating daily situation reports (SITREP) (http://www.osdma.org / fanicyclone-updates.html) and doing media briefing to fill in information gaps- an essential prerequisite to calm public distress and instill confidence amongst the masses. This explains why despite greater economic damage than Phailin, reports of public alienation are almost absent in the case of 'Fani'. One can't deny that operational problems post Fani disturbed normal life. Instances of delays in restoration of road network and power supplies (repairs needed for 80,000 km of low tension power lines and 64000 distribution transformers) were mobilised. In any disaster of this magnitude, administrative and response systems would be overwhelmed for days (as happened during Katrina (2005) in America) but systems have been set up for effective response, rehabilitation and reconstruction. The Prime Minister publicly praised the Chief Minister for effective handling of Fani.

Ms. Margareta Wahlstorm, UN Special Representative of the Secretary General for Disaster Risk Reduction rendered huge praise on India's handling of Phailin (https://www.downtoearth .org.in/news/un-felicitates-odisha-for-its-disaster-management-model-during-phailin-43087) and declared it as a best practice fit for replication in other countries.UNDRR – United Nations Office for disaster risk reduction (previously known as UNISDR) has also praised Odisha's 'zero casualty' policy with respect to responding to calamities like 'Fani'. (https://www.outlookindia.com/website/story/india-news-odisha-receives-high-praise-for-cyclone-fani-handling/329826).

There is well acknowledged maxim amongst Disaster Management philosophers and practitioners: countries and communities facing catastrophic impact of disasters on continuous basis are best prepared to face them. Its best examples are: Bangladesh in cyclones (after loss of over 2,00,000 lives during Bhola cyclone in 1970 & over 1,30,000 during Gorky cyclone in 1991), Japan (after Kobe earthquake) and Turkey in earthquakes, Vietnam and Cambodia in riverine floods.

Odisha's coastline is vulnerable to cyclones but the physical and psychological pummelling by 1999 super- cyclone raised such public outcry that the then Chief Minister lost his job, and political future, and ruling party- the power in elections few months later. Lessons were learnt by the political class both at the National and State level – that business as usual and an ad-hoc approach of disaster management wouldn't work. Change in this mind set is best exemplified in State Government, constituting Odisha State Disaster Mitigation Authority (OSDMA) within months to formulate short and long-term disaster preparedness and mitigation measures. A look at OSDMA website (http://www.osdma.org) would reveal the series of steps undertaken by the State Government to face cyclonic threats.

4. Disaster Preparedness Efforts post 1999 Super-cyclone in Odisha

Some of the steps taken by the State Government of Odisha in the aftermath of 1999 Super-cyclone included the following:

1. Initiation of a pilot programme of community based disaster preparedness (CBDP) in 10 Blocks that eventually formed the basis of world's largest disaster management programmes known world-wide as GOI-UNDP Disaster Risk Management Programme (DRM) (https://www.preventionweb.net/publications/view/14421).
2. Learning from the Andhra Pradesh's preparedness measures post Diviseema cyclone (1977 that killed over ten thousand people), Odisha decided to expand the construction of Multi-Purpose Cyclone shelters (increased from 23 cyclone shelters in 1999 to 874 during Phailin)
3. The State formulated a State Disaster Management Policy in 2005 that mainstreamed disaster management issues in development planning
4. Odisha built multiple levels of communications utilizing telecommunications including cellular network, satellite phones, VHF/UHF, HAM Radio clubs network. It sent over 20 million text EW messages at the community level.
5. To be fully self-reliant, State Government established its own Odisha Disaster Response Force (an example followed by Government of India in setting up National Disaster Response Force when Disaster Management Act was enacted in 2005);
6. Under DRM, the local community was involved in preparation of village level DM plans including constitution of DM Teams and mock drills were regularly practiced to validate these plans.
7. The State Government started using GIS/GPS while distributing relief through air sorties.
8. Even under World Bank supported National Cyclone Risk Management Programme, the constitution of cyclone shelter committees included elected Panchayat representatives and NGOs who were actively involved in mock drills.

5. Enactment of the Disaster Management Act 2005 and prevention, mitigation and preparedness efforts in India:

Parallel to State Government's efforts during the intervening fifteen years, Government of India also enacted a new legislation, namely the Disaster Management Act 2005 that set up National Disaster Management Authority (NDMA) to coordinate pan India policy and programmatic interventions on disaster risk management. The Authority's official website (www.ndma.gov.in) gives an overview on the various path breaking measures that NDMA has undertaken and facilitated to proactively address disaster risk reduction in the country.

In fact, learning from the example of OSDMA, the Disaster Management Act stipulated setting up of State Disaster Management Authorities by all States. Government of India has also amended building bye laws and recommended to State Governments to do the same. It also amended Coastal Zone Regulations to maximize mitigation measures to protect the coast. It also modernized its metreological warning dissemination systems by getting a super computer calculation upgrade as well as setting up a network of Doppler Radar system across the country. The State Government of Odisha has also installed Doppler Radar with its own resources in vulnerable locations for supplementing effective early warning system. During 1999 Odisha Super-cyclone, the early warnings were sent by IMD in routine manner to State Government and District Magistrates assuming that they will ensure their dissemination at the local community level but the system failed with disastrous consequences. Moreover, the delay in predicting when cyclone would make landfall in 1999 (the cyclone continually changed its course) also led to some complacency about preparedness against warning alerts. Government of India also improved its coordination system by setting up various Committees at Ministry, Cabinet Secretariat and PMO levels where military, paramilitary and other agencies also participate on need basis; it also improved its disaster warning dissemination system post Tsunami as those warnings couldn't reach the State Government machinery in time. Govt. of India set up a National Control Room in the Ministry of Home Affairs that works 24x7 to ensure timely dissemination of early warnings.

India has demonstrated credible achievement in reducing death toll while facing such severe cyclones. But action on elaborate risk reduction measures with respect to prevention and mitigation need much reinforcement. NDMA had prepared a list of policy and programmatic interventions across various segments after studying the impact of cyclone Hudhud (https://ndma.gov.in/images/pdf/Hudhud-lessons.pdf). A look at the recommendations would show that Coastal States still have a long road to travel in taking actions against those specific recommendations.

6. Conclusion

The reduction of human casualty to a minimum during Phailin and Fani has brought international appreciation of India's disaster risk reduction measures. However, the reduction in death toll and extension of immediate relief is only one part of the story. The disaster risk insurance is still to take roots in people's lives and financial resources are always limited for both State and National Governments. Post 'Fani', the State Government filed a memorandum seeking financial aid. Govt. of India extended support however, the funds received are not sufficient to address the entire gamut of the ongoing restoration and rehabilitation works. The risks would be rebuilt in most areas. At best one can say that India's disaster response preparedness story is fine but much needs to be done to address disaster risk reduction in a holistic manner.

Secretary, Mines, Government of India & Former Additional Chief Secretary, Disaster Management, Government Tripura

Responding to Flash Flood at Kotrupi (Mandi District) – Disaster Risk Mitigation through Installation of Low-Cost Landslide Monitoring and Warning System

Rugved Thakur, IAS

Focus of the Case Study:

This particular case study focuses upon the efforts undertaken by the Mandi District Administration in installing Low-Cost Landslide Monitoring Sensors which assisted the district administration to promptly respond and avoid any major casualty in the flashflood that hit Kotrupi in July 2018.

1. Introduction

The Mandi District in Himachal Pradesh is highly vulnerable to landslides. Every year, there is loss to property and life due to wreak caused by landslides. According to earlier studies conducted especially vulnerability mapping done by International Journal of IT, Engineering and Applied Sciences Research, the most prone area to landslide in Mandi is along NH- 154 (Pathankot to Mandi) and NH 21 (Kiratpur to Manali).

On the night of 12^{th} & 13^{th} August 2017, a massive landslide struck at Kotrupi village in Sub Division Padhar, 35 kms. from District Headquarters Mandi. Due to this landslide, 2 buses of Himachal Pradesh Road Transport Corporation (HRTC) were buried in the debris and this landslide engulfed 46 precious human lives. Here in the Kotrupi village, the entire road of approximately 300 Meters was washed away leaving no mark of the existing National Highway. This road was restored temporarily for service during day time on 26.08.2017 and fully restored for the traffic on 14.09.2017 after a period of more than one month over the existing massive loose debris of the landslide. Especially, before the onset of the monsoon season of 2018, the deployment of Aapda Dal/ Home Guards was made on both sides of this vulnerable land, but there was no method to monitor the movement of existing huge debris and intermittent landslides which were potential threat to the public.

After a series of deliberations by District Administration with landslide experts of IIT(Indian Institute of Technology) Mandi, a plan got formalized to install low cost

and effective Early Warning System to alarm the public on potential/ prospective landslides. The IIT Mandi was working on this project and these systems were proposed to be installed for the first time in the State of H.P. at the initiative of the District. Administration Mandi.

District Administration with the help of IIT Mandi placed 10 Landslide Monitoring Sensors and Early Warning Systems at places like Kotrupi (2), Gumma (2), Drang (1), Deod (1), Hanogi (2), Dwada(1) and Reins Nallah (1).

2. Working of Landslide Monitoring Sensors and Early Warning Systems

Landslide Monitoring Sensors and Early Warning Systems is a low-cost Micro-Electro-Mechanical Systems (MEMS)-based sensor technology for efficient monitoring and warning of landslides. The technology senses various soil parameters and weather properties at a landslide prone site. This technology captures data as per the following process:

(i) First, historical rainfall records, soil properties and geology information of the selected site are analyzed to understand the behavior of the landslide prone area.

(ii) Second, site-specific low-cost MEMS sensors are installed that collect data about rainfall, temperature, pressure, relative humidity, light intensity, soil moisture, and soil movement at the selected site.

(iii) In addition to these sensors, a Global System for Mobile (GSM) service is used for uploading the sensed data on a 10-minute interval. Also, a local storage device is installed for keeping data stored locally.

The proposed technology works in two phases:

First, on-site weather and soil properties are collected and uploaded in the web-server every 10 minutes. Second, the uploaded data is parsed and, depending upon

the magnitude of the soil- movement, a rule-based algorithm issues threat alerts via SMSs to people who have subscribed for receiving such alerts in advance.

After the Kotrupi disaster, a temporary road was made through the debris for traffic flow. In July 2018, it is reported that Kotrupi started experiencing a seepage overflow situation, which was originally a part of its old route due to substantial rainfall activity. Although for draining this seepage overflowed, public works department (PWD) had constructed a drainage facility. However, the internal water source was still active at some places underneath the temporary road, which was not easy to identify in the massive debris. When the monsoon started in July 2018, the seepage broke the integrity of soil and allowed water to go through as water finds its path through points of lowest energy. This breakage caused the movements in soil internally, and it started sliding. This internal slide of soil began to rupture the road from the center to provide way to release internal water. This complete scenario activated movements in the soil.

3. Deployment of MEMS Sensors in Mandi:

At 2:30 AM, on the night of 27th July 2018, it was raining heavily at Kotrupi village and a flash-flood occurred. Underground water came rushing down towards the NH-154. However, between the water source and the road, there existed a low-cost landslide monitoring and warning system (LMWS), which the Mandi district administration had just deployed two- weeks back in collaboration with researchers at the Indian Institute of Technology (IIT) Mandi. The LMWS was triggered by rainwater and the system sounded an alarm and blinkers, which the Home Guards on the NH-154 heard in time. Immediately, the police guards stopped the road traffic and the flash flood went past the road into the dark valley.

Due to the catastrophic effects of landslides on life and property, the Mandi district has partnered with researchers at IIT Mandi to develop effective, low-cost LMWS for managing landslide disasters in the region. Under a small project from Mandi district, iIoTs, a group incubated at IIT Mandi, successfully developed and evaluated an LMWS that was low-cost and based upon Micro- Electro-Mechanical Systems (MEMS)-based sensors. This LMWS could monitor soil and weather parameters and generate warnings about soil movements among different stakeholders like the District Collector's office, police, and disaster control emergency center via SMSes. Also, the LMWS could generate local warnings via hooter and blinkers for alerting local police and road traffic at the deployment site.

Before July 2018, the Mandi district administration did not get any preliminary information about soil movements and weather just because they did not have low-cost LMWSs, to get this information. However, in the monsoon of 2018, the Mandi district administration and iIoTs, IIT Mandi, teamed together to deploy LMWS prototypes at 10-different locations in the Mandi district. This installation, the largest of its kind in India, succeeded in the first week of July 2018 and it included

the following deployments: five LMWSs along the Mandi - Jogindernagar National Highway and five LMWSs along the Mandi – Manali National Highway.

Currently, three more deployments are being carried out in at Urla (close to Kotrupi), where the hill is likely to slide in the coming winter rainfall season.

The current landslide monitoring system costs crores of rupees; however, the LMWS costs INR 20,000 per system, where the cost is 1/100th of the cost of a conventional system. Since its deployment, the LMWSs have regularly generated soil movement warnings of different magnitudes to alert the district administration about potential sites that are vulnerable to landslides. Also, the system has generated severe weather advisories in Pandoh and Jogindernagar about significant rainfall events , where the probability of rainfall is greater than 80% and amount of rainfall is greater than 3 mm in next two hours.

4. Conclusion

Beyond preventing loss of life at Kotrupi on 27th July 2018 as well as alerting people about potential soil movements, the LMWSs have the ability to gather soil movement, soil properties, and weather data over an extended period of time. Once this data is collected, one could use this data to do predictive analytics, where one could predict soil movements by training AI algorithms based upon historical patterns between soil movement, soil properties, and weather data. This predictive module is planned to be the next big upgrade in the LMWSs deployed in the Mandi district to safeguard the district from landslides that are yet to occur in the near future.

Deputy Commissioner, Mandi District Disaster Management Authority
District Mandi, Himachal Pradesh

SATARA – Preparedness and Response during 2019 Floods

Shweta Singhal, IAS

Focus of the Case Study:

The said case study highlights the various preparedness and response measures undertaken by Satara District Administration during 2019 floods in Satara leading to minimal loss of lives and damage to material assets.

1. Background:

The Satara district is located in the south-western part of the State of Maharashtra and lies between 17.5° to 18.11°North Latitude and 73.33° to 74.54° East Longitude. It is bound on the north by Pune, on the south by Sangli, on the west by Ratnagiri, on the north-west by Raigad, and on the east by Solapur district of Maharashtra. The whole State of Maharashtra is divided into six revenue divisions; Pune, Konkan, Nashik, Aurangabad, Amravati, and Nagpur. Satara district is part of the Pune division along with the districts of Pune, Sangli, Kolhapur and Solapur. Satara district covers an area of 10480 sq. kms. with an east west expanse of 135 kms. and a north south expanse of 112 kms. The district is divided into seven Sub Divisions and eleven administrative sub units (Tahsils) - Satara, Wai, Khandala, Koregaon, Phaltan, Khatav, Man, Karad, Patan, Jawali and Mahabaleshwar. The monsoon starts during the month of June, and the district experiences the maximum precipitation in the months of July and August. The district has an average rainfall of 918.8 mm, but the pattern of precipitation varies for various parts of the district. The Western Ghats of the district (Mahabaleshwar region) in the west receive the highest rainfall, more than 6000 mm.

2. Flood preparedness measures

The various measures undertaken by Satara District Administration for flood preparedness before the onset of monsoon season in 2019 are briefly summarised below:

1. **Pre monsoon and DDMA (District Disaster Management Authority*) Meeting*:** As part of preparedness for monsoon season, DDMA conducted a review meeting on 9th May 2019 of all DDMA Members, line department agencies,

including field officers like SDO(sub-divisional officer), Tahsildar, BDO(block development officer) and Chief Officer of Nagarpalika. In this meeting , a detailed department wise review was undertaken for monsoon preparedness. The major instructions given at the said meeting included the following:

a) Remove the encroachments and illegal constructions on the river bed before monsoon starts that is first week of June.

b) Keep the equipment's ready such as rubber boats, life jackets, life bouys, ropes, mega phones, search light etc.

c) Public Works Dept. (PWD) was instructed to keep the manpower and machinery ready for Landslide prone area in the Ghat section. Ghat wise nodal officers were appointed. Telephone numbers of people having JCB and other equipment was prepared and shared.

d) Interdepartmental coordination committees were set up.

d) All departments were asked to activate control rooms 24X7.

e) The Health Dept. was asked to keep the stock of necessary drugs and medicines in each PHC (primary health centre) and Rural Hospital of the area.

f) The Irrigation Department was tasked to maintain the water storage and to undertake removal of all types of encroachments from all river bed and dam catchment areas. Irrigation Dept. was asked to give the early warning to riverbed villagers while doing discharge of water from the dam to river.

g) Search and rescue teams, first aid teams to be kept ready at the tahsil level by police and municipal council and health department respectively.

Frequent DDMA meetings were conducted to review the flood situation between 10th July 2019 and 10th August 2019.

2. Training and Capacity Building Programme for Flood prone Villages : The Disaster Management Unit conducted the village level training for the flood prone villages of total 172 river bed villages in Satara District. The training module included content on search and rescue methods, first aid, use of local equipment in flood situation, evacuation, early warning for villagers, school teachers and students, youth mandals, self-help group members and village level government officials.

3. Awareness Programmes : Awareness programmes like street plays, Do's and Don'ts, audio jingles at bus stands in flood prone and other disaster prone villages were conducted. Mobile Van (Chitra-Rath) was

Chitra-Rath

created for awareness which included posters, banners, handbills, audio clips for the awareness of common people. Audio Jingles of Do's and Don'ts were broadcasted at all ST Bus Stands for all types of disasters such as Flood, Lightning, Earthquake, Road Accident, Fire, etc.

4. **Procurement of Equipment:** Necessary equipment such as rubber boat, inflatable search light, Walkie- Talkie, life jacket, search light, and rain gauges have been procured by DDMA , Satara.

3. Floods in Satara - 2019 (Duration : JULY – AUGUST 2019)

The average rainfall of Satara District between June and September is 918 mm. However In the year 2019, Satara District recorded total rainfall of 1761.26 mm. The highest rainfall was recorded at Mahabaleshwar Tahsil that is 8131.44 mm.

3.1 Flood water Released from Major Dams

Due to heavy rainfall resulting in huge collection of water in dams and catchment areas of river Krishna & Koyna, the discharge of water from various dams started from 30th July 2019. On 6th of July 2019, maximum 123823 cusecs water was discharged from Koyna Dam. Also subsequently from other major dams, also heavy discharge of water happened. Total water discharged from Koyna, Dhom, Kanher, Urmodi and Tarli Dams was 174519 cusecs, including catchment areas of river; total discharge in Krishna River at Karad was 259210 Cusecs on 6th August 2019. Due to very heavy rainfall resulting in water discharge from various dams, flood situation occurred in 5 Tahsils of Satara District i.e., Patan, Karad, Wai, Satara and Koregaon. Also due to very heavy rainfall in Mahableshwar, Patan, Jawli and Satara Talukas, some villages vulnerable tolandslides suffered slip circles.

3.2 Prompt Response:

a) Data Collection:

- Rainfall data from the catchment area was collected by automatic weather stations of agriculture department as well as revenue department
- Frequently Monitoring of India Meteorology Department (IMD) website for weather alert and heavy rain alert in that period.
- Inflow and Outflow of water from major dams in the district such as Koyana, Dhom, Kanher, Urmodi ,Tarali etc.

b) Close Monitoring:

- Close monitoring of dam water discharge at an hourly basis from various dams.
- Observation of alert and danger levels of Krishna River at places like Khodashi Dam, Warunji seal level, Koyana seal level and Krishna seal level.

[Alert level of Krishna river after sangam is 45 feet (187874 cusecs) and danger level is 56 feet (280222 cusecs)].

c) Media Management:

- In flood and heavy rainfall situation, effective use of social media was made. Urgent messages were sent to the common people like '*do not undertake travel to hilly areas unless important*', '*do not cross the river or bridge when the water overflows on that particular bridge*', '*do not stay long time at the ghat section since there is high risk of land sliding in that region*'. The district administration appealed to the people to not drink the water directly and consume the same only after boiling.
- By using social media, radio and other effective media like print media, the district administration appealed to the people to stay calm and follow instructions of the government agencies.
- **Press Conference & Message Broadcasting***:* In the flood situation, the district administration frequently organised press conferences for print as well as electronic media. The impact of press conferences was that local people were not under any panic/stress; they were getting factual messages from the district administration. The advisories and important contact numbers were circulated regularly to the local community through electronic and print media, therefore, people could directly communicate with the nodal agencies. Also on All India Radio, the appeal messages were broadcasted frequently along with the Information on Do's and Don'ts for the local community during floods.

d) Contour Mapping:

- Contour mapping of the low lying areas in the villages was undertaken and people were evacuated / shifted from those areas to safer locations.

4. Response:

4.1 Traffic Diversion

Due to discharge of water from various dams, the major roads, bridges were under water or some bridges were not safe for traffic movement. Due that reason, DDMA Chairman took a quick decision to close vehicle movement on such bridges. Few ghat section roads were also closed on account of partial impact of landslides due to floods. Debris removal work from these roads started on a mission mode. Two major bridges collapsed due to heavy rainfall but no human loss was reported as the traffic was proactively diverted from these vulnerable bridges and roads.

4.2 Closure of schools : DDMA kept the schools and educational institutions closed during the entire period of heavy rainfall/floods.

4.3 Medical Camps : The medical camps were arranged in various evacuation shelters. Primary drugs and other medicines were distributed to the affected families. Pure drinking water and hygienic food were provided at the camps. Total 5696 affected persons were administered medical treatment. 57 medical teams were deployed at the medical camps.

4.4 Medical Camps for animals: The medical camps were arranged at the evacuation shelters for affected animals as well. Sufficient drinking water and required fodder were arranged. Total 3248 animals were medically treated at the animal camps.

4.5 Vaccination for animals: Around 16000 animals were vaccinated by animal husbandry department in different flood affected areas. Even primary drugs were distributed for the animals.

4.6 Food Grains Distribution: A total of 3055 families received 59.28 ton wheat and 59.28 ton rice as relief material. Also eatables, drinking water, biscuits etc. received from NGOs, schools, religious trusts were distributed to the affected population.

4.7 Distribution of Kerosene: Total 15235 litres of kerosene were distributed as per the need of affected population through district administration.

4.8 Gratuitous Relief: A total of 1740 families received relief totalling to an amount of Rs. 205.10 lakhs. The amount distributed per family was Rs. 15000 through direct benefit transfer mode.

4.9 Community Support: NGOs, Youth Mandals, Local Bodies, NSS/ NCC students and other institutions helped the administration in providing manpower support for distribution of relief materials, search and rescue operations, health treatment and hygiene and sanitation activities.

4.10 Evacuation: A decision was taken to shift population residing in low lying areas on priority basis before the flood water reached the concerned villages or towns. Evacuation and shifting of all the families at safe locations like school, community and religious places, their relatives, government buildings, was undertaken. A total of 10755 people from 2480 families were shifted. For evacuation purpose, 1 team

of NDRF (25 members), 6 teams of Nagar Palika, 6 teams of local bodies and 4 teams of NGOs were deployed.

5. Recovery (Reconstruction / Rehabilitation)

5.1 Extensive Cleaning Operations : After floods , immediate cleaning and fumigation work started in flood affected areas as well as public places through local government bodies.

5.2 Temporary Shelters: Due to heavy rain, landslides took place in Talukas- Patan, Javli, Mahabaleshwar & Satara. Temporary shelters were created by Public Works Department in 3 affected talukas , in 15 affected villages and for 633 affected families.

Temporary Shelters in Bendwadi Tal. Satara

5.3 Panchanama

a) **Panchnama details of Agriculture :** Around 20075.25 hectors of rain-fed crops affected 104028 families requiring Rs. 4327.56 lakhs funds.

b) **Panchnama of Infrastructure / Govt. Public Properties:** This included assessment of damage with respect to physical infrastructure, i.e roads and bridges, drinking water supply works , irrigation, Irrigation project; power; primary school buildings, fisheries and police buildings at an estimated cost required for repair and reconstruction up-to Rs. 36203.87 lakhs.

5.4 Reconstruction / Structural Works:

The Proposal for reconstruction (for structural works) activities for the vulnerable villages is in the process of formulation.

6. Mitigation:

Structural Works like Retaining Walls: In Satara District, Karad city was the worst affected city in floods. Since all rivers like Krushna, Venna, Urmodi, Tarli and Koyna are flowing west to east. all the flood water came centrally at Karad Priti Sangam place that is in Krishna River. Therefore, at the time of heavy rainfall, Karad city was most impacted by flood. Due to this, Structural Work of Retaining wall at Krishna River is proposed.

7. Outcomes

- In such a massive flood, only 4 persons and 65 animals lost their lives because of timely evacuation procedures undertaken by district administration.
- No tourist was stranded, although Satara is predominantly a tourist destination.
- The situation was brought under control with minimum resources (1 NDRF team, two boats)
- The Satara district administration was able to also extend help to the neighboring districts.
- Temporary shelters, speedy panchnama and timely relief distribution were undertaken.

8. Conclusion:

Due to effective micro planning, prompt early warning and quick response, only 4 persons and around 65 animals lost their lives during the 2019 floods in Satara. Not only Satara district independently handled flood situation but also helped other neighbouring districts with sufficient manpower, relief materials like drinking water, clothing, food grains and helped them in rescue operations as well.

District Collector, Satara District, Maharashtra

Prayagraj Kumbh Mela 2019

Col. V N Supanekar (Retd.)

Focus of the Case Study

The focus of the Case Study is to reflect the various mitigation and preparedness measures undertaken by concerned Central and State Authorities to ensure Safe and Secure conduct of the Kumbh Mela in 2019 in Prayagraj.

1. Introduction

The Kumbh Mela at Prayagraj is known for offering mesmerizing views and organizing Mela events every six years; the world witnesses the biggest congregation of faith and humanity. Kumbh Mela has been recognized as world's 'intangible cultural heritage of humanity' by UNESCO. The Kumbh Mela is an event that intrinsically encapsulates the science of astronomy, astrology, spirituality, ritualistic traditions, and socio-cultural customs and practices, making it extremely rich in knowledge. Prayagraj Kumbh Mela 2019 was the largest mass gathering in the world which witnessed close to 120 million visitors. This congregation included Ascetics, Saints, Sadhus, Sadhvis, Kalpvasis, and Pilgrims from all walks of life. The event spread over the course of approximately 48 days from 15 Jan. to 04 Mar. 2019 to bathe at the sacred confluence of the Ganga, the Yamuna, and the mystical Saraswati. The underlying structure of the Mela emerged in the creation of a temporary city on the banks of river Ganges and Yamuna, to house its many pilgrims. This city was laid out on a grid, constructed within a matter of months; within the grid, multiple aspects of contemporary urbanism came to life, including spatial zoning, an electricity grid, food and water distribution, physical infrastructure construction, facility centers, public gathering spaces, and day/ night time social events.

To make Kumbh 2019 an event of unparalleled grandeur, the Government of Uttar Pradesh had undertaken multiple measures for ensuring the efficient running of the Mela. Unprecedented sustainable construction of flyovers, railway under bridges, road widening in the city and beautification of major intersections are few highlights of the massive construction and upgradation tasks undertaken to make Prayagraj Kumbh 2019 a grand success.

The origin of Kumbh Mela was transcribed by the 8th-century philosopher Shankara. Kumbh Mela, in Hinduism, is a religious festival that is celebrated four times over the course of 12 years, the site of the observance rotating between four pilgrimage places on four sacred rivers—at Haridwar on the Ganges River, at Ujjain on the Shipra, at Nashik on the Godavari, and at Prayagraj (modern Allahabad) at the confluence of the Ganges, the Yamuna, and the mystical Saraswati. The Kumbh Mela comprises of many rituals including bathing ritual, which by far is the most significant ritual performed at Kumbh. Along with the bathing ritual, the pilgrims also worship on the banks of the holy river and participate in discourses from various sadhus and saints.

2. Vision of the Mela

The vision of Prayagraj Kumbh Mela 2019 was "DIVYA KUMBH" and "BHAVYA KUMBH", to include the following objectives:

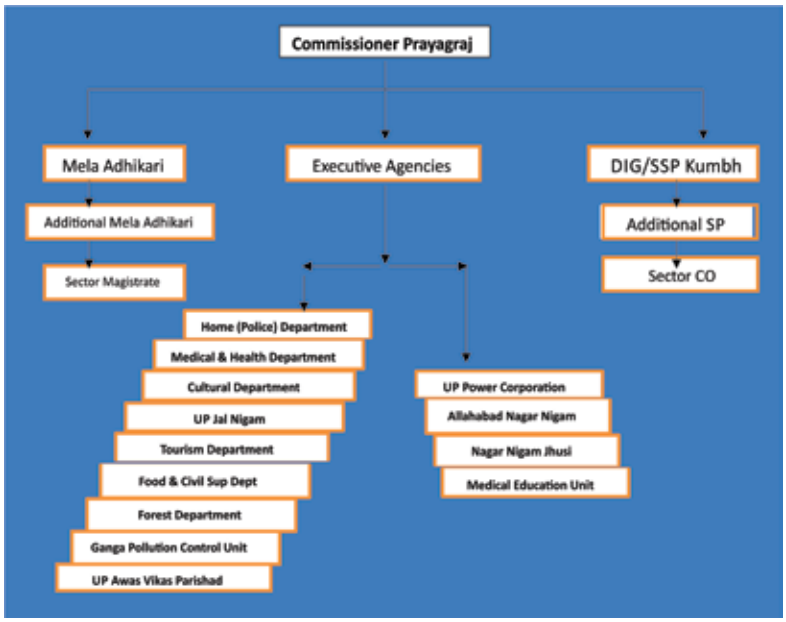
- State-of-the-art infrastructure, facilities and basic amenities.
- Blend of tradition and modern technologies in development of Kumbh Mela infrastructure.
- Integrated approach, in coordination with Departments of the State, Centre, Private Players and Community, for development and efficient management of Kumbh Mela 2019.
- The core principle was to ensure enhanced pilgrim experience by ensuring safe and secure Kumbh.

3. Mass Gathering management: Preparedness Measures:

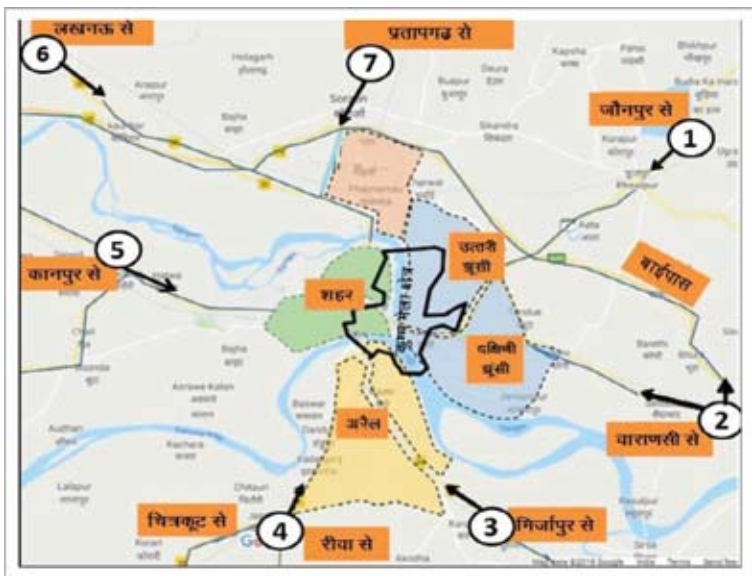
The preparations for next Kumbh start when the current Kumbh ends. The factors like increase in pilgrim strength and requirement of infrastructure and facilities as against existing gets worked out and overall development plan was undertaken to include up-gradation of Railway Stations, construction of the new Prayagraj Civil Airport, Road construction by National Highways Authority of India which included rebuilding and upgrading major Highways connecting Prayagraj to Pratapgarh, Rai-Bareilly, Construction of Flyovers and bridges and Waterways Operations by Inland Waterways Authority of India building five Jetties.

4. Organisation Structure for Prayagraj Kumbh Mela 2019

The broad organization structure for Prayagraj Kumbh Mela 2019 was as under:

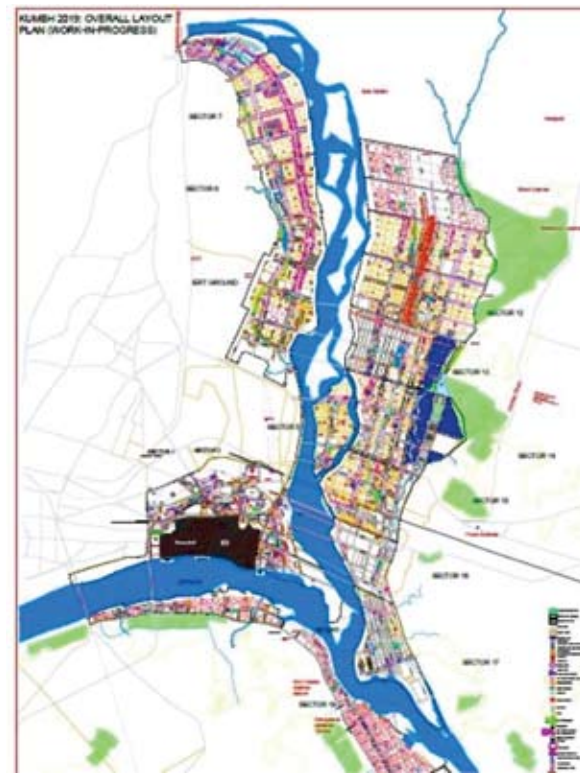


5. a) Kumbh Mela Area Map



The consideration for development of Event Management Plan was not only restricted to Kumbh Mela Area but also included all approach roads leading to Prayagraj. The area adjoining Kumbh Area was considered as Area of Influence, the activities in this area had direct impact on Kumbh area. This was primarily Prayagraj City- Preparedness of Prayagraj area which encompasses many historical places was also taken into account and accordingly facilities created and resources earmarked especially on Shahi Snan days.

5. b) Layout of Kumbh Mela Operational Area:



Though the approximate area availability is known from past experience, however the actual area can only be finalized once the water from rivers recedes. The total Kumbh Mela operational area was approximately 3200 Ha. Considering the past experience of vulnerable areas, for ease of management and command and control, the entire area was divided into 20 Sectors as compared to earlier division of 18 sectors. In coordination with Mahamandeleshwer, the Akhadas were camped on the northern bank of River Ganges. The grid road (steel plates) network was wide and plain, which enabled absorbing the large visiting crowd density. The Emergency Support functions were deployed in all sectors to meet any contingencies. The area also had vending zones, banks, media center, and amusement area etc.

i) **Airport:** The frequency of flights and number of flights were increased by the Government of India by constructing a new air civil terminal in Prayagraj, which connected the city of Bengaluru, Indore, Nagpur, and Patna through air routes. A heliport was also set up to facilitate helicopter joy ride for tourists. The Airport was upgraded to international standards to ensure accommodating internal tourists and international tourists visiting Kumbh Mela.

ii) **Railways:** Prayagraj city is well connected to all major Cities in India via the Indian Railways network. Upgradation of railway stations was completed prior to starting of Mela.

iii) **Roadways:** Apart from Air and Railways reaching Prayagraj, a detailed transportation plan was implemented to facilitate pilgrims reaching Prayagraj Mela Area. More than 524 shuttle buses and many CNG auto rickshaws were deployed for carrying pilgrims to and from Mela Area. For systematic and smooth traffic management, digital signages were installed in the Mela area, city and conveyance areas. A controlled transportation plan was also implemented inside Kumbh Mela Area.

iv) **NHAI/PWD:** Major works on 116 roads were undertaken including widening of roads by Public Works Department (PWD) and completed before commencement of Mela. Beautification of main squares within City area was also undertaken by UP State Bridge Corporation. Nearly 84 parking places were constructed, majority within 0.5 kms. to 6 kms. Out of 84 parking places; 18 were developed as facility centers to include public conveniences and vending zones, to enhance the experience of Pilgrims.

171109 chequered plates used for 488 km road in Mela Area

2387 Pontoons used to construct 22 Pontoon Bridges

v) **Uttar Pradesh State Bridge Corporation:** The following infrastructure work was completed by UP State Bridge Corporation as briefly summarized below:

- Nine flyovers were constructed to ease traffic movement, in one and a half years.
- The Bridge Corporation had created a record by constructing a 4-lane 1,325-

metre-long flyover in front of the High Court in the Prayagraj city area within 14 months.

- In the densely populated areas of the city, six railway underpasses have been widened to 4-lane within a year.

Vending Zones

- Theme-based vending zones for food stalls, grocery stalls, clothes, utensil stalls etc. were part of Camping area to facilitate easy access to pilgrims.
- Online stall allotment system to ensure online registration and identification of vendors was done to ensure fair allotment and ensuring right mix of stalls all over camping area.
- Due care was taken to ensure that concerned party ensures proper safety arrangements in his area of responsibility and is made aware of emergency response plan.
- Art and Craft stalls from various states were the main attraction for foreigners visiting the Mela.

Camping Area

- To facilitate tourists, a city of 4,200 premium tents was established on Public Private Partnership model. Pandals were set up in each sector. For hosting cultural programs, the Ganga Pandal was setup to accommodate 10000 pilgrims. It was used for organising cultural, spiritual and official programmes.

vi) UP State Electricity Board:

The peak load worked out for Kumbh Mela area was 61.5 MVA. There were total of 54 substations in Kumbh Mela Area and each sub-station was provided with repair and maintenance teams operational 24 x 7. The average distances between substations were not more than 500 mtrs. There were total of 128 transformers in Kumbh Mela Area and 30 trolley mounted transformers were located in general area for emergency requirement. With respect to safety initiatives, no socket points were provided inside residential tents to avoid fire incidences. All street light poles were plastic insulated and earthing of street light post acted as lightning arrestors. The poles were numbered and acted as reference point for location identification.

Complaint centers were established in each substation. Spares like MCB, LED lights were maintained in each sector with proper inventory.

vii) Uttar Pradesh Jal Nigam

Overall quality of water in the river Ganges was well within permissible limit for people to take bath. The BOD(biochemical oxygen demand) level measured at different locations on River Ganges in 2016 was well over 9 mg/1 as against acceptable limit of 3 mg/1. In 2019 the BOD level measured was 3.1 mg/1.

The Mela authorities ensured adequate and safe drinking water supply 24 X 7 in Kumbh Mela Area. The water intake was from River Yamuna and catered for 90 MLD(millions of liter) per day with 100% reserve from 67 Tube wells in general area with 30 tube wells having power back up. Underground water reservoirs were created at 40 locations having two tanks of 8000 ltr. capacity. The underground water tanks were earmarked for fire services.

Hygiene & Sanitation:

For maintaining cleanliness and hygiene, and to host an open- defecation-free Kumbh, to ensure that the banks of the Ganga and the Triveni remain clean and the Ganges remains pollution free, the Swachh Bharat Mission and the Namami Gange project are being executed in Prayagraj. 32 nullahs (drains) opening in the Ganga have been sealed. A robust ICT-based system was deployed to monitor and ensure timely cleaning of these toilets. A proper onsite sludge management, cesspool operations, and odour management technologies were deployed to keep Mela area clean and ensure an enhanced pilgrim experience.

Rehearsals/Mock Drill:

Police forces during their training period carried out terrain familiarization of the Area to enable them to respond to the situation anywhere in the Kumbh area. Similarly all departments carried out their departmental training pertaining to their departmental roles during Kumbh event. All departments also carried out rehearsals for any unforeseen contingency/disruption in their departmental functioning. Apart from departmental level and state level rehearsals and mock drills, National level Mock Drills were carried for CBRN and Terrorism scenarios.

6. Disaster Preparedness Initiatives:

Apart from Mela Authorities, Uttar Pradesh State Disaster Management Authority proactively initiated action to prepare Disaster Management Plan for Kumbh Mela 2019. The same was integrated in the Mela Authorities plan for Event Management.

Disaster Preparedness activities were conducted pertaining to Kumbh Mela as summarized below:

- Hazard, Vulnerability, Risk and Capacity Assessment: Based on departmental feedback and experts' feedback, the major hazards identified were Health Emergencies, Fire, Epidemics, Floods and Crowd related hazards. Related to each/multi hazard scenario, vulnerability assessment was done and departmental and overall capacity to respond to any such emergency was reviewed.
- Departments were asked to undertake preventive and mitigation measures as per findings of the review.
- Requirement of Structural, Fire and Electric Audits was stressed and requirement of 24 hours of maintenance of services provided with immediate arrangements for repairs (spares and maintenance stock)/ redundancy plan was explained.
- Departments were given a format to do the micro resource (human, material, equipment, machinery, transport, etc.) planning regarding anticipated emergencies.

- All Mela Team members were briefed on operational requirement and presented a typical tactical plan for crowd control where requirement of integrated approach was stressed.
- Based on the above, an organisational structure was presented with requirement for proper staffing.
- Considering the likely population in the Prayagraj and Kumbh Mela area, crowd management plan was presented.

Broadly the entire area was divided into three parts - firstly Approaches to Prayagraj, secondly- Areas adjoining the Kumbh Mela Area as Arc of Influence and Thirdly - Kumbh Mela Area as Operational Area. The major activity on approaches was diversion of heavy traffic passing through Prayagraj and route signages leading towards Kumbh area, to facilitate pilgrims. In the area of influence, the major activities were receiving large number of pilgrims at railway and bus stations as well as management of departing pilgrims. Inside Kumbh Area, the activities encompassed all activities visualized in a township and secondly managing large number of floating population, especially on Shahi Snan Days. The major task performed in Area of influence and Operational Area was Crowd Control during the event period, especially on Shahi Snan Days.

Traffic Plan: In consonance with plan submitted by UPSDMA, the traffic plan was implemented starting from diversion points to shuttle Bus Service/E-Rickshaw service as under:

- **Vehicle**

a. Traffic diversion was done for heavy and commercial vehicles passing through Prayagraj. A total of five major diversions were established from various directions for traffic going towards Varanasi, Banda, Mirzapur, Rewa and Lucknow.

b. Satellite Town Parkings': A total of 18 satellite parkings' were established on outskirts of Prayagraj. Facilities like cloak room, pharmacy, electricity, light, drinking water, vending zone, toilet and security were provided at each of the satellite town parking areas.

c. Parking areas: A total of 84 parking areas for heavy and light vehicles were established on all approach routes to Prayagraj and Kumbh Area. These were established on approach roads from Jaunpur, Varanasi, Mirzapur, Rewa, Kanpur, Lucknow and Pratapgarh routes.

d. Roadways/ Private Bus Parkings': A total of seven such parking areas were established and these were connected to shuttle bus service/e-rickshaw service.

- **Pilgrims**

e. To facilitate pilgrims coming from different states, route specific ghats were created and depiction on map was displayed to facilitate pilgrims

to reach location. A total of 41 ghats were established on six major routes

The pilgrim flow on approach and exit routes from various ghats during Shahi Snan days was made unidirectional catering for holding places en route to meet any unforeseen contingency.

Holding areas: Holding areas were established on six main routes leading towards Prayagraj Kumbh Mela Area. These were established with dual purpose of accommodating pilgrims in case of any emergency en-route and secondly pilgrims and visitors could stay in these holding areas for some time.

Green Corridor: The concept of green corridor was adopted and followed during the Kumbh Event. Emergency Evacuation routes were identified and mechanism kept in place to sanitise the area in shortest possible time for evacuation of casualties. Certain bridges and roads were kept free of traffic for emergency movement. Waterway boat routes were pre- determined along-with emergency routes.

Integrated Command & Control Centre: A modern Emergency Operation Centre was established in Kumbh Area where monitoring and surveillance activities were carried out. This considerably reduced deployment of field personnel and also ensured real time monitoring of crowd build up and essential activities conducted on ground. The traffic management system installed was user friendly and it helped greatly in management of human as well as vehicle traffic. The brief details are as under:

Intelligent Traffic Management System (ITMS)

i. Variable Message Display (VMD) Boards: 31 locations
ii. City Surveillance System for 127 Strategic locations

1. Kumbh Area: 92 Locations
2. Parking Area: 13 Locations
3. Railway Station Areas: 22 Locations

f. CCTV Cameras: 431 Nos (PTZ(pan –Tilt – Zoom): 177 Nos, Fixed: 246 Nos, ANPR: 8 Nos)

i. Kumbh Area: 364 Cameras (PTZ: 152 Nos, Fixed: 212 Nos)
ii. Parking Area: 21 Cameras (PTZ: 13 Nos, ANPR: 8 Nos)
iii. Railway Station Areas: 46 Cameras (PTZ: 12 Nos, Fixed:34 Nos)

g. Crowd Management Analytics for 8 locations, 27 Cameras

i. Integration and IT Infrastructure for 25 Cameras
ii. Viewing Centers for 4 locations

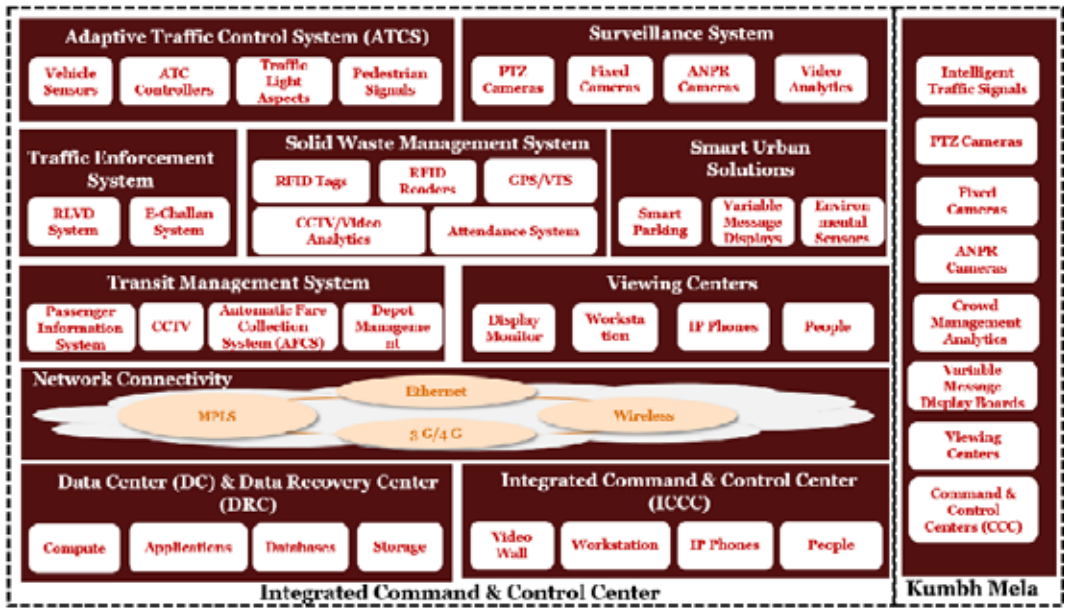
1. Sangam Nose
2. Arail Police Line
3. North Jhunsi
4. South Jhunsi

h. KumbhMela Command & Control Center (CCC) at Triveni Bandh

i. Command & Control Center (CCC) at Modern Control Room, Police Lines

j. Solid Waste Management for City Area

i. RFID Tags for 500 Bulk generators
ii. RFID readers for 20 Nagar Nigam vehicles
iii. Integration with GPS based VTS for 315 Nagar Nigam vehicles
iv. GPS + Biometric based Attendance System: 100 Devices



7. Emergency Response Force

Police: The main involvement of police department was on commencement of the Kumbh Mela event for Law and order related activities. Notwithstanding, entire police force underwent rigorous training and were involved in Hazard assessment and risk analysis to arrive at Tactical Plan. The Major Hazards identified apart from Natural Hazards were Crowd Related Disasters (Stampede), Fire, Epidemics, Accidents (collapse/damage to Pontoon bridges, Boat accident etc.) and Terrorist activities. Considering the threat scenario, the resource requirement was worked out to include the police force deployed; from Women

police force, Traffic Police, Horse Mounted Police, Police teams, Fire Station Teams and Water Police Teams. Apart from Police Force; the forces deployed included PAC((Provincial Armed Constabulary) Teams, SDRF, NDRF, CAPF, ATS and Sniper teams. A modern Control Room was established at Kumbh Mela Area.

The overall Command and Control set up for management of Kumbh Mela with respect to Emergency Response Force was under Police Force

Jal Police: Jal Police played important role of providing safety and security to the pilgrims on the bathing ghats and pilgrims using the facility of boats for visiting Sangam. Jal police also was responsible for underwater security and security of pontoon bridges in coordination with other allied agencies

Fire Services: The fire department also divided the entire area in to 9 zones and there were 50 fire stations established in the Kumbh Mela Area with adequate manpower and equipment.

Fire Services undertook public awareness campaigns to educate visitors/pilgrims on fire hazard and fire safety aspects. There were 40 Fire observation towers to give early warning relating to fire incidences.

National Disaster Response Force: A multi disaster and well trained national response force was made available for the event. This force was actively involved in river bank and waterways operations. Their presence in the area enhanced the emergency response capability of Kumbh Administration for any kind of disaster.

Army Column: Though not actually deployed on ground but were catered for as force multiplier in case of CBRN or Terrorism related incidents.

Air Effort: Air effort at Bamrauli Air Base was kept as standby in case of any emergency.

Volunteers: Availability of volunteers for assisting the police/ fire services in management of event was found very beneficial for crowd control duties.

7.1 a) Health Plan:

- ***Medical Plan***

A total of 22 hospitals with more than 450 beds, about 150 ambulances and around 2,000 medical staff were deployed in the Mela area to attend to all medical and healthcare emergencies during Kumbh Mela 2019. DMCC (Disaster Management Control Cell) was established in Central hospital to coordinate health activities.

A 100-bed Central hospital was established in Sector 2 of Mela area with facilities of x-ray, ultrasound and pathology services along with, 24 hour availability of specialist doctors. Apart from that, 11 other circle hospitals with 20 beds each was

set up in sector 1, 4, 6, 7, 10, 12, 16 & 19 to provide all health related facilities. Two 20- bedded Infectious disease hospitals in Sector 14 & 20 were also established.

Mobile Medical Teams in the form of 72 Quick Medical Response Teams of 5 members each, were deployed, 2 at each circle office and 2 at each circle hospitals.

For immediate response, 25 first-aid posts inside Mela area and 27 health posts outside the mela area were established to provide emergency service to patients.86 fully equipped Ambulances with wireless sets were available 24x7 in the Mela Area to support these teams.

7.1 b) Hygiene and Sanitation Plan

The Health plan encompassed sanitation, vector-borne diseases, solid waste management and disaster management along with general health services.

Health department had made a record by establishing 1.10 lakh toilets across the Mela premises. The solid waste management of these toilets was also managed by the department.

Apart from the above, a vector control unit was formed to address infectious diseases.

7.2 Emergency Support Function

a) ***Electricity Department:*** The main threat identified by the electricity department during the Kumbh Mela was providing uninterrupted power supply during the entire event and more so during the six auspicious days. This was achieved by the department by drawing electricity from different grids and integrating in the entire electricity grid established within the Kumbh Area. A number of Trolley mounted generators were positioned in various sectors to meet any unforeseen eventuality.

b) ***Water Supply/ Irrigation Department:*** The major threat during such large congregations is Epidemics. Necessary pre-event preventive / mitigation measures were initiated by Central as well as State Governments. The cleaning of River Ganga was a major initiative which improved the quality of water to acceptable limits for people to take bath. The second major threat was adequate supply of Safe Drinking Water. This was achieved by laying pipe line throughout the Kumbh Area, creating water stand post. The third threat was availability of water for fire-fighting; this was achieved by creating underground water reservoirs. Bank erosion was visualized as one of the threats and for that necessary training to teams was given related to bamboo barricading and required resources were placed near likely locations of bank erosion.

c) ***Media Centre-*** Media centers were established in the Kumbh Mela Area. There were separate halls for Local, National and International Media. All Media briefing was based on Press Note duly approved by Mela Adhikari.

d) ***Kumbh Mela Economics:*** The Uttar Pradesh government had allocated Rs 4,200 crores for the conduct of 50-day Kumbh Mela 2019, making the contribution three times higher than the earlier one.

e) ***Other Country Participation in Kumbh Mela Event:*** The Indian Council for Culture tied up visit of foreign guests from 115 countries to Prayagraj. The Mela attracted a massive number of foreign tourists from various countries like Australia, UK, Canada, Malaysia, Singapore, South Africa, New Zealand, Mauritius, Zimbabwe and Sri Lanka.

Kumbh Mela 2019 with a Difference:

The variety of activities during Kumbh Mela period made the event more attractive. During the Kumbh Mela an effort was made to display rich culture of India. The cultural, sanskritik, literary stalls attracted every bodies attention and remained as the life time experience for all visitors including foreign visitors.

Director & Professor, Center for Disaster Management, YASHADA, Pune, Maharashtra

Managing the Phuktal River Crisis – Disaster Averted in High Himalayas

G. P. Ramaswamy, IAS

Jammu & Kashmir Cadre

Focus of the Case Study:

The case study renders a step by step detailed account into the various preparedness and response measures that were undertaken by a host of stakeholders in managing the Phuktal River Crisis in Zanskar Valley, J&K in the year 2015.

1. Introduction

The sub-division of Zanskar in Kargil district is an extremely remote area nestled in the high Himalayas which is cut-off from the world for more than six months in a year and during those six months, the only means of accessing Zanskar is by air. It is for this reason that the District Administration of Kargil stocks the Sub-Division of Zanskar with essential supplies in advance of the bitter winter months that the Sub-Division experiences. It is in this backdrop that the Phuktal river crisis has to be viewed as our aim was to address a problem that was extremely difficult to handle from the very beginning not only because of the magnitude of the problem per se but also due to the extreme hostility of the terrain. It was a problem which pitted the administration against near impossible odds. The distances involved and the unforgiving terrain baffled all concerned and in the beginning, confusion and a lack of precedence made it obvious that ahead of us lay a truly Himalayan task. The author was the District Magistrate of Kargil and what follows is a first-hand account of the experience of handling a problem; unique in many ways. The purpose of the case study is to document an experience unprecedented in India and to share the lessons learnt and inferences drawn.

2. Detection of the Problem

On 10.01.2015, the Sub Divisional Magistrate, Zanskar informed the author that the flow of water in the Tserab Chu (Phuktal) river meandering through the Phuktal valley before passing through Padum town (the administrative headquarters of Zanskar) had decreased substantially. Sensing that this could mean possible landslide and blockage of the river upstream, an aerial survey by a district level committee of engineers was carried out by the

author seeking assistance of the Air Force. On 18.01.2015, the aerial survey was conducted by the technical committee and a report submitted on the same day according to which the dimensions of the blockage and the reservoir formed were specified (briefly the blockage was 60 metres in cross section, 600 metres in length along the river bed, 50 metres high, the reservoir was 10 kms. in length and had attained in height, 80 percent of the height of the blockage and the gorge gradient was estimated to be 70-80 degrees). A massive Fallstruz lake had thus been formed (N.C Shah, 2014). Furthermore, the technical committee opined that the matter was too complicated and needed to be referred to the National Crisis Management Committee (NCMC) for a possible solution. The Government of Jammu & Kashmir abided by the recommendations of the technical committee and the matter was referred to the NCMC. Henceforth the NCMC was responsible for dealing with the blockage and the state government was responsible for rescue, relief and relocation activities. The NCMC immediately set upon the task of constituting an expert team to study the problem, suggest and implement workable solutions.

3. Operation 'KHATAK'

While the National Crisis Management Committee was preparing to tackle the problem by constituting a task force, the onus of sensitising and relocating the people in vulnerable locations downstream of the blockage/reservoir fell on the state government and consequently, upon the district administration. Kargil District did not have a district disaster management plan and thus lacked a communication and initial response machinery deemed most crucial in a crisis situation (Second ARC Report, 2006). Accordingly on 01.02.2015, the author landed at Padum and held a meeting with the Sub-Divisional Administration, Zanskar, local civil society members, officers of the Indian Army and the Indian Air Force seeking opinion and information from all the stakeholders. It was decided in the meeting that the SDM Zanskar shall prepare lists of all the hamlets, families (along with contact persons from each hamlet), infrastructure (government and otherwise) and alternative rehabilitation sites in the eventuality of a complete breach of the blockage by the water. The SDM was also directed to ensure that the communications and control centres established at Padum and the Phuktal Monastery (habitation closest to the blockage) are staffed and fully functional. By 03.02.2015, communications and control rooms had been established in Kargil, Leh, Padum, Phuktal, Alchi and Chilling (all big hamlets downstream of the blockage).

The District Administration of Kargil on the basis of the meetings held with the Sub-Divisional Administration and following the instructions passed by the Divisional Commissioner, Kashmir launched Operation Khatak, which was the detailed communications, relief and emergency preparedness plan tailor-made for handling any emergency arising out of a sudden breach of the landslide blockage across the Tserab Chu (Phuktal) river. All subsequent displacement and temporary rehabilitation activities in the wake of the Phuktal river crisis were carried out as per Operation Khatak. In the weeks to come, operation Khatak was to guide the Kargil district administration in planning for vulnerability mapping, disaster management and post facto mitigation efforts. The unique thing about Operation

Khatak was that it was totally tailor-made to suit the extraordinary circumstances prevailing in Zanskar and in doing so a lot of improvisations were made.

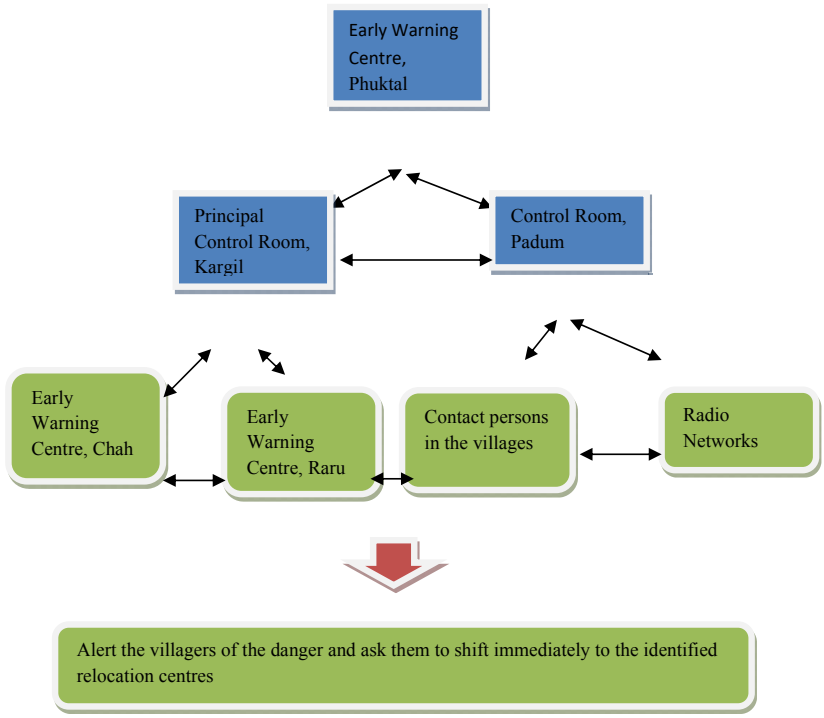


Figure 1- The emergency communication and relocation plan

3.1. Partnering with the civil society

Operation Khatak was the joint response of the district administration and the local community to the daunting challenge of preparing the villages/hamlets downstream of the blockage for quick response and an early recovery in the face of a complete breach. Very simply, the plan was to identify vulnerable locations along the river bank downstream of the blockage, relocate the people and livestock in those locations to higher, safer villages where they were to be looked after by a team of people whose job was to facilitate shelter, essential rations, medical care and most importantly, motivation to stay. There was a serious impediment to accomplishing the task and that was the near impossibility of physically reaching the villages. More than 15 villages/hamlets ranged from 10 to 80 kms upstream of Padum in terms of distance and the road leading to them was completely snowed in and dangerously prone to avalanches. There was no reliable way to access these locations through telephones as no lines existed and mobile networks were either absent or unreliable. Airlifting the teams of people from Padum to the villages upstream was not immediately possible as barring a couple of locations, none of the others had functional helipads and landing in those locations needed the Air Force to take tremendous risks. There was another problem, a severe shortage of government officials who could be tasked to reach these locations and implement the plan. The high degree of official absenteeism from the sub-division of Zanskar, typically considered a punishment posting due to its perceived remoteness and harshness, was felt acutely during the crisis.

A breakthrough came about when a group of volunteers, notably led by the local Religious youth associations came forward and offered manpower to be led by the administration to reach the locations upstream and implement Operation Khatak. Teams of ten persons were then formed, each led by a senior government functionary whose task was to trek to the villages/hamlets earmarked for them and then sensitise/relocate the people as per the requirement. It was also suggested that not all manpower needed to be mobilised from Padum; as in many cases the teams after reaching the locations could draw more volunteers through their local associations and contacts. In this way, more than 15 teams were activated and they played a very crucial role in ensuring that no soul was left behind in any village/hamlet that was deemed vulnerable. The hamlet of Nyuru was the first to be relocated on 07.02.2015 and this gave all concerned stakeholders tremendous confidence that the task could be accomplished despite the overwhelming odds.

Furthermore in order to circumvent the requirement of transporting men and materials to the vulnerable locations upstream of Padum, it was decided that local resources were to be mobilised. Thus the vulnerable hamlets were shifted to nearby villages where relatives/contacts were available who could accommodate the displaced families till the crisis was resolved. Free ration was allocated out of the sufficient stocks available in the local public distribution system depots. Timber and fodder requirement was met locally and thus this was not the typical case of 'displacement' as experienced during cyclones or floods in the plains. The entire crisis management plan was fine-tuned to suit local requirements and circumvent local limitations which without the wholehearted co-operation of the local community, could not have been as effective.

4. Multiple Agencies ; Multiple Issues

The course of action was straightforward. The National Disaster Management Authority(NDMA) was mandated by the NCMC to lead a select team comprising scientists, engineers and geologists to find ways and means to reach the blockage site and create a channel along the blockage to allow the water in the reservoir an outlet. The NDMA was to be assisted in its endeavour by the Leh based 14 corps of the Indian Army and the Indian Air Force. The state government was to facilitate the team in carrying out its activities. The operation was thus expected to be a joint effort of the National Disaster Management Authority, the state government of Jammu and Kashmir, the Indian Air Force and the Indian Army. The district administrations of Leh and Kargil had the responsibility of ensuring the safety of the people living downstream of the Phuktal river blockage and that no one approached or ventured near the blockage site.

As expected, problems of coordination surfaced immediately and the first issue that cropped up was the issue of leadership. Although it was decided that the NDMA would be leading the operation, the involvement of the various security forces like the Army and the Air Force complicated the situation. It was becoming

increasingly obvious that establishing a unified command structure, very crucial to a crisis management operation (Second ARC Report, 2006) was not to be an easy task. Also, competition for aerial sorties between the Kargil/Leh district administrations and the NDMA led operational team was becoming a real problem as the Air Force had only a limited leverage in committing aerial sorties for transporting men and materials to the blockage site.

The author was informed during one of his visits to Padum that a group of French trekkers were trapped there as the Chadar trek route they took to reach Zanskar was officially closed. Since they were foreign nationals, the Air Force refused to airlift those citing Ministry of Defence regulations. The Ministry of Defence in this case needed clearance from the External Affairs Ministry which in turn needed a similar clearance from the French Embassy which refused citing a technicality. Thus denied a safe exit, the French tourists were provided financial assistance by the Kargil District Administration along with medical care and requested to be patient till the problem was sorted out. This episode is instructive of how tourists, especially foreign tourists faced troubles during a crisis as there are no ready-made procedures to fall back on.

The operation was reviewed periodically by meetings chaired by the Cabinet Secretary where the actual physical progress of the Operation was reviewed and coordination issues were sorted out. A very serious issue which was brought up at the meeting chaired by the Cabinet Secretary on 04.03.2015 was that the members of the NDMA were of an advanced age and they faced frequent health issues in the form of high blood pressure, hypoxia etc. and it was decided that younger people were required to assist the core team of NDMA and inducted for carrying out the operation at Phuktal. It was also decided in the meeting that two videographers were to be inducted in the operational team whose responsibility was to video-record the whole operation for purposes of documentation and information. In this regard, two videographers of the Leh Information Department were chosen and insured by the District administration of Kargil. The State government was to provide insurance to the members already in and those to be further inducted in the operation and it was done promptly. The District Administration succeeded in shifting 245 people in 13 Villages/Hamlets to safer grounds out of a total of 257 people by 04.03.2015. In the meanwhile, with the assistance of the Kargil District Administration, the Central Water Commission succeeded in installing an Automatic Water Level Monitoring System at the Phuktal River near the Phuktal Gompa. This was a significant achievement as it enabled the continuous and accurate monitoring of the water level in the Phuktal River downstream of the blockage which was to be indicative of the state of the blockage and the reservoir.

5. A Channel along the Blockage materializes

The practical problem being faced by all concerned stakeholders was that there was no conclusive proof of how the blockage would respond to rising water levels once thawing began in a couple of months. Meanwhile hundreds of Zanskaris

were held up in Leh as they could not be airlifted to their remote homes as was customary during the winter months. This resulted in unrest as the people started getting impatient with the entire operation. Alternative mechanisms were being suggested by certain Non-Governmental-Organizations and private individuals to remove the blockage without expert knowledge. The result was that time was running out on all the stakeholders and the target was required to be achieved.

The plan was that a campsite would be established upstream of the blockage at a flat piece of ground close to a makeshift helipad. The campsite was to be connected to the blockage site by a rough track with an improvised ropeway for safety and men and materials, especially explosives which were to be transported by this track. The operational team was particularly plagued by extraordinarily bad weather in the first two weeks of March, 2015 due to which almost all the operations of the Indian Air Force in connection with Operation Phuktal were stalled and very little progress could be achieved other than establishment of the camp sites at Phuktal and blockage site. The practical implications of the bad weather was that not only men and materials could not be transported from Leh to the campsite, most aerial operations from New Delhi and Srinagar to Leh were also stalled. The team also discovered to their utter dismay that after every blast, the exploding debris would spill over the place including the channel thus dug and the team had to clear it before commencing further operations. But despite the bad weather and the harsh terrain, the team succeeded in carrying out 7 controlled blasts using 175 kgs. of explosives and succeeded in creating a channel 2 metres wide by 2-3 metres deep and 55 metres in length. On 16.04.2015, water started flowing through the channel and it was confirmed by the increase in water level downstream of the blockage site as measured by the automatic water level monitoring system installed at the river near Phuktal Gompa.

In the meeting held on 17.03.2015, chaired by the Cabinet Secretary, the operation was reviewed and it was decided that the next course of action in the wake of the flow of water from the reservoir through the channel was to be continuous monitoring of the water level downstream of the blockage. In this regard, the District Administrations of Leh and Kargil were supposed to keep the communities downstream of the blockage in a state of high alert and monitor the water level downstream of the blockage, especially at Phuktal and Padum. Apart from monitoring the water level, periodic aerial surveys of the reservoir and the channel across the blockage were also recommended. In pursuance of the decisions taken in the meeting of 17.03.2015, the District Administration of Kargil continued to monitor the water level.

6. The Breach and its Aftermath

The situation in Zanskar was difficult after the channel was dug as for a month after the operation was completed, no significant change in the water level of the reservoir was noticed. The uncertain nature of the problem at hand meant that

the heightened vigil had to be maintained till something dramatic happened. Accordingly, after the NDMA, the Army and the Air Force withdrew the task of monitoring the situation based on water level readings; maintaining the advance warning centres fell on the state government of Jammu & Kashmir. The problem obviously was that nobody knew when the inevitable would happen and when it did, the magnitude of the mishap. Also it was practically impossible to keep the people displaced from their homes and in a state of alert indefinitely. The Gohna Fallstruz lake breach in the state of Uttarakhand in 1970 and the subsequent loss of human life and property had proven that such lakes could last for an unpredictably long time (N.C Shah, 2014).

A message was received by the Kargil District Headquarters in the wee hours of 07.05.2015 from one of the many monitoring stations downstream of the blockage that there was a huge and steady increase in the water levels of the Phuktal River. This was a matter of grave concern and after ascertaining the veracity of the report; the District Administration sprung into action and alerted all the monitoring and early warning stations downstream of the Phuktal Gompa. Soon enough, reports started pouring in from all the centers in Zanskar about the damage to property caused by the wall of water unleashed as a result of the sudden breach. Aerial sorties were immediately requisitioned by the District Administration to airlift necessary supplies expecting the worst and to take stock of the damage. In the meanwhile, the Zanskar sub-divisional administration was directed to mobilize all possible resources to avoid any loss of life/ property of the people living up/ down stream of Padum. Also both the District Magistrate and the Superintendent of Police conducted aerial recce of the Phuktal Area by Chopper and monitored the rescue operations while interacting with the people of Zanskar.

Seventy school students in Padum and the Surrounding areas of Zanskar were rescued safely by the sub-divisional administration of Zanskar. As a result of the heavy flow of water from the breached reservoir at Phuktal, nine bridges and a school were washed away and two bridges were damaged. That however, was the extent of damage and no life, human or animal was lost.

7. Conclusion – Lessons Learnt

1. We were unprepared :

When the landslide and the resultant blockage across the Phuktal river was first reported, the Kargil district administration realized that it was severely short of trained men and logistics to tackle the situation. The district did not have a workable disaster management plan even though multiple agencies like the Army, Air Force, Border Roads Organization (B.R.O) operated in the area.

2. Lack of standard procedures :

In extremely remote areas like Zanskar, more often than not the only viable option in the event of a natural calamity is the Air Force but there are no standard operating procedures

to deal with such situations. The Air Force has to seek clearances and permissions from the Ministry of Defence to fly extraordinary sorties which are a must in the event of a natural calamity. Much of the assistance drawn from the belt forces in the instant case was based on mutual understanding and personal acquaintances.

3. The law of unintended consequences operates:

While multiple agencies were involved in tackling the Phuktal crisis, discontentment was building in Muslim majority areas of Kargil on the attention being showered on 'Buddhist Zanskar'. We faced protests by Zanskaris in Leh against the 'inordinate delay' by the administration in tackling the crisis and freeing the Air Force to operate passenger sorties for commuting people. Furthermore once the channel was dug, pressure was mounted on the district administration to ease the restrictions on the movement of people even though the uncertainty about the breach of the blockage was still looming large.

4. Improvisations are very important during crisis situations:

Two experts from the National Hydel Power Corporation (NHPC) based in Srinagar were to be airlifted to Leh. They did not have the wherewithal to reach Leh on their own and could not avail transfer allowance from the NHPC for the purpose. Ultimately they were provided tickets to Leh and the expenses paid for by pooling money from certain private individuals. Due to an inevitable communication breakdown, the operational team could not give the Kargil District Administration the promised 24 hour notice before carrying out explosions over the blockage site and smoke candles were deployed by the officials in some villages to communicate the message among themselves in a very primitive yet effective way.

References

1. N.C Shah, A historic Fallstruz lake, Gohna, District Chamoli, Uttarakhand, India (1893-1970), Earth Sciences India Journal, July, 2014
2. The Second Administrative Reforms Commission, Third report on crisis management, September, 2006

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Effective Crowd Control at the Nashik Kumbh Mela 2015 – A Perspective Watch

Dr. Praveen Gedam, IAS

The focus of the Case Study is to give an overview on the various preparedness measures which were undertaken for effective crowd control by the Nashik Administration at the 2015 Kumbh Mela.

1. Introduction:

The Kumbh Mela is one of the largest peaceful gatherings in the world, and is considered as the world's largest congregation of religious pilgrims. The celebrations for Kumbh Mela 2015 commenced at Nashik on 14 July 2015 and lasted till 2016.Nashik Kumbh Mela is celebrated at two places ie. Nashik and Trimbakeshwer. Devotees congregate and perform several rites and rituals. Numbers of ceremonies are performed like religious discussions, devotional singing, mass feeding of holy men and women and poor, out of which bathing is considered as most sacred and takes place at the bank of river in every town, where Kumbh is celebrated.

The most important event of the Kumbh mela which is ritual bathing or *shahi snan,* takes place at the river banks called ghats. Millions of *sadhus* and devotees walk to the designated ghats and take a holy dip at the prescribed time. The most astrologically auspicious days are known as *parvani*, and these days attract the highest gatherings. The foremost priority before the facilitators was people's safety and crowd control. To prevent any mishap, it was decided to monitor and direct this massive crowd and traffic flow to the ghats.

"If we were to select just one area of organisation that got precedence over everything else, then it would be this," says Dr Praveen Gedam, then Nashik Municipal Corporation (NMC) Commissioner, "even ahead of, say, fire-fighting or medical arrangements. If the crowd cannot move, or if the people aren't safe in the first place, nothing else would be of any use."

2. Estimating Crowd Profiles and Flows

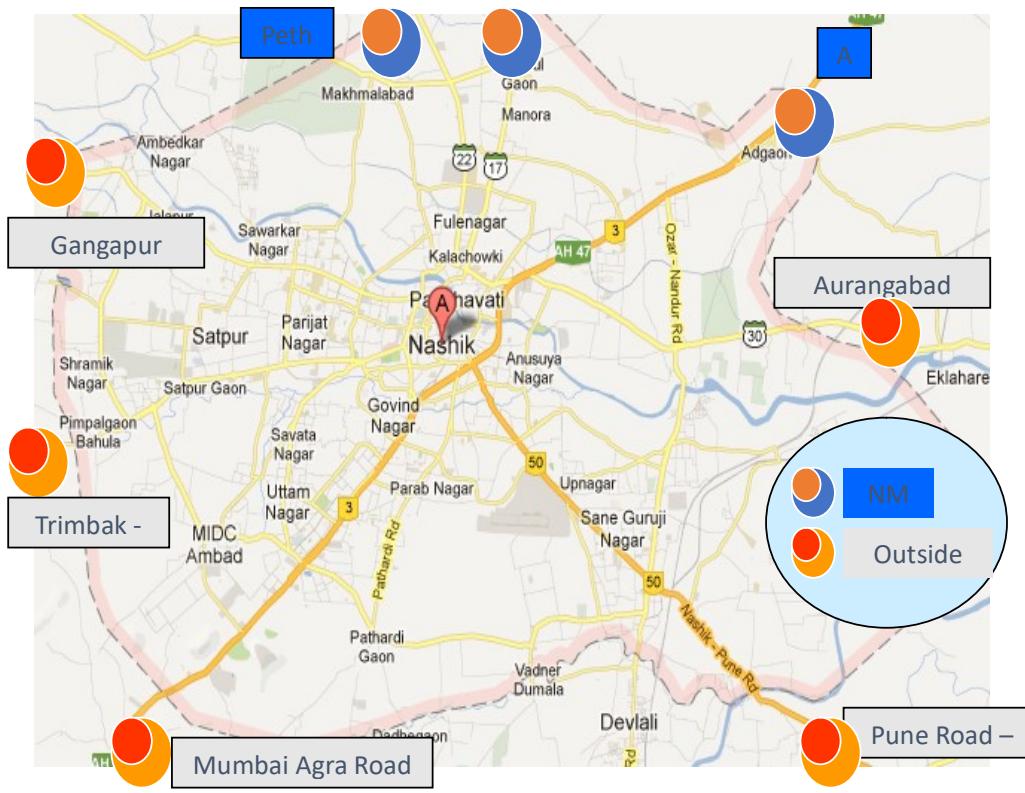
Planning for crowd control, therefore, began by taking into account the likely crowd profile in terms of age (preponderance of middle aged and old people); gender (men outnumbering women); region (mostly from North India); language

(mostly Hindi-, Marathi- and Gujarati-speaking, but also people speaking south Indian languages; many Indians also understand a fair amount of English); the places most likely to be visited and the time or days (geographical and temporal distribution) of these visits.

Planning for control of crowds began with making estimates about how many people were likely to come into the city, via what mode of transportation and from which direction – thus helping to streamline traffic (both human and vehicular) and road usage. These estimates were based on figures of vehicles parked during the earlier Simhastha in individual sectors. To these figures were added estimated numbers of devotees coming by train and alighting at Nashik Road railway station. This then was an additional point of entry to the city. Those coming by train would alight at Nashik Road railway station and for practical purposes they were to be clubbed with the crowd coming by road from the Pune side. Entries via other nearby railway stations such as Odha and Deolali were also taken into account, and facilities were provided at these entry points.

The number of expected devotees ranged from 80 lakh to 1 crore. Devotees coming before *parvani* days was estimated at 30 lakh, which was estimated to shoot up to 50 lakh on *parvani* days.

The sites designated for inner parking.



Sadhugram

Spread over an area of 327 acres in Tapovan, Sadhugram was the temporary abode of the *sadhus*, mahants, various *akhadas* and charitable institutions that come for the Kumbh Mela. This pop-up city was, for all intents and purposes, be a fully functional city *within a city* for almost an entire month – complete with its own plots for housing, internal and service roads, signage and directional boards, electricity, street lights, 24x7 water supply, drainage and sewerage pipelines, security arrangements, shops, hospitals, toilets, bathrooms, parking arrangements, fire and disaster management facilities, and even a media centre.

Sadhugram in 2015 under construction:

The toughest task in creating Sadhugram was flattening the ground as it would stand on agricultural land. Since Kumbh Mela takes place during the monsoon, we had to take extra care, Chief Coordinator, Nashik Municipal Corporation (NMC). The plots had to be hardened so that they could take the load of the vehicles, temporary construction and a large number of people who were expected to live there.

Sector offices were also created within Sadhugram from which government officers could operate. A sum of Rs 55 crore was budgeted for the creation of temporary parking lots backed by mobile toilets for the use of out-of-city pilgrims. Sadhugram was also equipped with standposts and plinth work for toilets and bathrooms; electricity supply; street lights; 24x7 water supply; toilets, bathrooms, showers and taps; drainage lines; adequate sewage and sewerage lines along with massive water tanks on stilts; hospital and medical facilities; fire-fighting equipment, plot hardening to prevent seepage and contamination of the ground and river waters; security arrangements, PDS shops, media centre; and six ATMS.

Infrastructure Details: Sector 1 and 2

Category	Unit	Sector 1	Sector 2	Total
Plot number	No	642	827	1,469
Plot area	Sq m	2,25,160	3,43,595	5,68,755
WC seats	No	3,628	4,720	8,348
Bath taps	No	4,480	5,950	10,430
Standpost taps	No	949	1,852	2,801
Sewer line	RMT	8,631	15,938	24,569
Water supply lines	RMT	15,708	14,822	30,530
Street lights	No	592	600	1,192
Internal roads	RMT	8,947	11,707	20,654
Service roads	RMT	5,564	11,213	16,777

3. Demarcating Zones

(i) Entering the cities:

Crowds coming into Nashik were grouped into eight zones from eight directions. Which ghat a pilgrim would go to, was decided by the route he or she took to travel to Nashik. The police department linked all the old and new ghats to the routes coming into the city.

Traffic diversions were planned for devotees who wanted to go to Trimbakeshwar directly – they did not enter Nashik. Devotees also had the option of visiting Nashik, proceeding to Trimbakeshwar or Shirdi, and then return to home base directly without coming back to Nashik. Ring roads and bypasses greatly facilitated this movement.

(ii) Outer parking zones:

Parking arrangements were streamlined by providing eight 'outer parking' sites around the city; three of these were on the city's boundary. Pilgrims coming by trains and by road were clubbed here. Parking space for one lakh vehicles was created in these outer parking spaces. Separate parking arrangements were made for two- and four-wheeled vehicles, Light Motor Vehicles and Heavy Motor Vehicles. Vehicles were not allowed beyond these sites. From these parking sites, only Maharashtra State Road Transport Corporation (MSRTC) buses were allowed in – they ferried devotees up to the six 'inner parking' sites inside the city. Round-the-clock, non-stop services through 3,000 state transport buses were provided. Devotees then had to go on foot from the inner parking spaces to the designated bathing ghats. Returning crowds followed a similarly designated route.

The sites designated for inner parking.

For instance, people coming from Mumbai were directed to particular ghats through a particular route and they returned via that same designated route. They were not allowed to go to any other ghats. All the eight or nine radial roads coming into the city were connected to one or the other ghats. So, there was no issue of bottlenecks or crowding in some location because everybody wanted to go only to some specific ghat. Thus, was the immense crowd managed.

'Hold and release' to manage crowds

To avoid high density build up, a '**hold and release**' policy was followed at 19 specific places along various stretches. As with the shelter places, the holding areas were also provided with facilities such as drinking water, electricity, toilets, public address systems and sheds to rest in, among others.

Initially the idea was to construct the outer parking sites with just enough shelter to cater to the needs of passengers in transit from their private vehicles to the state transport buses. Work started accordingly. Then it was realised that these places were unlikely to be used solely as transit places or bus stations and that they could end up being used as a place of residence,

akin to a dharmashala. It was then decided, in April 2015, to increase the area of the shelter spaces so that if the devotees chose, they could even stay here.

In the outer parking sites, shops were given on rent to local entrepreneurs and also to self-help groups which sold food and other items. Later on, community kitchens, which provided cooking facilities to devotees bringing their own rations, were also established by involving private players. The parking areas were given to private players who were allowed to charge predetermined fees.

Good Practice

To communicate effectively with crowds coming from different states, the police department used officers drawn from those very states, who could converse with the visitors in their own language.

Each zone thus had an outer parking site connected to a specific inner parking site that led to a particular ghat. The zones were made operational only on the days of *parvani* plus/minus 24 hours, the hours being flexible depending upon the situation on the ground. On other days, outside vehicles could come in till the inner parking sites. But not beyond.

(iii) Inner parking zones:

Vehicles were stopped at the city periphery, in the outer parking zones. From these parking lots, MSRTC buses ferried devotees up to the inner parking zones. Food, shelter and other arrangements similar to the outer parking zones were made in the inner parking sites also. As it turned out, these places were also extensively used by devotees to stay – thus, the area of the shelter spaces here too was increased. The only difference was there was no need to have parking slots for private vehicles, as was the case in the outer parking sites.

The roads leading towards the ghats from the inner parking sites were fenced at both sides to prevent unmonitored crowd movement, which could cause a stampede. Barricading was deployed. To avoid high density build up, a 'hold and release' policy was followed at 19 specific places along various stretches. As with the shelter places, the holding areas were also provided with facilities such as drinking water, electricity, toilets, public address systems and sheds to rest in, among others.

(iv) Other arrangements:

Planning also included estimates of the ebb and flow of parked and to-be-parked vehicles. The total duration of a devotee's visit to Nashik on parvani days was estimated to be 36 hours. It was assumed that devotees who had parked their vehicles would return within nine hours. Accordingly, it was estimated that there would be four parking cycles (over 36 hours) at each parking site. This became a vital part of the administration's strategy to prevent overcrowding and traffic snarls in the outer parking sites.

Reserved areas were created for the state transport buses. Bus stands were scaled up and renovated. Boundary walls were built around the bus stands to control crowd movement. Strong barricading between arrival and departure zones of the bus stand with clear signage were established to avoid confusion as well as congestion. Continuous crossing of buses between the two parking spaces was achieved using clearly marked dividers to avoid any accidents.

Good Practice

Planning also included estimates of the ebb and flow of parked and to-be-parked vehicles, and of parking cycles, in the designated outer parking sites. This became a vital part of the administration's strategy to prevent overcrowding and traffic snarls in the outer parking sites.

Eighteen shelter places were identified between all the routes from outer to inner parking sites. These shelters were equipped with facilities such as electricity, toilets, drinking water, public address systems, LCD TVs and so on.

All the outer and inner parking sites had facilities such as shelters, toilets, clean drinking water, temporary clinics, mobile dispensaries, temporary toilets and water facilities, various shops, along with facilities for cooking food. Community kitchens were also established. To keep these places clean and healthy, daily garbage collection and proper sanitation works were also carried out. Police, fire fighters and all other emergency service-giving teams were stationed at these parking sites. As it turned out, these places were extensively used by devotees as shelter places.

In this way, crowds coming from various directions were segregated and channelized so that they did not merge together or cross each other's paths. The giant Simhastha Kumbh was thus, effectively, broken up into eight separate sub-Kumbhs. Making Ramkund and its perimeter 100 per cent vehicle-free was one of the significant crowd control measures undertaken by the authorities. Seamless communication and coordination was maintained at all times between all the agencies responsible.

Learning from parking regulations

- One downside of not allowing vehicles into the inner parking areas was that it forced devotees to go on foot to the bathing ghats. Many devotees, mainly older ones coming from North India, expressed their dissatisfaction over this particular measure, according to a 'satisfaction survey' carried out by a group from a local journalism college. Incidentally this survey showed very positively that 85% of citizens responded to overall arrangement made for Kumbh Mela

Source: Bhargave, Vrinda (2015). *Loksatta*; Special Supplement dated September 5; Nashik.

Clear and visible multilingual signages in bold fonts were placed at all the important places, starting from railway platforms to bus stands to roads to ghats, to guide the visitors.

Each zone was colour coded. So all the signage, boards and other structures in a particular zone, were in one specific colour. For instance, the zone which catered to the crowd coming from Dhule/Delhi, was designated a 'blue zone'. Therefore, all the signage, etc., in the zone was colour coded blue. The devotees were also colour-coded for easy identification and towers and tanks in the vicinity were numbered with prominent numerals and codes.

Crowd Psychology

The authorities also had to contend with subtleties of crowd psychology: the surging crowd of devotees, for example, forced to wait behind barricades while the sadhus finish their *shahi snan*, is hardly static. The authorities had learnt by experience that in such cases it always helped to engage the devotees that were 'held' before being 'released', using public address systems or by providing them continuous television coverage of ceremonies that are out of bounds to them because of security reasons. The latter action sometimes spoke louder than words because it created a sense of participation and tranquillity so essential for prevention of crowd unrest.

Not Purely Traffic Control

Changing the route of the Shahi Miravnuk (Royal Procession) from Tapovan to Ramkund proved to be critical for crowd management. The traditional route went through some narrow lanes of the older part of the city. This was the very same route that witnessed the tragic 2003 stampede resulting in death of 39 persons. To overcome this problem, the administration constructed a wide new road along the Godavari. But something else, completely unanticipated, surfaced after the construction was completed. The mahants refused to use this route: it was deemed to be 'inauspicious' because it passed from in front of a crematorium. All attempts at persuasion failed. The only option then was to have yet another alternative route. A

reasonably wide route going through the congested part of the city was then finalised and used.

Such situations can be tricky, especially since cultural and religious sensitivities are involved. It would have been better to involve the ultimate users in the initial stages itself, incorporate their inputs and ideas and then arrive at a mutually acceptable solution.

Having learnt its lesson, the administration from then on scrupulously stuck to a consultative strategy process. Whenever other meetings and site visits were carried out, they were scrupulously documented. Also, agreements were also taken from the *akhadas*, given the fact that dynamics within them kept shifting.

Thus, changing the ceremonial route ultimately called for not only traffic management and ergonomics or management of traffic flows, but strategic management of psychodynamics and handling of religious sentiments as well.

Routine bathing was disallowed on *parvani*, which was reserved as a day only for *shahi snan* followed by ritual bathing of devotees. Those who wanted 'normal' ablutions could go to Ramkund a day before *parvani* or a day later.

Crowd analysis also showed that as many as 80 per cent pilgrims to the Simhastha also made a went to Shirdi; the shrines in Kavnai attracted some five lakh visitors and those in Junnar drew five to seven lakh devotees.

Law and Order

Two months before the Kumbh Mela started, Mumbai traffic police had already begun training state police personnel on how to control traffic during the days of the Mela. "Our officers have been asked to train with officers in Nashik in preparation

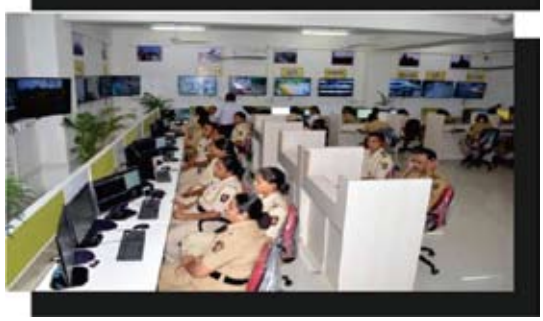
for the Kumbh Mela. These were just some examples of how the police department micromanaged its responsibility of managing the crowds, traffic, and the law and order situation during. The vast numbers of people expected, and the resultant traffic, necessitated a strong police presence. Over 29,500+ police personnel – men and women – were requisitioned from all over Maharashtra. Apart from local policemen, paramilitary forces including the Border Security Force (BSF), Indo Tibetan Border Police (ITBP) and the Central Reserve Police Force (CRPF) had also been roped in for crowd management. The police was also helped by almost 7,000 volunteers from various non-governmental organisations (NGOs) to assist in crowd management. In addition, the logistics involved in planning for accommodating such a large contingent were not neglected.

<table>
<tr><td>TIMELINE</td><td>D-2 Yrs.</td><td>D-1 Yr.</td><td>D-6 Months</td><td>D-3 to D-1 MonthS</td><td>D-DAY</td><td>DURING KUMBH</td></tr>
<tr><td>STAGES</td><td>Rough Planning</td><td>Submission of Plans</td><td>Initial Implementation</td><td>Implementation</td><td>Execution</td><td>In Action</td></tr>
<tr><td>PHASES</td><td>• Planning started 2 years prior
• Mela Adhikari and Various Officers were appointed for execution as well as the seamless management of the Kumbh</td><td>• Official submission of Plans</td><td>• Approval of plans
• Implementation of Plans</td><td>• Final Implementation of Plans</td><td>• End of the all Preparatory Implementation
• Starting of Event</td><td>• Smooth running of the Event.
• Monitoring</td></tr>
<tr><td rowspan="8">LAW & ORDER</td><td>• Planning for deployment of Police Force.</td><td rowspan="6">• Details plan submitted to LAW & ORDER (?) Dept.</td><td></td><td></td><td colspan="2">• 29,000 + police personnel were deployed</td></tr>
<tr><td>• Planning for deployment of Control Rooms.</td><td></td><td>•7 Control rooms of police were set up</td><td>• Keeping track of the every activities in Mela</td></tr>
<tr><td>• Planning for Barricading</td><td></td><td>•60 km barricading were set up</td><td>• Managing the crowd</td></tr>
<tr><td>• Planning for CCTV Cameras</td><td></td><td>•559 CCTV cameras were deployed</td><td>• Monitoring</td></tr>
<tr><td>• Planning forPA System</td><td></td><td>•2034 PA systems were deployed</td><td>• Monitoring</td></tr>
<tr><td>• Planning for Crowd Management</td><td colspan="2">• Innovation of New Technology for Crowd Management</td><td>• Keeping track of crowd movement</td></tr>
<tr><td rowspan="3">• Planning for additional Fire Stations along with additional arrangement in permanent Stations.</td><td rowspan="3">• Planning</td><td colspan="2">• Additional arrangement in 5 permanent fire stations.</td><td>• Emergency Care</td></tr>
<tr><td></td><td>• Deployment of 8 temporary fire stations.</td><td>• Emergency Care</td></tr>
<tr><td></td><td></td><td>• Deployment of 22 fire ambulance.</td></tr>
</table>

Putting Infrastructure in Place

The control was equipped with state-of-the-art digital equipment: closed circuit television (CCTV) display and monitoring units; communication equipment such as satellite phones, faxes, fixed line and mobile phones, computers, laptops, internet connectivity, and video calling facility.

Earmarking Zones and Routes



The police anticipated that the crowd would be at its maximum on the three parvani days – August 25, and September 13 and 25. These three days are considered the most sacred of all the days and a dip on one of these days gives a devotee maximum benediction. The police also made some changes in the route taken by the Naga sadhus for their holy dips. The routes of the *akhadas* and the general public were bifurcated for better crowd management .

Patrolling and Vigilance

Another first for the 2015 Kumbh was the use of bicycles by the police for patrolling. In addition to motorised modes of travel, the police used this eco-friendly mode of travel as it gave them the flexibility to patrol narrow alleys and roads, especially in Sadhugram. "Police on bicycles patrolling the area will increase their visibility and it will be an effective and easy way to reach out to the pilgrims. Motorbikes were also a great means of patrolling the narrow, crowded areas of the old city on *parvani* days – better than vigils on foot.

Fire and Disaster Management

"Fire is a good servant but a bad master." We have all heard this proverb innumerable times. It was dinned into our heads in school and like most things from our school days, it has probably evaporated from our consciousness. Gathering information speedily and responding effectively in real-time becomes critically important. The Emergency Operation Centre (EOC) had a crucial role in this process. It was conceptualised to function as the "brain" during the Kumbh even as the "limbs" performed the functions assigned to them on the ground. Experts from the Yashwantrao Chavan Academy of Development Administration also participated in the preparation of the disaster management plan.

Identifying Risks

Fire Safety in Sadhugram: In Sadhugram, for instance, food is cooked inside the temporary structures. Most of the tents are temporary and not fire proof

– there were simply no funds to make that provision. All *pandals* are made of wood, plywood and other inflammable materials. The *sadhus* use oil lamps, and *dhunis* are kept burning all over the premises. There is also the danger of fire occurring from short circuits and spreading quickly through the makeshift tents.

Cooking and catering appliances and equipment; faulty or misused electrical equipment; light fittings and lighting equipment (for instance, lamps or display lighting; hot surfaces and obstruction of equipment ventilation (such as generators) – anything could lead to a fire. Planners have to be mindful of even packaging materials and litter. Deliberate acts of arson and terrorism also cannot be ruled out.

TIMELINE	D-2 Yrs.	D-1 Yr.	D-6 Months	D-3 to D-1 MonthS	D-DAY	DURING KUMBH
STAGES	Rough Planning	Submission of Plans	Initial Implementation	Implementation	Execution	In Action
PHASES	• Planning started 2 years prior • Mela Adhikari and Various Officers were appointed for execution as well as the seamless management of the Kumbh	• Official submission of Plans	• Approval of plans • Implementation of Plans	• Final Implementation of Plans	• End of the all Preparatory Implementation • Starting of Event	• Smooth running of the Event. • Monitoring
DISASTER MANAGEMENT	• Planning for additional arrangement for Disaster Management.	• Details plan submitted to X Dept.		• Appointment of disaster management team		• 63 employees operated four hotline numbers and they resolved more than 90,000 distress calls. • For the Kumbh Mela, a dedicated ambulance lane was created specifically for the entire city. In case of any medical emergency, an ambulance can cover 3 km in 5 minutes. • 3 inch rainfall in only 3 hours lashed the city for first time in monsoon just a day before parvani day (crowded day) leading to heavy floods • Technology & timely evacuation ensured zero loss of life, limb & property

Equipment and Facilities

Preparations and training for fire safety started 18 months before the start of the Kumbh. The purchase of new additional and necessary equipment began. Additional manpower and fire fighters were arranged from other municipal corporations. Requests were sent to the Director, Maharashtra Fire Services, to

allocate trained manpower and resources. With this, the Nashik fire brigade became the only department in Maharashtra to have a fire-fighting unit mounted on motorcycles. They are mounted with a fire-fighting unit with a CAFS base, also called the 'bullet water mist'. In addition to the six existing fire stations in the city, the NMC set up four temporary fire stations in Sadhugram. Twenty-two fire brigade teams had been formed to deal with emergencies. Eight fire brigade teams with rescue vans were deployed in Trimbakeshwar.

Planning for fire and emergency services			
SR. NO.	LOCATION	FIRE STATION	FIRE UNITS
1	Permanent Fire Stations	6	6
2	Sadhugram – Temp. Fire Station	2	4
3	Outer Parking – Nashik	8	8
4	Outer Parking – Trimbak	3	3
5	Internal Parking – Nashik	5	5
6	Internal Parking – Trimbak	4	4
7	On the banks of Godavari River	-	10
	Total	**28**	**40**
8	Search and Rescue Teams	-	2

Staging Areas

As for rapid local response, 18-20 staging areas were identified. The staging areas contained critical services which disaster relief and rescue teams would require: fire fighters, trucks, dumpers, ambulances, fire brigades, JSBs, personnel armed with the latest equipment and gear, along with the requisite trained manpower trained to operate these – everything was stationed here to respond to an emergency within a maximum response time of three minutes.

Eight of these staging areas were located so strategically that teams could reach any place within a few minutes – thus helping prompt response in case of any disaster. Some companies of the National Disaster Response Force (NDRF) were also stationed at strategic locations, including in few staging areas. Fortunately, the NDRF did not need to be pressed into service. A contingent of 18 fire fighting personnel, including four officers from the NMC, had also been deputed on disaster management duty at the Nashik Kumbh on August 27, 2015.

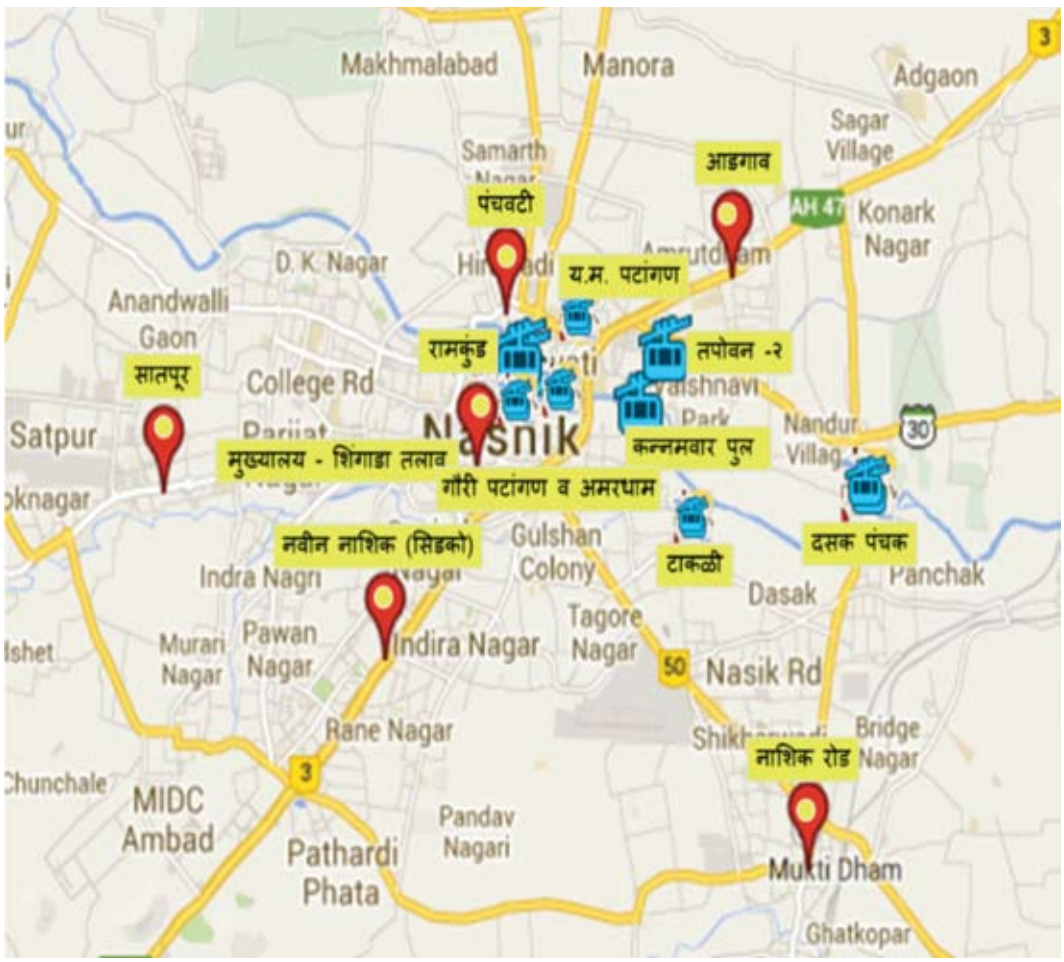
Escape Routes and Signage

Escape routes ensure that every person is able to turn away from a disaster – be it fire, rain, stampede, terror attack – and escape to safety. It is critical that escape

routes be accessible for everyone: plans should include people with disabilities (vision, hearing, mobility, etc), those with special needs, senior citizens, people in a state.They were for the use of rescue teams and personnel – to respond to emergencies and also to provide various services.

Disaster Management: Emergency Operations Centre

The Emergency Operations Centre (EOC) comprised the senior officials and heads of all the departments sitting together from D-minus 24 hours to D-plus 24 hours in one big hall. There were hotlines connecting to the staging areas and other locations, in addition to landline phones. It also had the facility for viewing live streaming and footage from various closed circuit television cameras (CCTVs, which kept a watch on the crowd movement in the city) and also the facility to see live telecasts of various channels. All kinds of information – from plans to deployment of manpower to maps to phone numbers – was kept readily available in this place so that the administration could take rescue and relief in case of any emergency



Giant maps were displayed all over the EOC to provide a sense of location and geographical perspective to everyone present there. The EOC even had facilities for the working personnel to rest, bathe and eat.

Emergency Response and Technology

Some software engineers of the Water Resources Department created an app that could predict rising flood levels at various times and places. This included altitudes of various points, contour levels, structures, and so on. When it rained, the rainfall was recorded at various specific points in real time and the input would then generate possible water levels in the river, which would also get reflected visually on a map. Thus, it was possible to predict the areas that would possibly get submerged and the hour at which this was likely to happen. It wasn't possible to test the software widely. So the administration used the software only as an additional decision-making tool. The primary inputs for their decisions always came from actual feedback from the field.

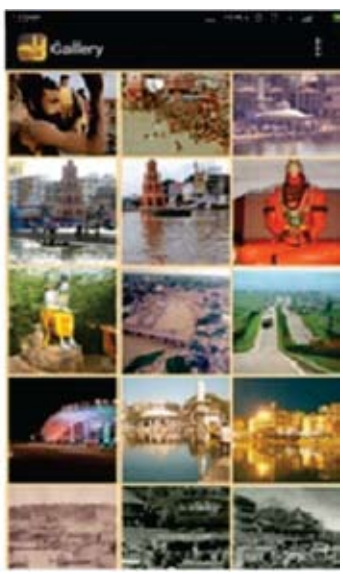
The concept of risk and disaster management through the EOC proved to be extremely successful. Microplanning ensured that there was no confusion at all in such a complex scenario as the Kumbh.

Emergency Response Action Saves the Day!

Nashik experienced torrential rains on September 17, 2015. When senior officers went to inspect the condition of the ghats they were shocked to see the whole area covered in knee-deep muck and weeds that had completely smothered the ghats. The next Parvani was to start at 6 am – they had only nine hours to clean up! They called all the staging areas and the fire stations to send all their available men and machines to clean up the slime. It wasn't possible to clear the ooze manually. JCB excavators and fire-fighting engines had to be used. This operation by the emergency response teams, along with senior officers, lasted the whole night.

Official Government App

The NMC decided to launch a special app for devotees where they could access all the relevant information. With an intuitive interface and easy user graphics, the Kumbh Nashik App provided data in Marathi and English.



Left: The home screens gave information in Marathi and English. Right: The gallery provided photos of Nashik; Trimbakeshwar and shahi snan. This was live synced from the Kumbh website.

Call Centre

A call centre was launched by the NMC to not only provide information but also to record the suggestions or complaints of the visitors and devotees. Sponsored by ICICI Bank, the call centre was the directional hub, manned by 63 persons working in three shifts, 24x7, for a month, with the flexibility to increase the number as and when needed. The staff spoke various Indian regional languages.

Know Our Works

It proved to be an occasion for the NMC's technical team to test its innovative abilities. Prashant Magar, the Head of IT in NMC, and his young colleagues created many software solutions that helped the administration use its scarce resources in an efficient way. One can see this by visiting the NMC website (www.nashikcorporation.in) or by downloading the mobile app (Smart Nashik).

Bank Transfers

Many workers had come to work at the Kumbh from far off places, for instance, Uttar Pradesh. Most of them did not have any knowledge of banking and condition

that payments to workers would compulsorily be made through RTGS/NEFT electronic transactions only.

WhatsApp Groups

The person incharge, as the Whats App administrator as well as a representative of the city administration, was member of nearly 125 Whats App groups, including a few specialised groups (doctors, press and so on). This was found to be immensely useful in spreading messages of alerts of possible floods and other helpful warnings. It also provided a platform for technology companies to test their newer technologies and apps. For example, Tata Consultancy Services (TCS) introduced one of its WhatsApp-like in-house social platforms, Gappa Goshti (chitchat) or GG Talk. It is a platform to upload images and send messages about incidents related to traffic or emergencies.

4. Balancing Crowd Safety versus Necessity

An important thing to note is that disallowing private vehicles in a high vulnerability area was only one side of the safety equation. This had to be balanced by a provision for vehicular traffic in case of emergencies. And this had to be not just by ambulance, police or government vehicles but also by air. That meant providing every ghat with competent medical staff and mobile ICU facilities backed up with partnerships with the Indian Medical Association and resources from private practice. This also entailed establishing CSR initiatives and involving non-governmental organisations – as many as 10,000 cadets (armed with special telephone lines linked to call centres) were pressed into service.

5. Key Learnings:

a) Barricades were used to control the crowds in many places. This led to a slight issue about the barricades themselves. The Nashik Municipal Corporation did not want the newly constructed roads to get damaged because of the police barricades. The issue was resolved by using wheeled barricades in many places. Still at many places there was no option then to dig up the routes which were finalized after negotiations between police and NMC.

b) All the newly constructed ghats for the Nashik Simhastha were labelled as 'Ramghats' – this was done, firstly, to divert people from overcrowding in Ramkund, which could prove potentially fatal. Secondly, it showed people that a *snan* in a Ramghat was as ritualistic as one in Ramkund. In Trimbakeshwar, Jayant Shikhare, the President of Trimbakeshwar Purohit Sangh, urged devotees who had been unable to visit Kumbh for *shahi snans* on all specific days to take heart and not to feel disappointed. The Kumbh would continue till August next year, he added. Pilgrims could come for a holy dip in Nashik

and Trimbakeshwar at any time during this period. This also helped to control the crowds.

c) Significantly, in Maharashtra, during the *parvani* days of the Simhastha, all VIP movement had been officially banned (NDTV2015a). The Guardian Minister of Nashik, the state water resources minister Girish Mahajan assured the Legislative Assembly that there would be "no VIP or VVIP movement" during the royal bath. This was meant to protect the seers and the devotees from inconvenience. The elimination of VIP culture was a big step contributing to the overall safety of the Nashik Simhastha.

Conclusion

The 2015 Kumbh Mela was an event with a difference. It was not just a mega gathering of devotees and tourists. It was also about the coming together of digital and scientific experts who were armed with innovative ideas. Crowd management applications could be used in large gatherings such as concerts, religious gatherings and other places. Medical help can be delivered more efficiently with apps and other devices, and diseases monitored and controlled more effectively. Pop-up housing can help ease housing burdens in cases of the temporary relocation of people, emergency housing and also during an influx of temporary residents to a place for work. The build-and-dismantle concept can be used during disaster relief, in transit camps during redevelopment of urban areas, migrant hostels, slum redevelopment, and so on.

Dy. CEO, National Health Authority, (NHA) Government of India

Centre for Disaster Management

Centre for Disaster Management (CDM), LBSNAA is a capacity building and research centre functions under the umbrella of LBSNAA, Mussoorie. Apart from conducting training programmes the Centre has been involved in formulation of national strategy for adaptation of the global best practices to suit Indian conditions. The Centre is involved in training to officers belonging to IAS and other Group-A civil services at induction as well as at in-service level in various aspects of disaster management, sociological aspects, use of IT, and communication technology, action research projects, documentation of best practices, case studies, teaching materials etc.

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