



**Proceedings of Consultative Workshop
on
Forest Fire Management in India**



May 2022



NATIONAL DISASTER MANAGEMENT AUTHORITY (NDMA)
Government of India
NDMA Bhawan, A-1, Safdarjung Enclave,
New Delhi-110 029



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of
Consultative Workshop
on
Forest Fire Management in India

National Disaster Management Authority
(NDMA)
NDMA Bhawan, A-1
Safdarjung Enclave, New Delhi - 110029

Ministry of Environment, Forest and Climate Change
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Proceedings of Consultative Workshop on Forest Fire Management in India
conducted by NDMA on 11th May 2022

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Contents

Workshop Inauguration	1
Welcome Address & Workshop Introduction	2
Opening Address	4
Special Address	5
Inaugural Address	6
Inaugural Address	8
Vote of Thanks	10
Technical Session I - Forest Fire: Scenario, Early Warning, Management & Best Practices	
Overview of Forest Fire Management: Issues and Challenges in India	12
Monitoring and Forecasting Climatic and Weather conditions causing Forest fire and its further behavior	14
Fire Alerts and Early Warning: Present Practices and Future Challenges	15
Forest Fire Management in Protected Areas	16
Global Best Practices on forest fire management: possibilities in India	17
CAMPA: Funding Options and Strategies in Forest Fire Management	18
Technical Session II - Strengthening Coordination Mechanism for Forest Fire Management	
Capacity and Training Constraints in responding to Forest Fire	20
Aligning Fire Services & Civil Defense to Combat Forest	22
Training on Forest Fire in Academies and Institutions	23
Training needs Analysis on Forest Fires	26
Forest Fire Response Mechanism by Indian Air Force: Issues & Challenges	28
Technical Session - III - Understanding needs and challenges of Forest Fire Prone States	
Initial Framework of a "National Forest Fire Management Project"	32
Presentation and discussion on 'Needs and Challenges of Forest Fire' by Forest Fire Prone States	36
Summary of deliberations	48
Way forward	50
Special Address	50
Vote of Thanks	51

Workshop Schedule

09:00 - 09:30	Registration	
INAUGURAL SESSION		
09:30 - 09:40	Welcome Address & Objectives	Mr. Kunal Satyarathi, IFS, JS(PP), NDMA
09:40 - 09:50	Opening Address	Dr. C. P. Goyal, IFS, DG-cum-Special Secretary (Forest), MoEF&CC
09:50 - 10:00	Special Address	Mr. Kamal Kishore, Member & Secretary (I/C) NDMA
10:00 - 10:10	Inaugural Address	Mr. Nityanand Rai, Honorable Minister of State, Ministry of Home Affairs
10:10 - 10:20	Inaugural Address	Mr. Ashwini Kumar Choubey, Honorable Union Minister of State, Ministry of Environment, Forest & Climate Change & Consumer Affairs, Food & Public Distribution
10:10 - 10:20	Vote of Thanks	Dr. Suneesh Buxy, IFS, IG (Forest), MoEF&CC
TEA BREAK (10:30 - 11:00)		
Technical Session I - Forest Fire: Scenario, Early Warning, Management & Best practices Chair: Dr. K. S. Vatsa, Member, NDMA Co-chair: Mr. S P Yadav, IFS, ADG (FC) cum Director, Wildlife Institute of India		
11:00 - 11:15	Overview of forest fire management: issues and challenges in India	Mr. Arun Singh Rawat, IFS, DG, ICFRE, Dehradun
11:15 - 11:30	Meteorological Drivers of forest fire & forecasting	Dr. M. Mohapatra, DG Meteorology, IMD, Delhi
11:30 - 11:45	Fire Alerts and Early Warning: Present Practices and Future Challenges	Mr. Anoop Singh, IFS, DG, Forest Survey of India (FSI), Dehradun
11:45 - 12:00	Forest Fire Management in Protected Areas	Mr. S.P. Yadav, IFS, ADG(FC) cum Director, Wildlife Institute of India
12:00 - 12:15	Global Best Practices on forest fire management: possibilities in India	Mr. Piyush Dogra, World Bank, Delhi
12:15 - 12:25	CAMPA: Funding Options and Strategies in Forest Fire Management	Mr. Subhash Chandra, IFS, CEO, CAMPA, MoEF&CC
Technical Session II - Strengthening coordination mechanism for Forest Fire Management Chair: Lt. Gen. (Retd.) Syed Ata Hasnain, Member, NDMA Co – Chair: Mr. Sanjeev Kumar Jindal, JS (DM), MHA		
12:30- 12:40	Capacity and Training Constraints in responding to Forest Fire	Mr. Atul Karwal, IPS, DG, NDRF, Delhi
12:40- 12:50	Aligning Fire Services & Civil Defense to Combat Forest	Mr. Taj Hassan, IPS, DG, Fire Services and Civil Defense
12:50- 13:00	Training on Forest Fire in Academies and Institutions	Mr. Bharat Jyoti, IFS, Director, IGNFA, Dehradun
13:00- 13:10	Training needs Analysis on Forest Fires	Mr. R. S. Choudhary, Director, National Fire Service College, Nagpur
13:10- 13:20	Forest Fire Response Mechanism by Indian Air Force: Issues & Challenges	Wing Commander Mr. Praveen Kumar, IAF
13:10- 13:20	Discussion and Q&A	
LUNCH BREAK (13:30 - 14:00)		
Technical Session - III - Understanding needs and challenges of Forest Fire Prone States Chair: Mr. Kamal Kishore, Member & Secretary-in-Charge, NDMA Co- Chair: Ms. Uma Devi, IFS, Additional Secretary, MHA		
14:00- 14:15	Initial Framework of a “National Forest Fire Management Project”	Dr. Suneesh Buxy, IFS, IG (Forest), MoEF&CC
14:15- 16:15	Presentation and discussion on ‘Needs and Challenges of Forest Fire’ by Forest Fire Prone States	1. Chattisgarh 2. Telangana 3. Maharashtra 4. Andhra Pradesh 5. Mizoram 6. Uttarakhand 7. Madhya Pradesh 8. Himachal Pradesh 9. Assam 10. Uttar Pradesh 11. Odisha
TEA BREAK (16:30 - 16:45)		
VALEDICTORY SESSION		
16:45- 16:55	Summary of Deliberations	Mr. Kunal Satyarathi, IFS, JS(PP), NDMA
16:55- 17:05	Way Forward	Mr. Kamal Kishore, Member & Secretary (I/C) NDMA
17:05- 17:15	Special Address	Ms. Leena Nandan, IAS, Secretary, MoEF&CC
17:15- 17:25	Vote of Thanks	Dr. Pavan Kumar Singh, Joint Advisor (PP), NDMA

Workshop Inauguration



National Disaster Management Authority (NDMA) organized the National level Consultative Workshop on Forest Fire Management in India, in association with Ministry of Environment, Forest & Climate Change (MoEF&CC), at India International Centre, New Delhi on 11th May 2022.

The programme began with felicitation of the guests of honor and lighting of lamp.

Welcome Address & Workshop Introduction



Mr. Kunal Satyarthi, IFS

Joint Secretary, NDMA

Mr. Kunal Satyarthi, IFS, JS (PP), NDMA welcomed all the dignitaries and participants present in the workshop and thanked them for taking time out of their busy schedule to attend this important event. He cited from the meeting conducted by the Honorable Prime Minister Shri. Narendra Modi ji on heat wave management and monsoon preparedness few days back online. In this meeting the Hon'ble Prime Minister had given directions regarding Forest Fire Management as under:

- i. Need to work to substantially reduce the vulnerability of forests across the diverse forest ecosystems in the country against fire hazards,
- ii. Enhance the capacity of forest personnel and institutions for timely detection of possible fire

- events and for fighting forest fires,
- iii. Speed up recovery after a fire event.

He stated that NDMA and Ministry of Home Affairs took cue from this meeting to bring together, on one platform, the officials of related ministries especially Ministry of Environment, Forest, and Climate Change and departments both at Central and State Government level, so as to discuss the issue of forest fires, plan for achieving the objectives laid down by the honorable Prime Minister as well as challenges and opportunities in dealing with the issue of forest fire management.

Therefore, representatives from Central, and State Forest Departments, Ministry of Environment, Forest, and Climate Change (MoEF&CC), National Disaster Management Authority (NDMA), Forest Survey of India (FSI), National Disaster Relief Force (NDRF), Forest Research Institute (FRI), Indian Council of Forestry Research and Education (ICFRE), Indira Gandhi National Forest Academy (IGNFA), Fire Services and Civil Defense, National Institute of Disaster Management (NIDM), Indian Meteorological Department (IMD), National Fire Service College (NFSC) have all assembled in this first of its kind forum to discuss the current situation and plan a way forward.

Mr. Kunal Satyarthi cited few important points that need to be considered regarding forest fires, which are as follows:

- i. The frequency and intensity of forest fires are increasing day by day in India and globally.
- ii. Forest fires are spreading to hitherto unaffected areas like the forest fires which occurred in Zuko valley of Manipur and Nagaland last year where NDRF played a key role as well as the forest fires in Simlipal Tiger Reserve where SDRF of Odisha played a significant role in forest fire control.

iii. Forest fires are mostly anthropogenic and happening mainly due to human activities both intentional and unintentional. Therefore, it is of utmost importance that the workshop deliberations focus on the issue of involvement of communities in forest fire management.

iv. There is an urgent need for enhancing the capacity of forest guards at the beat levels in terms of training, workforce, equipment etc. to enable them to effectively deal with forest fires. The age-old methods of preparedness by way of controlled burning, fire lines, water tanks etc. have not been adequately taken up in the field and thus necessitating enhancement of preparedness measures in this respect.

He also expressed that the main objective of this workshop and the proposed National Level Project is to develop Standard Operating Procedures (SOP) for the chain from end-to-end detection to suppression through involvement of all the stakeholders. Most importantly, the coordination between NDMA and MoEF&CC, SDMA and the State Fire Departments as well as between the DDMA and District Forest Officials need to be institutionally enhanced to achieve objective of effective and efficient forest fire management.

Mr. Satyarthi then gave an overview of the three technical sessions planned for the day. The First Technical Session of the workshop included dealing with the scenario of forest fires in India including early warning systems, management, and best practices. The Second Technical Session is focused on the coordination mechanism for forest fire management and to deliberate on how to increase cooperation and collaboration in this regard. The Third Technical Session presentations would be made by the Nodal officers of states which have one or more of the twenty-six districts which are most affected by forest fires in the past ten years. These twenty-six districts account for about 50% of the forest fires affected areas occurring in India. The presentations will focus on the challenges faced at ground zero for forest fire management and the respective needs and priorities in this regard.

Mr. Satyarthi concluded by expressing hope that this workshop will help in laying the foundation stone for planning and design of a National Programme on forest fire management to achieve significant reduction in the forest fire incidents in the country in a span of three to four years.



Opening Address



Dr. C. P. Goyal, IFS

DG-cum-Special Secretary (Forest),
Ministry of Environment, Forest
& Climate Change

Dr. C. P. Goyal, Director General and Special Secretary, Forests, MoEFCC welcomed all the dignitaries and participants to the consultative workshop on behalf of Ministry of Environment Forest and Climate Change. He appreciated the efforts of Mr. Kamal Kishore, Member Secretary, NDMA, for coming up with the idea of collaboration to solve the issue of forest fires. Quoting recent example of forest fire management in Sariska Tiger Reserve, he stressed upon the need to have good cooperation and convergence between NDMA, NDRF, SDRF, and the State Forest Departments to successfully control forest fires.

He stated that due to limited resources and capacities, forest department is not able to achieve the desired results despite doing their best. Convergence of resources, knowledge, skills, and capacities is the urgent need of the hour. He intimated that 10% of the total forest area is highly sensitive to forest fires in India. These fires not only lead to loss of biodiversity but also cause loss of carbon stock which is a cause of serious concern. He apprised that an Action Plan to tackle the forest fires will be prepared after this consultative meeting. At the end he wished all the success to the workshop.



IAF helicopters used to spray water over a forest fire in the Sariska Tiger Reserve, in Alwar district

Special Address



Mr. Kamal Kishore

Member & Secretary (I/C), NDMA

Mr. Kamal Kishore, Member & Secretary (I/C), NDMA welcomed the honorable ministers present on the dais, representatives of NDMA, NDRF, MHA, MoEF&CC as well as the officials representing State Forest Departments. He informed that NDMA and MoEF&CC have been preparing for this workshop since the last five to six months. He stated that there have been continuous discussions between MHA and MoEF&CC on ways and means to collaborate for tackling the issue of Forest Fire Management.

The success of this workshop will be visible only after few months or so, when the objective of designing a comprehensive National Programme would be achieved. He expressed that this workshop would help to validate the framework being developed for the National Programme through the inputs of the officials from different departments and agencies which will greatly help in reaching the milestone of launching a National Programme duly owned and operationalized by the relevant stakeholders.

He also expressed that the honorable Prime Minister and Home Minister have been continuously emphasizing on the issue of Forest Fire Management and have expressed that the country should work towards reducing the impact of Forest Fires on lives and livelihood by fifty percent within a period of one year. This target though ambitious is achievable. Therefore, the focus of this workshop would be on the actions that need to be taken to tackle forest fires in the country.

He cited three things which are crucial in this regard. Firstly, forest fire management is not the sole responsibility of NDMA, MHA or MoEF&CC. In order to implement an effective forest fire management programme in the country there will be a need to have a multi-stakeholder approach including local bodies as well as direct involvement of the communities living in forests or in the vicinity of forests and also listen to perspectives of all concerned stakeholders, to tackle the forest fire, in effective manner.

Secondly, in case of forest fires, prevention is the cure. If adequate steps are not taken before the fire season such as removal of combustible material, construction of fire lines, establishing systems of water collection etc at the local level, then even advanced fire detection and suppression systems would fail to achieve the desired results.

Thirdly, there is a need to make judicious and integrated use of technology for tackling forest fires such as technologies related to fire danger alerts, assessment of wind speed, humidity and temperature, communication of fire danger alerts as well as improvement of communications systems through appropriate feedback. Technological possibilities in this regard should not be viewed on piecemeal basis. A comprehensive approach needs to be adopted to optimize the impact of available technologies, which would surely help reduce the impact of forest fires on lives and livelihood.

Inaugural Address



Mr. Nityanand Rai

Honorable Minister of State,
Ministry of Home Affairs

Mr. Nityanand Rai, Union Minister of State for Home Affairs, in his Inaugural address, stated that In India, forest fire has become a regular phenomenon. The country has been witnessing an increase in incidences of forest fires which are more frequent and intense. According to Forest Survey of India 2019, nearly 4% of country's forest cover is extremely prone to fire whereas 6% of forest cover is highly prone to fire. Forest fires in India are generally ground fires. The, human activities trigger 95% of forest fires in India, such as burn agricultural practices, deforestation, firewood burning etc. Drought and higher temperatures further aggravate the risk of forest fire. The impact of fire is diverse on the forest ecosystem. Besides directly damaging

the forest, fire also adversely affects forest regeneration, soil erosion, wildlife etc. It has wide-ranging adverse ecological, economic & social implications.

He further added that Disaster Management is of great concern to Hon'ble Prime Minister, Shri. Narendra Modi which has been clearly defined in the PM's Ten-Point Agenda in his inaugural speech at Asian Ministerial Conference in 2016. This ten-point agenda stressed on disaster risk reduction, local community involvement, using social media for disaster risk reduction, involvement of women in managing disasters as well as reviewing and learning from past experiences through analysis and deliberations.

He drew attention towards high level review meeting, which was held on May 5, 2022, under chairmanship of Hon'ble Prime Minister, to review heat wave and monsoon preparedness. During review meeting, issues pertaining to fire prevention, timely detection and to

enhance capacities of forest officials, institutions & concerned stakeholders, to tackle forest fire were raised, and need of a national level consultation workshop was felt. Keeping that perspective NDMA has organized this workshop very timely, which will be very useful for all concerned.

He highlighted key initiatives taken by NDMA in context of forest fire management, such as, in the revised National Disaster Management Plan (NDMP) 2019, Forest Fire has been included and addressed as a hazard, with specific time bound action plans, and clear roles & responsibilities of Central, State agencies and key stakeholders.

NDMA prepared the report on Global Best Practices on Forest Fire Management, in 2020, to initiate necessary action to address forest fire issues in India. The report captures unique fire management practices of countries facing forest fire. For example, Australia's Bushfire Safety System encourages people to use exclusive App in Victoria region, which provides timely information about the fire risks and helps the stakeholders in decision making. Another example is Indonesia's Fire Free Village Program, which inspires local communities, NGOs and other stakeholders to address causes of fires. In Bali, if anyone burns trees, then he would be fined. Incentives are given for no burn villages. However in Indian context, the thrust should be more on the awareness than imposing fine on local villagers.

NDMA in collaboration with Forest Research Institute (FRI), Dehradun has undertaken a research project on compiling indigenous best practices in forest fire management across India. The main objective is to collect traditional practices of forest fire prevention and mainstream these practices into modern firefighting.

The eleven main states with frequent occurrence of forest fires in recent times are: Andhra Pradesh, Assam, Chhattisgarh, Himachal Pradesh, Mizoram, Madhya Pradesh, Maharashtra, Odisha, Telangana Uttar Pradesh

and Uttarakhand. Further, 26 districts from these 11 States mainly account for about 50 percent of the total forest fire affected area and are highly vulnerable.

NDMA, in association with MoEF&CC, has organized this one-day consultation workshop to better understand the gaps and challenges in these 11 States and 26 districts, which will help in designing forest fire response throughout the country at national, state and district level. The inputs received during this workshop with all the relevant stakeholders, would be helpful to plan out forest fire management, in a more effective manner.

The workshop will mainly throw light on the following key aspects, including:

- Response mechanism to forest fire at International, National, State and District level
- Increased and efficient use of forest fire alerts
- Use of innovative equipment and technology for response to forest fire
- Understand capacity and training constraints in addressing forest fire
- Needs for improving models to improve forest fire alerts and forecasting
- Community engagement in forest fire mitigation and response.

He stated that fire-fighting action plans must be prepared for each forest range, considering the climate, type of vegetation, availability of water etc. Local communities should be trained as first responders to forest fires. He said that the challenge before us is to strive towards higher levels of preparedness, mitigation efforts and strengthening our response mechanisms to deal with the effects of forest fires.

Inaugural Address



Mr. Ashwini Kumar Choubey

Honorable Union Minister of State,
Ministry of Environment, Forest &
Climate Change, and
Consumer Affairs, Food & Public
Distribution

Mr. Ashwini Kumar Choubey, Minister of State MoEF&CC, welcomed all dignitaries and participants to the workshop. He emphasized upon the importance given to forests in Rigvedas and Upnishads. He also explained the harmful effects of forest fires on flora and fauna and expressed deep concern over increasing frequency and intensity of forest fires in the country.

He apprised that Hon'ble Prime Minister of India

has raised concern about forest fires in recent meeting and has urged to reduce forest fires by 50% in a year. Hence, it is important to focus on twenty-six districts in eleven states which are contributing to about 50% of forest fires in country. He apprised and appreciated various efforts done by MoEF&CC to control forest fires in the past and emphasized on post fire recovery of the affected area.

He stated that in our country a large number of Forest

Fire Prevention and Management (FFPM) practices have been adopted for prevention of forest fire, detection of forest fire, post fire management and forest fire suppression. Further, the National Action Plan on Forest Fires (NAPFF) was launched in 2018 by MoEF&CC to minimize forest fires by informing, enabling and empowering forest fringe communities and incentivizing them to work with the State Forest Departments.

He further emphasized on following prevention and control measures of forest fires:

- Capacity building of local communities
- Forest fire risk zonation and mapping
- Forest floor biomass management
- Forest fire detection and alert system
- Digitize location of critical resources
- Maintenance of forest fire lines
- Equipping fire fighters, training field staff

Appreciating the efforts of NDMA, he mentioned that the Common Alert Protocol (CAP) is being implemented across all the States. Here, a standard message format, which contains all the relevant details like type of hazard, intensity, duration, area of impact actions to be taken can be clearly defined. Forest fire alerts are being explored in CAP. He further suggested that more such workshops should be organized to raise awareness especially during hot and dry season. He

urged to involve local communities in forest fire management.

He also stressed upon the need to bring parity to frontline staff of forest department with police department officials. He categorically mentioned that Forest officers and staff are actually the VAN DEVTA, as they protect the forests. However in current context, a need is being felt for improved local coordination between forest officers and district administration. He urged that MHA and States should come forward to acknowledge the efforts of these forest officers & staff, and the adequate resources should be provided to them, for efficient forest fire management.

He further suggested that we need to identify and address our own gaps, which can be helpful to minimize the human induced fires in the forest. He also emphasized the importance of community support, their participation and overall coordination at local level.

At the end, he wished success to the workshop and expected that the workshop will increase the knowledge and capabilities of all the stakeholders present and help in increasing awareness about forest fires in the country.

Vote of Thanks



Dr. Suneesh Buxy, IFS

IG (Forest), MoEF&CC

At the end of the inaugural session, Dr. Suneesh Buxy, IG (Forest) MoEF&CC presented a vote of thanks to all the dignitaries, heads of participating organizations, PCCFs of the eleven participating states and other participants.

He mentioned that NDMA and MoEF&CC will jointly make this workshop successful, with the participation of all concerned stakeholders present here. He further emphasized that this workshop will prove to be a major milestone in context of forest fire management and overall preparedness.

He assured that best possible efforts will be made to make forest fire management a successful program in the country and this workshop will help in development of policy for controlling forest fires in the country.

Technical Session - I

Forest Fire in India

Scenario, Early Warning, Management & Best practices



***Chair: Dr. K. S. Vatsa, Member, NDMA
Co-Chair: Mr. S P Yadav, IFS, ADG (FC) cum Director,
Wildlife Institute of India***

The Chair of the session welcomed all the participants and highlighted broader concerns of forest fire management in India. The months of March and April had been unusually hot this year. Due to the rising temperatures, forest fire incidents have increased across the country. This has been the trend for the last few years. It is a matter of serious concern of the Honorable Prime Minister and Honorable Home Minister. This workshop has been convened to discuss the broad policy and programme. It is important to devise appropriate response at the community/ local level. Parallely, there is also a need of a national level programme to address the issue at hand. A programmatic framework to respond to the increasing incidents of forest fires which are growing in scale is the need of the hour.

Overview of Forest Fire Management: Issues and Challenges in India



Mr. Arun Singh Rawat, IFS

Director General,
ICFRE, Dehradun

Mr. Arun Singh Rawat, DG, ICFRE, mentioned that from the perspective of forestry, controlled forest fires have always been used as a management tool for regeneration, clearance of accumulated debris to reduce the amount of fuel load in forests. Over time, climate change has also been acknowledged as one of the key reasons for increasing forest fire incidents.

The **four stages** of forest fire management are:

- **Prevention:** In the forest manuals, working plans, and guidelines issued by the government following prevention measures are mentioned:
 - Creation and maintenance of forest lines / fire breaks.

- Weed management - It is imperative to remove dried leaves to reduce fuel load, especially in the forests of Uttarakhand and Himachal Pradesh that face severe forest fire incidents every year.
- Silvicultural practices like salvage or removal of thinning, dried or fallen trees.
- Prescribed/ control burning/ Fire risk zonation and resource allocation
- Soil and Moisture Conservation
- Conversion of dry biomass into energy like pine needles to briquettes
- Regular awareness raising and capacity building of local people.

• **Detection:** Some of the detection mechanisms are as follows:

- Forest fire watch towers- density of these are more in the protected areas in comparison with the areas outside the protected areas.
- Early warning system
- Involvement of local people for ground-based detection this depends on the acumen of the local DFOs in involving local people as informers
- Regular patrolling activity which are intensified during fire seasons

• **Suppression:** Some of the suppression mechanisms are as follows:

- In addition to the traditional method such as bush beating, used for dousing forest fires, many SFDs are buying firefighting tools
- Involvement of JFMCs, EDCs, BMCs, WMCs
- Each state has its own best practices of forest fire management and working plans, which are being implemented by the govt. officials.
- Liaising with local people
- Involvement of district administration wherever situation goes out of control.
- Deployment of SDRF/ NDRF in critical situations

• **Post Fire:** -Criteria for damage assessment post fire varies in every state.

- Soil and moisture conservation measure should be taken
- Plantation of native fire-hardy species & broad-leaved species.

Some of the issues and challenges in the four stages of forest fire management are as follows:

• **Prevention**

- Information on fire prone areas (mapping of causes) – It is necessary to get information from multiple credible sources to ensure better resource allocation.
- Database on forest fuel characteristics - It is important to gain information about the places where fuel load is increasing or decreasing.
- National Level database of major forest fires should be prepared to learn from their causes and increase preparedness for the future.
- Community based forest fire management to address the issues of forest fire not only in protected areas but also the buffer areas between the protected areas and villages.
- Coordination between different agencies
- SOPs all the states should be there
- Impact of climate change on forest fire should be researched
- Frequent awareness programmes should be conducted
- Forest fuel modification at strategic points
- Funds should be released on time before the start of forest fire season

• **Detection**

- Time lag in the satellite-based detection
- Digitization of forest infrastructure (RFA boundaries, fire line, watch tower, crew station)
- Ground-based detection (UAV/ drones, watch towers, fire watchers)
- Fire Danger Rating System (FDRS). The existing system can be further refined by adding attributes such

as fuel characteristics

- Knowledge of fire behavior to predict the direction of spread of fire

• **Suppression**

- Hilly terrain is problematic due to topography
- Dry firefighting is generally practiced due to poor availability of water source.
- Additional resources and firefighting tools are needed.
- Trained workforce is needed.
- IRS: Incident Response System

• **Restoration:**

- Uniform format for Damage assessment should be made
- Implementation of post fire restoration and rehabilitation programme should be carried out
- Provision of plantation schemes should be made
- Research is needed to study the long-term impact of forest fires.
- Site specific silvicultural operations should be done.

In **National Action Plan on Forest Fires** (NAPFF) 2018, ICFRE has been directed to perform the following roles:

1. Standardize protocols for estimating losses due to forest fires
2. Development of (a) Firefighting equipment, tools (b) Protective clothing
3. Assist in designing/ organizing training programmes

Further, ICFRE is doing a project titled 'documentation of traditional forest fire management practices' with NDMA. It is also developing a National Collaborative Scheme on Forest Fire Management (NCSFFM) with FRI, DFE, and FSI. This scheme has been submitted to the MoEF&CC for sanction.

Monitoring & Forecasting Climatic and Weather Conditions causing Forest fire and its further behavior



Mr. Rajendra K. Jenamani

National Weather Forecasting Center(NWFC)
IMD, New Delhi

Mr. R. K. Jenamani, Scientist, IMD, Delhi talked about the assistance IMD can provide regarding climatic and weather conditions that cause forest fires. Several forest fire prone countries such as Canada, and Australia have applied meteorology and climatology in their forest fire management. The climatic and weather information that is available is yet to be integrated with the vulnerability and other conditions that lead to forest fires. The GIS-based weather and climatic guidance systems can be used to determine the risks and vulnerabilities to monitor and determine the potential occurrence area.

Role of Weather and Climate on forest fire are

as follows:

- Besides the types of vegetation, topography, anthropogenic activities, and ignition sources, weather and climatic conditions prevailing in the area plays an important role.
- These have a profound influence on forest fire ignition potential, fire potential, and fire severity.
- Meteorological parameters like temperature, relative humidity, precipitation, wind velocity, and solar radiation of those particular month play a major role.
- Large-scale and regional atmospheric pattern also affect the local weather and climate.

Forest Fire Indices: In several countries, extreme weather is typically evaluated using fire weather indices that incorporate daily weather variables related to fuel moisture and fire behavior. One of these can be adopted for the Indian context. The Canadian Fire Weather Index System (CFWIS) is highly useful. There are three indices: Fire Weather Index (FWI), Initial Spread Index (ISI), Vapor Pressure Index (VPD)

Role of IMD: IMD has a large dataset with may stations and district-wise grid data. All the basic data like maximum temperature, wind velocity, relative humidity, and solar radiation are also available. Additionally, forecast at daily to weekly and monthly and seasonal time scale – at station, district based to regional scale of temperatures, rainfall etc. are available for guidance to identify areas of forest fire vulnerability in real time.

Mr. Jenamani informed that IMD collects only MODIS satellite data of forest fire. The main issues and challenges for forest fire warning system lies with non-availability of data regarding forest cover and types of forest. Additionally, the past forest fire data is also required from the states.

Fire Alerts and Early Warning: Present Practices and Future Challenges



Mr. Anoop Singh, IFS

Director General,
Forest Survey of India (FSI), Dehradun

As per forest fire detections by SNPP-VIIRS sensor during fire season (01st Nov 2021 to 30th April 2022), where in real time monitoring is done and including sending of SMSs, the distribution of forest fires is the same as every year. There are more fires in Maharashtra as compared to Karnataka as a result of difference in forest fire management practices and more rainfall in the State of Karnataka. Similarly, last year, Uttarakhand had a greater number of fires compared to Himachal Pradesh due to difference in forest fire management practices.

According to ICFR 2021, 35.46% forests in India are prone to fires. The key requirements for forest fire management and planning include identification of stakeholders, classification of areas as per Forest Fire

Risk Zonation, location planning, identifying causes of fire, involving/motivating communities and application of science and training in fire control.

Forest fire risk zonation is done by FSI to identify the causes of these fires. For instance, during the Chaitra festival in Odisha, a sudden spurt in forest fires is noted at the time. That is why it is very important to include community in forest fire management.

For example, 48000 users have registered in Himachal Pradesh. Older forest fire incidences are also available on the portal. FSI Van Agni Geo-portal is also used along with identification of fire prone forest areas – using historical data. The portal has multiple layers which can be switched on and off by the users. A fire weather index is also maintained. Some issues might be as follows: -

- Centroid of the pixel is notified while fire could be on one corner. This is a technological limitation.
- Number of forest officers are not changed in the system despite their transfers.

There are 3 categories of fires – large, medium and small. State wise data is also available to analyse how much time was taken to douse large fires. For example, in Karnataka, 84% of fires were doused within 24 hours.

Following case studies were also presented:

- Sariska Tiger Reserve, 700 hectares of area got burnt.
- Haridwar, Uttarakhand, where it was highlighted that if a fire is observed within 500 miles and 72 hours, then it is the same forest fire.
- Northeast States, fires are caused due to shifting cultivation practices.

Forest Fire Management in Protected Areas



Dr. S. P. Yadav, IFS

ADG (Forest Conservation) & Director, Wildlife Institute of India

There are large number of protected areas in the country under the Wildlife Protection Act. Since they are remotely located and sparsely populated, controlling forest fires in protected areas is difficult. Some salient features also include:

- Poor staffing. 40-50% vacancies are unfulfilled in protected areas. Low paying jobs and most people are employed on contract basis currently.
- Lack of budgetary resources.
- Application of new technologies such as cloud seeding is needed especially for controlling forest fires in hillocks.

- Villagers also set fires in forests for various reasons. Some of them being human-wildlife conflicts or revenge fires, encroachment etc.
- Controlled burning - fire is also used as a tool for management of forest fires in protected areas. It is utilized for shaping the ecosystem such as grassland management, meadow management, eradication of invasive species, weed management etc.
- There are three types of forest fires – namely Ground, Surface and Crown, out of which Crown fire is not there in India. It is observed in California, Brazil, Australia etc.
- There are large areas of dry deciduous tropical forests in the country. These are characterised by leaf shedding in summer which generates fuel for forest fire.
- Funding support is provided to tiger reserves and other protected areas under various schemes.
- Fire Audit Protocol has been recently developed to ensure that all precautionary measures have been taken care of in tiger reserves and protected areas, through various frameworks and respective indicators which have been mentioned in this protocol. It will be piloted in six tiger reserves.
- Based on these criteria, there will be an independent assessment in each tiger reserve in the month of January. The report generated shall be analyzed for taking remedial actions, if any required.
- In the protocol, audit will also rank the tiger reserves or protected areas based on which the Government of India will issue directions.
- So far, forest fire is not a notified disaster and it must be included in Sec 2(d) of the Disaster Management Act, 2005.

Global Best Practices on Forest Fire Management: Possibilities in India



Mr. Piyush Dogra

World Bank, New Delhi

A joint report was created by World Bank and MoEFCC in 2017 & 2018 based on surveys and interactions with States/UTs. Some of the learnings include:

- Forest fires are widely spread yet can be concentrated in distinct regional patterns.
- Most fires are caused due to natural and social factors.
- Negligence is one of the biggest causes of fires. For example, timber, forest produce and production of Mahua.

Assessing the Forest Fire Management Cycle:

Prevention: Lack of fire lines maintenance due to budget constraints. For example, this is a problem in Telangana. One of the best practices include risk prone zonation.

Suppression: Fewer techniques are there. There is a need for additional equipment.

Detection: While FSI is a leading force in this, the system can be improvised and made more robust. For example, Forest Fire Messaging System (2007) was used in Madhya Pradesh which led to reduction in time in extinguishing of the fire.

Post-Fire Management: Some challenges include an institutional disincentive to report which is a big hurdle as it causes underreporting, poor community engagement and inadequate funding and empty vacancies as per CAG. FFPM, CSS and CAMPA unable to mitigate funding gap.

Some international best practices include Early Warning System or EWS and FDRS. These systems, however, need to be developed and modified as per local conditions, otherwise might lead to unsatisfactory results as was the case in Croatia, Indonesia, and Australia.

Some key takeaways include:

- A national FFPM Action Plan.
- Improving staffing capacity and management practices.
- Essential to engage with community.
- Effective utilization of technology such as EWS and FDRS.

CAMPA: Funding Options and Strategies in Forest Fire Management



Mr. Subhash Chandra

IFS, CEO,
CAMPA, MoEF&CC

These funds were started by the order of the Supreme Court of the country. National Authority came into existence to replace Ad-hoc CAMPA in 2018. Provisions are made regarding the utilization of these funds and there is emphasis on public awareness and capacity building. Since, 90% of the funds are allocated to State governments and 10% for the national authority, gradually state support from state funds have reduced. While 80% funds are utilized for new forest improvement, wildlife, and regeneration, 5-20% are used for handling forest fires.

Some issues and recommendations are as follows:

- States to work on integrated annual plan for fund management and reduce their dependency on CAMPA funds.
- A systematic approach to be practiced instead of ad-hoc measures currently in place.
- Timely availability of funds. States should release funds in a timely manner to field functionaries.

Technical Session - II

Strengthening coordination mechanism for forest fire management



Chair: Lt. Gen. (Retd.) Syed Ata Hasnain, Member, NDMA

Co – Chair: Mr. Sanjeev Kumar Jindal, JS (DM), MHA

The Chair of the session welcomed all the participants and introduced the objectives of the session which included response to forest fire. He mentioned that due to numerous aspects in disaster response and involvement of multiple stakeholders, it is only progressively with experience that lessons about sequencing, SOPs, and thresholds at which different actions are to be taken can be learnt.

The Co-chair of the session mentioned that in the recent major forest fire incidents at Sariska Tiger Reserve, Rajasthan and Dzukou Valley in Manipur-Nagaland border, excellent response was received from IAF and NDRF. He stated that in the first technical session importance of prevention of forest fire through coordination was highlighted. The same coordination needs to be escalated to the response level. This will enable in determining, in advance, the forest fire hotspots and accordingly early warning systems can be populated to the entire community from the district level to the national level to provide effective response.

Capacity and Training Constraints in responding to Forest Fire



Mr. Atul Karwal, IPS

Director General, National Disaster Relief Force (NDRF)

Mr. Atul Karwal, DG, NDRF, presented major findings and recommendations of the Joint Assessment study conducted by MoEF&CC and World Bank in 2018. In addition to the lack of implementation of the National guidelines issued by MoEF&CC on Forest Fire Prevention and Management in 2000, the other major constraints pertain to the lack of community engagement, dedicated funding, public engagement, training, and equipment. Recruitment of required field staff, fire watchers, involvement of volunteers and local community is essential. There is also a need for standardization of functioning of SDMA and SDMPs across all states in India. All these agencies

need to learn from best practices of each other, which is currently lacking.

The main training of NDRF is towards rescuing people, and NDRF has only recently started getting involved in managing forest fire incidents.

A. The key constraints in the Capacity and Training of Other organizations are:

1. Lack of cohesion and coordination among different organizations, implementation of documented policy, clear hierarchy and escalation of response, able-bodied people in the Community, funding in forest fire management, availability of firefighting equipment and protective clothing.

2. Need to train community, SDRFs and other local organizations, design region-, climate-, and terrain-specific training and equipment, regular drills, and rehearsals among the stakeholders, involve community for early warning system.

B. The key constraints in the Capacity and Training of NDRF are:

1. NDRF is specialized force in limited numbers. As the main forte of NDRF is in rescuing people during or after a disaster incident, there is a lack of adequate training and equipment in combating forest fire.

2. A dedicated forest fire team can be developed in NDRF, as overburdening the existing personnel with multiple responsibilities could lead to lack of focus and could also affect the training period of NDRF.

3. Clarity of role and threshold level for deployment is required. The concept of simultaneous response can also be explored.

The formation of an Expert Committee on Forest Fire which may comprise representatives from all relevant institutions such as NDMA, NDRF, MoEF&CC, FSI, IMD, FRI, Fire Services etc was proposed. The proposed role for NDRF included:

1. Instead of routine reinforcement/ pre-emptive deployment, NDRF should only be employed for specialized action e.g., aerial support and specialized equipment.
2. SOPs should be formulated clearly delineating roles and responsibilities of NDRF and other agencies in forest fire management.
3. Air nodes can be identified for pre-location of aircrafts during vulnerable season.
4. NDRF can participate in conducting mock exercises, joint training and FAMEx.

The process of preparing NDRF for Forest Fire will include the following activities:

1. Identification of Manpower –
 - a. fully committed for mandated tasks,
 - b. additional workforce requirement,
 - c. Proposed to induct 01 CISF Unit which has firefighting skills.
2. Location of Teams – 18 teams to be placed in most vulnerable areas.
3. Training interventions
 - a. Devising training curriculum for individual & collective training
 - b. Exposure through foreign experts and USDA Fire Service
4. Equipment Profile – Basic/ Advanced Tools/ Equipment and Clothing
5. Air Resources – Training of NDRF personnel with IAF in use of Modular Airborne Fire Fighting Systems (MAFFS)



Aligning Fire Services & Civil Defense to Combat Forest Fire



Mr. Taj Hassan

Director General, Fire Services & Civil Defense

Mr. Taj Hassan, DG, Fire Services and Civil Defense introduced the characteristic of Forest Fire and its management. He emphasized the importance of systematic prevention for Forest Fire management which requires huge resources in terms of staff and fire equipment. The various ways in which engagement of State Fire Services to combat Forest Fire may help in are - clearing roads and access points, use of trained fire fighters and equipment, handling peripheral hazards of forest fire, involving human safety etc.

The challenges before the State Fire Department in managing the Forest Fire pertain to the following:

1. Managing Forest Fire is currently not mandated as per the Fire Acts and Regulations
2. The priority of State Fire Department is managing city/ village fire incidents, which involves saving human life and property.
3. The State Fire Department may not be able to commit for extending help in combating forest fire, as during summer season, incidents of fire in cities/ villages also increase manifold.
4. Poor Strength, inadequate equipment, and insufficient training in handling Forest Fire.

For engaging Civil Defense - a volunteer force engaged in disaster management, to combat forest fires, the Forest Department may involve them in – awareness campaign on fire safety, fire prevention plan in 'off-fire season, helping evacuation of human beings and animals, first aid etc. As combating fire is a high skilled professional work, Civil Defense may require specific training in handling forest fires. Some suggestions regarding involving State Fire Service and Civil Defense are as under:

1. Conducting regular interaction between the Forest Department and Fire Department.
2. Building capacities of both departments through mutual training exercises and mock drills.
3. Increasing community participation through State Fire Department, and Civil Defense.
4. Keeping Fire department staff in various fire safety committees and audits of the Forest Department.
5. Creating awareness campaign through Fire Departments and Civil Defense.

Training on Forest Fire in Academies & Institutions



Mr. Bharat Jyoti, IFS

Director,
IGNFA, Dehradun

Mr. Bharat Jyoti, IFS, Director, IGNFA presented the extent, nature, and intensity of Forest Fire in India, wherein, primarily ten states, comprising of twenty districts have been affected by forest fire for years. Forest fires are regarded as disaster incidents and as a long-term adverse phenomenon. It was recommended that the capacity building and training frameworks have to incorporate both these perspectives.

Section 7.1 of National Action Plan on Forest Fire, issued by MoEF&CC in 2018 details out the requirement for training for field staff, firewatchers, and community fighters. The measures mentioned in NAPFF pertaining to the prevention, mitigation, and containment of forest fire incidences require practice-oriented training inputs

and delivery. These are as follows:

1. Adequate competent, trained, and equipped workforce on ground, ready to respond and take immediate action.
2. Training to field officers, seasonal firewatchers, and community volunteers involved in firefighting.
3. Training provided to firefighters tailored according to the landscape, nature of terrain, their level of responsibility and role in the command structure in responding to fires.
4. Other agencies involved in fire response: NDMA, NDRF, and the SDMA may be involved in a consultative role.
5. Mock drills before fire season at various fire prone areas involving all the stakeholders for identification of gaps in the existing mechanism and better preparedness during crisis time.
6. Provision of training beyond state-managed forests to community institutions in regions such as the North-east Indian States, where communities manage most of the forest estate.

In development of a modern training curriculum by the SFDs, it is essential to standardize the curriculum in content and course/ module design. Customization is also needed for the SFDs based on the nature, extent and intensity of forest fire, landscape, and vegetation characteristics for different types of stakeholders such as different tiers of different cadres, community, State stakeholder agencies/ organizations etc. The following table lists down the institute's/ academy's training responsibilities, participants, and training inputs.

S. No.	Academy/ Institutions	Participants	Training Inputs
1	Central level Training Academy -IGNFA, CASFOS Dehradun, Coimbatore & Burnihat	IFS and SFS officers	<ul style="list-style-type: none"> • Theoretical and field inputs on Forest Fire including prevention, detection, and suppression related activities, • Forest fire as management tool
2	State level Training Institutes – SFTIs	RFO, Foresters, Forest Guard	
3	Training Institutions (MoEF&CC) - FSI, ICFRE institutions,	FSI <ul style="list-style-type: none"> • State Nodal Officers for forest fire / IFS/SFS Officers • Webinars: Technology solutions for Remote sensing-based Forest fire monitoring (Senior Forest Officers at MoEF&CC and SFDs) • Customized trainings for SFD personnel (officers, staff & community firewatchers/volunteers) • Both online and offline trainings 	<ul style="list-style-type: none"> • Specialized Training: Use of pre fire & Near Real Time alerts, large forest fire alerts, Forest danger rating etc • Community members are registered with FSI forest fire alert service and making use of the alerts
		ICFRE Institutions <ul style="list-style-type: none"> • Training for IFS Officers • Armed forces • NDRF • Ex-servicemen 	<ul style="list-style-type: none"> • Modern firefighting equipment, • Eco-restoration of fire degraded/damaged landscapes and Invasive species etc.
4	Other Training Institutions <ul style="list-style-type: none"> • National Fire Service College (NFSC), Nagpur • National Institute of Fire and Safety Engineering (NIFSE), Gwalior • National Institute of Fire Engineering & Safety Management (NIFESM), Chandigarh • Central Building Research Institute (CBRI), Roorkee • Private institutions 		<ul style="list-style-type: none"> • BE Fire Engineering • 6 months to 1yr certificate and Diploma courses

The current intra-department training curriculum consists of the following:

1. Central and State Academies/ SFTIs

- Theoretical aspects as component of basic systematic training of recruits to IFS, SFS, RFO and subordinate cadres.
 - The ecological aspects and as ecosystem management tool.
 - Operational measures: Prevention, detection, fire suppression etc.
- Basic practical aspects of forest fire control through field demonstrations.

2. Forest Survey of India (FSI), Dehradun

Technology solutions:

- Remote sensing-based forest fire alerts system and Pre-fire alerts
- Large forest fire monitoring
- Forest danger rating system
- VanAgni geoportal
- Subscription based services for forest department personnel and community members for receiving forest fire alerts for quick response
- Technical inputs on above aspects are provided to forest officers, field staff and community members involved as firewatchers/fighters and volunteers through customized online and offline trainings.

3. Forest Research Institute (FRI), Dehradun

- Information about modern fire fighting tools
- Eco-restoration etc. and invasive species in fire-prone, fire ravaged tracts

4. State Forest Departments (SFDs): State specific training curriculum developed for different levels by SFDs. E.g., Tamil Nadu SFD has finalized its training curriculum in 2021.

The gaps and deficits in training and training curriculum are as follows:

1. Updating of Forest Fire related training courses and modules for different cadres of SFDs
2. Lack of institutionalized training at the level of seasonal firewatchers or community volunteers on basic fire suppression strategies.
3. Lack of training among NDRF/ SDRF/ Police/ Fire fighters to handle forest fires.
4. Lack of exposure to international fire fighting standards.

The proposed recommendations to address the above-mentioned gaps and deficits in training and training curriculum are as follows:

1. Institutionalized trainings with different modules catering to different levels of personnel based on specific requirements.
2. Updating of training modules by involving expert agencies that are working on forest fire related issues.
3. A module about 'Forest Fire Management Operational and Planning' to be included in the on-job-training of IFS, SFS, and RFOs in state cadres.
4. SFTIs to undertake or scale-up training of Local organizations, volunteer groups and seasonal fire fighters and other stakeholders.
5. Training of Trainers – By IGNFA, FRI, CASFOS, SFTIs
6. Adaptive revival of traditional knowledge system of forest fire mitigation and containment – NDMA project for compilation of traditional knowledge under way by FRI – Outcome to be incorporated in training curriculum.

Further the proposed Scheme Implementation Unit (SIU) under “National Collaborative Scheme on Forest Fire Management” (earlier proposal on Centre of excellence on forest fire, proposal under consideration of ministry) may consolidate and anchor all the above activities. Under this scheme, activities to be undertaken by Directorate of Forest Education, Dehradun primarily includes training of trainers (ToTs) and Capacity Building of all stakeholders, which are to be organized in consultation with SFDs.

Training needs Analysis on Forest Fires



Mr. R. S. Choudhary, Director, NFSC, Nagpur, presented the need for conducting Training Needs Analysis (TNA for Forest Fire Management. Training Needs Analysis provides information on the training and skill development of all the responders. It further enables to identify - gap between current and required levels of Knowledge, Skills, and Abilities (KSA) and the content of general training. It forms foundation of a training plan and ensures that relevant and appropriate training is delivered.

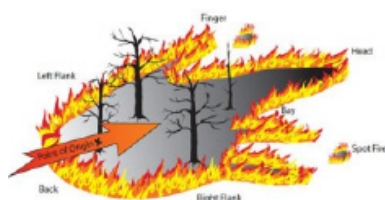
The training for providing knowledge and skills about Forest Fire can be carried out for varied target groups, such as, young people, teachers, officials working in the forest department, elected officials of local communities, personnel working in fire prevention and suppression, volunteers (NGOs) etc. Currently there is a need of having a structured training program for forest fire management. To achieve desired outcomes, well developed training resources/ facilities, training modules for different level of functionaries and application of modern simulation technology in learning process is required.

Mr. R. S. Choudhary

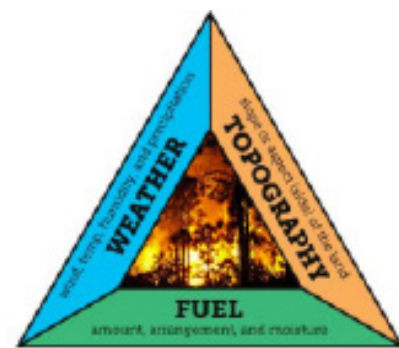
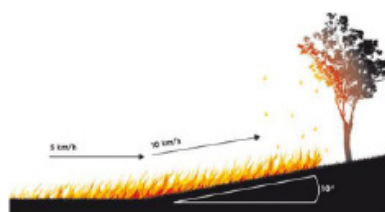
Director,
National Fire Service College, Nagpur



Topic: Handcrew Operations



Topic: Tactics & Strategy



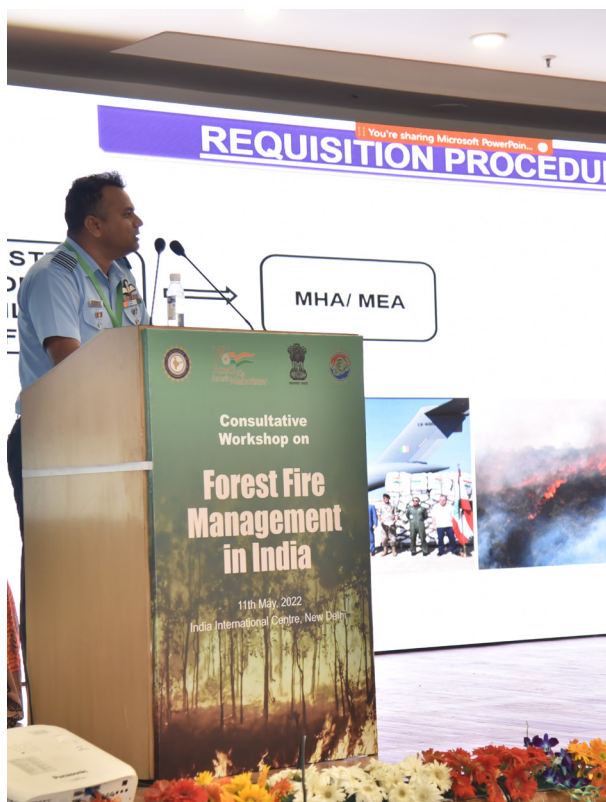
Fire Behavior Triangle



Topic: Forest Fire Behavior

S. No.	Topic	Objectives
1	Forest Fire Behavior	Information about – How Forest fire spreads, types of forest fuels and their characteristics, effect of topography on fire, influence of weather factors on fire, extreme fire behavior watch outs etc.
2	Safety on Forest Fires	Procedure to use PPE and Fire Shelter correctly, response when trapped in a building, forest fire behavior watch outs, safety procedure when working around snags, safety precautions for working near a bulldozer/ aircraft, LECS, 'Fire Orders and 18 situations that shout 'Watch Out', additional Forest Fire hazards.
3	Water Supplies	Water sources for use at a forest fire, different types of water sources, different equipments used to supply water.
4	Tactics and Strategy	Difference between tactics and strategy, size-up process, factors to be evaluated upon arrival at the fire, operational plan of action, establishing initial fire ground operation by fire officer
5	Fire Tender Crew Operations	Procedure to use a forest fire tender effectively, types of fire attack methods, different types of hose lays, procedure for use of mobile pump fire fighting.
6	Hand Crew Operations	Types of hand crews, different hand tools and methods of attack a hand crew uses, rules for working around inmate crews, procedure for use of various hand tools.
7	Backfire/ Burnout Basics	Backfire and burnout definition and difference, steps to be taken before undertaking a firing operation, tools to be used in firing operations, three different ignition techniques used in firing operations.
8	Bulldozers and Tractor Plows	Types of bulldozers, types of control systems and blades used on a bulldozer, demonstrate use of bulldozer, tractor plow and demonstration of its use.
9	Class A Foam and Fire-Blocking Gels	Class A Foam and its working principles, foam generation techniques, difference between CAFS and low-energy Foam systems, types of FB/ nozzles used to apply Class A foam, fire blocking gel and its tactical applications.
10	Use of GPS and Maps	GPS and its limitations, GPS reference lines on a GSI topographic map, GSI map reading demonstration, latitude and longitude, coordinate rules to find own position on map.
11	Firefighting Aircraft	Types of aircraft used in forest fire, difference between fixed-wing aircraft types, capabilities of air tankers, different coverage levels used by fixed-wing aircraft, capabilities and different tactics used by helicopters,
12	The Incident Response System (IRS)	Importance of IRS, five major functional units in the IRS, IRS forms used, demonstration of application of IRS in simulated fire situation

Forest Fire Response Mechanism by Indian Air Force: Issues & Challenges



Mr. Praveen Kumar

Wing Commander,
Indian Air Force

Mr. Praveen Kumar, Wing Commander, IAF, explained about the Forest Fire in Indian context and the role the Indian Air Force have played over the years in combating Forest Fire. He presented the requisition procedure, command, and control structure of IAF in responding to forest fire, and role of IAF in firefighting which includes casualty evacuation, search and rescue of victims, on-site fire control, provide communication aid and establishing enclosing lanes in addition to conducting aerial reconnaissance, preventing evolution, and extinguishing fire.

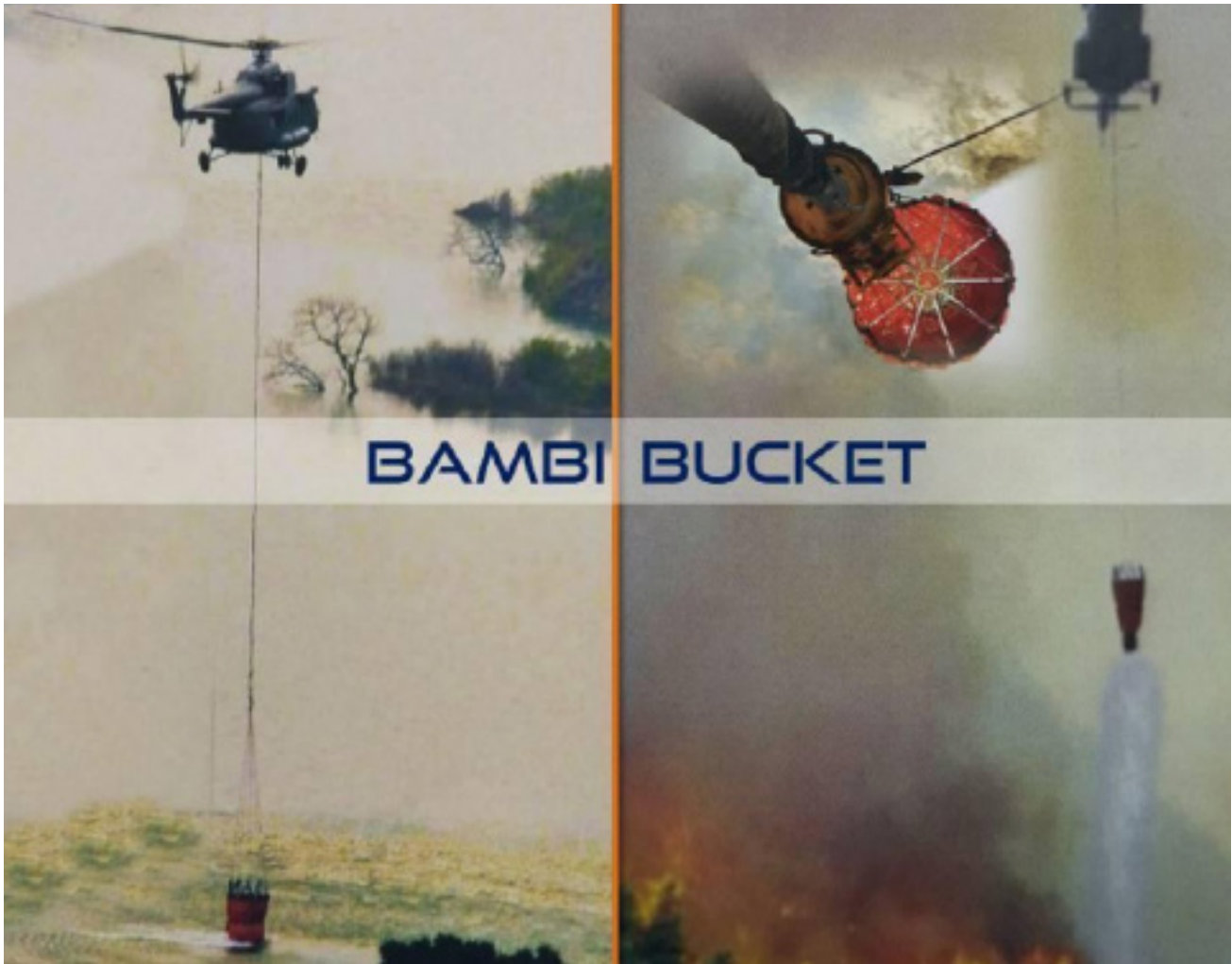
The assets used in managing Forest Fire by



IAF are Mi-17V5 helicopters and Bambi bucket of 3.5-ton capacity. There are two methods of firefighting operation namely, active – attack fire with water, and passive – create an enclosing lane.

Several challenges to firefighting flight comprise of complex final stage of flight, turbulent and strong winds, and high temperature – more than 70 degrees Celsius, smoke, and low visibility, low speed flight, crew fatigue etc.

The factors affecting effectiveness of aerial firefighting operations are pre-history of flight, altitude and speed, turbulence, spatial position, liquid flow rate etc. In experimental analysis, it has been determined that, in an aerial firefighting operation, on average, there is 30% loss of water due to evaporation and 20-30% remains on treetops. The average extinguishing capability is for 5-15 minutes, and there is a consistent water release for 5-6 minutes. This method is most suitable for closed/ localized/ inaccessible terrain.



Through the lessons learnt by past operations it is preferable that there should be water body in proximity, with substantial depth and clear of rocks and other bigger debris. There should be increased flight time and reduced turn around. These operations can be only carried out under VFR flights and cannot be carried out at night, and are not suitable for urban fires. Ground personnel safety is of immense importance while conducting aerial operations. To improve the effectiveness of such operations, it is recommended that drones should conduct aerial reconnaissance, to facilitate accurate fire assessment. There should be provision for turnaround support.

For the safety of the aerial personnel, flight at low speed at minimum safe height is recommended. The aerial operation should be carried out as a joint operation,

and there should be coordinated effort by aerial platform and ground troops.

Further, the Civil Air Arm can also be employed in relief operations. The IAF capability can be enhanced by providing suitable firefighting equipment, fixed wing: roll-in roll-out equipment with retarders (MAFFS) for isolating and combating fire from both air and ground. The IAFs also provide timely output and prompt deployment with optimal planning and has quick response time and is a highly mobile force.



Chattisgarh



Andhra Pradesh



Mizoram



Uttarakhand



Madhya Pradesh



Himachal Pradesh



Assam



Uttar Pradesh



Odisha

Technical Session - III

Understanding needs and challenges of Forest Fire Prone States



Chair: Mr. Kamal Kishore, Member & Secretary-in-Charge, NDMA

Co- Chair: Ms. Uma Devi, IFS, Additional Secretary, MHA

Initial Framework of a “National Forest Fire Management Project”

Dr. Suneesh Buxy, IFS

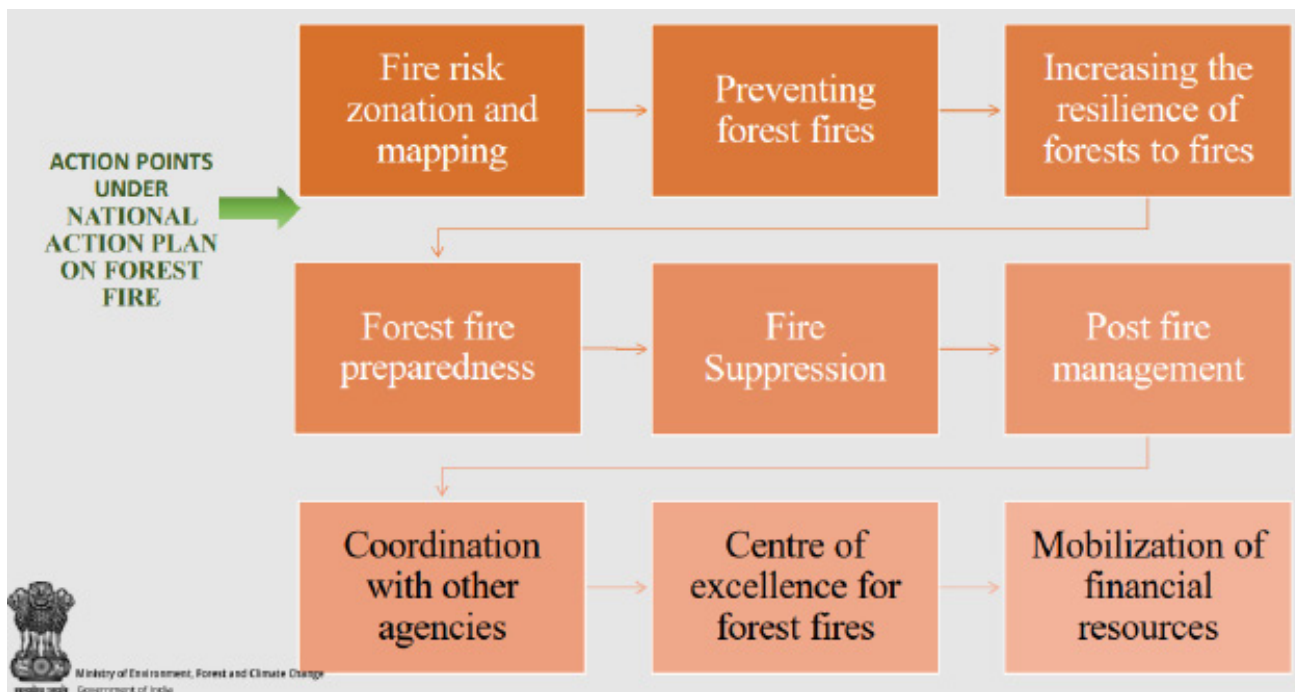
IG (Forest), MoEF&CC

Dr. Suneesh Buxy, IFS, IG (Forest), MoEF&CC presented on Initial Forest Fire Risk Management Framework which included process of planning, preventing, controlling fire and fighting fires to protect people, property, and forest resources. The objective of the framework is to minimize forest fires by informing, enabling, and empowering forest fringe communities and incentivizing them to work in tandem with the State Forest departments. It also intends to substantially reduce the vulnerability of forests across the diverse forest ecosystems in the country against fire hazards. He highlighted the following points:

- Gap analysis needs to be done between Centre and States and discussion is required on major obstruction of fund flow.

- MoEF&CC has constituted **Central Monitoring Committee (CMC)** on forest fire under the Chairmanship of Secretary (EF&CC) to monitor the implementation of the National Action Plan on Forest fire and address all issues arising out of forest fires. Members of this committee include DGF&SS, ADG (FC), ADG (WL), IGF (FPD), CPCB, WII, NDMA, ICFRE, FSI, NRSC and Principal Chief Conservator of Forests of all States and Union Territories.

- **National Action Plan on Forest Fire (NAPFF)** has been developed and various action points mentioned in the plan are as follows:



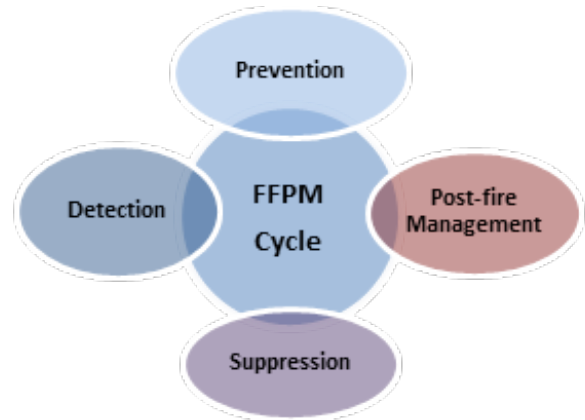
- There is a **Forest Fire Prevention and Management (FFPM) Scheme**, through which MoEF&CC supports the efforts of States/UTs in prevention and control of forest fire by providing financial assistance for various forest fires preven

tion and management measures such as creation and maintenance of fire lines, procurement of firefighting equipment, construction of water harvesting system, engagement of fire watchers, training and pre-fire season workshop, Incentivizing villages/JFMCs for protection

against forest fire and awareness creation.

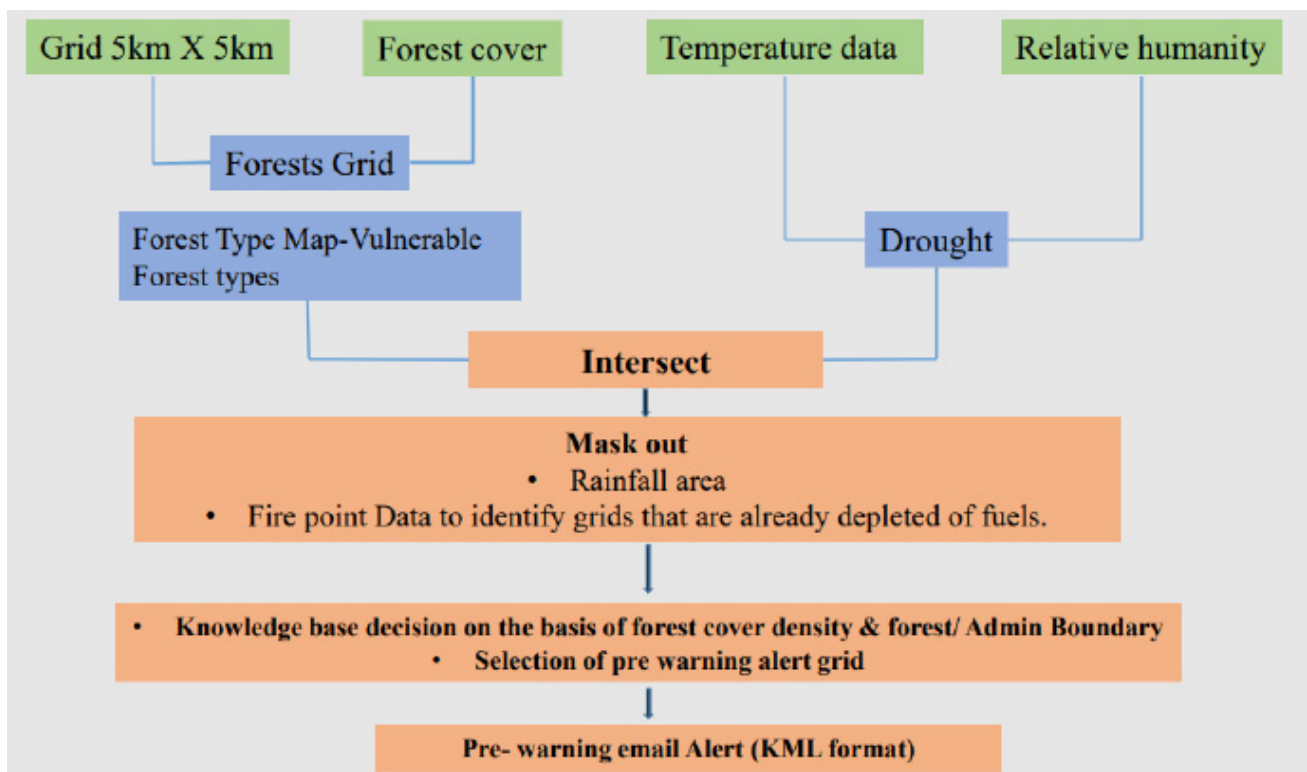
- Under the FFPM scheme, approximately fifty crores are funded every year through CCS schemes, with a 60:40 share between the centre and the states.

- Elements of **FFPM Cycle** are shown on the right:
- In **Forest Fire Monitoring process**, pre-fire alert is given one week in advance based on forest fire danger rating. Near real time forest fire danger monitoring has been done using MODIS and SNPP- VIIRS and the alerts are given to first responders. Monitoring of large forest fire which has affected area more than five square kilometer is also carried out. Process of forest fire monitoring is given below:



- In **Forest Fire Management Process**, he explained the system tools and components of system process.

- **Grid Based Pre- warning Alert System** was explained and the same is illustrated on the following page:



• Dr. Buxy highlighted the need for advancement in firefighting equipments and requested Director of National Fire Service College, Nagpur to develop vehicles to douse fires.

• Various other **Initiatives that are taken by the Ministry** are as follows:

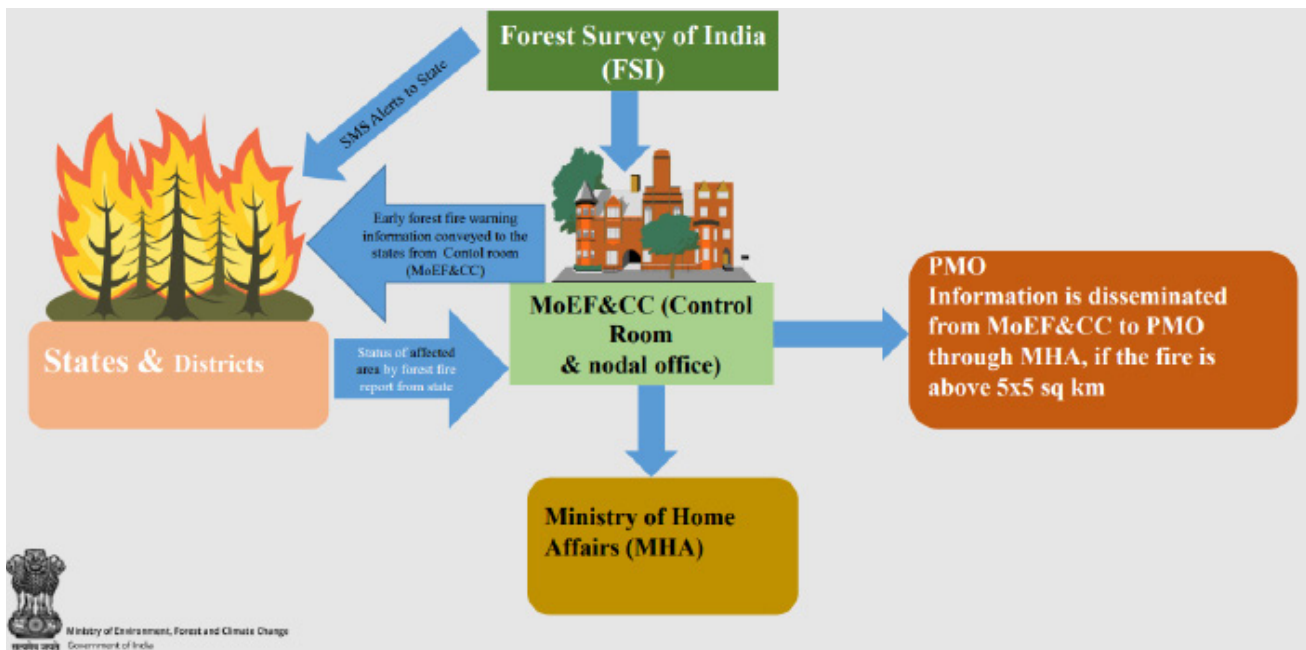
- To collaborate on developing firefighting infrastructures, communication systems, modern firefighting equipment tools
- Development of Drones for surveillance in forest prone areas
- Establishment of water sprinkler towers, watch towers, check dams water reservoirs
- Specialized vehicles for firefighting operations
- Creation, Maintenance, and monitoring of fire lines
- Mapping of Fuel load, control burning
- Capacity Building of Communities
- Convergence with NDMA, MHA, NDRF, SFD and COMMUNITIES

• As per ISFR 2021, total Fire prone forest area is 35.46% (7,13,789.03sq km) of the forest cover. Out of which 22% area is high, very high, and extremely fire prone. North-East and central India is most vulnerable to forest fire. Slash and burn (Jhum Cultivation) is the main reason for forest fire in North-east. Recently Madhya Pradesh, Chhattisgarh and Odisha are also facing high fire prone areas.

• Mechanism of Forest fire information dissemination system in MoEF&CC is given on the opposite page:

• Further, Top twenty-six districts in 11 States have been identified according to number of forest fires detected by FSI using SNPPVIIRS sensors. These districts form the basis for formulation of a national project on how center and states can converge to have well defined SOP with the finding of MoEF&CC and NDMA.

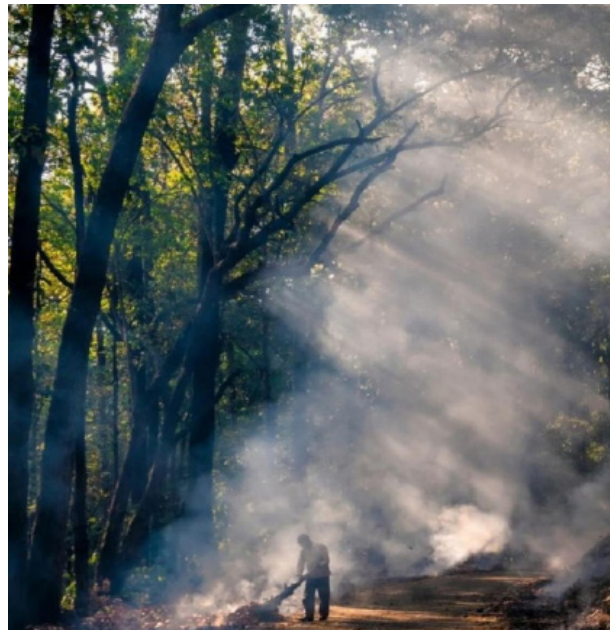
• Consultative workshop will be organized in these eleven States, at district level, where local people, stakeholders and forest officials should come up with ideas based on their ground experience during forest fire incidents.



- DMP of MoEF&CC is being finalized with the help of NIDM and will be released soon.
- Forest fire should be considered as disaster and to be added in NDMA Act.
- He mentioned that in event of large forest fire, an alert is sent to PMO, and MHA responds by providing helicopters to douse fires.
- IAF charges for services provided during the event of forest fire, but the North-East states are concerned about this, so some strategies should be worked out to meet these expenses.

At concluded his session by reminding that,

“Forest fire prevention and management should be rapid, safe & effective.”



Needs and Challenges of Forest Fire by Forest Fire Prone States

S. No.	State	Name & Designation of Presenter	Introduction	Challenges	Needs
1	Chhattisgarh	Raju Agasimani, IFS, CCF Kanker, Forest Department	<ol style="list-style-type: none"> 1. Geographical Area-wise 10th largest and forest cover-wise 3rd largest state of country. 2. 80% of the villages lie within 5 Km of Forest Area. 3. 40-45% area is highly forest fire prone as per 5 km Grid Forest Fire Prone Zone map. 4. 6015 officers/ staff have been registered on FSI Alert System and regular updates from FSI have been used effectively. 5. State Monitoring Committee (SMC) has been constituted and State Action Plan and Crisis Management Plan on Forest Fire have been prepared & sent to MoEF&CC. 6. Highlighted the issues which are aggravating the fires in the states 	<ol style="list-style-type: none"> 1. LWE areas including restricted movements and unsurveyed areas • Bijapur/Dantewada/Sukma/Narayanpur/Kanker/Kondagaon in Bastar region is affected by activities of LWE • Abujhmas Area consisting of Narayanpur, Dantewada are unsurveyed area and home to many Tribes. Have Inaccessible, difficult Terrain, Poor Road network and follow Shifting Cultivation. 2. Burning of surveyed forest area is associated with the period of Mahua Collection and Tendupatta pruning 3. Security Issues 4. FRA and encroachments 5. Manpower shortage: 24% of the positions of Forest Guard/forester/Dy Rangers/Rangers are vacant 6. Dependence of livelihood of the people: <ul style="list-style-type: none"> • 5 Lakh Families collect Mahua Flower during March-April every year • 14 lakh Families are involved in Tendupatta collection 7. Traditional practices like Parad, hunting by burning. 8. Destructive practice of MFP collection, Boda (truffles), Futtu (Mushroom), etc 	<ol style="list-style-type: none"> 1. Recruitment of Front-Line Staff 2. Employing more Fire Watchers 3. Need more Firefighting Equipment and better tools to equip the frontline workers 4. Need more vehicles and equipment 5. Requirement of funds 6. More fire lines to be maintained all along compartment boundaries not only RF/PF boundaries.

S. No.	State	Name & Designation of Presenter	Introduction	Challenges	Needs
2	Telangana	Telangana State Forest Department	<p>1. State has effective in-house GIS Cell to manage Forest Fire. He provided brief about three projects namely:</p> <p>Project- I: Fire Risk Zonation Areas- 2021 Approx. 35-40% of the total area lies in High to very high fire category. These areas have high slopes with dry deciduous forests. Maps showing the vulnerable areas is given to Range officer for management of fire.</p> <p>Project- II: Fire Vulnerability Units 4 Classes are defined as per Fire Pixel Counts (No Fire, Low, Medium, and High). 1061/9790 Compartments, 1192/ 16176 Villages and 1584/ 10633 Roads are vulnerable to high fire. All data published in Forest web Portals for downloading.</p> <p>Project- III: Fire Season (Present)- 2022 (Fire Pixels) During 2022 season, fire occurred in 4,004 of 9,790 Compartments (41%) and in 2,023 of 3,135 Beats (65%). An average 78 Fire Pixel Occurrences per Day. Average Burnt area per pixel in 2022 Fire season is 0.99 Ha. Last Fire Season-2021 is 1.13 Ha</p> <p>2. Fire encroachment maps for various divisions and districts in the 2021-2022 season were presented.</p> <p>3. Explained the State activities taken up by the States for Prevention, Detection, Suppression, Post-Fire Management of Forest Fire.</p> <p>4. Various training and capacity building activities done by the states.</p>	<p>1. The causes of the forest fires can be classified as</p> <ul style="list-style-type: none"> • Natural. • Intentional/deliberate. • Unintentional/accidental. <p>2. Highlighted various Challenges:</p> <ol style="list-style-type: none"> i. Crop residue burning. ii. Encroachment (Settlements) led to more area prone to forest fire. iii. Local rituals iv. NTFP Collection. v. Highlighted the resource crunch. vi. Shortage of workforce i.e., field officer vii. More fires in the month of March due to Tendupatta Collection. 	<ol style="list-style-type: none"> 1. Recruitment of Field Staff 2. Requirement of funds 3. Requirement of modern Firefighting Equipment

S. No.	State	Name & Designation of Presenter	Introduction	Challenges	Needs
3	Maharashtra	Maharashtra State Forest Department	<p>1. East of Maharashtra is densely forested and prone to major forest fires.</p> <p>2. State has Fire Cell, which is well equipped with basic infrastructures like, wireless network, Mobile phones, Computers with broadband network which works for 24 X 7 during fire season.</p> <p>3. State has Toll Free No 1926, “Hello Forest” to involve community and report regarding forest fire, encroachment, etc. District officers need to close the case in 2 days.</p> <p>4. All Field Officers are registered at NASA FIRMS and FSI fire monitoring sites for fire alerts. Field officers send data to Fire cell, where GIS team analyse the data and create forest fire map which shows exact location of fire in relation to forest administrative boundaries. Then this map is circulated to field staff on a WhatsApp group for combating forest fire.</p> <p>5. ANGAR MUKTT ABHIYAN is an awareness campaign that conducts competitive programmes in fringe villages adjacent to forest areas to sensitise local villagers about forest fires</p>	<p>1. Highlighted various reasons for forest fires:</p> <ul style="list-style-type: none"> i. Tendu leaf, Mahua flower collection and Gum Collection (Bosweliaserrata) ii. Fire spread from agriculture waste burning next to forest boundaries iii. Illegal cattle grazing iv. Retaliation against lawful activities of forest department v. Negligence and human error <p>2. Highlighted the lack in awareness programmes due to poor coordination and fund availability.</p> <p>3. Heavy winds on high hills leads to quick spreading of fire and tough to douse.</p> <p>4. Providing logistical support and communication with staff</p> <p>5. Ensuring the safety of forest staff and fire watchers</p> <p>6. Hilly terrain, mostly Teak bearing forests (Deciduous forests), serpentine roads and inter-spurring rivers makes forest protection an extraordinary challenge.</p> <p>7. The exact location of forest fire from watch towers cannot be assessed.</p> <p>8. Even if location is guessed, it is tedious to choose a road to reach the location.</p>	<p>1. Manpower Recruitment</p> <p>2. Timely availability of funds</p>

S. No.	State	Name & Designation of Presenter	Introduction	Challenges	Needs
4	Andhra Pradesh	Andhra Pradesh State Forest Department	<ol style="list-style-type: none"> The state has a forest area of 23% and a forest cover of 17.88% of its geographical area. The most affected areas in the state by forest fires are Kurnool (Srisaillam), Tirupati, and Visakhapatnam and forest fire incidences are more in the months of February, March, and April. State Monitoring Committee (SMC) is constituted & includes NGOs/SDMA (State disaster Management Authority), PR&RD department along with Forest Dept. Involvement of Village & Ward Secretariat staff (15004 no.) for awareness creation. Fire Risk Zonation Maps were prepared based on the number of fire occurrences from the year 2012 to 2022 by the IT wing of APFD. Enhanced user registration in FSI Fire alert system (2301 no. – from beat level to State level). 24 X 7 State level Forest Fire Monitoring Cell is being operated at State Headquarters/DFO/FRO level. MIS module is developed in-house to know the daily status of the forest fire alerts attended, no of people deployed, extent of area affected, time taken by staff to put off the fire etc. Nominated one Forest Section Officer for each 1 sq.km beat area for 100 top 1 sq.km most vulnerable forest areas to monitor occurrence of forest fires and to control the fires as identified by the Geomatic Cell. Preparation of Comprehensive State Forest Fire Action Plan is under progress. 	<ol style="list-style-type: none"> Filling up of the vacancies of the frontline staff. Reaching time to the forest fire spots is large. Strengthening of internal forest roads. Suppression of fire. Minimal infrastructural support during fire season in vulnerable areas. Enhancing Communication. Involvement of Communities who are residing inside/outside. Water sources. Increase in Forest fires during festivals. Southern Andhra Pradesh has Red Sand Wood, smugglers attempt forest fire for distraction. 	<ol style="list-style-type: none"> A standard Operating Procedure. Modern Fire extinguishing equipment. Fire fighter safety kit. Mobile Squads in fire season. Infrastructural Support near vulnerable areas during fire season. Mock drill training/capacity building. Co-operation from line departments viz., SDF, Fire departments. Assured Budgetary Support. Surveillance network.

S. No.	State	Name & Designation of Presenter	Introduction	Challenges	Needs
5	Mizoram	Mizoram State Forest Department	<p>1. State has Forest Area of 84.53% of its Geographical Area which is highest in India and forest of Mizoram are mainly dominated by Bamboo Brakes.</p> <p>2. At the state level, various arrangements have been made, such as a fire alert system, fire lines construction, guard, involvement of local people and NGO, various awareness programmes, institutional arrangements at the state/district/village level, and the organisation of Fire Prevention Week (7-12 Feb 2022).</p>	<ol style="list-style-type: none"> 1. Jhum Burning is the major issue. There is a need for technology to manage weeds, but it has financial implications. 2. Hunting of Wild Animals 3. Requirement of new edible Bamboo Shoots led to forest fire 4. Increase in Forest fires during festivals. 5. Carelessness of people 6. Despite various arrangements in remote areas, the department faces communication challenges. 7. The southern region has steep slopes where fires spread faster and require more effort to extinguish. Therefore, there is a need for a strategy to control such fires. 	<ol style="list-style-type: none"> 1. Effective Communication and Monitoring 2. Equipping the Fire Fighters 3. Training / Capacity Building 4. Adequate Manpower 5. Awareness 6. Forest Floor Biomass & Weed management 7. Fire Watchers and Community Fire Fighters 8. Digitisation of the Critical Resources 9. Adequate Infrastructure 10. Trained Manpower (SDRF/ AAPDA Mitra) 11. Coordination with other agency/ institution 12. Strengthening of legal tools 13. Post Fire Management and restoration 14. Mobilisation of financial resources

S. No.	State	Name & Designation of Presenter	Introduction	Challenges	Needs
6	Uttarakhand	Uttarakhand State Forest Department	<ol style="list-style-type: none"> 1. State has total recorded Forest Area is more than 71% of the geographical area having 45.44% of the geographical area as forest cover. 2. Most fire sensitive districts are Almora and Pauri, which have the highest number of incidents and most affected area. 3. Most of Forest are part of human dominated landscapes. 4. 18-20% of the forest is at risk of medium to high fire. 5. Fire sensitive zone map has been developed based on 10-year history. 6. State has an online application for the Forest Fire Management System, which has two modules: one for reporting based on divisions and the other for FSI fire alerts. 7. In collaboration with the IIRS Institute, the State has developed technological tools to generate Automated Forest Fire Risk Advisory, a mobile app for reporting forest fires, and method to estimate of forest fire burnt area. 8. To facilitate fire alerts, data analysis, and monitoring, an in-house centre of excellence is proposed. MoUs have been signed with FSI, FRI, IIRS, and other organisations. 9. Incident Response Team is in place in State. 	<ol style="list-style-type: none"> 1. The state experiences peaks in forest fires every 2-3 years. Some incidents resulted in the deaths of firefighters. 2. Extent of Chir forest is huge in the State. Chir pine needles are highly inflammable due to its high fuel load. 3. Increase registration in the FSI fire alert system and reach out to local government. 4. Insufficient Protective gears 	<ol style="list-style-type: none"> 1. Budget Support and availability at the right time. 2. Standardisation of Fire Fighting equipment. 3. Strengthening community organisations, particularly the Chir growing community 4. Reward Mechanism for Districts to prevent forest fires. 5. The development of a moisture regime, i.e., the construction of ponds to fight fires.

S. No.	State	Name & Designation of Presenter	Introduction	Challenges	Needs
7	Madhya Pradesh	Madhya Pradesh State Forest Department	<ol style="list-style-type: none"> 1. State has total Forest Area of 25.14% of its geographical area. Out of this 65.36% is reserved forest, 32.84% is protected forest and 1.80% is other forest. 2. This year, 61548 forest fire alerts have been recorded, which equates to approximately 3000 alerts per Division and 9000 alerts per Circle. 3. State has managed to reduce the dousing time from 11-12 hrs to 3-4 hours now. 4. Centralised and decentralised monitoring and dissemination of near-real time fire point data through social media platform. 5. Use of machine learning for advance localisation of forest fires through incorporation of multi-level fuel, topography, moisture, wind speed and other datasets. 	<ol style="list-style-type: none"> 1. Vast area of the state 2. Inaccessible areas 3. Mahua collection: fires ignited to clear ground. Even sudden rise in market rate led to increase in forest fires early in the month. 4. Traditional burning in certain areas 5. Burning of forests for new flush of grasses & tendupatta 6. Burning of forests for encroachment 7. Revenge fires 8. Low community involvement 9. Shortage of equipment 10. Shortage of staff 11. Low allotment of budget 12. Unable to implement of working plan/ fire plan provisions due to paucity of resources 13. 15628 forest committee in place but difficult to engage them due to no provision of incentives. 	<ol style="list-style-type: none"> 1. Need budget to procure firefighting equipment. 2. Community involvement through incentivizing them. 3. Adequate Manpower

S. No.	State	Name & Designation of Presenter	Introduction	Challenges	Needs
8	Himachal Pradesh	Himachal Pradesh State Forest Department	<ol style="list-style-type: none"> The state has a forest area of 66.52 % and a forest cover of 27.7 % of its geographical area. Chir forest about 17.8% and dry/ mixed deciduous forests (about 12%) are prone to forest fire. Forest fires have been reported in 26 of the 38 divisions. 339 of the 2026 beats are highly sensitive to forest fires. A fire vulnerability map for the state has been created and made available to field personnel in order to monitor forest fire activity. Patrolling by the Mobile Units in the Sensitive Areas and contact/ helping the Field Staff. Daily reporting of the Fire Incidences to the Control Rooms, CCF (FP & FC), Bilaspur, PCCF, HP, Shimla by the Field Staff through DFOs & CFs. State has developed the methodology for fire damage assessment. 	<ol style="list-style-type: none"> Honey-comb habitation in Fragmented landscape. Heavy biotic pressure. Inaccessible areas, steep slopes- limiting the use of modern firefighting tools. Adequate workforce not available particularly at short notice. Community co-operation near urban areas is missing. Excessive and non-responsive tourism. Organising and managing a team in village is difficult due to small size villages. 	<ol style="list-style-type: none"> Procurement of fire fighting equipment Control burning, fire line creation and maintenance Soil and moisture conservation work in high-risk areas Engagement of fire watchers Awareness campaign Training and capacity building on firefighting methods frontline staff students' youths and village communities Incentivizing village / communities for protection against forest fires, under participatory forest management approach Short term research/ Survey on Forest Fire related issues

S. No.		State	Name & Designation of Presenter	Introduction	Challenges	Needs
9		Assam	Assam State Forest Department	<ol style="list-style-type: none"> The state has forest cover covering 37% of its geographical area. Upper Assam has a high moisture content and thus no forest fires, whereas Lower Assam is dry and prone to forest fires. North Assam is prone to forest fires due to encroachment. The Barak valley region is semi-forested, and it is prone to forest fires as a result of Jhum and encroachment. Hilly districts such as Karbi Anglong, Dima Hasao and others faces forest fire due to Jhum cultivation. 	<ol style="list-style-type: none"> Legal Jhum cultivation practices resulted in burning of debris from February to May. Highlighted the issues of Jhum cultivation in Dima Hasao District: <ul style="list-style-type: none"> Around 95% of forest fire in district is due to Jhum cultivation. Peak fire season typically begins in late February and last around 11 weeks. Insufficient fire-fighting equipment 	<ol style="list-style-type: none"> Jhum rehabilitation is required because livelihood is dependent on it. Permanent cultivation practices should be encouraged rather than shifting cultivation. Regular awareness programmes for local villagers Pre-fire season workshops among Line Departments Training and capacity building to staffs on fire fighting Procurement of firefighting equipment Construction of water storage tanks with pump Controlled burning Fire line creation and maintenance

S. No.	State	Name & Designation of Presenter	Introduction	Challenges	Needs
10	Uttar Pradesh	Uttar Pradesh State Forest Department	<ol style="list-style-type: none"> In 2022, there are 3150 forest fire incidents and 1288 Ha affected area in the state, which is less than in 2021. In 2022, there are 161 forest fire incidents and 78 Ha affected area in Dudhwa Tiger Reserve which is less than in 2021. There are 2380 forest fire incidents and 783 Ha affected area in Vindhya and Bundelkhand. The state uses the GIS platform in fire management to digitise fire lines, mark fire alert points on the GIS platform, analyse fire data, and determine sensitive areas using the DSS system. Explained various management practises used by the state to manage forest fires. Sonbhadra, Mirzapur, Banda, Chitra are recently added to forest fire region. 	<p>1. Causes of forest fire in the State are mostly Anthropogenic.</p> <p>2. Reasons of forest fire in Tarai Region:</p> <ul style="list-style-type: none"> • Presence of excessive leaf litter and combustible biomass • Large human habitation in Vicinity • Immense biotic pressure • Burning of agriculture refuge in adjacent fields • Retaliatory fire • Intentional fire by criminals • Accidental fire • Use of fire by locals for NTFP Collection <p>3. Reasons of forest fire in Vindhya and Bundelkhand Region</p> <ul style="list-style-type: none"> • Excessive temperature for prolonged period • Dry climatic condition • Inaccessibility due to tough terrain • Water scarcity • Excessive presence of people during tendu leaves collection • Retaliatory fire • Intentional fire by criminals • Accidental fire • Use of fire by locals for NTFP Collection <p>4. Nighttime fire suppression in wildlife areas</p>	<ol style="list-style-type: none"> Timely Financial Assistance for deployment of workforce, procurement of fire fighting equipment and maintenance of infrastructure Cooperation from villagers Timely communication and information dissemination Minimising response time Deployment of a team of 10-12 specially trained SDRF personnel during fire season at strategic location Strong campaign for mass awareness Strengthening inter-state/ international co-ordination

S. No.	State	Name & Designation of Presenter	Introduction	Challenges	Needs
11	Odisha	Odisha State Forest Department	<p>1. In 2022, 90.24% forest fire incident are reported compared to 79.39% in 2021 .</p> <p>2. State has forest fire information collection and dissemination system for management.</p> <p>3. Highlighted various awareness programmes, mock drills, community participation awareness meetings and rallies, use of technology for surveillance, use of media for out-reach and others.</p> <p>4. The Forest Fire Free Panchayat scheme began this year. The village forest fire management plan is in place, and the beat village forest fire management plan is being developed.</p>	<p>1. Reasons of forest fire in Similipal Tiger Reserve (STR):</p> <ul style="list-style-type: none"> •Fire is mostly due to anthropogenic factors •Collection of NTFP like Mahua •Eradication of ticks and insects •Facilitate growing of succulent grass/leaves for domestic cattle •Huge number of Buffer and fringe village in and around STR <p>2. Maintenance of fire lines is the biggest challenge.</p>	<p>1. Forest Fire Early Warning System with integration of socio-economic factors such as festivals, Mahua flower</p> <p>2. Post- fire habitat Assessment</p> <p>3. Development SoP which define the role of various line department</p> <p>4. Continued awareness programmes</p> <p>5. Timely Financial Assistance</p>

Concluding remarks of Technical Session - III



Mr. Kamal Kishore, Member and Secretary-in-Charge, NDMA thanked all the speakers for highlighting the challenges faced by the respective states and need of the states for better forest fire management. He highlighted two issues that requires attention, which are as follows:

1. There are very few registered users in the FSI Alert system, implying that it is not reaching people in a meaningful way. It is important to not only make the early warning system only supply driven but hear the needs of the people, the information they want and methods to provide this information in a manner that is actionable, usable, and understandable. To achieve this, collaboration between FSI and the SFDs working on the ground is vital.
2. A socio-economic perspective should be kept in mind in forest fire management because the real issue is people's livelihood, not Mahua flowers or Tendupatta. Efforts should be made to ensure sustainability of people's livelihoods which should be in sync with a good forest fire management system. Similarly, Jhum cultivation cannot be used as a culprit, since it is the only livelihood of the people living in those areas. Therefore, integrating the forest fire management initiatives with socio-economic issues of people who live in and around the designated forests is extremely important. He also explained that because a large number of people live in and around forests in India, it is necessary to integrate their voices in the conversation about Forest Fire Management System.

Valedictory Session

Mr. Kunal Satyarthi, Joint Secretary, NDMA

Mr. Kunal Satyarthi, IFS, JS (PP), NDMA welcomed the dignitaries present on dais and off dais into the valedictory session. He summarized the remarks of the inaugural session which included addresses by Mr. Nityanand Rai, Honorable Minister of State, MHA, Mr. Ashwini Kumar Choubey, Honorable Union Minister of State, MoEF&CC and Ministry of Consumer Affairs, Food & Public Distribution, Dr. C. P. Goyal, DG (Forest) MoEF&CC, Mr. Kamal Kishore, Member Secretary, NDMA, Dr. Suneesh Buxy, IG (Forest), MoEF&CC.

The inaugural session was followed by enriching presentations by heads of the institutions of forestry sector including ICFRE, IMD, FSI, Wildlife Institute of India, IGNFA, and NFSC. The technical sessions talked about coordination of NDRF, IAF, Fire Services, their role in the sector, possible contributions, constraints, and challenges. Further, eleven states presented their own best practices and their forest fire scenarios in a separate session.

Mr. Satyarthi summarized the deliberations and discussions of the day and highlighted the issue raised outcomes and way forward from all the presentations and deliberations made by the speakers and the participants. During the sessions following are the main issues and challenges in forest fire management that were discussed

- Fire proneness of forests in India is a socio-economic issue.
- There is an increase in extent, duration, frequency, and intensity of forest fire in the past.
- Traditionally fire has been used by forest managers as a tool in forest fire management and has always been an integral part of landscape. Therefore, zero fire is not an option. It is critical to watch for the peaks and the deviants.
- It is mostly caused by anthropogenic activities, mostly happening near roads and habitations.
- Man-animal conflict is an issue, wherein revenge fires are ignited.
- Forest Rights act is a problem for forest fires as was highlighted by six states in their presentations. Most of the forest fires being recognized as forest fires are actually happening in encroachments.
- LWE areas of Chattisgarh and Telengana are challenging.
- Tendupatta and Mahua collection, Hunting by burning forest areas, pilgrimage routes through forests are some important issues to address.
- In Northeast states Jhum/ shifting cultivation is an issue, and Uttar Pradesh highlighted the issues in the grasslands of Terai belt.
- Forest fires are happening in new and remote locations; moist evergreen which never caught fire are now catching fire in North Eastern states like Manipur, Nagaland.
- Temperature rise, heat wave days, erratic rainfall and wind are also important contributing factors.
- Other issues are limited capacities of First responders (Forest guards /SFD), large number of vacancies, lack of trained Human Resource, Training, Motivation & Equipment.
- Preparedness is key in forest fire management. If the inflammable material is taken care of, forest fires can be largely prevented.
- Community sensitivity and response and incentives to the volunteers through Panchayati Raj Institutions (PRI) is critical.
- Fire management in accessible areas and mountainous terrains is critical and requires a different approach. In these cases, air force deployment can be

considered.

- High Media attention and quick administrative upscaling leading to NDRF/ IAF deployment very quickly is also a very important concern.
- There was also a demand for declaring forest fire as disaster in Disaster Management Act. The National Disaster Management Plan, 2019 has detailed forest fire as a disaster, and MoEF&CC is the nodal ministry.
- FSI talked about risk zonation and fire rating applicability. Outreach to masses is an issue.
- For end-to-end detection and suppression system, NDRF is ready to be involved in the task of forest firefighting as last responders but for that it needs specialized training and equipment. Fire services and home guards highlighted that it is a very decentralized department with each state having its own model. Their mandate is to save life and property and forest fire is not their prime mandate. If their services are required, they will need training and equipment.
- Indian Air Force highlighted the use of Bambi bucket in dousing forest fire. However, 60% of water loss occurs during operations – 30% water remains in the canopy and 30% gets evaporated due to high temperatures. It is an important tool but should be used judiciously as the cost of operations is high at Rs. 6.5 lakh per hour.
- In post fire damage assessment, there is under reporting and there are no recovery plans.
- National fire service college presented information about the training modules, equipment, and technologies that they possess. They are willing to share the responsibility of training themselves and forest department officers in fighting forest fires.
- Synergies in institutional response (Intra-State & State-Central agencies) is required. Currently there are no guidelines, SOPs, or Formal mechanisms to kickstart the response at different levels.
- Importance of database of forest fire was elaborated in many presentations which included past fires records, Preparedness, HR, equipment, Digital

maps etc.

- Research on forest fire management (ICFRE): Structural & Non-structural (Causes and damages)
- Regarding Training, IGNFA talked about possibility of training forest officers, NDRF together with forest college.

He said that NDMA is looking forward to formulating a National Project on Forest Fire Management from the workshop's deliberations. It shall focus upon pre, during and post phases of fire disaster management. This project will be implemented in twenty-six most forest fire prone districts of seven States including four districts of two Himalayan states and two national parks in India. MoEF&CC will do overall supervision of project and NDMA-MHA will do strategic planning and support and the project will be implemented by the DFOs concerned. Further, he briefly mentioned about the stakeholders and their role in the project, suggested remedies, implementation modalities and expected outcomes of the project in brief.

He concluded his presentation by thanking all the participants.

Way Forward

Mr. Kamal Kishore, Member & Secretary (I/C), NDMA

Mr. Kamal Kishore, Member & Secretary (I/C), NDMA stated that the workshop with thirty presentations was very enriching. It informed about different aspects of forest fire management in the country. It threw light upon the existing capacities, challenges, and the expectations from the forest fire-prone states.

He further mentioned the two achievements of the workshop, which is the kind of work that needs to be done, through which different areas of the programme have been defined. Also, different stakeholders to be involved in the proposed national project have also been identified through the workshop. Based on these learnings, a clearly thought-out programme should be formulated within the year 2022. Through this programme, it is aimed to achieve a transformative impact in the forest fire management system. The intention of the project should be to undertake activities to achieve results such as reduction in forest fire by at least 50% or reduction of the impact of forest fires. It is imperative to establish coherence among all the stakeholders to work together in a collective manner to achieve the results.

Special Address

Dr. Suneesh Buxy, IG Forest, MoEF&CC

Dr. Suneesh Buxy, IG Forest, MoEF&CC thanked all the stakeholders for active and fruitful participation in the workshop deliberation and discussions and appreciated the efforts of all in making it successful. The workshop was able to achieve convergence of so many agencies involved in forest fire management in India. He said that the issues highlighted in the presentations such as training / capacity building exercises of forest guards and volunteers through right agencies and equipping the groundwork force. Further he said that involvement of community will be addressed through state consultation meeting during implementation of the programme.

Valedictory Address

Ms. Leena Nandan, IAS, Secretary, MoEF&CC

Ms. Leena Nandan, IAS, Secretary, MoEF&CC appreciated the attempt made through this workshop to share knowledge, information, and perspectives on how to develop an integrated strategy to manage the big concern of forest fire. These fires not only destroys the precious natural resource but also sets back the efforts that have been made to combat climate change, sustain the livelihoods of people, and portrays a very poor picture of disaster management in real time. Some of the issues that were highlighted in the workshop needs to be addressed through root cause analysis. This requires preparation of micro plans. There is also an issue of lack of convergence in the approach to manage forest fires.

Ms. Nandan talked about the importance of understanding the context, and not adopting a one-size fits all approach in implementing a plan. She elaborated that each context has unique aspects and challenges. The twenty-six fire-prone districts must also have their unique causes and constraints. Further, the Ministry can also look at converging its own schemes, such as afforestation scheme can be undertaken in the fire-prone districts. Regarding capacity building, the Ministry has a scheme called ENVIS, through which it conducts several skilling

programmes. Additionally, there are also eco-clubs running in schools in districts through the state governments. Through this clubs, outreach and advocacy can be done by teaching the future generations about the harmful practices that can lead to forest fire.

Ms. Nandan emphasized upon preparation of Standard Operating Procedure (SOP) in case of forest fire with clear decision making and processes and protocols for requisitioning external agencies such as IAF, NDRF etc. With regards to the community participation, the ministry has tried to build biodiversity committees which are drawn from gram panchayats. This already available resource can be tapped to strengthen the forest fire management. These can be trained as first responders, and also used for gathering information.

There is a need to go from macro-level planning to micro-level planning. The responsibilities of the Ministry vis-à-vis the state governments should be addressed. At the state and district level there is a need of more concerted response. Further, attempts should be made to increase crowd involvement in the information gathering system to inculcate within them a sense of ownership. She mentioned that the projects and programme should not create dependence, but create institutional structures, lasting capacities and a thorough understanding of undesirable practices and what makes them undesirable. If a certain activity is practiced because it is critical to the livelihood and sustenance of local people, attempts should be made to supplement and replace it, instead of talking down to people. Ms. Nandan concluded by congratulating all the participants for the intensive discussions.

Vote of Thanks

Dr. Pavan Kumar Singh, Joint Advisor (PP), NDMA

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Abbreviations

CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CAP	Common Alert Protocol
CASFOS	Central Academy for State Forest Service
CBRI	Central Building Research Institute
CFWIS	Canadian Wildland Fire Information System
CISF	Central Industrial Security Force
CMC	Central Monitoring Committee
CSS	Centrally Sponsored Schemes
DFE	Directorate of Forest Education
EDC	Eco-Development Committee
ENVIS	Environmental Information System
EWS	Early Warning System
FAMEx	Familiarization Exercise
FDRS	Fire Danger Rating System
FFPM	Forest Fire Prevention and Management
FRA	Forest Resource Assessment
FRI	Forest Research Institute
FSI	Forest Survey of India
FWI	Fire Weather Index
GIS	Geographic Information System
IAF	Indian Air Force
ICFRE	Indian Council for Forest Research and Education
IGNFA	Indira Gandhi National Forest Academy
IMD	Indian Meteorological Department
IRS	Incident Response System
ISFR	Indian State of Forest Report
ISI	Initial Vapor Index
JFMC	Joint Forest Management Committee
LWE	Left Wing Extremism
MAFFS	Modular Airborne Fire Fighting System
MHA	Ministry of Home Affairs
MoEF&CC	Ministry of Environment, Forest & Climate Change
NAPFF	National Action Plan on Forest Fire
NCSFFM	National Collaborative Scheme on Forest Fire Man
NDMA	National Disaster Management Authority
NDRF	National Disaster Relief Fund
NFSC	National Fire Service College
NIDM	National Institute of Disaster Management
NIFESM	National Institute of Fire Engineering & Safety Management

NIFSE	National Institute of Fire & Safety Engineering
NTFP	Non-timber Forest Product
NWFC	National Weather Forecasting Centre
RFA	Recorded Forest Area
SDMA	State Disaster Management Authority
SDMP	State Disaster Management Plan
SDRF	State Disaster Relief Fund
SFD	State Forest Department
SFTI	Self Financing Technical Institutes
SIU	Scheme Implementation Unit
SMC	State Monitoring Committee
UAV	Unmanned Aerial Vehicle
USDA	United States Department of Agriculture
VPD	Vapor Pressure Deficit



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