PROCEEDINGS OF
15TH FORMATION DAY OF NDMA
On 27 September 2019

"Fire Safety in India"

NDMA
New Delhi

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EXECUTIVE SUMMARY

Across the globe, fire remains a major cause of loss of life and property. In the past, India has witnessed many tragic fire incidents for e.g. Uphar cinema, New Delhi (2007), school in Kumbakonam (1997) and Kamala Mills, Mumbai (2017). More recently, the Surat-coaching-class fire highlights the urgent need to improve the fire safety preparedness. In order to discuss and deliberate the issues associated with fire risk and fire safety, National Disaster Management Authority (NDMA) selected the theme 'Fire Safety' on occasion of 15th Formation Day celebrations on 27th September 2019 at Hotel Ashok, New Delhi.

Each day with economic development, emerging technologies, shortage of prime land and lifestyle changes we are continuously increasing existing fire risks. Fatalities in the high rise buildings like multistoried residential complexes, cinema multiplexes and malls are high. These days the residential buildings are using a multitude of materials like PVC foam, Upholstery etc., whose fire safety standards are not certified. In the industrial areas, wear and tear of machinery, storage and new materials used add new fire risks every day. In the transportation sector increase in transport of inflammable material, addition of new services like metro rail, monorail etc. has increased fire risk too. Multilevel parking and buildings, data centers, aging nuclear plants etc. are introducing new fire risks.

In addition, climate change is making us rethink our fire safety provisions. Presently around 3% of the earth's land surface burns annually requiring urgent intervention. The frequency and intensity of forest fires have

increased because of global warming and will continue to increase under medium and high emission scenarios.

As part of the institutional mechanism, India has been taking up proactive measures to address fire risk. At the Central level, the Director-General (Civil Defense, Home Guards, & Fire Services), Ministry of Home Affairs is assisted by the Fire Adviser to deliberate upon the management of fire services. In addition, the Standing Fire Advisory Committee provides inputs for improving fire management in the country. The National Fire Service College, Nagpur provides training and education.

Fire being a state subject, most of the states has established Fire & Emergency Services by an Act of state legislature based on Model Fire Service Bill circulated by the Ministry of Home Affairs. Certain states like Gujarat, Rajasthan, and Madhya Pradesh have fire services under respective Municipal corporations/Committees /Councils. The State of Maharashtra, on the other hand, has dual arrangements i.e. Mumbai Fire Brigade is under Municipal Control while other Fire Services in the state are covered under Maharashtra Fire Service Act. Secondly, specific fire safety norms have been established. Currently, the National Building Code -2016 is the basis for fire safety norms in India.

The workshop brought out various gaps and highlighted multiple measures in order to improve the fire management in India.

Enforcement of laws relating to fire in already existing buildings is posing challenges. Repeatedly, from IMRI Hospital to Surat coaching classes fire, it is observed that adhering to building codes alone will not improve fire safety profoundly. Along with regular audits, there should also be an equal emphasis on creating awareness among different stakeholders like citizens, administrators, politicians, builders, engineers etc. regarding fire safety. Similarly, training

loc   a l community for fire response by conducting regular mock drills will improve community preparedness to fire.

Simple interventions like constructing water storage tanks at suitable locations can provide water during fire emergencies. In addition, adopting modern technology such as water mist and drones is the need of the hour. Incorporating various international best practices into fire management wherever

feasible say for instance into urban planning to make smart cities fire resilient will go a long way in fire mitigation. In similar lines, a system for certification of new materials with reference to fire safety needs to be developed.

Fire services are always the first responder to not only fire disasters but also any disaster. However, the urban fire services face many challenges including limited financial resources, working in high-crime areas, leveraging relationships with citywide institutions, reaching out to multicultural communities and getting residents to focus on fire safety. The fire services focus has largely been on urban fires and needs to be further expanded to the rural areas too. The number of fire stations across both in urban and rural areas needs to be expanded. Upgrading these fire stations with state of art technology and equipment will ensure less loss of life and property in case of fire. Intra-agency coordination with the fire service during a fire plays a vital role in limiting the damage. Especially, poor traffic conditions often reduce the response time of fire tenders.

In the future, the fire services need to re-define their role and relook at how the fire is managed. A roadmap for the growth of fire services with both short term &long-term goals needs to be prepared. Further, the efforts for capacity building of the fire services need to be paid more importance by imparting specialized training & education especially in using innovative technology. Documenting and sharing lessons learnt from fire incidents also needs to be supported. Innovative funding through public private partnerships must be incorporated into fire management.

INTRODUCTION

Fire risk is one of the dominant causes of human life loss in India. Being a dependant of many types of ignition processes, fire can occur anywhere – residential areas, commercial buildings, slums, offices, industries, trains, transportation corridors, multi-level basements/parking, etc. The life loss due to fire accidents has increased over the years. Much of the reaction to these fire accidents has been rescue and relief and no proactive fire risk management measures are in place in many states.

Rationale

Globally, the devastating fires in the Amazon basin that have eroded huge tracts of rain forests. We can never get back those precious lungs of the globe. Forest fires have been a problem in India too, with Mizoram, Maharashtra, Madhya Pradesh, Assam and Meghalaya have seen more than 10000 fire incidents each in the last year, 2018. While the forest fires in the north-eastern states can be attributed to the jhoom cultivation, other states account for the deliberate (as in stubble burning) and unintentional fires. The extreme temperature rise during summers and impact of climate change is also responsible of forest fire.

When it comes to urban fires, Mumbai, the financial capital has seen more than 49000

incidents of fire in last decade, resulting in more than 600 lives lost. Similarly, Delhi has seen major fires in the hotels, hospitals and residential areas in recent times.

In the recent past incidences of fire in the urban areas of Delhi, Maharashtra, Gujarat due to short circuit and forest fire due to natural and man-made causes have increased in Uttarakhand, Himachal Pradesh and other States.

One of the landmark fire accident has been Uphar cinema in New Delhi on 13 June, 1997. The limitation and lack of fire safety measures in this theatre proved to be the last fatal event for 59 people while another 100 people were critically injured in the stampede that followed.

The Surat-coaching-class fire highlights the failure of the civil society as well as the fire hazard related emergency agencies. Lack of emergency exit to this building forced the students and the instructors to jump off the building to escape the fire and in the process, lost their limbs and life as well.

These incidences show that the fires are not limited to any particular land use or type of buildings. They occur everywhere and as mentioned by the Jt. Sec (Policy and Planning), NDMA, "if a fire can happen, it will happen".

In order to discuss and deliberate the issues associated with fire risk and fire safety, National Disaster Management Authority (NDMA) has decided the theme, Fire Safety for the 15th Formation Day celebrated on 27th September 2019 at Hotel Ashok, New Delhi.

SCHEDULE OF THE EVENT

National Disaster Management Authority (NDMA)
15th Formation Day Celebrations
Hotel Ashok, New Delhi27th September 2019
Agenda

Time From	To	Particulars	Guest/Speaker
09:30	10:00	REGISTRATION	
		Inaugural Session	
10:00	10:05	Lighting of Lamp	
10:05	10:15	Welcome address	Shri. GVV Sarma, Member Secretary, NDMA
10:15	10:25	Special Address	Shri. Ajay K Bhalla, Union Home Secretary
10:25	10:35	Launching of Guidelines, Pocketbook and reports of NDMA	Shri. G Kishan Reddy, Hon'ble Minister of State for Home Affairs
10:35	10:50	Inaugural Address	Shri. G Kishan Reddy, Hon'ble Minister of State for Home Affairs
10:50	10:55	Vote of Thanks	Dr. V. Thiruppugazh, JS (PP), NDMA
		Tea break (11:00 to 11:30)	
		Session I: Fire Risk in India **Chair: Shri. PN Rai, former DG, Bihar Fire Services**	
11:30	11:55	Fire Risk: Existing and emerging scenarios	Shri. M V Deshmukh, President, National Association of Fire Officers (NAFO)
11:55	12:20	Climate Change and its implication for fire risk	Dr. Richa Misra, Forest Research Institute, Dehradun
12:20	12:45	Chemical and Industrial fire risk	Shri. Varadendra Koti, Group Head, S&RO – Fire Service, RIL
12:45	13:00	Discussion and question and answers	Moderated by Chair
		Lunch Break (13:00 to 14:00)	
		II: Fire prevention and mitigation **Chair: Dr. Rajeev Narang, CFEES, DRDO**	
14:00	14:20	Planning for fire risk mitigation and safety audit of buildings – a case of Surat	Shri. Hitesh Kumar Taparia, Chief Fire Officer, Vadodara
14:20	14:40	Legal aspects of fire risk – Act and regulations	Ms. Alpa Seth, Managing Director, VMS Consultants Pvt Ltd., Mumbai
14:40	15:00	Smart Cities and Fire Safety	Dr. Rajeev Kathpalia, Vastu Shilpa Consultants
15:00	15:20	Challenges of fire fighting in urban areas	Shri. HD Parab, Chief Fire Officer, Maharashtra Fire Services
15:20	15:30	Discussion and question and answers	Moderated by Chair
		Tea Break (15:30 to 16:00)	
		III: Institutional challenges and issues **Chair: Shri. M. Nageshwar Rao, DG Fire Services**	
16:00	16:20	Institutional mechanism - inadequacies and issues	Shri. GC Mishra, Ex Director, Delhi Fire Services
16:20	16:40	Modernization of fire services and Technology for Fire Safety	Shri. RA Venkitachalam (advisor, IIT-Gandhinagar)
16:40	16:45	Discussion and question and answers	Moderated by Chair
		Valedictory session	
16:45	16:55	Summary of the day's proceedings	Dr. PK Singh, J A (OPs), NDMA
16:55	17:15	Valedictory Address	Dr. PK Mishra, Principal Secretary to the Hon'ble Prime Minister
17:15	17:30	Vote of thanks	Sh. Bhupinder Singh, Director (PR&AG), NDMA
		1730 hrs - Closing of the workshop	

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INAUGURAL SESSION

Shri G.V.V. Sarma, Member Secretary, NDMA

Welcome Address

Shri G. V. V. Sarma began by greeting the dignitaries and participants, and welcoming them to the function. He recounted the journey of setting up of institutional mechanisms on Disaster Risk Reduction in the country and the efforts of NDMA towards centre-staging Disaster Management into the governance paradigm of the country since it was created in 2005.

He talked about the various initiatives, projects and programmes that are being implemented by NDMA across the country, including "Implementation of the Sendai Framework for Disaster Risk Reduction", "Strengthening of District Disaster Management Authorities of hazard prone districts out of the 115 identified Backward Districts", "VSAT-based National Disaster Management Services", "AapdaMitra - a pilot project for creating a pool of trained volunteers for flood rescue and response", "Landslide Risk Mitigation Scheme on pilot basis in four states – Sikkim, Nagaland, Mizoram and Uttarakhand", and "Coalition for Disaster Resilient Infrastructure - launched by Prime Minister Shri Narendra Modi at United Nations Climate Summit in New York in September 2019".

NDMA regularly conducts mock exercises on different disasters across the country to prepare stakeholders as well as communities for eventualities. Some of the most noteworthy exercises conducted last year were an exercise on earthquake preparedness held simultaneously across all 11 districts of Delhi-NCR, four districts of Haryana and three districts of Uttar Pradesh, and multi-disaster mock exercises in the run-up to the KumbhMela 2019 and along the Baltal and Pahalgam routes ahead of the annual AmarnathYatra.

NDMA also actively engages with the international community on various other aspects of Disaster Risk Management, said Shri Sarma.

He informed the gathering about the various guidelines, study reports and documents that were to be launched during the Formation Day celebration.

Talking about the theme of Fire Safety, he emphasised on the need to improve preparedness and promptly respond to fire incidents when they occur. He also underlined the need to spread awareness amongst the communities at large. He urged for a collaborative approach towards reducing fire risks and revamping the fire services in India.

Shri G. Kishan Reddy, Minister of State for Home Affairs

Inaugural Address

The Hon'ble Minister commended NDMA on choosing a theme as pertinent as Fire Safety. He also praised the selection of topics for technical sessions and the choice of experts. Fire accidents, if not handled carefully, can lead to a huge loss of life and assets, he said, underlining the importance of special measures needed to further improve and strengthen the ecosystem for fire risks prevention, mitigation and preparedness for response in the country.

Though the primary responsibility for disaster management rests with the States, issues pertaining to fire risk reduction need a coordinated approach from all stakeholders, said the Minister. He urged the State Disaster Management Authorities and the District Disaster Management Authorities to work in coordination with the agencies responsible for managing fire risks at city, district and village levels.

He commended the good work done by some States and UTs in improving their fire safety regime, and called upon the fire services to become the first line of response to all types of emergencies in a manner done by many western countries.

Enforcement of rules and regulations remains one of the major challenges, said the Minister, adding that those responsible for ensuring compliance should have a clear understanding of the techno-legal regime and knowledge of varying risk scenarios needing different types of equipment.

To deal with the wide spectrum of issues related to fire safety, the Minister listed a slew of measures to strengthen our dire preparedness and response:

a. Setting up/upgrading fire stations.

b. Constructing water storage tanks at suitable locations for use in emergencies.

c. Adopting modern technology such as water mist and drones.

d. Documenting and sharing lessons learnt from fire incidents.

e. Adopting international best practices, where ever feasible.

f. Capacity building and skill upgrade of government functionaries.

g. Generating awareness on a massive scale on all India level.

h. Training community for fire response.

I. Conducting regular mock drills with involvement of CD Volunteers.

Wishing the event a great success, he ended his address on a high note by acknowledging the efforts of NDMA for invoking the ideas of various stakeholders on this impinging issue. He said he looked forward to similar collective engagements in future too, for realizing the goals of disaster risk resilience environment both at national and global level.

Dr. V. Thiruppugazh, Joint Secretary (Policy and Plan), NDMA

Vote of Thanks for Inaugural session

"Ironically, fire has become our burning problem...We have come a long way from celebrating the invention of fire to collectively deliberating the dousing of fire." Humans have the knack of converting everything into a disaster, said Dr. V. Thiruppugazh, adding that fire prevention and mitigation is not a new concept. To drive his point home, he cited the example of Arthshashtra, which talks about fire prevention and mitigation in great detail.

The number of lives lost in fire accidents is mounting every year. In 2015, over 19,000 people died of fire accidents in the country, more than five times the number of people who died due to all other disasters in the same year. This is why NDMA has chosen 'Fire Safety' as the theme this year. According to a report, fire is among the top three disasters for business risk and continuity in the country.

We do not look at the worst case scenario. The last disaster we faced becomes the benchmark when it comes to disaster planning, when, in fact, we should be planning for the worst case scenario, he said. He further emphasized that instead of indulging in blame game, we need to look at the unresolved issues, and look at the root causes - this, he said, was the objective of this workshop.

Dr. Thiruppugazh thanked the Hon'ble Home Minister, other dignitaries, speakers and resource persons, civil society, media, Members, officers and staff of NDMA and all other participants. Quoting the great poet Rumi, he said that he was grateful for everyone who had come for each one was a guide from beyond.

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TECHNICAL SESSION I – FIRE RISK IN INDIA

Emerging Fire Risk in India

Shri P. N. Rai started with congratulating NDMA for choosing fire safety as the theme for the formation day. He pointed out even though fire is a major disaster, fire safety has remained in the background. Further, while there is a paradigm shift of disaster management in India from relief centric to preparedness, prevention & mitigation, fire safety remains response driven. Therefore, there is very limited focus on fire engineering and other risk management issues such as audit, awareness, capacity building & technology application. There is more focus on fighting rather than fire risk management.

Moreover in fire safety the major focus has always been on urban fires especially in multi-storeyed buildings. With the increasing pace of urbanisation, the peri-urban areas, often unregulated also needs to strengthen their fire management systems. Fire management is a dynamic process with an urgent need to address fire safety in many new emerging areas. For instance, in unregulated development of urban areas poses immense challenge for fire-fighters.

There should be an equal effort to energise the fire management in the rural areas.

Fire safety management requires co-ordinated action among several department and agencies involved in approval, enforcement, capacity building & implementation of fire safety regulation.

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Mr. Paras Nath Rai (IPS, retd.), Member, Bihar State Disaster Management Authority

However this is concern area.

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/bylaws and fire safety rule among department/ agencies responsible for giving approval for construction of building and implementation of regulations. Builders/ architect/engineers are equally unaware as a result the people get what is built by them. Unfortunately, the users, the people are also unaware of the safety. However, the absence of synergy among them is of serious concern. Everyday many fire risks are introduced into our life e.g. new furnishing, leaking transformers, electrical appliances increasing the fire risk. While more importance is given to the interior decorations and beautification of the house, the consumer is almost unaware of the level of fire risk in each of the material used. This needs to change with fire safety becoming more demand-driven with a more alert and aware 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 to ensure proper maintenance of fire safety measures exacerbating the risk more.

Even though there are several agencies involved in implementation and enforcement there is distinct absence of co-ordinated action among them. In the process there is less vigilance after approval and even it some audit takes place, the violator goes unpunished, many a times.

The rapid urbanization in the country and that too unplanned has increased fire risk in urban & semi-urban areas as there is less of regulation in new areas. As it is the unplanned urbanization is fearful in respect of all disasters. The old parts of cities are extremely vulnerable and pose very big challenge to fire 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 water makes it difficult to take off fire.

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 becoming serious. Above mentioned issue posed serious threat to fire safety. He mentioned about HarGhar Jal Ki Yojana being implemented in

Bihar which has addressed the challenge of water problem as water arrangement is being done in each village.

He also talked of potential risks that needs attention of all concerned. They are group housing society specially the government supported economically Weaker section housing, Ujjawala Yojna & electricity reaching village house holds, petrol pumps & LPG storage located in highly populated area & climatic change resulting in rising temperature which has resulted in more fires & created heat island. The changing climate also increases probability of fire in rural areas -fire in agricultural lands/ grasslands

The capacity of fire services to address disaster risk reduction is very limited. Hence capacity building need to be specifically designed for existing and emerging challenges as mentioned above. 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.

Emerging and Existing Fire Risk in India

Mr. Milind KumarDeshmukh started by reminding us that fire management is spoken of when there is an actual fire and congratulated NDMA for taking up fire management as a theme. He pointed out that fire risk, both existing and emerging, is a continuum. Each day with economic development, emerging technologies, shortage of prime land and lifestyle changes we are continuously adding to existing fire

risks.

The economic development and rapid urbanization in India in the last decade provided the impetus to real estate sector. The high rises, which are generally 15mts and above can be a residential building, hospital, etc. In case of fire the fatalities are higher because of a large number of people are present in the building, less awareness of exit routes and longer time for firefighters to put down the fire. These high rises have barricades and security checks that delay the evacuation process.

In the industrial areas, the fire safety norms are not able to keep up with the risks posed by advanced technology and new material used in industrial process. Wear and tear of machinery are often ignored in into fire safety measures. In addition, if the storing of all the raw materials as well as finished products used for various industrial processes are not properly taken care of, new fire risks may emerge. Government of India is coming up with innovative warehousing in logistics parks with almost 200% rise in warehousing. However,

Mr. Milind Kumar Deshmukh, Director Govt. Affairs, Fire Safe India Foundation

one needs to be sure of fire safety measures norms, implementation, and monitoring in order to reduce fire risk. Often products from small industries/ factories/ workshops contribute to the manufacturing of the final product. These unorganized industries are not properly monitored and often compromise on overall fire safety. Industrial fires are one of the major concerns, as these tend to spread faster and cause huge economic loss.

Over the years, transportation networks have proliferated across the length and breadth of the country. With increase in transport of inflammable material fire risk has increased too. For instance, in hilly regions in case of fire in a tunnel limited capacity exists to control the fire. Expanding Metrorail network in many cities also has increased the fire risk. Given the monorails are required to be light in nature, one needs critically assess if the fire safety measures suggested are adequate. Automating fire detection in transportation especially railways may not be very effective as it may strand the passengers and may delay evacuation. The government of India has been promoting use of electric vehicles in India. However, the expertise for checking of quality of lithium-ion batteries used in electric vehicles to ensure fire safety is very limited. In addition, battery charging stations are being planned in petrol pumps whether it is safe in terms of fire incident needs to be explored.

Data centers are one of the places where fire safety needs to be ensured. The data centers need to be equipped with diesel generators sets (DG Sets) for uninterrupted power. The power from DG sets needs to be stored in batteries and are generally placed on the roof.

There are no regulations on how to place and use these DG sets with reference to fire safety.

The residential buildings are using a multitude of materials like PVC foam, Upholsteryetc.whose fire safety standards are certified. Given the socio-economic conditions, quality of the materials used in a residential building may be compromised. Especially, the electrical fittings, if cheaper quality generates more heat, increase the chances of fire manifold. There is no regulation on these materials and specific rating or standards system needs to be developed. Similarly, construction material like glass façade, composite aluminum panels, false ceiling, etc. needs to be introspected in terms of fire safety. Awareness regarding these standards to the consumer must be created. Older buildings with modern electrical fitting/ appliances are also an emerging fire risk.

Multilevel parking and buildings also are one of the major sources of urban fire. Ensuring fire safety in piped gas transporting and distribution is one of the major emerging challenges for fire safety.

Our nuclear plants are aging and pose high risk to a fire event. Similarly, the ammunition industry is going to be privatized. Proper fire safety measures must be put in place in order to avoid any fire accidents.

The coverage of fire brigade in developed countries is much more developed. In India, even with the availability of large manpower the fire services are thinly staffed. Building codes need to be more dynamic with revision more frequent.

Climate Change and its implication on forest Fires

Climate change due to anthropogenic factors is resulting in increase in intensity and frequency of extreme weather events like extreme cases of floods, droughts etc. Present-day climate change is happening at a much faster rate altering the composition of atmosphere.

Forest fire and climate change is intrinsically linked to each other. While most of the forest fires are man-made, Climate change has been playing an increasing role in determining wildfire regimes alongside human activity with future climate variability expected to enhance risk and severity of wildfires in many biomes as tropical rainforests. Climate change has increased the spread of forest fires into northern latitude where fire events were less but has also altered the amount of precipitation leading to more intense forest fires. The frequency and intensity of forest fires have increased because of global warming and will continue to increase under medium and high emission scenarios. Presently around 3%

Dr.Richa Sharma, Forest Research Institute, Dehradun

of the earth's land surface burns annually. Recent, Amazon forest fires are one of the examples where prime rainforest has been burnt. In Indonesia more than two lakh cases of respiratory diseases are being reported locally due to forest fires. The economic loss of forest fires is very high. This loss is not only limited to monetary loss of the community but also affects future generations as it takes years for these pristine forests to regenerate.

Source: Jolly et al. 2015

Reds indicates areas where fire weather seasons have lengthened or long fire weather seasons have become more frequent. Blues indicate areas where fire weather seasons have shortened or long fire weather seasons have become less frequent.
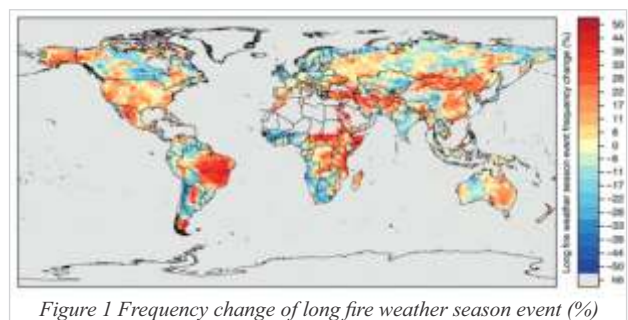
Figure 1 Frequency change of long fire weather season event (%)

Forest cover in India is spread across 701673 sq km and 21.34% of the total land area is under forest cover. Out of this total forest area, 50% of the land is prone to forest fire. The forests in India based on canopy cover density can be divided into the following groups: very dense forest(>70% canopy density), moderately dense forest(40-70% canopy density), open forest(10-40% canopy density) and scrub forest (<10% canopy density). The maximum number of forest fires is reported in moderately dense forest (40-
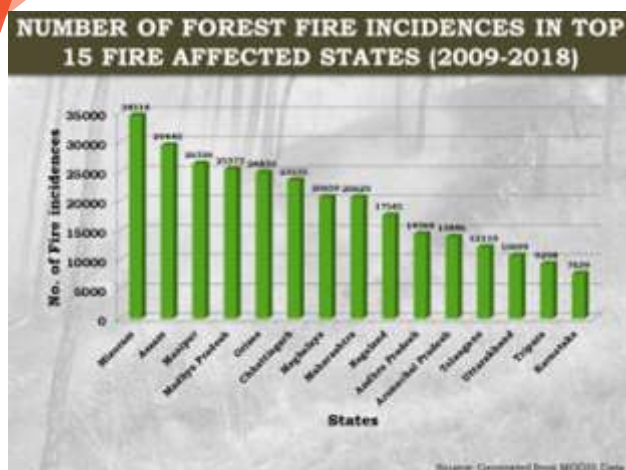
Figure 2: States affected by the forest fire (Source: FSI, Dehradun)

70%) and open forest (10-40%). Maximum forest fire incidences have been found to occur in tropical dry deciduous forest followed by tropical moist deciduous forests and tropical semi-evergreen forests. Many parts of the country but especially Mizoram, Madhya Pradesh, Orissa, Chattisgarh, Maharashtra and Uttarakhand face some of the worst forest fires in India. These forest fires have strong correlation with the higher temperatures.

One of the major reasons for forest fire incidences in the northeastern states is the shifting cultivation. Central India states are also prone to the forest fire. Forest Survey of India, Dehradun uses remote sensing data especially of MODIS and SNPP -VIIRS data to report forest fires. Forest Survey of India filters out the fire points falling in the forest areas and then overlays the state boundaries and forest boundaries and sends fire alerts to the states forest departments and all registered users on a near real time basis in the form of sms with fire coordinates and also kml files.

Looking at decadal data on forest fires in two states of Himachal Pradesh and Uttarakhand in 2016 is particularly high. Observing the decadal trend of forest fire

forest fires happen during April -June the pre-monsoon months. Different factors that affect the incidence and intensity of forest fires are like evapotranspiration; temperature, mean temperature of the driest quarter, etc are the prominent ones.

However, once the fire starts on the ground the management approach is very different and requires firefighting skills. Mechanical countering includes maintaining dry patches in the form of fire lines between adjacent forest patches so that forest fire does not spread from one to another forest, removing dry vegetation, putting off fire by hydrants etc. In the case of Uttarakhand fires, the pine forests which are especially vulnerable to fire. In case of the 2018 forest fires the NDRF and SDRF had to be brought in to help.

In India, Joint Forest Management (JFM) committees have been established at the village level especially in the forest fringe areas with an aim to involve people in forest protection and conservation especially involvement of JFM committees in Forest Fire Management. The villages in and around forest areas also have Village Forest Protection communities (VFPC). In case of a fire event these committees have also been given responsibilities to protect the forests from fires. The forest department also deploys Fire Watchers from local communities during Fire Seasons. Master Control Room (MCR) are established at Division level to strengthen the Fire Emergency Response System in India. All the Fire Crew Stations are connected with MCR through wireless communication system.

A simple Fire Danger Rating Index developed by Nesterov (1949) is being used in

MCR in many states like Uttarakhand. The Nesterov Index is based on the following parameters like days without rains, dry bulb temperature and dew point temperature (Calculated from relative humidity & temperature).

1. **When the Fire Danger Index is Minimum**

- Meetings are conducted in the villages, civil area and Van panchayats.
- Re affixing all the torn posters.
- Writing forest safety slogans on the walls at various places in the region.
- All Gram pradhans, panchayat members, other people representatives of the area including the Patwaris and Tehsildars of the region are informed about the safety of their critical areas and their responsibilities in Forest Fire Protection.
- All the Panchayats where combustible materials are stored in huge quantities are informed about safety. The meetings are conducted to provide the technical knowledge and steps to be taken accordingly by them when the incident occurred.

2. **When the Fire Danger Reading is Medium**

- Cleaning and proper burning in fire lines, routes, highways, a strip around the plantation.
- All the Mahila Mangal dal, Yuvakmangal dal and other security committees are informed to stay alert at the areas such as old plantation, critical areas and at the places where the accidents have taken place in the past.
- Different schools under the area are contacted and the teachers and students are addressed for fire protection so that they may help the forest staff when needed.
- Fire drills are conducted at all important areas in rotation.

3. **When the Fire Danger Index is high**

- The continuous patrolling and fire drills are compulsorily conducted every day.
- All the local people are contacted and are informed about the increased fire index so they stay alert to prevent fire.
- People residing in nearby areas who have vehicles (taxi or car) are contacted in prior and are convinced to be ready to help the crew stations with their vehicle in an emergency.
- The written information about the fire index has issued to all Gram pradhans and Patwaris, describing their roles and responsibilities in preventing fire accidents in their respective areas.

4. When the Fire Danger Index is extreme

- The actions done in case of high fire danger index are repeated and in addition, all the critical areas falling under the command area are patrolled day & night compulsorily.
- As per the need in the crew stations, the additional workforce is arranged prior.
- The facility of additional rented taxis and vehicles as per the need in the area is kept under the crew station beforehand.

The forest department has adopted innovative methods by engaging communities to remove forest wastes into renewable sources of energy e.g. Pine needles are converted into Bio-Briquettes selling it earns revenue for the group.

Chemical and Industrial fire risk

Shri. Koti explained the difference between the fire hazard and risk. Mere storage of the crude oil is only the hazard,whereas when it reaches a situation of explosion, it becomes a risk. So in order to reduce the hazard, the storage quantities need to be minimised, keeping in view the availability and logistics of procuring the crude. He had taken the audience through the process chain of the chemical and industrial products, hazard of these processes and the storage installation. Fire risk in industrial processes are mainly because of loss of containment. So as long as the hazardous material is contained, there is no risk.
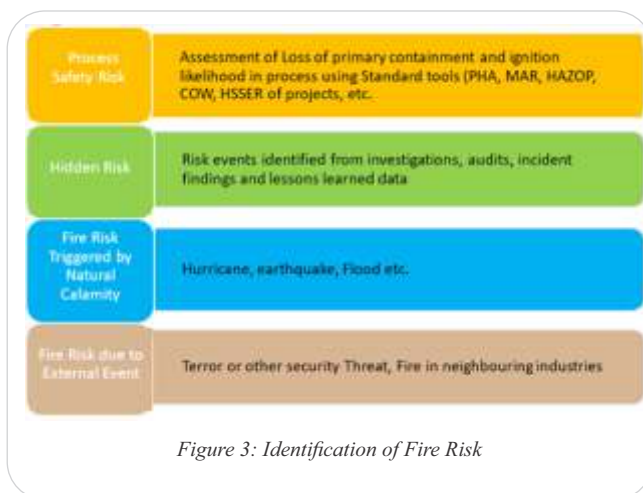

Figure 3: Identification of Fire Risk

He went on to explain the types of fires and ignitions. Some forms of these fires are: flash fire, explosion, vapour cloud explosion (VCE), Boiling Liquid Expansion Vapour Explosion (BLEVE), dust explosion, boil-over, etc. He had also explained how these types of fires affect the human beings who come in contact of these fires.

Shri. VaradendraKoti, Head, Group S&OR-Fire Services

Damages of fires on human-beings

Flash fire: Involves the combustion explosion. The flash fire has a heat flux of approximately 80kW/m2 for relatively short periods of time, typically less than 3 seconds.In a flash fire, the flame spreads at sub-sonic velocity, so the bulk of the damage comes from the thermal radiation and secondary fires. The heated air resulting from a flash fire can cause serious damage to the tissue of the lungs, possibly leading to death by asphyxiation and also can lead to smoke burns.

Explosion: Explosion is a sudden, rapid release of energy that produces potentially damaging pressures. Other than Combustion energy, energy sources which cause explosions include condensed phase explosives, Nuclear Energy, Compression energy, Chemical reactions, Rapid vaporisation, etc.

Vapour Cloud Explosion: Release of a large amount of flammable vapours (usually greater than 1 ton), which forms a large vapour cloud and upon delayed ignition explodes, creating

an explosion overpressure exposure to the surrounding area, causing both severe near-field damage effects and remote property and personnel exposure. The flame speed accelerate to sufficiently high velocities to produce significant overpressure. VCE refers to external deflagrations in a highly obstructed or partially confined area.

BLEVE: Results from the overheating of a pressurized vessel by a primary fire. This overheating raises the internal pressure and weakens the vessel shell, until it bursts open and releases its contents with blast waves with or without a Fire Ball. BLEVE happens only in containers of liquefied gases. Amount of energy released determines the strength of the blast wave, that is, the pressure disturbance propagating into atmosphere at a given distance far away from the energy release site. Casualties often caused by projectile fragments (Primary & Secondary), Blast wave (Lungs & Ear drums) and heat radiation (if the container is storing flammable gas).

Dust Explosion: Deflagration of combustible dust cloud in an enclosure while the dust concentration is greater than the minimum explosive concentration (MEC) leads to dust explosion. MEC depends on dust particle size and material composition. Typical lower explosive limits for dusts with characteristic particle size less than about 100 micro meter are in the 30–60 g/m3 range.

Percentage wise root cause

7
27
20
15
31

- Operator Error/lack of competency
- Inadequate Plant Design
- Maintenance Failure
- Inadequate Operating Procedure
- Other

Figure 4 Causes of industrial fires

He further talked about fire risk management strategy and fire risk emergency response system.

TECHNICAL SESSION II – FIRE PREVENTION AND MITIGATION

Fire Risk Mitigation and Safety Audit of Buildings – CaseStudy of Surat

Mr. Tapariya focused on the fire risk mitigation and safety audit in urban setting. He mentioned that lives lost during incidents like IMRI Hospital and Surat coaching Class, represent the ugly truth of fire safety in India, which the country certainly cannot afford. Fire accidents also puts a dent in the GDP of the nation, so mitigating the fire risk will help boosting the economy. Building permission process needs to be in sync with the fire regulations. He highlighted four approaches for fire risk mitigation – a) citizen's approach, b) bureaucratic approach, c) political approach and a need d) positively synchronise these approaches.

Safe usage of building is the objective of all

Shri. Hitesh Tapariya, Chief Fire Office, Vadodara

Figure 5 Surat Coaching Class Fire 2019

users, whether residential or commercial. So educating all the users before the building is occupied should be undertaken.

Shri. Tapariya explained the root causes of the Surat fire incident. He said that the building bye-laws and norms were not adhered to. Though the fire and rescue services reached in time, the damage had been already done, as panicked students jumped off the building causing loss of lives and injuries. He also highlighted the casual nature of the fire call made to the fire services and based on which, a minor fire tender team was dispatched when a much larger team was required. The owners did not pay heed to the fire norms and showed clear lack of awareness of fire safety of the building. This led them to misinform the fire department and added to the damage due to incident.

The lessons learnt from this talk were:

- Using building without audit and permissions is extremely dangerous;
- Fire Call should be made immediately;
- Vital details should be given on call with clarity;
- Fire Safety related compliance should be taken with utmost seriousness by service providers, users and builders.

Fire Safety Regime Understanding the Rules and Reality

Ms. Seth spoke about the intersection and harmony of rules and reality in the context of fire safety in Indian cities. She reminded that the fire services are usually managed by the State Fire Services or urban local bodies. The underpinning document for fire safety and regulations is National Building Code -2016. This document is a very good document, but we are lacking in terms of implementation. This document itself achieves a high 90% mark itself for the quality, while the implementation of these rules gets a10%. We need to bridge this gap. The NBC under Part 4, talks about Fire and Life Safety. It has the following aspects:

- **Fire Prevention:** Provisions pertaining to design and construction of buildings. Also, buildings materials and their fire rating.
- **Life Safety:** Provisions in the event of fire and similar emergencies, construction and occupancy features to minimise danger to life from fire, smoke, fumes or panic.
- **Fire Protection:** Accessories, components

and guidelines for suitable fire protection equipment and installations and Fire drills and evacuation guidelines for high-rise buildings

Standing Fire Advisory Council (SFAC) was set up to upgrade, homogenise fire services across the country. Is has the following as members:

- Each state's fire service
- Ministry of Home Affairs (MHA)
- Ministry of Defence (MoD)
- Ministry of Road Transport and Highways (MoRTH)
- Ministry of Communications and Information Technology (MCIT) and Bureau of Indian Standards (BIS)

She highlighted some of the high standards NBC sets up for achieving the fire safety. She expressed concern over setting the bar very high and not able to achieve it.

- Response time (3 to 5 minutes in urban areas and 20 minutes in rural areas)

The response time set up for Indian cities is impractical (in terms of standard), while other developed countries have response time as:Germany: 8 to 15 min, Japan: 5 to 10

Ms. Alpa Seth, VMS Consultants

minutes, USA: 3 to 8 minutes and UK: 5 to 8 minutes. She gave the example of the following fire incidents and explained the difference between the "rule and reality".

She questioned if the rationale for setting high standard of response time is justified in light of the reality as explained above. In none of the cases, the fire brigade could reach the fire site in given time. She questioned if we need to have that high standard in the first place.

- The scale of the population to be served – The standard set up for number of fire stations per 10sqkm area is also not practiced.

- The number of minimum standard equipment that are needed and manpower required for its operation – The gap of fire stations, vehicles, special equipment and total man power as per standards and in reality is huge.

- Norms – One Fire Station per 10 sqkm in urban area and 50 sqkm in rural area.

- She had also shown images of Basic Services for Urban Poor (BSUP) housing where the minimum gap needed (6 meters) between building blocks for an easy movement of fire tenders is missing.

The dilemma of fire tenders not evolving alongside the evolution of buildings was expressed along with graphics. The building heights have reached more than 50 floors in the cities like Mumbai. But do the fire tender's capacity to reach them has improved? The tonnage of the fire tenders from 24 tonnes to 75 tonnes, further to increase this tonnage is not physically possible. Also, there is no record of which building in the city will need which type of fire tender. This will increase the confusion for the fire officers, which building will need which type of fire tender.

- NBC mentions about the building material to be fire rated and also mentions about the minimum fire rating of 2 hrs. However, the usage of Aluminium Composite Panels has been observed in many buildings for aesthetic appeal. These panels are very fire prone and they enhance the combustion. An example of a General Insurance building in Gurugram, where the ACP was removed to follow the building due diligence was given to illustrate the need to remove these ACP panelling from the building facades. In the other cities, for better look and ease of construction, the same ACPs are used in hospitals and residential buildings.

- Another example of restricted fire tender movement is given from Mumbai. There are 4 towers of buildings which were designed with adequate fire tender access. However, the landscape architects have redesigned the fire tender access routes as green

Incident	Year	Response time of Fire Services	Fatalities
Surat Fire	2019	>35 min	22
Tilak Nagar, Mumbai	2019	∞ (Fire brigade access blocked)	5
AMRI Fire, Kolkata	2011	20 min	89

spaces and the CFO of the city had given the building occupancy certificate (OC) in spite of the irregularities. So the residents of the building went to court and got the fire tender access was restored. So the sense of the responsibility of the citizens was emphasised to maintain and get the fire safety.

- Finally, Ms.Seth had summarised her talk in the following points and hoped that these limitations will be taken care by.

  - Lack of state-wide unified fire services to provide training.

  - Lack of organisational structure, capacity building

  - Inadequate modernisation & standardization;

  - Lack of infrastructure – fire stations, equipment etc.

  - Lack of vulnerability analysis

  - Inadequate public awareness campaigns (DOs & DON'Ts), mock drills

  - Lack of uniform fire safety legislation in some of the states.

  - Inadequate funding

  - No serious consequences for non-compliance.

Truly Smart Cities

Smart cities

The common perception about Smart Cities is essentially about embedding the latest digital technologies - from censors and Big Data to solar panels in the master plan in order to optimize urban clusters.

Dr. Rajeev Kathpalia, Partner
Vastu Shilpa Foundation

Rhetoric

While there is no standard definition to suggest what a smart city is, the fundamental focus of smart city initiatives around the world is to use technology as the key driver of change and optimization of resources and delivery of services.

For example, Greater London Authority (2013) defined Smart London as a place "where the linkages between these different systems are better understood, where digital technology is used to better integrate these different systems, and London as a whole works more efficiently as a result".

Evolving eco-systems

Cities, however, are unlike smartphones that can be replaced when the next model becomes available, or when new updates are available, they can't be abandoned and replaced.

Cities last for centuries. They, in general, are one of the most complex and efficient systems that mankind has ever created (Batty, 2009). They consist of unique social, spatial, economic and institutional sub-systems that interact

with each other and several different agents in very complex ways. More importantly, cities often transform and evolve over long periods of time. Origin, sustenance and growth of the cities depend on their resilience to adapt to environmental challenges, new social or economic conditions and adapt to advancements in knowledge and technology. Historically, cities were dense, compact and efficient (Jenks et.al. 1996) bringing citizens and services closer to each other, creating communities and liveable conditions.

Urban sustainability

In recent times, there has been increasing focus on urban sustainability, however much of this focus has been on carbon emission and economics (Jenks and Jones 2010). Cities, such as Copenhagen, regarded as one of the most sustainable cities in the world, (Siemans, 2015) predominantly focus on the carbon neutrality but do not stress enough on the social indicatorsof the city.

Is de-urbanization the future?

More recently there are narratives about future of cities that are often anti-urban and propagate the ideas spreading out and living in isolation with technical and IT infrastructure allowing people to do business from a distance (e.g. Mitchell, 1999). Yet cities continue to thrive and develop in all parts of the world, in all cultural contexts.

Catalysts

People matter

If the discourse is about future visions of cities, then one of the fundamental reasons for cities -people and community, should be central to it, rather than infrastructure, smart buildings or data and sensors to make them operationally efficient. Therefore smart cities should be ultimately about clustering smart people and not just about steel and chrome towers.

Building human capital clusters, creating community and social capital, developing opportunity for social mobility, allowing access to infrastructure all need careful consideration and active management. With increasing pressures of urbanization, while the drive for efficient use of resources is important, it needs to recognize the importance of quality of life and liveability in the city to be fundamental to the future visions of city. Therefore, it is not surprising to see that much of the government policy statements and mission statements including countries like the UK and India focus more on the quality of life of citizens than data collection and efficiency (see The Smart City Mission, Government of India and UK Department for Business, Innovation and Skills).

Social and cultural infrastructure

Yet again any system that does not consider all the connected and intertwined subsystems and how people, society, environment, investors etc. respond to it could become obsolete. Therefore, there is a real need to understand the physical form of the city and its relationship to all the systems in the city (Environmental, social, economic, institutional etc.)

Education, health and wellbeing of people

along with cultural and intellectual institutions are fundamental in the future of human settlements (UN Development Goals etc.). Many of the

smart city advocates say very little about the need for social and cultural infrastructure such as museums, think tanks, theatres, temples, sports facilities nor about aspects of social capital within a city such as social cohesion, sense of belonging, social interaction. In fact many of these are fundamental to the quality of life as well as for its economics, making cities attractive for people and investment.

Participatory

Wonder and Joy

Successful and thriving cities in the world historically have been dynamic, flexible systems.In other words, these cities are not one-size-fit-all and have the ability to dynamically adapt to changes, mix of people and ideas. When one system fails a few others recalibrate and adjust to new conditions, constantly building and transforming public amenities, institutions and rebuilding and adjusting them again. In other words, successful cities absorb redundancies wholeheartedly, they are adaptable and flexible. Inherently, this contradicts with the current obsession with efficiency in urban areas through planning and management. In some ways they remove the wonder, delight, resilience, evolution and joy of the city and would rather replace it with a mechanical world that could work even if everything else would remain static.

Legacies

Postwar, the obsession with master plans and zoned development come from this silo thinking and education that resulted from the industrial revolution and related educational norms. The interconnectedness of various fields or disciplines was slowly eroded through the 20th century. A system of efficient, self-sustaining neighbourhoods through town planning that dominated the Euro-American thinking has filtered into the Indian educational systems and they still dominate Indian urban thinking.The result is development strategies and policies that often ignore the unique social, spatial, economic and institutional layers of cities as well as the complex relationships within and between these layers.

Urban thinkers today no longer advocate cities to be machines to live in (Corbusier, 19..) they are beginning to recognize cities as evolutionary systems that are constantly in flux. Thus, a successful city can encourage active participants of every agent in the system (Human, birds, insects, water, air, money, emotions, etc.), to interact with each other and with the physical form of the city that consist of public spaces, streets, building transport network, etc. Interaction between the agents and systems will make changes to behaviour, for example, encouraging walking, social interaction (Raman, 2010). Leading healthy lifestyle, create community and social capital, promote business etc. This interactive system also finds appropriate balance between people, their movement, land value and many other factors to find appropriate land

appropriation and functional mix of land use. The 20th century modernist masterplan with its zoned development replaced the mix use, mixed community vibrant, compact and liveable Indian cities with dull and inefficient and at time dangerous cities or suburbia.

Evolutionary education

Beginnings

There are many types of cities in the world. Some originated and have thrived as business centres, some as centre of power, and some as centres for learning. Successful cities are those that can cluster human capital and encourage innovation, creativity and exchange of ideas. To be 'smart' therefore, cities need both hardware and software. Universities are an essential part of this software. That is why great cities of the past - Athens, Florence, Constantinople, Rome, Alexandria, Ujjain, Varanasi - were almost always also great intellectual centres. They attracted talent, encouraged the churn of ideas and triggered innovation. Translated in modern terms, universities do not just attract young people to cities but provide venues for conferences, seminars, cultural and sporting events enabling human interaction that make for lively urban clusters.

Truly smart cities

Universities are a key to the software of a city. They attract young talent, encourage the churn of ideas and trigger innovation. The physical infrastructure of the university provides the venues for conferences, seminars and cultural/sporting events that allow for intense human interaction. Note how NYU played an important role in regenerating Lower Manhattan in the nineties.

Universities are an important part of the urban economy and should be seen as an integral part of city-building. Today, we build our IITs and IIMs and other University campuses outside our cities. As we build these new institutions, we urgently need to stop thinking of them as fenced - off factory townships, but see them as the anchors of our smart cities.

Metabolic systems

Nervous system of a city

A key element that defines great urban hubs is the way people move around and interact. Everyone agrees that a public transport system is very important in this context, but the backbone for any such infrastructure is walking. After all, the first and the last mile must be walked. Walking must be the most basic technology, but it is critical to smartness. Yet it is not an important part of the smart city discussion.

Why walkability? First, walking and cycling are the most environmentally friendly means of getting around.

Second, walking is the most socially inclusive means of transport. Both rich and poor can walk, and they must use the same public space. This creates social interaction and an egalitarian culture.

Third, walking has large economic benefits that are usually ignored. It is now widely recognised that much economic dynamism of urban agglomerations come from their ability to generate random and frequent interactions between people. This is what creates business

networks, encourages the exchange of ideas and triggers creativity (what is often called urban buzz).

Walkability is not just about building more pedestrian footpaths. It requires a combination of over/underpasses, pavements, safe crossings, public spaces, like parks and so on. It also needs supporting infrastructure like public toilets, signage, security systems and access to the physically challenged.

Walkability is about urban design that allows people to use walking (perhaps combined with cycling) as an important, if not dominant, means of getting around. Thus, people should be able to walk to work, as well as walk to urban amenities like schools, parks restaurants and shops. Obviously, walking cannot be the only means of urban mobility, especially in a large city. However urban design can be oriented to walking as a way of life, including linkages to other forms of transport, such as buses, trains and so on.

Walkability ingredients

Density: Walkability is about density, it cannot work in a spread out suburbia, even if there are lots of pedestrian paths. Thus, walkability presupposes a dense urban form. This has the additional benefit that it reduces the use of land and consequently, further lowers the environmental footprint.

Denser and compact urban form was a fundamental characteristics of many of the historic towns and cities in many parts of the world (Jenks and Dempsey, 2004) including India and Europe. Mixed use, compact urban blocks makes facilities and services closer to

each other and encourages walking. Post-industrial and post war urban development saw significant departure from this pattern of human settlements. Development of urban planning theories as a reaction to the proliferation of motor vehicles, related safety issues, to the huge demand of housing, sanitation etc. resulted in urban development models such as Garden City (Howard, 18..), Radiant City (Corbusier,...), which promoted zoned development and suburbia. Proliferation of such theories through modern planning theory pioneered by many American academics and spread across the world through planning schools, including in India has resulted in urban expansion in past 100 years in greenfield zones resulting in urban sprawl, often neglecting historic urban cores that were intimately linked to the identity and culture of the place and were compact and mixed in nature.

Mixed use: Walkability needs mixed use urban form where there is an ecosystem of urban activity and amenities. In fact we need to embrace street vendors and make enough space for them to make the walking experience more interesting.

Health: There is much research that has proven positive benefits of walking to our physical health such as diabetics, obesity, blood pressure and heart decease.Pedestrian movement has been found to encourage social interactions, formation of social networks and therefore social cohesion in neighbourhoods (Raman, 2010). Pedestrian movement has been proven to have positive benefits to local

trade and business (Green, 2000), therefore to the economy of the town (Hillier, 1996). There is also significant research that show the link between vehicular usage, air quality, and respiratory illness. So it could be argued that walking could bring positive benefit to city, its environment, economy and to health and wellbeing of its citizens.

Research has shown that layout and permeability and other elements of cities such as mixed, compact and vibrant public space can encourage walking and cycling in cities. Planning policies and urban development should therefore be more sensitive to the relationship between urban form, compactness morphology and focus on developing strategies and designs that promote sustainable travel behaviour such as walking and cycling.

Public transport: To promote walking and cycling in cities need to go in hand in hand with accessible, affordable and efficient public transport system. More compact urban form allows high quality public transport to serve all.

Decentralizing infrastructure-The Nallah network: Every monsoon, our cities flood because they lack drainage networks. Even a modest shower will flood our roads, homes and markets, and will bring our cities to a standstill. Neglected natural drainage systems like nallahs are linked to many aspects of urban management - the spread of diseases, like chikangunya and dengue and even the efficiency of public transport systems.

Unfortunately, the natural drainage network suffers from complete neglect. In many places it has become a smelly sewer, in others it has been overrun by squatters. Since no one cares for them, they are easily hijacked for other purposes like car parks and roads. Municipal authorities claim that drains continue to flow under the new construction but they are difficult to clean and quickly get clogged with garbage. No wonder, that even a moderate shower floods the roads.

The maintenance of these nallah networks is critical for avoiding repeated floods, but they are also a solution to another major problem faced by Indian cities - the lack of walking and cycling paths. A critical flaw in public transport systems in India is the first/last mile connectivity. In all other countries, this is usually walked, but in India one is forced to haggle with a rickshaw even for short distances.

A nallah network, by its nature, is made of long stretches of land. In fact for historical reasons, the nallahs usually run closest to the oldest and densest neighbourhoods and are often the only open space cutting through the landscape. Rather than covering them up, walking/cycling paths should be built along them. This would have the additional benefit of increasing public pressure to keeping the nallah clean as people would be walking along them. It is estimated that most of our cities like Ahmedabad, Delhi, Mumbai, Chennai or Coimbatore could have a first class walking/cycling network and a workable drainage network for a fraction of the money being spent on centralized sewage treatment plants with their attendant pumping stations.

In an automobile obsessed age, we think of roads as the arteries of the city, but it is really drainage networks that should play this part. They are not merely to ensure that roads do not get flooded after a downpour, but are an organic part of the city as green lungs, water table recharge, public transport, waste management and spaces for leisure. Many cities worldwide have recognized this, it is time we did.

Governance

Just City: Tax redistribution in most cities in the world was found to be unfair. Urban cores were often found to pay for both the services and roads of cost-efficient, compact and dense cities as well as for the sparse spread-out sprawls. In essence the poor often pay for rich.

Management: It is far better to have simple and clear regulations backed up by active management. There is no regulatory framework that can substitute for constant human monitoring and judgement. This is also true for cities. Indian cities need hard infrastructure, but ultimately they are not about buildings, roads and sewage drains, but about people and their varied social and economic interactions. In its pursuit of civil engineering and hardware, Indian urban thinking simply ignores the human software that brings cities alive. Ultimately, the future of Indian cities will be decided by the process of human capital clustering and interaction, a sense of place and belonging and, most importantly, the spirit of innovation and enterprise. This is why the most important infrastructure of a city relates to property rights, access to commons, municipal transparency, clustering of social amenities, upward mobility and so on.

The organic approach to planning is thinking about scenarios and building in optionality rather than meticulously laying out an ideal end state. There is nothing sacred about the master plan.

One must accept that some urban interventions will succeed while other will fail; yet others will have unintended consequences. This requires constant and dispassionate monitoring. The implication is that a constant updating of the real city's map is more important than the idealised map of the master plan.

The focus should be on managing constant transitions rather than on reaching an end point. This may seem obvious, but this is different from the usual Indian approach of blaming bad planning rather than bad management. Even a mediocre plan can lead to an acceptable outcome if the city is managed well, but even the best plan cannot work without decent management.
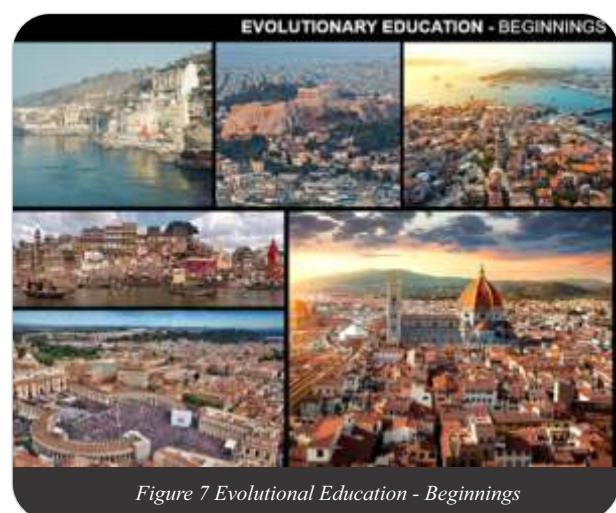

Figure 7 Evolutional Education - Beginnings

Fire Prevention and Mitigation - Challenges of Fire Fighting in Urban Areas

Shri. Hitesh Tapariya, Chief Fire Office, Vadodara

Shri. Parab spoke on the challenges and solutions for fire risk in urban areas. He gave the introduction to the topic and elaborated further. Urban fire departments have particular challenges with limited resources, working in high-crime areas, leveraging relationships with city-wide institutions, reaching multicultural communities and getting residents to focus on fire safety.

Cities across India are growing at exuberant rates.

In times of growing urbanisation, the importance of fire safety in urban spaces must be seen. If not, we will be walking unprepared into a deadly inferno. Fire safety is crucial in urban and rural habitats, and there must be continued investments in equipment and infrastructure to guarantee the safety of our citizens.

It is pivotal that fire safety is one of our topmost priorities across the country, especially in population dense urban agglomerations such as Mumbai, Delhi, and Bengaluru.

He exemplified the problems for the fire services as under:

- Trade activities are carried out without authentic licenses.
- Fixed firefighting system are not operative.
- Exits are not clearly marked.
- The premises / buildings fails its fire safety test.
- The sprinkler system are not operative.
- Combustible materials causes the fires to burn faster.

These situations have stimulated conversation about fire safety issues across India. He gave a background of the Mumbai fire services and their context. The hazards that happen in Mumbai are:

1) Hydrological & Climatologically Disasters

- Floods
- Cyclones
- Cloud Bursts
- Sea Erosion

2) Geological Disasters

- Earthquakes
- Landslides

3) Chemical & Industrial Disasters

(Chlorine gas leak in July 2010)

4) Accident Related Disasters

- Fires
- Oil Spills
- Major Building Collapses
- Festival related Disasters
- Air, Road & Rail Accidents

5) Terrorist Attacks

Attack of 26.11.2008

Mont Blanc Fire, Mumbai   **Lake View Fire, Powai**

Figure 8 Some glimpses of coverage of Mumbai fires

He gave examples of various wrong practices by the citizens which cause lives during a fire accident. Mumbai has 6 regional command centers and supported by 34 fire stations. They are distributed as:

- City - 15
- Western Suburb - 12
- Eastern Suburb - 7

Apart from these, there are 16 mini fire stations for quick response. Also, Mumbai fire services has started a program, Program on Enhancement of Emergency Response (PEER), which will run for 5 years. On capacity building front, many training facilities are provided. Main training centre at Wadala Fire Station and a Sub training centre at Malad and Borivali Fire Station. Training is conducted for

- Firemen and Officer (induction training)
- Sub Officer training
- Leading Firemen training
- Driver Operator training

- Various refreshers training for Special Appliances and various equipment
- First Medical Responder training
- Flood and Rescue training
- Rope Rescue training
- HAZMAT training
- Training for outside agencies, organisations, companies, etc.

The training facilities give smoke environment, hot environment, Zero Visibility environment and Hot Fire training facility.

Under the capacity building, a Customised Drill Tower cum Multi facility is created and a simulator proposed at Thakur Village Fire Station. These services provide:

- Confined space for search and rescue facility
- Rope Rescue facility
- Hot Fire training facility
- Smoke Diving facility
- Vertical rescue facility

A workshop for repairing and maintaining the equipment is created with

- Dedicated Workshop for repairs and
- Maintenance of Vehicles and Equipment
- Main workshop at Byculla Fire Station
- Sub Workshop at Marol Fire Station
- Sub Workshop at Mankhurd Fire Station (Not commissioned)
- Engineering staff and technical staff is available in the workshop and a wireless workshop with
- Dedicated workshop for the repairs and maintenance of communication equipment
- Main Workshop at Byculla Fire Station
- Sub Workshop at Marol Fire Station
- Officer and technical staff is available for this Workshop

He had informed the august gathering about the new proposed fire stations at

- Kandarpada, Dahisar. – Ready to be commissioned
- Thakur Village, Kandivali. – Plan Sanctioned
- Kanjurmarg.- Plan Sanctioned
- Amboli, Andheri-(W). – Acquisition Awaited
- Juhu, Santacruz (W). – Land Acquired, Demarcation awaited

Also, 273 vehicles includes Firefighting and Rescue and other vehicles are procured.

- Fire Engines - 62 nos.
- Special Fire Engine for Highrise Building (Volvo) – 01 no.
- Foam Tenders – 06 nos.
- Water Bousers - 32 nos (09, 14 and 18 KL capacity).
- Aerial Ladder Platforms – 10 nos (27 to 42 mtrs).
- Hydraulic Platforms – 04 nos (25 to 90 mtrs).
- Turn Table Ladders – 06 nos (30 to 55 mtrs).
- Rescue Van – 05 nos.
- B.A.Vans – 06 nos.
- Control Post Van – 03 nos.
- Customised Drill Tower cum Multi facility

Figure 9 Some of the equipment used by Mumbai Fire Services

Figure 10 Proposed equipment

- Simulator proposed at Thakur Village Fire Station.
- Confined space search and rescue facility
- Rope Rescue facility
- Hot Fire training facility
- Smoke Diving facility
- Vertical rescue facility
- Mini Fire Tender with piercing facility – 03 nos.
- Mini Water tender (Water Mist – 02 nos).
- Quick Response Vehicles – 17 nos.
- Lighting Van – 04 nos.
- HAZMAT Van – 01 no.
- Ambulance/ EMS Ambulance – 16 nos.
- Mobile Diesel Dispensing Vehicles – 02 nos.
- Other Vehicles (Jeep/car/Bus/Truck) – 93 nos.
- Fire Robot – 01 no.

Figure 9 Some of the equipment used by Mumbai Fire Services

Proposed equipment

Apart from sharing the information about the equipment and the training and capacity building initiatives taken by the Mumbai Fire Services, he also highlighted the issues of mitigation and prevention in terms of the building approval system proposed. He concluded by saying that by 2050, almost 70% of the world's population will live in cities. India and other countries should see the importance of fire safety, when building and extending cities. If not, we will be walking unprepared into a deadly inferno".

TECHNICAL SESSION III INSTITUTIONAL CHALLENGES AND ISSUES

The Institutional Mechanism-Challenges & Way Forward

At the outset, Dr. Mishra congratulated NDMA on celebrating the 15th formation day. The legal regime of fire management in India under the Constitution of India are enlisted under the state list. The article 243 W allocates the role and responsibility for maintenance and operation of fire services to the state government and municipal corporations. Fire Service appears in the List of 18 items covered under the Twelfth Schedule of the Indian Constitution clearly making the establishment & maintenance of the Fire Service as a state subject. However, the dilemma still looms large as to whether fire services should be viewed as a law and order issue or an emergency service.

Most of the States have established Fire & Emergency Services as an Act of the State legislature based on Model Fire Service Bill circulated by the Ministry of Home Affairs, Government of India. The States of Gujarat, Rajasthan, and Madhya Pradesh have fire services under respective Municipal corporations/Committees /Councils. Major limitation of this arrangement is that municipal corporations fall under jurisdictions which leaves large areas exposed to fire risk. The State of Maharashtra has dual arrangements i.e. the Mumbai Fire Brigade operates within Municipal Control while other Fire Services in the state are covered under Maharashtra Fire

Mr.G C Mishra, Former Director, Delhi Fire Services

Service Act.

At the Central level, the Director-General (Civil Defense, Home Guards, & Fire Services), Ministry of Home Affairs, Government of India is assisted by the Fire Adviser who deliberates upon management of fire services. In addition, the Standing Fire Advisory Committee which was formed in 1955 consists of all State and Union territories and other Central Ministries to provide timely inputs for better fire management in the country. However, given the lack of legal standing this committee can only recommend and has no role in its implementation. The recommendations if at all are accepted are under the discretion of the State. The Director-General has Administrative Control of the National Fire Service College, Nagpur a sole and premier institution that provides training and education. However, this institution has limited scope for undertaking scientific research.

Some of the major role and responsibilities of fire services include rescue, firefighting, road/rail/air/industrial accident response, first response for natural disasters, etc. They also engage in fire prevention activities and support various community preparedness activities.

The development of fire services in India has been more or less uninformed in terms of institutional growth. The fire services are driven by and large of conventional local needs rather than having a holistic approach. There is no clear roadmap on what needs to be achieved. Also, the scientific vigour for undertaking research on various fire management issues has been negligible. As a result, there is lack of any authentic database on fire incidents.

Some of the gaps in fire services are that the firefighters are inadequately equipped and are limited training/education about fire management. Overall, across India there is a shortage of manpower. This results in a delayed response to fire services in case of fire. One of the major gaps in fire services is that it is predominantly urban with no or limited presence in rural areas.

In addition, the fire services in India is governed by fire laws that are comparatively new. Most cities have a mix of fire law compliant & non-compliant buildings hardly reducing the fire risk. However, since most of the laws on fire management are enforced prospectively, the moment any fire mishap happens the questions are raised on implementation and monitoring of fire safety norms. Unless the laws include all the buildings, these norms become redundant. Even today the government machinery is largely focused on fire management of high-

rise buildings that are above 15 m and large industries.

The high population density in the cities is one of the major causesof high fire vulnerability in India. One major difficulty faced by fire services is the poor traffic conditions where fire tenders take a longer time to even reach the site. There is lack of awareness about fire and the community remains ignorant of hazards happening around.

In the housing sector, mixed occupancies of both commercial and residential in a given area, excessive fire loading, frequent internal changes, fast growth of tall structures, behaviour of building materials and reduction in ceiling height increase the fire vulnerability.

In the future, the fire services need to re-define the role, prepare a roadmap for growth of fire services with both short term &long-term goals. At present, there is a dire need to re-visit techno-legal regime mechanisms to monitor the progress on fire safety. Further, the efforts for capacity building of the fire services need to be paid more importance. This would require specialized training & education

Shri. R.A. Venkitachalam, IIT Gandhinagar

especially in using innovative technology for firefighting. Establishing a reliable database regarding compliances of buildings, offices, hospitals etc. is key to future fire management. In order to do so, support from academic institutions/research establishments/industries is going to be indispensable.

Developing an Agenda for Action

Shri R. A. Venkitachalam started with wishing NDMA on its 15th Foundation Day.He opened with making the observation that there is a very thin line between safety and security in terms of the fire accident.

On a fast urbanizing India and Fire Safety, Mr. Venkitachalam made the following points.

Firstly, India is changing very fast with increasing population and economy. This growth, mostly in the cities, is redefining how we live. Catering to high population densities, there has been a proliferation of high rises. Every day newer building designs & materials are introduced into construction. However, in all this, the safety infrastructures for protection against Fire have not developed at the same pace.

Secondly, our homes are changing in terms of the furnishing material both in type & use. For interior designs, the usage of various polymeric materials has increased manifold.

Third, our lifestyle changes have increased access & use of electricity. Similarly, cooking gas is used almost in all houses. The energy

storage devices and the number of appliances also have multiplied in any given household.

Fourth, the technologies we use like mobile phones, energy storage devices, modems, Internet of Things, Electric Vehicles etc have added multiple layers of fire risks in any dwelling.

Fifth, with expanding urban areas the industrial development in and around cities has become closer to residential areas. The mixed usage of the buildings and transport of inflammable material has increased fire risk.

Given the above nature of the present and the unfolding future, there is a need to leverage the initiatives already taken up by NDMA, NDRF, CISF and DGFS. Some of them are The SFAC Directives & Policy Initiatives, DGFS Mass Awareness initiatives, National building codes etc. The capability and capacity being built by NDMA, NDRF and CISF are of great significance.

However, we still have a large number of fire incidents in India, these pointing to gaps that we need to address and fill. For instance, there is always a time lag between the time of the event and the time an actual alarm is raised. How can we cut down this time with Communication Technologies?

Implementation of fire safety norms by retrofitting old buildings for fireproofing is important and should not be limited to new buildings only. What is the Research needed here?

All the agencies involved in fire management need to work on matters of coordination. Overall, the lack of data on events of fire is a dire issue and needs to be improved.

Let us look at the gaps in responding to a Fire incident, at three different stages pre-event, event- response and post-event. Pre-

Gaps and improvements in fire services:
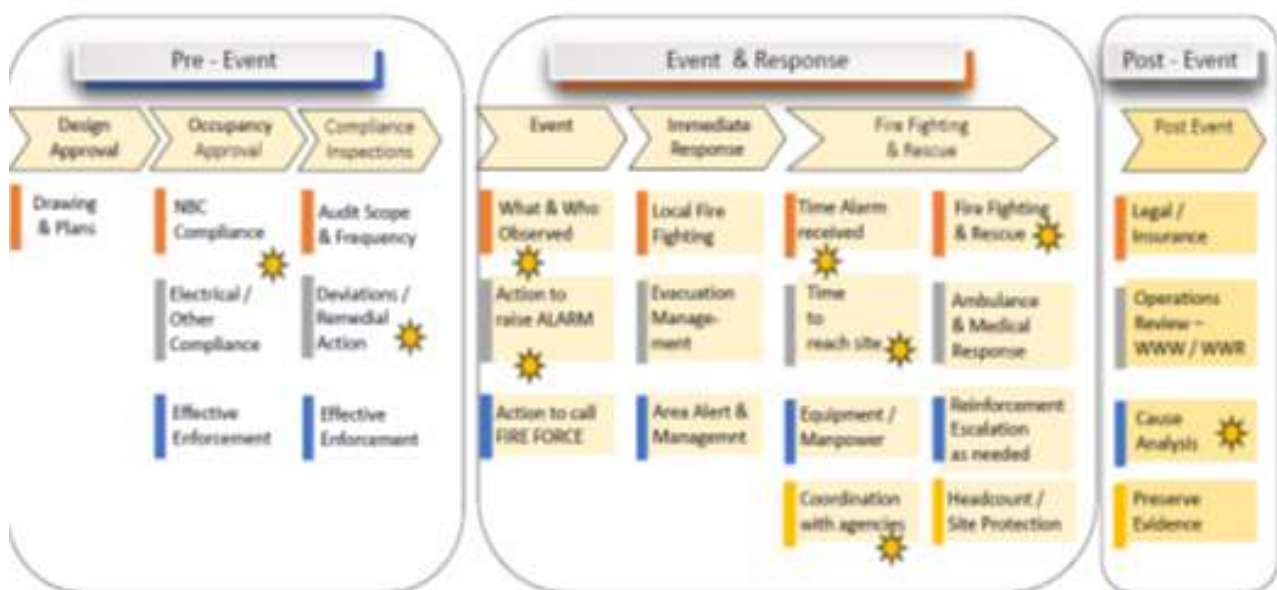
event strategies like design approval and compliance monitoring can help prevent the fire. During a fire event, communication and technology must be used efficiently to raise an alarm. Similarly, in post-event legal/insurance issues and causal analysis of why the event happened can improve the fire services preparedness.

In order to make India fire-safe, the participation of the public is the most critical piece. For public participation, mass awareness needs to be generated. This awareness should be innovative by engaging different stakeholders- like for instance gas cylinder distribution systems, healthcare providers etc. Technology thrust in areas like reporting a fire event, retrofit plan - policy guideline for non-compliant old buildings, sensors for electrical short circuit etc are equally important. Policy interventions like better institutional coordination, public-private participation for increasing the number of fire stations etc

needs to be emphasized. In this process, the fire department has to take the lead by capacity building to use modern methods for firefighting, periodic building audit etc.

The speaker pointed out that the fires from the electrical short circuit are the most common source of the fire. Repeatedly, the Miniature Circuit Breakers (MCBs) and Residential Current Circuit Breakers (RCCBs) connected in the circuits did not provide any protection or rats had nibbled the insulation to expose wire that started the fire. Early warnings like flickering lights, blown off fuse etc are indicators of weak electrical systems. Taking from these cues if proper maintenance of the electrical network is carried out can help prevent fires. But foremost, the way forward is to work together hand in hand with the public, policymakers and other diverse stakeholders to reduce the number of fire accidents.

VALEDICTORY SESSION

Summary of the Workshop

At the outset of Valedictory session, Dr Pavan Kumar Singh, Joint Advisor (Operations), NDMA, presented summary of the day's proceedings. The deliberations during the three technical sessions were encapsulated for the benefit of the dignitaries on the dais and the participants with focus on potential risk for fire incidents and identifying a possible way forward.

It was unanimously agreed during the discussion that to address the present and emerging challenges for fire incidents in forests, transportation sector, industries, residential/business complexes, fire services in India needs to be strengthened and

upgraded through conscious and planned efforts. To achieve this facet, a robust institutional mechanism and coordinated approach including all concerned stakeholders is warranted. This shall inter-alia include implementation/improvement of techno-legal regimes, availability of state of art equipment, R&D, adoption of best practices, awareness

Proceedings of 15th Formation Day

generation, training of community and conducting regular mock exercises.

Speakers of the technical sessions highlighted the nuances of various fire incidents and suggested certain prevention, mitigation and preparedness steps, which does not limit to, are as follows:

a. Focus more on rural and peri-urban fire incidents.

b. Less use of prefabricated material/plastic boards, glass and ACP claddings.

c. Reconsider thresholds and bars for fire incidents as they are much higher than any developed country.

d. Inspect building/infrastructure for appropriate load of fire tenders which over a period of time has increased from 24T to 75T.

e. More emphasize on high rise buildings and large industries

f. Use of technology, development of a reliable database.

g. Affix consequences for non-compliance of rules and responsibilities.

h. Focus on social and cultural infrastructure.

i. Improved governance and implementation of building codes.

j. Adopt PPP policy and work with hospitals for emergency response.

Dr. P. K. Mishra, Principal Secretary to Hon'ble Prime Minister

Valedictory Address

The Principal Secretary to the Prime Minister, Dr. P. K. Mishra, recalled his association with NDMA in its early days, and expressed satisfaction that NDMA's efforts and initiatives towards disaster management are being recognized widely. He appreciated NDMA for its role in forming a consensus with multiple partners and stakeholders to ensure that disaster risk reduction is integrated into our development activities at all levels.

Dr. Mishra described the launch of the guidelines on Disability-Inclusive Disaster Risk Reduction as a milestone in our path to resilience. He said this initiative delivers on Prime Minister Narendra Modi's vision of 'Sabka Saath, Sabka Vikas', and strives to make our risk reduction initiatives more inclusive by addressing the needs of one of the most vulnerable sections of our society. He observed that risk reduction is an ever-evolving process, and urged NDMA to continuously work to further improve its processes and interventions.

Talking about "Fire Safety", the theme for this year's Formation Day, he said that the subject has been in global focus recently, with incidents such as the devastating fire in the Amazon forests, and the Surat fire tragedy. In particular, he emphasized the need for fire risk mitigation planning in the urban areas. He said different kinds of fire – residential, commercial,

rural, urban, forest fire, and industrial fire – all pose different challenges and dealing with each one of them requires specific strategies. He stressed on the need for adequate training and the right protective gear for firefighters.

The Principal Secretary to the Prime Minister asserted that all critical infrastructure, shopping complexes, commercial establishments and government buildings should be regularly audited for fire safety, and necessary preventive measures should be put in place on priority.

He said that this is especially relevant for major cities, where adhering to municipal laws can prevent incidents like the one at Surat, where fire at a coaching centre in a commercial complex killed many students.

Dr. Mishra appreciated the efforts of the city of Mumbai, in incorporating the latest technology and equipment for fire prevention, mitigation and response. This includes drones, hand-held laser infra-red cameras, and remote-controlled robots equipped with thermal imaging cameras for firefighting operations. He urged other cities to emulate the Mumbai model.

Noting that response times are very critical in case of fire accidents, he said that mobile fire stations, as developed in Mumbai, Hyderabad and Gurgaon, are an innovative way of reducing the response time. He said local administrations should collaborate with fire services and come up with solutions best-suited to their local contexts to increase the efficiency of response.

Dr. Mishra drew attention to the fact that in the western world, fire services form the first line of response to any disaster or emergency. He said we should consider upgrading our fire services in a manner that firefighters become the first responders in case of any disaster or emergency, after the affected community itself. Regular mock drills coupled with massive awareness campaigns at the community level are needed to make fire safety everyone's agenda, he added.

He called upon NDMA to revisit and update its National Guidelines on Fire Services, released in 2012.

In conclusion, he reiterated that fire safety is a concern for everyone and that we need to strive towards "Fire Safety for all."

Vote of Thanks

Shri. Bhupinder Singh proposed the vote of thanks on the occasion of NDMA's 15th Formation Day.

First and foremost, he thank our special guest, Dr. P. K. Mishra, who despite his very busy schedule, not only found time to grace this occasion but also shared with us his views and insights.

He expressed his gratitude to the Minister of State for Home Affairs, Shri G Kishan Reddy, who was here with us during the Inaugural Session who enlightened us with keen insights on various issues pertaining to Fire Safety. He thanked Ministry of Home Affairs for their support to all endeavours of NDMA. He expressed heartfelt thanks for the National Disaster Response Force and National Institute of Disaster Management.

We are grateful to all those who have

chaired the sessions and the experts who have shared their valuable inputs with us. Deliberations at this workshop will go a long way in strengthening our fire preparedness and response. I once again thank all our speakers for being with us here today – it has been a great pleasure to listen to you.

He thanked all the Members and senior officials for their guidance and encouragement without which this function would not have been possible.

ThankingDr. V. Thiruppugazh, Joint Secretary, Policy and Plan, NDMA, who was instrumental in organising this Formation Day. With his support, guidance and valuable contribution the workshop has been a great success.

An event like this requires a lot of planning and teamwork. He thanked everyone at NDMA who have remained motivated and worked really hard to make this event a success. He placed on record thanks to the staff of Hotel The Ashok for their perfect logistic support and arrangements.

LESSONS LEARNED

i. The workshop brought out various gaps and highlighted multiple measures in order to improve the fire management in India. These are the following:

ii. However, State is responsible for fire management in India, central government also needs to be proactive in providing scientific and policy directions.

iii. Building codes provide basis of fire management in India. However, enforcement of laws relating to fire in old buildings is a major challenge. Absence of continuous monitoring and audit leads to profuse violation of these fire safety norms.

iv. There should be strong emphasis on creating awareness among different stakeholders like citizens, administrators, politicians, builders, engineers etc. regarding fire safety.

v. Engaging and training local community for fire response by conducting regular mock drills will improve community preparedness to fire.

vi. Simple interventions like constructing water storage tanks at suitable locations can provide water during fire emergencies.

vii. Adopting modern technology such as water mist and drones is the need of the hour.

viii. Incorporating various, international best practices into fire management wherever feasible say for instance into urban planning to make smart cities fire resilient will go a long way in fire mitigation.

ix. A system for certification of new materials with reference to fire safety needs to be developed.

x. Financial incentives need to be channelized into fire services to reduce lack of funds. Innovative funding through public private partnerships must be incorporated into fire management.

xi. The fire services focus has largely been on urban fires and needs to be further expanded to the rural areas too. The number of fire stations across both in urban and rural areas needs to be increased.

xii. Upgradation of these fire stations with state of art technology and equipment will ensure less loss of life and property in case of fire.

xiii. Intra-agency coordination with the fire service during a fire plays a vital role in limiting the damage.

xiv. A roadmap for the future growth trajectory of fire services with both short term &long-term goals needs to be prepared.

xv. Capacity building of the fire service personnel's need to be given more importance by imparting specialised training & education especially in using innovative technology.

xvi. Documenting and sharing lessons learnt from fire incidents also needs to be carried out.

ANNEXURES
Biographies of the speakers

Session I: Fire Risk in India
Chair: Shri. Paras Nath Rai,

Former DG, Bihar Fire Services

Indian Police service (1982 batch, Retd.)
Member Bihar State Disaster Management
Authority

- He has worked in the Department of Disaster Management as Special Secretary.
- In addition to original charge, he has worked as DG police where he managed post disaster operations like response and recovery of Kosi disaster 2008 and flash floods 2017.
- He has prepared (2011) Bihar State Crisis Management plan for internal security.
- He was associated with the department of disaster management in Govt. of Bihar for preparation of 15 year (2015-30) DRR roadmap of Bihar.
- Before joining as member in Bihar State Disaster Management Authority in February 2018 and after his retirement (Jan 2018) as DGP Home Guards and Fire Services, he has worked closely with Authority in Disaster Risk Reduction/ mitigation programs.
- Presently, he is working as Member to BSDMA. He is involved in several long term programmes of capacity building of community and responders.

Fire Risk: Existing and Emerging Scenarios
Shri M.V.Deshmukh,

Director, Govt. Affairs, Fire Safe India
Foundation
Fire Advisor M.S.R.D.C., President - National
Association of Fire Officers, Director – Govt.
Affairs, Fire Safe India Foundation

- Mr M.V.Deshmukh has an illustrious career as a Fire professional since last 39 years.
- He has been part of active firefighting operations for 19 years, especially in the Industrial Belts where Chemical, Petro-Chemical and Hazardous Industries are situated.
- He was elevated to undertake higher responsibilities mainly in the field of Fire & Life Safety.
- Additionally, he has managed HR, Security and IT Departments of MIDCGovt. of Maharashtra for more than 15 years.

Educational Qualifications

- Graduated in Public Administration
- Gold Medallist from National Fire Services College, Nagpur MHAGovt. of India.
- Fellow IFE (UK).
- MBA from University of Mumbai
- LLB from University of Mumbai
- Diploma in Industrial Safety,

- Masters Diploma in Information Technology

Honours & Professional Achievements

- In 1993 appointed Chief Fire Officer & Fire Adviser, Maharashtra Industries Development Corporation (MIDC)

- In 2002 appointed Fire Adviser , Government of Maharashtra

- In 2005 appointed Director, Maharashtra Fire Services.

- Instrumental in initiating the process of enactment of "The Maharashtra Fire Prevention And Life Safety Measures Act 2006"

- In 2016 he retired from his dual posts of CFO (Chief Fire Officer) & FA (Fire Advisor) M.I.D.C & Director & FA (Fire Advisor) Govt. of Maharashtra.

- Having an avid passion for imparting knowledge, was a visiting Faculty with leading Business Institutions such as NarseeMonji Institute of Management Studies, Wellingkar Institute of Management Studies &Jamnalal Bajaj Institute of Management Studies, from 2001 to 2011 in varied subjects viz., Human Resource Management, Project Management, Business Ethics ,Environment Management & Productivity etc.,

- Attended & chaired innumerable Fire Prevention & Life Safety Conferences, Seminars and Training Programs nationally and internationally.

- Has been an active member of joint exercises for skill building and knowledge exchange conducted amongst various Fire Services and Technology providers on National and International Forums.

- He is instrumental in driving "MISSION FIRE SAFE INDIA"

Climate change and its implications on fire risk
Dr.Richa Mishra, IFS

Forest Research Institute (FRI), Dehradun

- She is an Indian Forest Service (IFS) Officer of 2001 batch, West Bengal Cadre.

- She has served in the Buxa Tiger Reserve in North Bengal, and Sundarban Tiger Reserve in South Bengal.

- She has also served in Forest Survey of India and looked after forest Cover mapping of the country besides capacity building of Forest Officers.

- Her last posting was on state deputation to Women and Child Development and Social welfare. There she was looking after social welfare and child protection issues.

- She has recently joined Forest research Institute.

Chemical and Industrial Fire Risk
Shri. VaradendraKoti

Group Head S&OR-Fire Service, Reliance Industries Limited

- BE(Fire Engg.,) graduate from National Fire

Service College (2nd Batch)

- 36 years of Fire Safety Management Experience in Hydrocarbon Industry (14 years served for Indian Oil Corporation & since last 22 years in Reliance Industries Limited)

- Has been Fire Chief of World's Largest Grassroots refinery at Jamnagar for 15 years from Project stage to Commissioning of two major refineries.

- Presently leading Fire Safety Management for the Reliance Group at Head Quarters, Navi Mumbai as Head, Group S&OR-Fire Services.

- Has been Functional Committee member for OISD Standard and Technical Committee member for BIS CED 22 & 36

- Steering Committee member of LASTFIRE Project Group, a consortium of 16 major International Oil Companies involved in Research work and developing Industry standards on emergency Response.

Session II: Fire Prevention and Mitigation
Chair: Dr. Rajeev Narang,

Centre for Fire, Explosive and Environment Safety (CFEES), DRDO

- Shri Rajiv Narang, Outstanding Scientist and Director CFEES obtained his Bachelor of Engineering Degree in Chemical Engineering from Panjab University, Chandigarh in 1985 and received the Arun Modi Gold Medal and University Medal.

- He completed his M Tech in 1994 from IIT Delhi.

- Shri Narang joined DRDO at High Energy Materials Laboratory, Pune in 1986. During his 13 years stint at HEMRL, he contributed immensely towards Development of High Explosive filling for Advance Demolition Devices, Anti-Tank Nag Missile, Prithvi Missile Warheads.

- In 1999, he moved to CFEES and was involved in various Projects and STEC Regulatory and Advisory activities.

- Some of his notable achievements are Design and Development of New Generation Explosive Storage buildings; Design validation and safety parameters for storage of specialized ammunition like Akash and BrahMos missiles, SMERCH and PINAKA rockets; Hazard Classification tests; Safety clearances for new explosive storage buildings/ facilities; Formulation, amendment and implementation of explosive safety regulations for all MoD establishments handling, explosives.

- He is the author of 15 Research Papers and 34 Technical Reports.

- He is recipient of many awards in recognition of his contributions viz. State Centre Medal by Institution of Engineers 1988, DRDO Technology Award 1996 and 1998 and DRDO Award for Performance Excellence 2016.

- He is Life Member of High Energy Materials

Society of India (HEMSI) and Associate Member of Institute of Engineers (India) & Indian Institute of Chemical Engineers.

- He has taken over as Director CFEES w. e. f. 24 January 2017

Planning for Fire Risk Mitigation and Safety Audit of Buildings – A Case of Surat
Shri Hitesh J. Taparia,

Chief Fire Officer, Vadodara

- With 34 years of service, he has procured 12 years of work experience as Chief Fire Officer in fire services.
- He has completed Advance Diploma in fire engineering. He is a qualified Graduate from IFE.
- He has worked efficiently during natural disasters and social unrest in Gujarat state.
- He is a member of several institutes that work for firefighting and rescue technology up gradation like IFE, NAFO, and RED-CROSS.
- He went to Europe for multi-disciplinary advance training of firefighting and rescue.
- He has presented more than 10 papers at national level workshop and seminars in India.
- He was awarded presidents' fire service medal for meritorious services in the year 2005.

Legal Aspects of Fire Risk – Act and Regulations
Ms. AlpaSheth

Managing Director, VMS consultants Pvt. Ltd., Mumbai

- Ms AlpaSheth is Managing Director of VMS Consultants Pvt. Ltd, Mumbai
- She has been lead designer for over 300 projects including eighty-storied buildings and large industrial projects.
- She has been Seismic Advisor to Gujarat State Disaster Management Authority and also served as Disaster Management Consultant to Maharashtra.
- She has served on numerous national and international Earthquake Reconnaissance Teams.
- She is a member of numerous Bureau of Indian Standards (BIS) Committees and co-drafted the earthquake and tall building codes.
- She is Founding Trustee of Structural Engineering Forum of India and Children's Liver Foundation, India.
- She is Fellow, Indian National Academy of Engineering.
- She holds a Master of Engineering degree from University of California, Berkeley.

Smart Cities and Fire Safety
Dr. Rajeev Kathpalia

Partner at Vastu-Shilpa Consultants

- Rajeev Kathpalia is a partner at VastuShilpa Consultants or VSC, the multi- disciplinary practice founded in 1955 by the Pritzker laureate Balkrishna V. Doshi.
- He serves as a trustee and former director of the VastuShilpa Foundation, a research based non-profit charitable trust.
- He has won several national and international competitions for the Indian Institute of Technology, Indian Institute of Management and the Nalanda University among others.
- Designing across a range of scales, his practice encompasses regional and city plans, institutional campuses, individual buildings, and even furniture.
- He also runs the Foundation's International Habitat Studio Program, which brings together students from across India and around the globe.
- He was recognized with the Prime Minister's Award for innovative Urban Design for his pioneering advocacy and design work on the inner city of Hyderabad within the Charminar precinct.
- He has earned his Bachelor's degree in Architecture from the Chandigarh College of Architecture and his Master of Architecture and Urban Design from Washington University.

- For the past 30 years, he has also taught as a university professor, lecturing extensively in India and abroad, and received several honours and awards.
- Most recently, he was conferred the Award for Distinction in Architecture by Washington University.

Challenges of Fire Fighting in Urban Areas
Shri H. D. Parab

Deputy Chief Fire Officer, Maharashtra Fire Services

- Working as Dy.Chief Fire Officer Mumbai Fire Brigade
- Municipal Commissioner awarded him silver medal for carrying out rescue work at serious house collapse at Mumbai.
- Municipal Commissioner Awarded him commendatory certificate for carrying out rescue work at serious house collapse at LaxmiChhaya building, LT Marg, Babhai Naka, Borivali (West) Mumbai 92.
- He is a Graduate in Fire Engineering (India) in the year 1992.
- He has completed Masters in Fire Engineering (U.K.) in the year 1994.
- He has passed Advance Diploma in Industrial Safety in 2011.
- Additional Municipal Commissioner awarded certificate for carrying out the work at Kar-Nocobar on 26.12.2004.

- The Fire Advisor to Govt. of Maharashtra awarded him certificate of merit in Tactical Medley Drill Competition in 1992.
- Received Best Fireman Trophy in Annual Drill Competition 1991.

Session III: Institutional Challenges and Issues
Chair: Prof.Dr. CVR Murthy

Professor, IIT Madras

- C. V. R. Murthy received B.Tech. (Civil Engineering) and M.Tech. (Civil Engineering: Structural Engineering) degrees from IIT Madras, and Ph.D. degree in Earthquake Engineering from Caltech, USA.
- He worked in IIT Delhi (1992-93) and IIT Kanpur (1993-2010), and is serving at IIT Madras since 2010. Currently, he is Institute Chair at IIT Madras.
- Murthy's primary research & development interests are related to earthquake safety of built environment in India. He is working in the area of nonlinear behaviour of buildings and buildings, towards developing displacement-based seismic design procedures.
- He has been Member & Team Leader of Post-Earthquake Reconnaissance Teams to study 11 damaging earthquakes in India since 1993. He works closely with the National Disaster Management Authority (NDMA), Government of India, to prepare policy, guidelines and implementation strategies.
- Currently, he is a Member of the Advisory Committee of NDMA. He has been associated with major revisions of the Indian Seismic Codes on design and construction of Buildings and Bridges, as Member of Bureau of Indian Standards Committees.
- He has authored/co-authored four books on earthquake resistant design and construction; two of them received the 2005 ICI Best Construction Technique Paper Award, and the 2016 ACCE Nagadi Best Publication Award. He was the Editor-in-Chief, World Housing Encyclopaedia, USA during 2005-2008.
- He received the Distinguished Teacher Award from IIT Kanpur, and with the Best Teacher Award from IIT Hyderabad.
- He is a Fellow, Indian National Academy of Engineering and Institution of Engineers (India), and a Chartered Engineer of the Institution of Engineers (India).

Institutional Mechanism - Inadequacies and Issues
Dr. G. C. Mishra

Ex Director, Delhi Fire Services

- Dr.Misra is a student in fire engineering science & technology having over 37 years of experience in the profession in various capacities.
- He started his career from Indian Petrochemicals, Vadodara, served the National Fire Service College, Nagpur and Delhi Fire Service.
- He retired as Director in March 2019. Presently he is serving Government of Assam as Senior Consultant.
- Dr Misra graduated from Lucknow University followed by graduation, post-

- graduation and PhD in fire engineering from Nagpur University.
- He has undergone several professional courses/training programs within the country and outside.
- He is decorated with President's Fire Service Medal for Distinguished Service, and President's Fire Service Medal for Meritorious Service.
- He is first fire engineer to receive "Eminent Engineer's Award 2018" conferred by the Institution of Engineers (India), Delhi.
- He is a Fellow of Institution of Fire Engineers (India), New Delhi & a Fellow of Institution of Engineers (India)" and has published several articles and a book on fire service hydraulics.
- He is also known for his contribution in fire service legal regime.

Modernization of Fire Services and Technology for Fire Safety
Shri R. A. Venkitachalam

Advisor, IIT- Gandhinagar, Former Vice President, Public Safety Mission, Underwriters Laboratories, Bangalore

- During his tenure (2013-2017) as the Vice President - Public Safety Mission of UL, Shri Venki focused on advancing UL's Safety Mission across India and the Developing World.
- During this period, Shri. Venki led pioneering work in areas covering Road and Fire Safety, Policy Advocacy and School Safety Awareness Programs.
- The National Safety Science Quiz and the India Fire Safety Council have evolved to become two of the most widely recognized programs on Public Safety in India today.
- As the Vice President & Managing Director (2003-2013) for Emerging Markets, Shri Venki led the aggressive growth of UL in the region covering South East Asia, India, Middle East and Africa.
- Significant investments in technical infrastructure and expansion of geographic footprint were key to achieving this growth.
- The relevance of the 'public safety mission' of UL to India, when linked with the need for 'local for local' services, led to the development of UL's 'In India for India' strategy, the growth mantra for the period. Prior to joining UL, Venki held senior General Management / P & L responsibilities at CEO level with leading organizations, covering Consumer, Capital Goods and Telecom sectors [Asian Paints / Thermax / Vodafone] from 1979 -2003.
- Shri Venki is an alumnus of the Indian Institute of Technology, Chennai, holding a Bachelor of Technology degree in Chemical Engineering and a Masters in Industrial Management.
- As a part of continuing education, Venki was seconded by UL for the Executive Leadership Program at Yale School of Management.

SOME PROMINENT FIRE INCIDENTS IN INDIA
Table Some Fire incidents in India

SrNo.	Duration	State/City	Incident name	Death toll
1.	May 2019	Gujarat, Surat	Taxshila Coaching center fire	24
2.	February 2019	Delhi	Karol Bagh Hotel fire	17
3.	February 2019	Bandipur Tiger reserve	Bandipur Tiger reserve	1000 sqkm land burned down
4.	February 2019	Karnataka, Bengaluru	Aero India show	300 vehicles gutted
5.	December 2017	Mumbai	Kamala Mills	14, 21
6.	February 2013	Kolkata	Multistoried market complex	19
7.	September 2012	Tamilnadu, Sivakasi – Mudalipatti	Fireworks factory	54 (78 injured)
8.	December 2011	Kolkata	AMRI Hospital	89
9.	February 2010	Bengaluru	Carlton towers	9, 16
10.	September 2005	Bihar	Khusropur	35 (50 injured)
11.	April 2006	Meerut	Brand India fair, Victoria park	100
12.	July 2004	Tamilnadu, Kumbakonam	Higher secondary school and Erwadi fire	94
13.	June 2002	Uttar Pradesh, Agra	Sree Lee International Footwear factory	42
14.	February 1997	Odisha, Baripada,	Religious congregation	206 (148 injured)
15.	June 1997	New Delhi,	Uphaar Cinema	59 (103 injured)
16.	December 1995	Haryana, MandiDabwali	Short circuit and stampede	540

BE SMART
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