2026



GUIDEBOOK ON FOREST FIRE MANAGEMENT IN TAMIL NADU

TAMIL NADU STATE FOREST FIRE CONTROL CENTRE



TAMIL NADU STATE FOREST FIRE CONTROL CENTRE

TAMIL NADU FOREST DEPARTMENT

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GUIDE ON FOREST FIRE MANAGEMENT

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1.Introduction

In natural forest systems, fire plays a very important role. It is one of the methods for the natural recycling of nutrients often helping the tree species to regenerate. The fire ecology often removes invasive weeds and helps in maintaining habitat for wildlife. However, in modern-day society with human populations cohabiting and being heavily dependent on forest resources, the forest fires are becoming more frequent and intense. Also, the over-extraction of resources has led to the degradation of large tracts of forest area. With climate change leading to drying of biomass and adding organic build-up over time the forest fires are enormous and are no longer beneficial to the forest health. According to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, annual carbon emissions from forest fires are in the range of 2.5 billion to 4.0 billion tons of CO2 (MoEFCC, 2018). Globally, the raging forest fires are affecting the wildlife habitats and biodiversity. These fires are also displacing millions of people and taking away livelihoods.

In India, the legal status of the forest is taken into consideration to determine the forest area. According to this 'forest area' is an area recorded in the government records and is commonly known as 'the recorded forest area'. In the State of Tamil Nadu, the recorded forest area includes Reserved Forests (RF), Reserved Lands (RL), and Unclassed Forest (UF). Covering an area of 1, 30,060 sq. km., Tamil Nadu has 26450.22 sq.km of recorded forest area. As per the assessment of the Forest Survey of India (India State of Forest Report, 2023), which constitutes 20.33% of the total geographical area of the State. Considering this data, forest fire is a critical threat to the health of the forest and depletion of the forest resources. From people perspective, forest fire is risk to the forest fringe communities and the front-line forest staff.

1.1. Global Scenario of Forest Fire

Globally, only around 4% of all forest fires have natural causes while the rest are of anthropogenic origin. Often, the burned areas and with it the entire ecosystem of the animals living within it, are irretrievably lost.

Forest fires across the globe are increasing. In many regions of the world, forest fires are natural processes and can have beneficial effects on forests. However, the recent trends of forest fires are giving a different picture. Some fires are too severe, occurring in habitats where they were very limited, unseasonal, or even more intense and frequent. In these cases, forest fires pose a serious threat to forest ecosystems and the well-being of humans. For the majority of fires, humans are responsible – directly or indirectly, deliberately or due to carelessness (Hirschberger, 2016).

In recent times the world has witnessed the forest fires that has engulfed large tracts of forest in the USA, Australia, Siberia, and the Amazon (Figure 1.1). The California wildfire season was overwhelming with more than 2,59,823 acres burnt and costing about $80 billion in damage and economic losses. In 2018, fires burned through 1.8 million acres in the state as compared to 1.3 million the previous year. Seven of California's ten most destructive fires have happened in the last four years (Goodman and Robinson, 2019).

The Amazon saw more than 80,000 forest fire episodes this year, an increase of 75% from 2018 (The Verge, 2019). Many of these fires have been attributed to people and companies clearing land predominantly for Cattle and soy farming. Following a particularly hot and dry spell, hundreds of fires were observed across Siberia. Though wildfires happened in Siberia, the scale of the 2019 blazes was unusual and decreased the air quality of nearby cities of Novosibirsk and Krasnoyarsk. Toxic smoke engulfed the entire country and is estimated to have released 300 megatons of carbon dioxide (Goodman and Robinson, 2019). The fires also produce black carbon soot which settles on the Arctic ice and absorbs sunlight, thus exacerbating global warming. The 2019–20 Australian bushfire season, colloquially known as the Black Summer, began in June 2019.

The fires burnt an estimated 18.6 million hectares destroyed over 5,900 buildings (including 2,779 homes) and killed at least 34 people. An estimated one billion animals have been killed and some endangered species may be driven to extinction. At its peak, air quality dropped to hazardous levels.

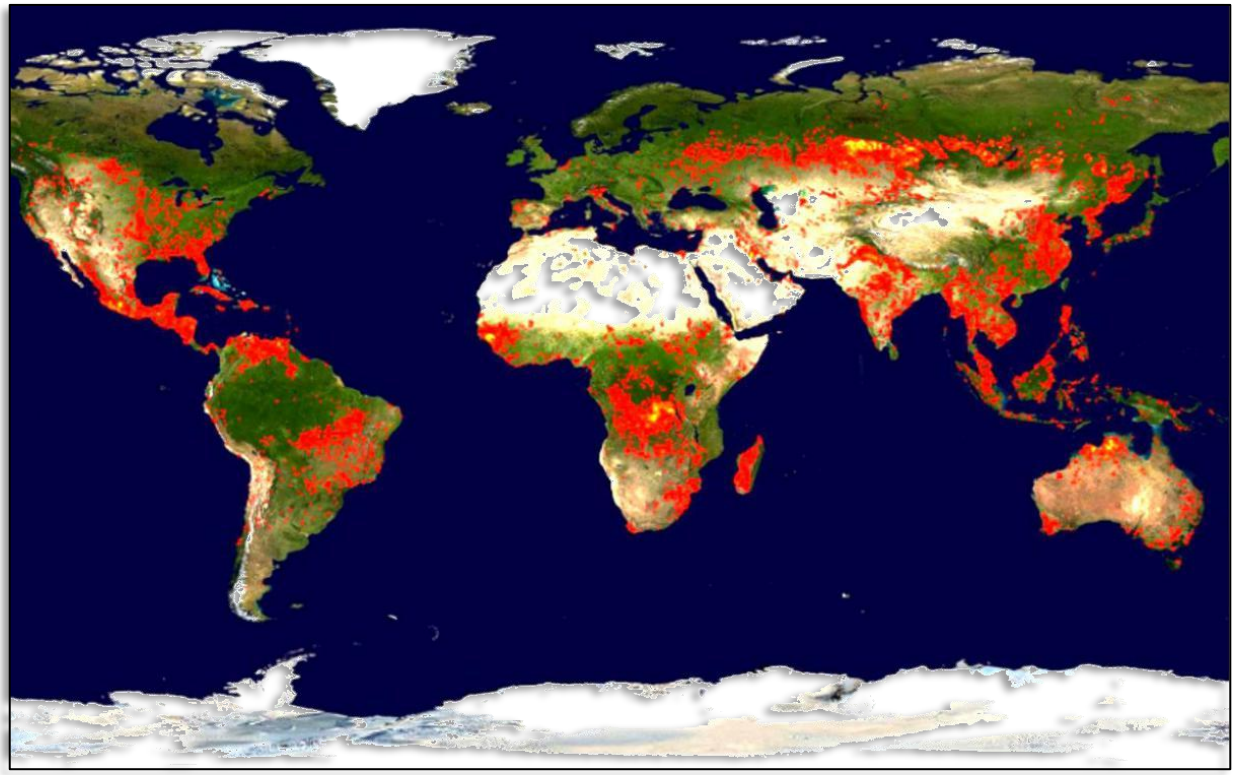


Figure 1.1: Fire Information for Resource Management System (FIRMS -2023)

1.2. National Scenario of Forest Fire

Forest fires are a regular phenomenon in our country often observed during summers in India. FSI has evolved its technologies in generating near real-time fire detection alerts. Presently MODIS and SNPPVIIRS based alerts are generated by FSI. A number of 26,390 forest fires were detected using MODIS (Moderate Resolution Imaging Spectro-radiometer) sensor and 2,03,544 forest fires were detected using SNPP-VIIRS (Suomi-National Polar-orbiting Partnership - Visible Infrared Imaging Radiometer Suite) during forest fire season from Nov 2023 to June 2024. Figure 1.2 shows the fire detections between November 2023 and June 2024. Tamil Nadu has seen a lesser number of fire incidents when compared to few other states.

As per ISFR 2023, more than 43.19% of the country's forest cover was estimated to be prone to frequent forest fires. 1.45 % of the country's forest cover was extremely prone to fires, whereas 9.89% of forest cover is found to be very highly fire prone. In Figure 1.3, it can be clearly seen that most parts of Tamil Nadu fall under the "less fire-prone" classification. However, with the effect of climate change that has altered the rainfall and

wind pattern, the issue of forest fire has become a growing concern to the state as the intensity of the heat and incidence of heat wave is getting prevalent in recent years.

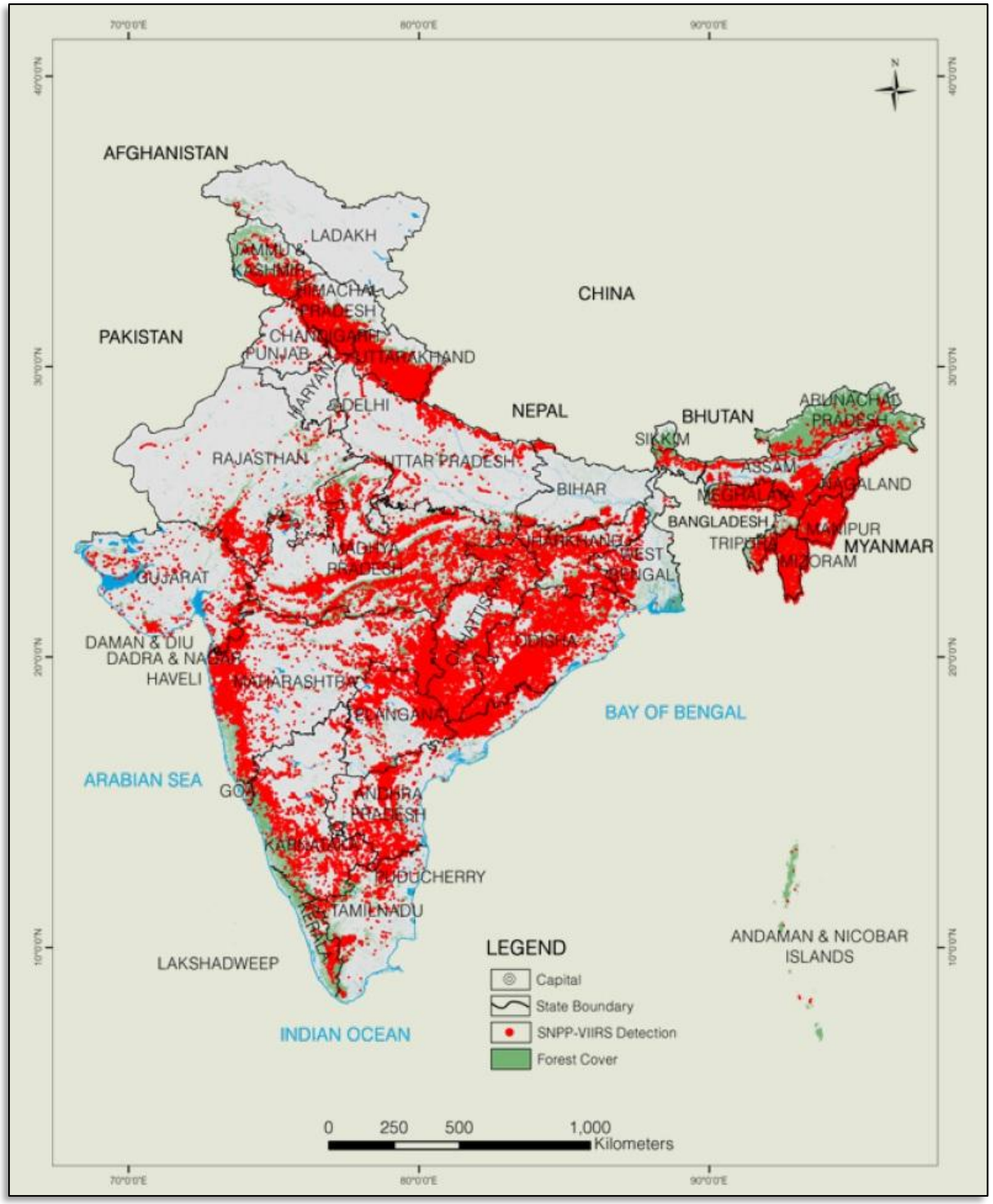


Figure 1.2: Forest fire detections by SNPP-VIIRS sensor during fire season (01st Nov 2023 to 30th June 2024 by FSI)

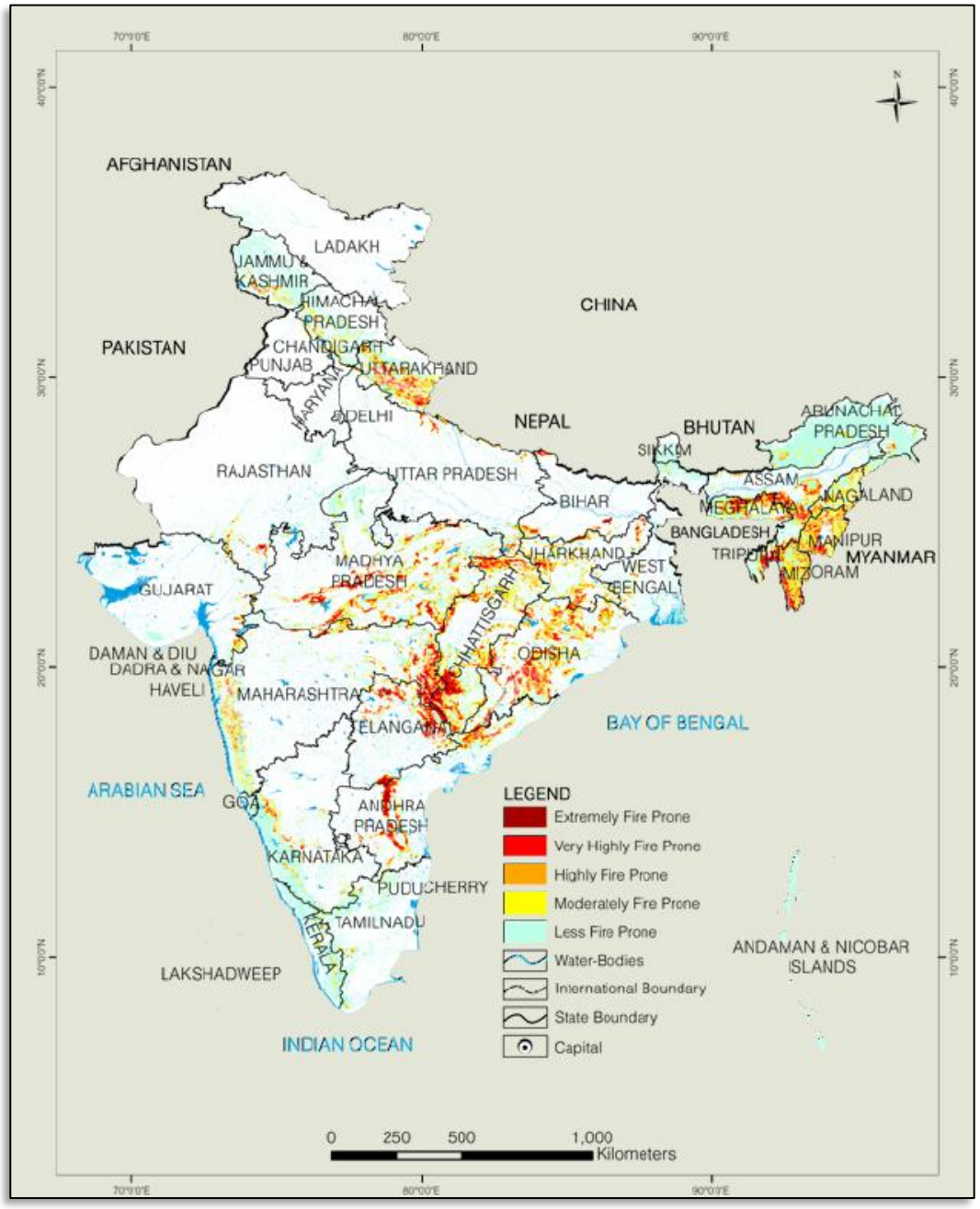


Figure 1.3: Fire Prone Forest Areas in India (ISFR 2023)

SL. No.	Category	Forest Cover and Scrub (in km^2)	% of Total Forest Cover and Scrub
1	Extremely Fire Prone	11,018.24	1.45%
2	Very Highly Fire Prone	75,084.02	9.89%
3	Highly Fire Prone	1,26,187.87	16.63%
4	Moderately Fire Prone	1,15,484.30	15.22%
5	Less Fire Prone	4,31,190.82	56.81%
	Total	**7,58,965.25**	**100.00%**

Table 1.1 List of Fire Prone Forest Areas in India

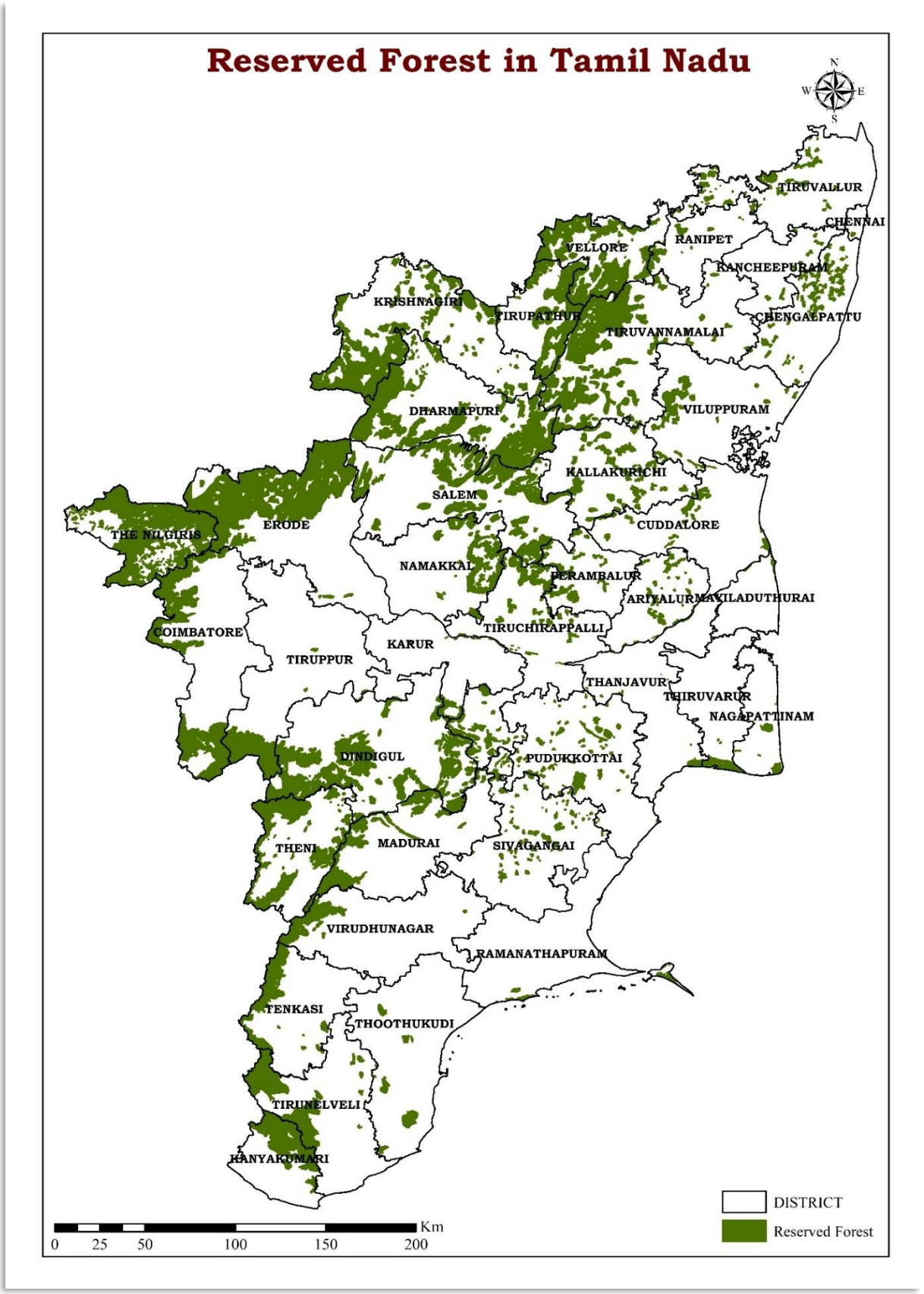


Figure 1.4: Notified Forest area of Tamil Nadu

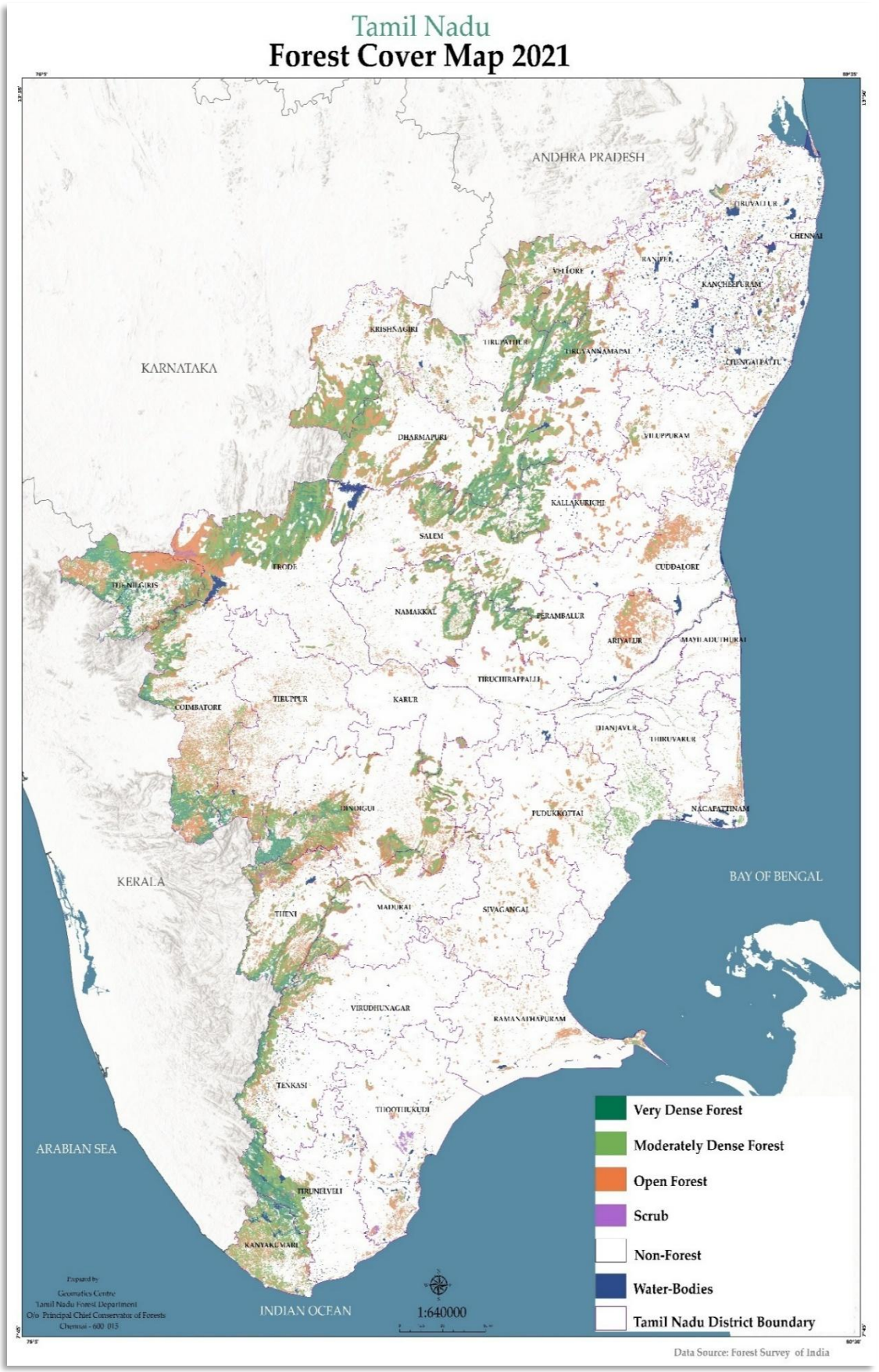


Figure 1.5: Forest Cover map of Tamil Nadu

1.3. Institutional Mechanism for Forest Fire in TN

The State Forest Fire Control Centre (TNSFFCC) operates under the Protection and Vigilance Wing of the office of the Principal Chief Conservator of Forests in the Tamil Nadu Forest Department (TNFD). It serves as the nodal office that coordinates with the Forest Survey of India (FSI) regarding forest fire alerts. The Centre was established in 2024. Its primary objective is to function as a control and command centre for forest fire incidents in the state and to coordinate with forest divisions through the District Forest Fire Control Centres (DFFCCs). TNSFFCC also liaises with nationalized organizations, institutions, and state nodal authorities regarding forest fire management.

One of the major activities at the Centre is forest fire monitoring using spatial technologies and GIS. The fire-burnt area is assessed annually using multispectral satellite images to evaluate forest fire damage and its spatial spread. Since 2016, the Suomi National Polar-orbiting Partnership (SNPP) satellite, with its higher detection power due to better resolution, has enabled the detection of a greater number of fires. A detailed multivariable analysis was conducted for the years 2016 to 2024 to assess the vulnerability of forests to fire. The analysis revealed that 90 beats are highly or very highly sensitive and vulnerable to fire.

Daily fire alert Monitoring using VIIRS, MODIS data

Near real-time MODIS and VIIRS data are valuable for determining the locations of active fires. Forest fire alerts received from FSI are promptly sent to the concerned Divisional Forest Officers (DFOs), Wildlife Wardens (WLWs), and Deputy Directors (DDs) for immediate field action through TNFFMIS system (mobile app and dashboard) and through SMS from FSI portal. A database of these fire locations is maintained at the Tamil Nadu State Forest Fire Control Centre. This database has been instrumental in identifying fire-sensitive beats, planning mitigation measures, and devising management strategies.

In 2019, all DFOs, WLWs, DDs, Chief Conservators of Forests (CCFs), and Conservators of Forests (CFs) across circles were registered with the FSI's fire alert system for quick dissemination of fire alerts. However, the current count of registrations is close to 5600 only which has to be increased and extended to all related stakeholders.

The TNSFFCC serves as the nodal office for coordinating and facilitating actions related to forest fires across Tamil Nadu. It acts as a hub for coordination between nodal agencies in the Government of India, State Government, and the District Forest Fire Control Centres (DFFCCs), which are established at 34 different locations across Tamil Nadu.

1.4. Objectives

The objective of this book, *"Guide on Forest Fire Management"*, is to:

- Provide comprehensive information for the **effective management** of forest fires in the state.
- Minimize the occurrence and impact of forest fires by informing, enabling, and empowering **forest fringe communities** and all stakeholders through a **participatory approach**, encouraging them to collaborate with the forest department.
- Focus on **reducing the vulnerabilities** of forests across diverse ecosystems in Tamil Nadu, especially in fire-sensitive areas.
- Enhance the **capabilities of forest personnel**, institutions, and other stakeholders in firefighting efforts and accelerate recovery after fire incidents.
- Ensure **effective coordination** during forest fire occurrences for efficient incident management through collective effort.

2. Forest Fire – Causes, Behaviour & Impact

Forest fires are a recurrent annual phenomenon in India. Almost all the fires in forest areas are manmade and usually the forest dependent communities are known to use fire for various purposes ranging from clearing community forests for shifting cultivation to clearing the forest floor to encourage grass growth. However, uncontrolled and unmanaged fires cause tremendous adverse impact on the environment and the society. In recent years, there have been spurts in the number of forest fire incidents which is a cause of serious concern for all. In recent past, grave wildfires have been observed in different parts of the globe such as California, Tasmania, Cape Town, Melbourne, United Kingdom etc. In one of the major wildfire outbreaks in California, about 60,000Ha of forest was burned resulting in 86 deaths and destruction of approximately 19,000 structures. Forest fire disaster of 2016 in Uttarakhand and Himachal Pradesh, Kurangani fire incident of Tamil Nadu, Mt. Abu and Vaishnodevi fires of 2018 are some of the recent examples from our country.

Forests are vulnerable to a variety threats like insect/pest attack, disease, fire, cyclone, flood, drought etc. Natural threats are part forest ecosystem. Man-made forest fires, their time, intensity and frequency can affect health of forests, survival, productivity, biodiversity and thereby disrupt flow of goods and services from forests. Increasing temperature, rising atmospheric carbon dioxide levels as a result of forest fire accelerate the adverse effect of global climatic change.

Forests fires are as old as the forests themselves. Usually seasonal, forest fires have influenced the evolution, development and management of some forest ecosystems. Small and limited forest fires are an integral part of forest ecosystem and very essential to maintain health and hygiene of the forests. Though fire is a factor for forest degradation, it is often used as a tool to renew natural environment. Controlled burning has been used as a management tool. Prescribed burning is used as a way to put fire in a specific area of land. However, uncontrolled fires caused extensive damage to forests, wildlife, environment, soil fertility and quality and retrogrades forest regeneration.

2.1. Causes for Fire

In India, most of the forest fires are attributable to anthropogenic reasons. The list of human motivations includes land clearing and other agricultural activities, maintenance of grasslands for livestock management, easy extraction of non-wood forest produce, hunting, industrial development, attempt to encroach, resettlement, negligence and arson. Some other man-made causes are fire leftover by travellers, campers and picnickers, fire that escape from neighbouring agricultural lands while clearing agricultural residues, power lines that run through the forests while unintentional fires caused by careless throwing of burning matchsticks and escape of cooking fire from temporary shelters for road workers also account for many forest fires. Forest Survey of India has reported that 54.40% of forests in India are exposed to occasional fires, 7.49% to moderately frequent fires and 2.40% to high incidence levels while 35.71% of India's forests have not yet been exposed to fires of any real significance. Major affected areas lie in the North East India and in the forests on the Deccan plateau. Prolonged droughts make forests vulnerable to fires and the changing climate further aggravates their vulnerability. The fragmentation of most of Indian forests, interspersed with habitations of all sizes, results in high human presence in most forested areas which adds to their vulnerability to fires. About 99% of forest fires are human related, mostly caused by the people deliberately and have a close relationship to their socio-economic conditions (NRSA, 2006).

2.2. Fire Behaviour

The components determining the severity and spread of a fire are:

- Fuel load - quantity/size/class of flammable material available
- Weather – temperature/wind/moisture; Droughts favour forest fires and winds aid in their spread.
- Topography – aspect/elevation/slope; slopes that face South are drier and more vulnerable to fire than north facing slope. High wind velocity at higher elevations and steepness of slopes encourages spread of fire especially upwards.

2.3. Impacts of Forest Fire

Forest fires cause wide ranging adverse local, regional and global/ social, economic and ecological impacts like loss of life, cattle and property, loss of biodiversity, natural regeneration and reduction in forest cover including wildlife habitat, degradation of water catchment areas resulting in loss of water, increase in greenhouse gases in the atmosphere, resulting rise in temperature, global warming/climate change due to depletion of carbon sinks and so on.

Forest fires are one of the most important causes of land degradation that lead to biodiversity loss, deforestation and desertification processes. In Tamil Nadu, most forest fires are restricted to the forest floor and are well controlled by beating the fire with the help of the local communities. But, the intensity and number of fires vary greatly across the years and are dependent on mostly the moisture conditions in the forest areas.

3. Forest Fire Management

India has a strong legal and institutional arrangement for forest fire prevention and management. The national laws strictly forbid setting fire in forests. As per, sections 26 and 33 of the Indian Forest Act of 1927 it is a criminal offense to burn or to allow a fire to remain burning in reserved and protected forests. Section 30 of the Wildlife (Protection) Act of 1972 further prohibits setting fire in wildlife sanctuaries. Ministry of Environment, Forest, and Climate Change (MoEFCC) is the nodal ministry. Recently, the National Action Plan on Forest Fires (NAPFF), has been formulated to minimize forest fires from taking place by informing, enabling, and empowering forest fringe communities and maybe incentivizing them to work in tandem with the forest departments.

Apart from public awareness and their participation in controlling forest fires, use of all the technological options for prevention, detection, early warning, firefighting and damage assessment should be employed under a scientifically prepared forest fire management plan for each district or forest division Table (3.1). Geospatial technological tools and techniques have been very effectively used in forest fire management world over in the last couple of decades.

Several Forest Fire Prevention and Management (FFPM) Practices are used to prevent forest fire. The most common methods of prevention employed by forest departments in India include the clearance of fire lines and conducting controlled burning to limit fuel loads. Other methods may include silvicultural practices such as selective thinning and planting fire-adapted tree species in fire-prone areas. FSI has developed methods to generate early warning and fire danger rating systems which are also a part of the prevention process.

Over the past 10-15 years, remote sensing has been used extensively for forest fire detection in India. FSI implemented its first nationwide system for monitoring active forest fires using remote sensing and providing alerts to local forest departments in 2004. State-level detection and alert systems have also been developed in states of Madhya Pradesh, Andhra Pradesh, Chhattisgarh, Telangana, and Uttarakhand. Tamil Nadu Forest Department is also developed the Tamil Nadu Forest Fire Management

Information system (TNFFMIS) exclusively for the state to digitize the whole process of fire alert communication, tracking response and reporting in order to improve the efficiency in managing the forest fires in the state.

The Forest Fire Suppression relies very heavily on "dry" firefighting techniques like directly beating out the fire with hand tools to smother the flames (for very low-intensity fires) or by separating the fuel in advance of the active fire by a natural break or deliberately creating mineral earth breaks devoid of fuel.

3.1. Fire Protection

Forest fire and its management have a long history in Indian forestry. Fire prevention, detection and control activities are the responsibility of the State government. Fire protection measures revolve around the three stages of fire, namely

1) **Pre-fire season** (Preparedness)

2) **During fire** (Fire detection, spread and control planning) and

3) **Post fire** (Damage assessment and mitigation planning)

The incidence of forest fires in the country is high. Standing trees and other natural regeneration including fodder are destroyed on a large scale by such fires. Special precautions should be taken during the fire season. Improved and modern management practices should be adopted to deal with forest fires. The conventional method of fire protection (pre-fire season preparedness) involves clearing a network of fire lines, watchtowers, block lines and guide lines. During fire season fire watchers are engaged. As prevention is better than cure, a preventive program of zoning, vulnerability/danger rating, early warning and real time monitoring has to be designed and installed.

Post fire scenario–There is need for continuous updating of database from the field for numbers of fires, area burnt, damage caused to flora and fauna, effect of fire on land and soil, causes of forest fire, measures taken, extent and effect of prescribed fires, etc. Burn scar maps derived from remote sensing images also provide information on the spatial extent and distribution of the fire affected areas and the total area burnt which is useful for forest managers for mitigation planning.

3.2. Forest Fire Risk Management

Prevention, Mitigation, Response and Recovery are four basic phases of the disaster management cycle (Figure 3.1). In a situation of forest fire, prevention plays a major role, as it helps to reduce the chances of fire occurrence if not, at least to reduce the effect of the intensity and loss. Early Warning Systems using different apps, web-based software, geospatial tools, and new technological advancements help us in preparation and early detection. Other than this, community awareness, strengthening the local information system, equipping for fire suppression are some ways to ensure mitigation (Table 3.1). During the forest fire, controlling it in the early phase is very important. So quick response after warnings and information about the fire is critical. Mobilization of quick response units and local communities for help and co-operation is a must under the response phase. State & District Forest Fire Control Centre are established in Tamil Nadu to ensure quick communication, mobilize resources, and to monitor the action taken. In last, post-fire management by rehabilitation of burnt forest areas, wildlife management in burnt area and supporting regeneration of native species are required.

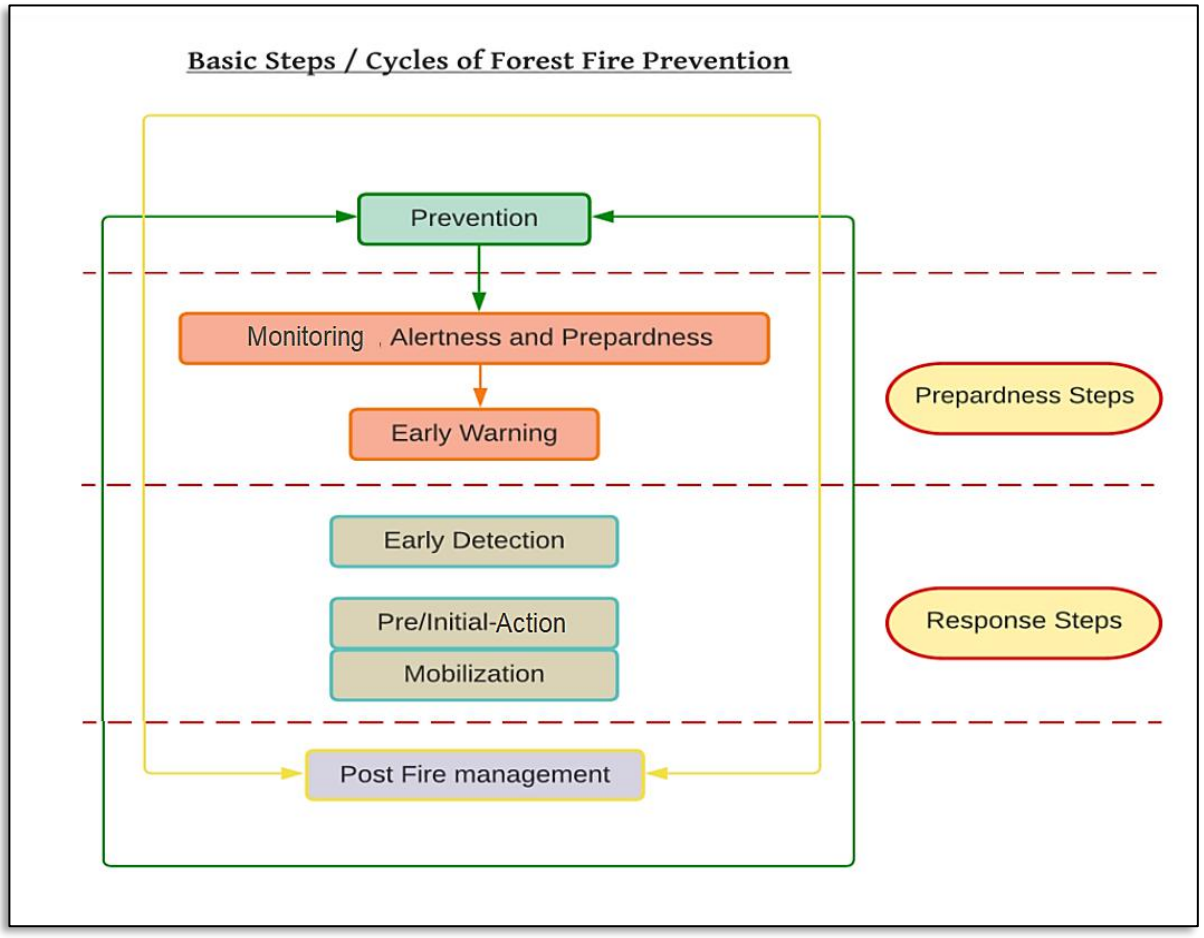


Figure 3.1 Steps in Forest Fire Management

Sl. No	Phases	Activities
1	Mitigation & Prevention	- Surveillance/Watching on forest
		- Early detection of Forest Fire
		- Establishing preventive measures such as watchtowers, equipment, community teams, etc., to control the situations
		- Use of indigenous knowledge and methods for fire prevention
		- DM Planning (unit level to state level)
		- Usage of IoT devices/GPS/Drone technology and application-based models
2	Preparedness	- Awareness generation
		- Emergency response & logistics planning
		- Early warning systems and communications to concerned departments and authorities
		- Constitution of Community/Volunteer teams and their training
3	Response	- Activation of fire control methods
		- Manpower support for large areas of fire
		- Affected person evacuation
		- Search & rescue, evacuation, and First-aid
		- Shelter management
		- Relief camp management
4	Recovery	- Afforestation activities
		- Managing and taking care of the forest

Table 3.1 Forest Fire Management in various phases

3.3. Forest Fire Risk/Vulnerability Zonation

Vulnerability assessment is a prerequisite for advance planning and preparation to combat fire. The vulnerability of forests to fire varies from place to place depending upon the type of vegetation, topography and the climate. Understanding fire vulnerability and forest fire spread model could provide sufficient data for detailed fire control planning.

The Geoinformatics Centre of the Tamil Nadu Forest Department conducted an analysis of the Fire Vulnerability Index (FVI) for 2023. assess forest fire risks across the state. The study revealed that 11.8% of the forested areas fall under the "Very High" and "High" vulnerability categories, indicating a significant risk of fire incidents the forest cover. A majority, 60.90%, were classified as "Moderately Vulnerable," highlighting areas that require targeted monitoring and preventive measures. Meanwhile, 20.12% of the forest areas were deemed to have "Low" and "Very Low" vulnerability, reflecting a lower

likelihood of fire occurrence (Table 3.2). This analysis was carried out using the Multi-Criteria Decision Analysis (MCDA) technique, specifically leveraging the Analytic Hierarchy Process (AHP). AHP is a structured and systematic approach that integrates various criteria to prioritize areas based on their vulnerability of forest fires.

Fire Vulnerability Index	Area in %
Very High Vulnerability	2
High Vulnerability	9.8
Moderately Vulnerable	60.9
Low Vulnerability	13.37
Very Low Vulnerability	6.75

Table 3.2 Fire Vulnerability Index

3.4. Role of Communities

Forest fire is a growing threat to communities around the world. Traditionally, reducing forest fire risk was co-managed by the administration and local communities. But over time the role of the local communities has largely reduced. However, community-driven forest fire management can reduce the effect of the forest fires and to reduce the losses. The community cohesion and 'attachment' to local resources are also important for controlled fire use. In Tamil Nadu, there are many instances where the local forest fringe village communities have rendered support to the have successfully taken over forest fire management from sponsored/ government projects. However, the allocation of resources for forest fire management needs careful planning to ensure that rural communities are not overburdened by such arrangements, support the community's needs and in the future should provide benefits.

In recent decades, there is a rising desire to live closer to nature which has pushed populations into the "Wildland-Urban Interface" (WUI) — areas with more vegetation, parks, and forests than their city centre and older suburb counterparts. These establishments built on not-local material, with high energy requirements; consumer goods, and not fire resilient design often face severe consequences of the forest fire.

3.5. Brief Guidelines of Forest Fire Management

1. Classify areas as per Forest Fire Risk Zonation (Forest fire prone areas- FFPA) – extremely high FFPA, High FFPA, forest fire prone area, moderate FFPA, low FFPA

– this helps in pre-fire planning and for resource allocation. Prepare district level FFPA map for every 5 years.

2. Identification of all stake holders – Local Communities, State agencies, District Administration, NDRF & SDRF, FSI, MoEFCC, NDMA & SDMA and Tribal welfare Department.
3. Identify cause of fire – NTFP collection, Local festivals/rituals, clearing for cultivation
4. Involving/motivating communities – Involve Community organizations, VFC etc.
5. Location planning –Equipping the District Forest fire control centre with fast and seamless communication either through wireless or high-speed internet connectivity with the field level staff and also with the State Forest Fire Control Centre. Construction of new watchtowers and maintenance of existing watchtowers, setting up Base camps at extremely high FFPAs with all firefighting equipment, maps of Fire lines, creation of new Fireline and maintenance of existing fire lines, controlled burning to reduce fuel load (Figure 3.2).
6. Finalizing Methodology of firefighting different categories of fire based on various factors like fuel load, type of fuel, type of vegetation – District level SOP has to be developed.
7. Training of front-line forest personnels in Forest Fire management including controlled burning, creation and maintenance of fire-lines, fighting fires using equipment, mock drills on firefighting, Training of Trainers on Forest fire dissemination systems of FSI, then training staff.
8. Using the National and State Forest Fire Alert System – Forest Survey of India sends daily alerts on forest fire, Registration of all stakeholders on Forest Fire Alert system. Ensuring that all TNFD front line forest staff are using Tamil Nadu Forest Fire Management Information System (mobile application) to get the fire alerts and use this platform to update the status of fire.
9. Post fire monitoring–extent of area burnt, data analytics.



Figure: 3.2– Core Strategies for Forest Fire Management

3.6. Strategies

The core strategies in effective forest fire management are,

1. Early Detection
2. Quick Communication
3. Early Action

- Public Oriented Measures
    - Gaining local public support
- Awareness and education of the masses
    - Restrictions on activities that can lead to forest fires
    - Establishing information system
    - Incentives to fire volunteers
- Administrative and Technical Measures
    - Close monitoring of sensitive beats
    - Establishing base camp during fire season
    - Identifying water points and access to it
    - Putting in place fire control task teams.

- Clearing and Maintaining Fire Lines
- Establishing quick wireless communication channels
- Ensuring the functioning of fire equipment's



Figure: 3.3 – Training of front-line forest staff on handling fire equipment

4. Forest Fire Alert System

Globally forest fires all over the world are under reported due to various factors. Conventional system involves use of fire watch towers at vantage points and fire watchers to detect fires and communication through wireless network to immediate superior officers to mobilize resources for firefighting.

The Fire Information for Resource Management System (FIRMS) distributes Near Real-Time (NRT) active fire data within 3 hours of satellite overpass from both Moderate Resolution Imaging Spectro-radiometer (MODIS) and Visible Infrared Imaging Radiometer Suite (VIIRS).

MODIS/VIIRS provides geo-coordinates (latitude and longitude) of centre of pixel, date, time of overpass of satellite, satellite name etc., for the fire hotspots. Each hotspot/active fire detection from MODIS represents the centre of a 1 km. (approx.) pixel flagged as containing one or more fires and from VIIRS 375m pixel. For near real time data received from NASA, Geomatics Centre, Tamil Nadu Forest Department downloads these, overlaying with Forest Administrative maps to identify the Forest block/Beat/ Range/Division and then communicates it to the concerned District Forest Officer/Conservator of Forests/Chief Conservator of Forests for immediate action in the field. During 2016-2024, 15,106 fire incidents were detected by MODIS & SNPP-VIIRS within the geographical area of Tamil Nadu.

4.1. MODIS & SNPP VIIRS

The National Aeronautics and Space Administration's Moderate Resolution Imaging Spectroradiometer (MODIS), with channels specifically designed for fire detection, is the most used satellite sensor for detecting fires over large regions. The image resolution used for detection of fires is 1 km (Table 4.1). A hotspot is detected by MODIS sensor using data from middle infrared and thermal infrared bands. There are two satellites carrying the MODIS sensor viz. Terra and Aqua, which together provide complete coverage of India approximately 4 times daily. MODIS can routinely detect both flaming and smouldering fires ~1000 m^{2} [1] in size. Under very good observing conditions (e.g. little or no smoke, relatively

homogeneous land surface etc.) flaming fires one tenth this size can be detected. Under pristine (and extremely rare) observing conditions even smaller flaming fires ~50 m^2 can be detected. There is no upper limit to the largest and/or hottest fire that can be detected with MODIS.

The Visible Infrared Imaging Radiometer Suite (VIIRS), operated by the US National Aeronautics and Space Administration (NASA), was designed to be the successor to both AVHRR and MODIS. There are two satellites carrying the VIIRS sensor, which has fire detection channels at both 750-m and 375-m resolution (Table 4.1). The resolution of the VIIRS sensor is finer than MODIS and it can detect smaller fires. FSI uses VIIRS-SNPP (375-m resolution) satellite data.

Feature	MODIS (Moderate Resolution Imaging Spectro-radiometer)	SNPP-VIIRS (Visible Infrared Imaging Radiometer Suite)
Sensor	36 spectral bands (channel 21, 22, 31)	5 HR Imagery channels (I-bands), 16 moderate resolution channels (M-bands), and a D/N Band (M13 and M15)
Satellite	Aqua and Terra	Suomi National Polar-orbiting Partnership (NPP) satellite
Launch	Dec 1999 and May 2002	Oct-2011
Algorithm	Contextual	Thresholding and Contextual (Hybrid)
Equatorial Pass	Terra: 10:30 am & 10:30 pm; Aqua: 01:30 am & 01:30 pm	01:30 am and 01:30 pm
Resolution	1 km x 1 km	375 m x 375 m

Table 4.1 Comparison between the two sensors MODIS and SNPP- VIIRS Satellites

4.2. Detecting Forest Fires through Satellite Sensors

Satellite sensors record the intensity of electromagnetic radiation from Earth in various spectral wavelengths or channels. The forest fires are detected by thermal sensors aboard satellites, which can detect the temperature of objects. During satellite overpass, those areas having higher temperatures compared to surrounding areas (thermal anomalies), are picked. Only the fire hotspots detected within the forest area (green coloured area) are selected and communicated as the Forest Fire Alerts by FSI The fire hotspots falling outside the forest areas are filtered out and not processed any further.

up by the sensors due to the radiation emitted from such areas. The data processing software identifies the corresponding fire affected pixels on the satellite data. The MODIS and SNPP VIIRS sensors are aboard polar orbiting satellites and they pass over an area on earth only twice in a day. Therefore, a sensor usually provides two sets of satellite detections corresponding to the overpass timings. FSI uses fire detection satellite data from two sensors viz. MODIS and SNPP. The Terra MODIS instrument acquires data twice daily (10:30 a.m. and 10:30 p.m.), as does Aqua MODIS (1:30 p.m. and 1:30 a.m.). Therefore, four daily MODIS observations are available for forest fires. The SNPP-VIIRS also has its equatorial passes twice a day (1:30 a.m. and 1:30 p.m.). Therefore, FSI communicates forest fire alerts based on a total of 6 satellite passes in a day

4.3. Near Real Time Forest Fire Detection System

Forest Survey of India (FSI) has initiated Near Real Time monitoring of forest fires in collaboration with National Remote Sensing Centre (NRSC). Geospatial point data showing forest fires provided by National Remote Sensing Centre (NRSC) is acquired and provided to FSI on near real time basis. The active fire spots or hotspots are generated by using MODIS and SNPP-VIIRS satellite sensors. The locations of fires as received from NRSC are regardless of land use and land cover. These coordinates are superimposed on the latest forest cover map of India, to eliminate any fire hotspots coming from industrial, agricultural or any other sources other than forest. Attributes like state, district and Survey of India 1:50000 toposheet's numbers are attached with each coordinate of the forest fire locations as attribute information. The processed forest fire information is then converted into *.KML (Keyhole Mark-up Language) format and is e-mailed to the appointed nodal officers of each state. The SMS messages are also sent to every registered user. Forest fire detection and dissemination of alerts is done twice daily during the fire season i.e. November to next year June.

The process of acquisition, processing and dissemination of active forest fire locations generated in KML file format to State Forest Departments involves a period of 2 hours. After collecting the geo coordinates of the fire spots, through GIS analysis, attributes up to beat level are added to each fire spot and sent between 1100 -1200 and 1400 - 1500 hrs to State Forest Departments and registered users through Email and SMS during fire season giving a summary of total number of forest fires detected in their chosen areas. Usually, the MODIS satellite data is processed within 40 to 60 minutes of satellite

overpass by NRSC and in case of SNPP VIIRS, it takes around 60 to 90 minutes to process the satellite data. Forest Survey of India using fully automated customized software generates email alerts to the State Nodal officers within 5 minutes of receipt of email alert from NRSC. However, SMS are sent to the users usually within 30 to 60 minutes of receipt of email from NRSC.

The FSI Forest Fire Alerts system has undergone periodic changes to facilitate not only foresters but also common people in a better way. Fully automated Forest Fire Alert System 3.0 disseminates its alert system for 21 states at beat level and 2 states at Range level. Forest fire alerts generated for Tamil Nadu are up to the beat level, which also has details of the concerned reserve forest. The number of FFP alerts generated during the fire season for Tamil Nadu in 2023 and 2024 is available in (Table 4.2).

S.NO	MONTH	FSI FIRE ALERT - 2023			FSI FIRE ALERT - 2024		
		MODIS	SNPP	TOTAL	MODIS	SNPP	TOTAL
1	JANUARY	9	50	59	4	13	17
2	FEBRUARY	139	743	882	32	215	247
3	MARCH	146	852	998	223	1330	1553
4	APRIL	53	283	336	370	1704	2074
5	MAY	1	22	23	27	160	187
6	JUNE	5	39	44	0	11	11
Total		**353**	**1989**	**2342**	**656**	**3433**	**4089**

Table 4.2 – Number of Fire alerts in TN during 2023 and 2024

4.4. Process Of Fire Alerts Detection and Communication

The process of generation and dissemination of forest fire alerts is described below.

1. After a satellite overpass, the active fire spots or hotspots are received by NRSC (National Remote Sensing Centre), Hyderabad in their ground station at Shadnagar, Telangana and are shared through email by NRSC to FSI.
2. The fire alerts provided by NRSC include all thermal anomalies detected by the sensors irrespective of whether these fall within or outside forests. FSI filters out all fires other than forest fires using a custom filter which is a combination of Recorded Forest Area boundaries as well as forest cover data. Enrichment of the forest fire information is carried out by adding attributes like State, District, Division, Range, Beat, Compartment boundaries etc. to the forest fire locations (Figure 4.1).

3. This information is then disseminated to State Nodal Officers, registered users and also uploaded on the website of FSI in the form of Table and Maps.
4. Users who have specified their areas of interest are also notified of the fires therein through SMS

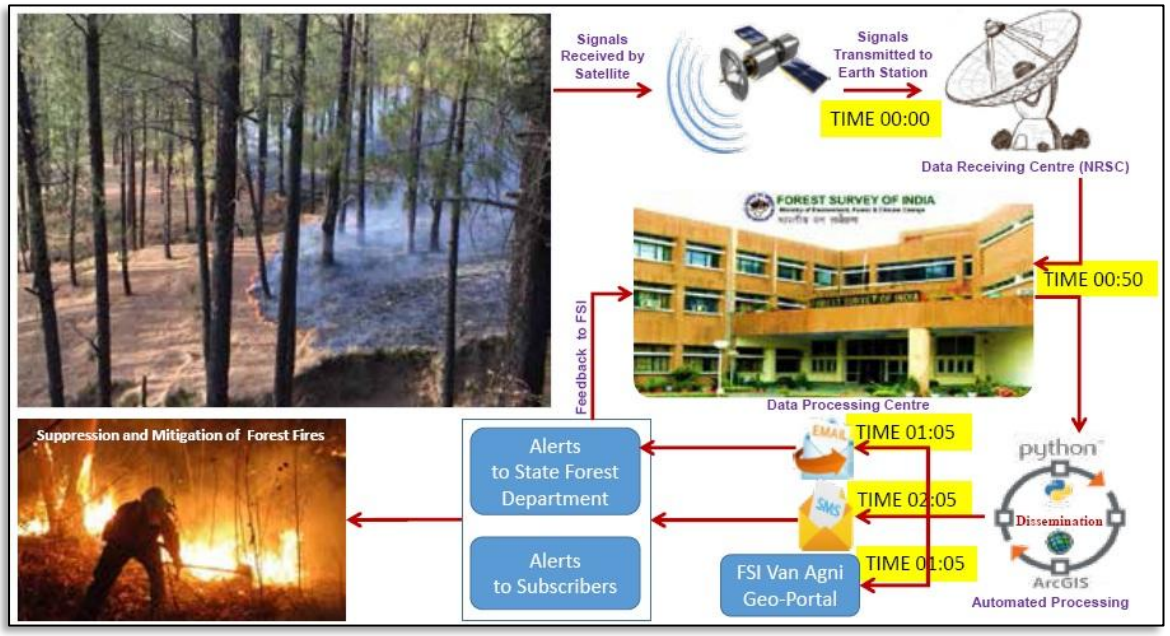


Figure 4.1: Process of Forest Fire detection and alert generation

4.5. Large Forest Fire Monitoring

Forest Survey of India has also launched the Large Forest Fire Monitoring Programme using near real time SNPP-VIIRS data in 2019. With the launch of Large Forest Fire Monitoring System under FAST 3.0 (FSI Fire Alerts System), large fire events are tracked across the country and Large Fire alerts are disseminated with the objective to identify, track and report serious forest fire incidents so as to help monitor such fires at senior level in the State Forest Department and also seek timely additional assistance that may be required to contain such fires. The programme detects minimum of 3 SNPP pixels in proximity to identify a Large Forest Fire. Once detected, it is continuously monitored until it is put off. The programme scans the fire for additional 3 days after its inactivity to detect dormant fires, if any.

'Large Forest Fires' are identified by carrying out the clumping of fire polygons with criteria being at least 3 SNPP forest fire polygons to be detected in proximity. This one clump is considered as a single 'large forest' fire. Unique large fire nomenclature is assigned to every large forest fire based on its range/district name. If any fire in the

subsequent satellite passes is within 500 m buffer of any of the previous continuing large fire, then it's continued under the same name of the previously continuing fire. Such continuous monitoring is done until the fire douses and for additional 3 days after the inactivity of the fire. 'Large Forest Fire Database' is generated with these details. Dataset of active large fire layer of the current pass of satellite in continuation with its fire extensions from the previous passes is created. Enrichment of the forest fire information is carried out by adding attributes like State, District, Division, Range, Beat, etc. to the large forest fire polygons. This information is then disseminated to State Nodal Officers as KMZ through e-mail, to registered users through SMS and uploaded on the FSI fire geo-portal for interactive viewing.

As per the FSI Portal Data, Tamil Nadu has recorded about 392 Large fire incidents between Jan 2019 to June 2024. The details of these large forest fire sites are available in the FSI Large Fire programme portal (https://fsiforestfire.gov.in/lff/). During the period between 1st November 2023 to 30th June 2024, Tamil Nadu has recorded 218 Large Forest fires whereas the below image shows the top 5 states with highest number of large forest fire events (Figure 4.2 to 4.5).

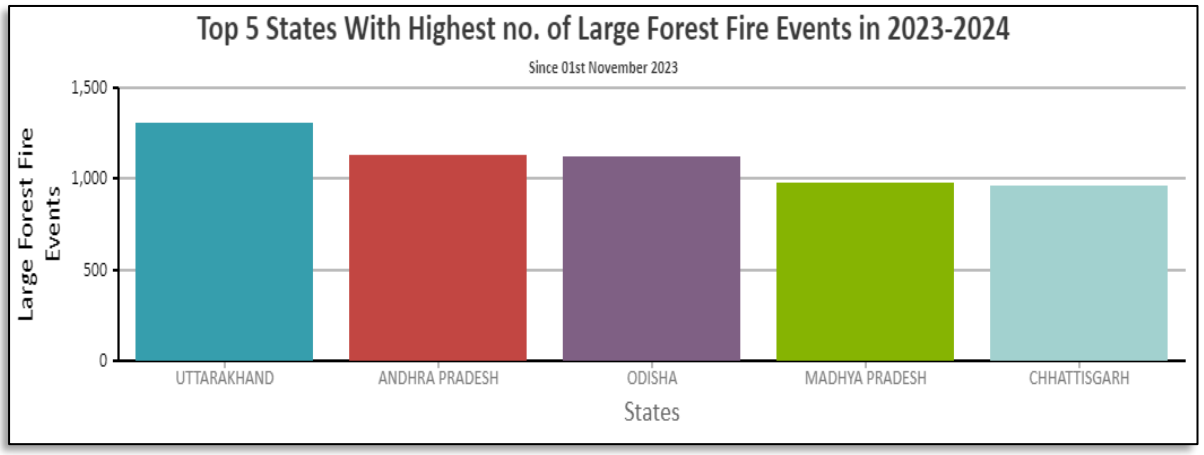
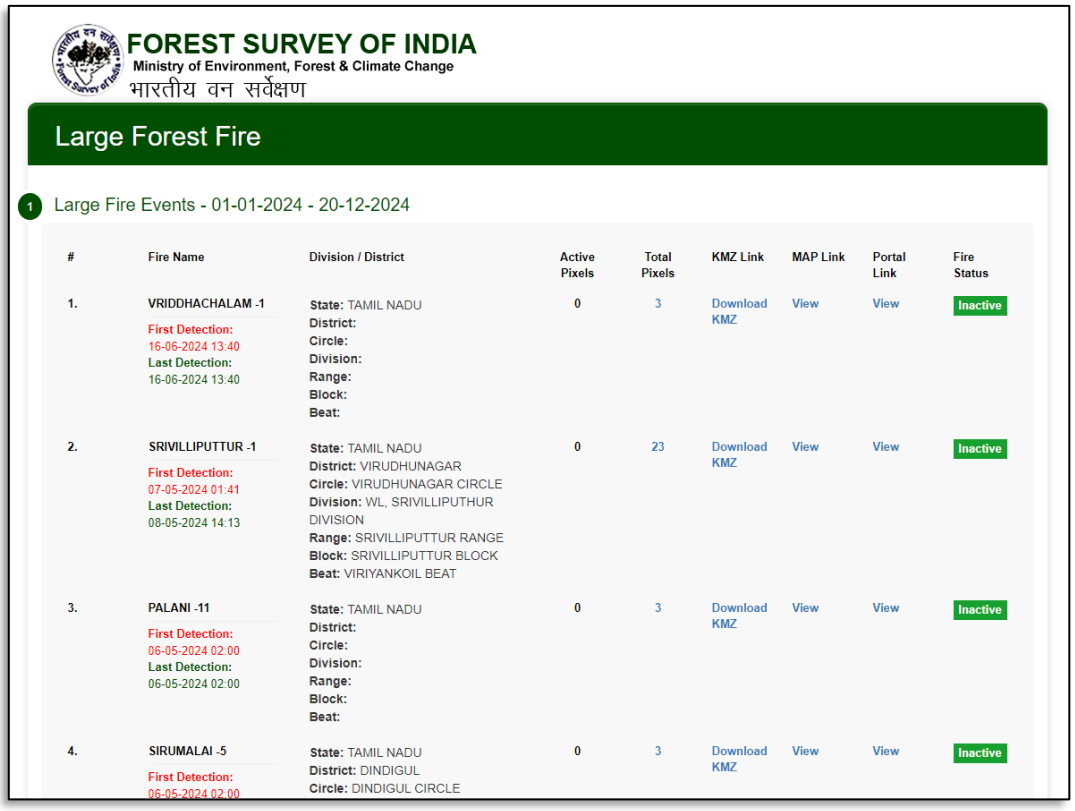


Figure 4.2: Top 5 States with highest Large Forest Fire in 2023-24



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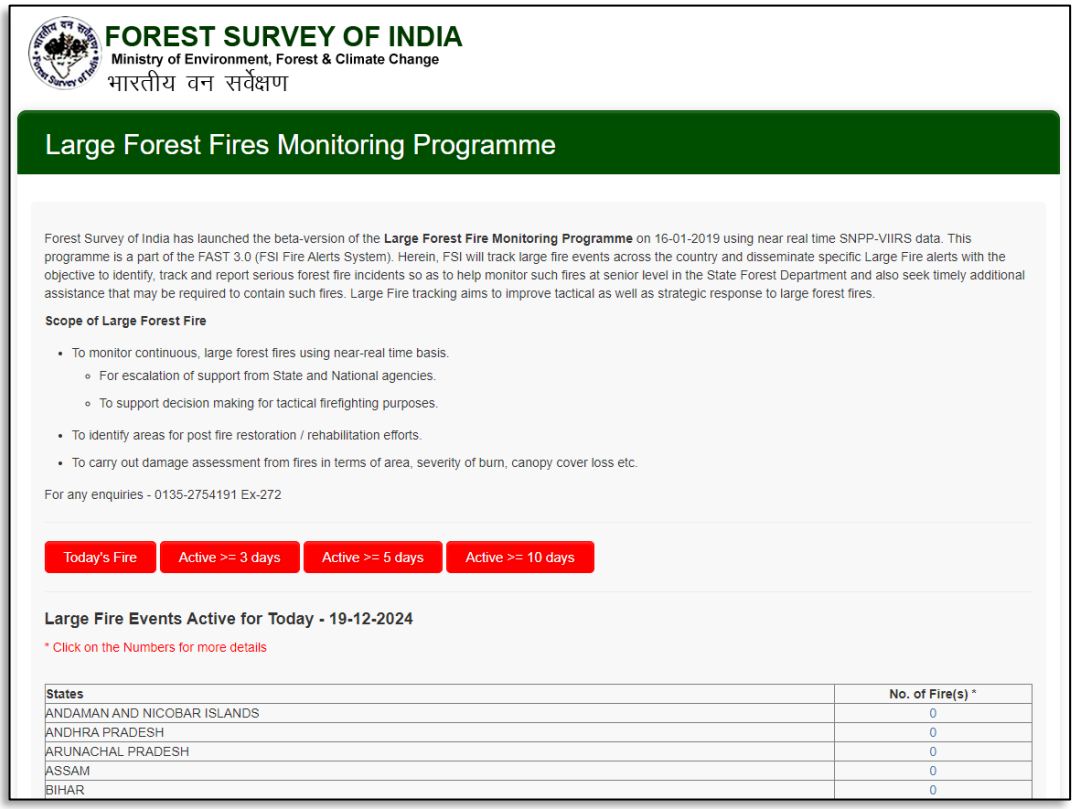
Large Forest Fire

1 Large Fire Events - 01-01-2024 - 20-12-2024

#	Fire Name	Division / District	Active Pixels	Total Pixels	KMZ Link	MAP Link	Portal Link	Fire Status
1.	VRIDDHACHALAM -1 First Detection: 16-06-2024 13:40 Last Detection: 16-06-2024 13:40	State: TAMIL NADU District: Circle: Division: Range: Block: Beat:	0	3	Download KMZ	View	View	Inactive
2.	SRIVILLIPUTTUR -1 First Detection: 07-05-2024 01:41 Last Detection: 08-05-2024 14:13	State: TAMIL NADU District: VIRUDHUNAGAR Circle: VIRUDHUNAGAR CIRCLE Division: WL, SRIVILLIPUTHUR DIVISION Range: SRIVILLIPUTTUR RANGE Block: SRIVILLIPUTTUR BLOCK Beat: VIRIYANKOIL BEAT	0	23	Download KMZ	View	View	Inactive
3.	PALANI -11 First Detection: 06-05-2024 02:00 Last Detection: 06-05-2024 02:00	State: TAMIL NADU District: Circle: Division: Range: Block: Beat:	0	3	Download KMZ	View	View	Inactive
4.	SIRUMALAI -5 First Detection: 06-05-2024 02:00	State: TAMIL NADU District: DINDIGUL Circle: DINDIGUL CIRCLE	0	3	Download KMZ	View	View	Inactive

Figure 4.3 FSI portal on Large Forest Fire Monitoring Programme



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Large Forest Fires Monitoring Programme

Forest Survey of India has launched the beta-version of the **Large Forest Fire Monitoring Programme** on 16-01-2019 using near real time SNPP-VIIRS data. This programme is a part of the FAST 3.0 (FSI Fire Alerts System). Herein, FSI will track large fire events across the country and disseminate specific Large Fire alerts with the objective to identify, track and report serious forest fire incidents so as to help monitor such fires at senior level in the State Forest Department and also seek timely additional assistance that may be required to contain such fires. Large Fire tracking aims to improve tactical as well as strategic response to large forest fires.

Scope of Large Forest Fire

- To monitor continuous, large forest fires using near-real time basis.
  - For escalation of support from State and National agencies.
  - To support decision making for tactical firefighting purposes.
- To identify areas for post fire restoration / rehabilitation efforts.
- To carry out damage assessment from fires in terms of area, severity of burn, canopy cover loss etc.

For any enquiries - 0135-2754191 Ex-272

Today's Fire | Active >= 3 days | Active >= 5 days | Active >= 10 days

Large Fire Events Active for Today - 19-12-2024

* Click on the Numbers for more details

States	No. of Fire(s) *
ANDAMAN AND NICOBAR ISLANDS	0
ANDHRA PRADESH	0
ARUNACHAL PRADESH	0
ASSAM	0
BIHAR	0

Figure 4.4: Details of Large Forest Fire Event as shown in dashboard

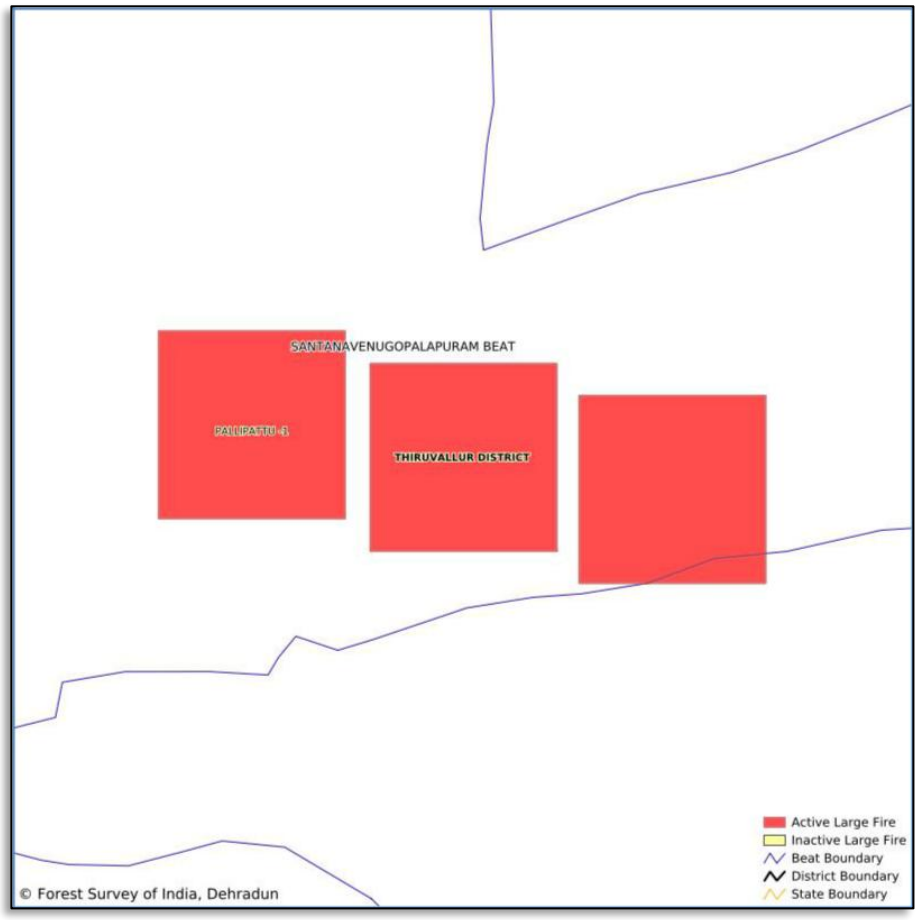


Figure 4.5 Map view of Large Forest Fire

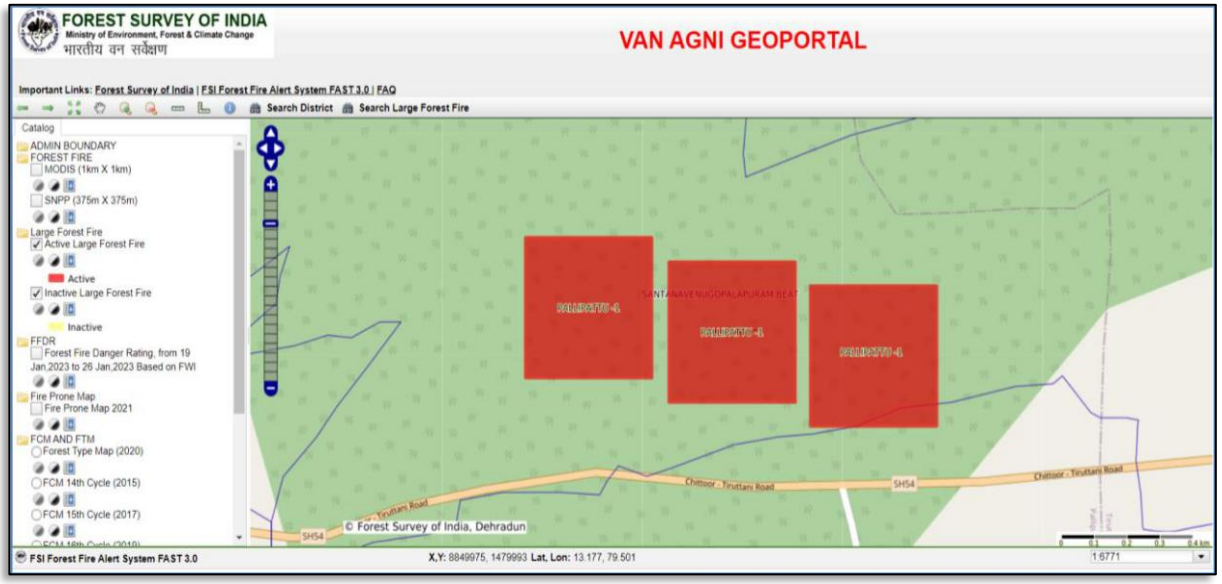


Figure 4.6 View of Large Forest Fire in Van Agni Portal

4.6. FSI Forest Fire Geoportal

FSI Forest Fire Geo-portal, VAN AGNI 1.0 (http://117.239.115.44:90/fsi_fire/fire.html) is a portal created using Opensource Software's viz. Map Server 7.0.7 & GeoMOOSE 2.9. It has been developed for user-friendly interactive viewing where the user can view forest fire related data inter alia, forest fires, large forest fire events tracking etc. along with other thematic layers such as Forest admin boundaries, Forest and Forest cover, forest type etc. A snapshot view of the geo-portal is shown. (Figure.4.6).

4.7. Need for Other Sources of Fire Detection

FSI is generating forest fire alerts six times in a day from MODIS Aqua, MODIS Terra and SNPP VIIRS sensors. Each of these sensors provides two sets of data every day in a period of 24 hours. Therefore, the forest fire alerts generated by FSI correspond to these 6 satellite overpasses and all fires data active in between these satellite overpasses cannot be detected by the satellite-based fire alert systems. So, it is highly recommended to use the FSI forest fire alerts for strategic purposes and not to rely on these for tactical firefighting purposes fully.

Satellite fire detection has also got some minor limitations:

1. The algorithms cannot detect fires through thick cloud, smoke and haze. A large fire may therefore go undetected for several days and then suddenly it reappears later when the cloud cover gets removed. There are chances that a small fire may burn and even die out without ever being detected.

2. Same could be the case for ground or surface fires under very thick, dense canopy which could go undetected, as optical and thermal (like: MODIS and VIIRS) wavelength-based sensors cannot penetrate through cloud or canopy cover. In those cases, the satellite may miss the existence of fire.

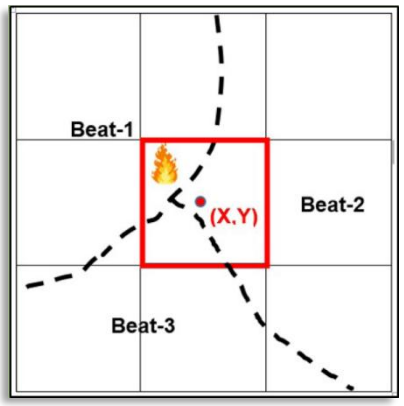
3. The forest fire alerts generated by FSI correspond to only 6 satellite overpasses in a day and all fires data active in between these satellite overpasses cannot be detected by the satellite-based fire alert systems.

4. The time lapse between fire detection by the satellite and dissemination of the alert to the user is between 1 to 1.5 hours, depending on the sensor and

processing time. This delay limits the utility of satellite detection for tactical fire operations.

5. The actual size of the actively burning area cannot be determined from satellite imagery. A 1-km^2 hotspot pixel may represent a fire as small as100 m^2. In addition, an intense fire covering an area less than 1 km^2 may show up as a cluster of several hotspot pixels.

6. Within a pixel of size 375m X 375m, one cannot specify the actual fire location. In those cases, an approximation is taken as, anywhere the fire is within 375 X 375 sqm; we need to consider its location at the centre of that pixel. When a pixel showing thermal anomaly falls in the junction of two or more adjacent range or beat boundaries; in those scenarios, the fire alert is disseminated to all the concerned persons of the said adjacent ranges and respective beats.



7. Satellite detects any active fire irrespective of its source. Filtration of forest fire is done at FSI. In some cases, fires in industries or agricultural land lying very close to forest area or falling under the RFA boundaries of states are sometimes considered as Forest Fires. Although utmost care is taken to mask out such industrial fires to avoid any false alarm, still sometimes, such fires are disseminated as forest fires.

8. The fire alert doesn't give details about the terrain in which the fire occurs. Steep slopes or interior location with dense ground vegetation makes it very hard for the field forest personnel to reach the point. There will also be challenges in accessing water points. So, there is need to integrate the digital elevation model with the forest fire points to give the real picture of the site which will help in arranging for additional support in handling such critical fires and tracking the forest fire response.

Therefore, it is highly recommended to use the FSI forest fire alerts for strategic purposes only and not to rely on these for tactical firefighting purposes fully. Other sources of forest fire detection such as observations from watchtowers, ground-based sensors, local information etc, wherever they are available, should be integrated and correlated for forest fire detection.

4.8. Guidelines for Three Types of Alerts

(i) Pre-warning Alert system developed by FSI is generated based on short term weather variables, is valid for 1 week and communicated to the Nodal officer on Fridays. On receipt of such information, it will be communicated to Circle and District Forest Fire Control centres which in turn will ensure intensification of patrolling and monitoring for potential fire in areas indicated by the pre-alert for the week.

(ii) Fire alert is issued once the same is detected during satellite overpass and this is communicated to Nodal Officer as well as to all those registered with FSI for the purpose. On receipt of fire alert from FSI, the state nodal Office also shall pass on the information to the concerned District Forest Fire Control centre. The DFFCC will immediately alert the Range officer and team, coordinate with all concerned, mobilize transport, equipment and personnel for firefighting, keep sending feedback to State Level Central Control Centre and ensure necessary assistance to firefighting teams.

(iii) Field detection – When fire watcher/patrol teams or other informers detect forest fires and inform the local staff, they should immediately alert both the firefighting teams and district forest fire control room. The District Toll free number has to be widely publicized especially in the forest fringe areas information boards, local tv channels and district administration. The DFFCC shall pass on this information to the SFFCC and ensure that the concerned range team is getting into the action on fire.

5. Pre-Forest Fire Season – Fire Control Preparedness Guidelines

The pre fire scenario needs inputs on effective preparations and planning for managing and combating fire. Understanding fire vulnerability and forest fire spread model could provide sufficient data for detailed fire control planning. Based on Government of India guidelines, past experiences, Tamil Nadu Forest department carryout various fire preventive measures like fire line clearing, patrolling by fire watchers in sensitive and vulnerable beats, mock drill etc.

Forest Fire preparedness is the primary responsibility of every District/Divisional Forest Administration. DFOs shall prepare an inventory of resources critical for forest fire prevention and management and make relevant information available to all in the forest divisions. Resources and assets may include forest department resources such as watch towers, control rooms, check posts, fire lines, patrolling paths, forest roads, water holes and other department resources such as location of fire stations, fire tenders, hospitals and their contact numbers, National and State Disaster Response Forces that could assist in preparedness and planning for response to forest fires.

As per Spatial-temporal analysis of 2016 - 2024 SNPP-VIIRS forest data of the State, January - June is the fire season, the longest dry spell of the State. The preparedness for forest fire season especially works meant for fire protection shall be completed prior to the month of January i.e. before the start of the fire season every year (pre fire season).

5.1. Pre -Fire Season Guidelines

The following guidelines is recommended to be followed during the pre-fire season in Tamil Nadu.

1. **Registration for Fire Alerts**

   District Forest Officers/Wildlife Wardens/Deputy Directors shall encourage and ensure the registration of all frontline staff to register with FSI's forest fire alert system by visiting FSI website. All staff up to the Forest guard shall be encouraged to use only the Tamil Nadu Forest Fire Management Information System (and the mobile application) to receive alerts in addition to the FSI SMS alerts. This dashboard/ mobile

app has to be used to update the status of the fire and also to report the action taken – flash report and final report. Till the time, this dashboard/application is made operational the usual mode of reporting through physical means shall be followed.

2. **State Forest Fire Control Centre (SFFCC)**

   SFFCC shall be nodal office for national and State level coordination in the state of Tamil Nadu. The centre will be equipped with all relevant data/information, facilities, equipment's to ensure that the fire related information is handled in a faster and continuous manner.

3. **District Forest Fire Control Centre (DFFCC)**

   District Forest Fire Control Centre (DFFCC) is a nodal forest fire command and control centre located in the Division Headquarters. It is provided with basic facilities to serve as a war room during the forest fire season equipped with communication devices, firefighting equipment's. It also serves as the base station for the firefighting crew in coordinating with local support agencies and also with SFFCC.

4. **District Fire Management Plan**

   The District Fire Management Plan will be prepared at Division/District level by the concerned DFO. It is a comprehensive document comprising strategy for fire management, resources available, logistics, facilities & operations of District Forest Fire control room, base stations at high-risk areas, communication system, details of fire sensitive areas, formation of committees, assignment of roles and responsibilities at different levels, alerting health services, requirement of resources etc., in a comprehensive manner. Each district has to prepare a comprehensive fire management plan, which will be endorsed by the concerned Circle Conservator of Forests and shall be submitted to the State Forest fire control centre (SFFCC) at the start of every fire year i.e. in the month of November

   Action plan for smaller units of Range and beat will be prepared wherein strategies and techniques for prevention and control will be given in detail based on criteria given below:

   - Fire sensitivity / fire vulnerability
   - Previous year fire occurrences and present status
   - Fuel load position in entire beat
   - Fire exiting point in the beat taking current year position

- Sources of water (to be recorded separately for drinking and other purpose) available during fire season in each beat
- Inventory of equipment's and other facilities such as hand tools, improved fire-resistant clothing and fire tenders, first aid kits, etc. available within the department and in neighbouring government and non-government agencies, hospitals, etc.
- Strength of labour force in surrounding villages and villagers to be covered for awareness.

The action plan should also chalk out details of preparatory works to be taken up such as extent and location of fire lines to be traced, moisture retention work, etc. based on the above criteria.

5. **Clearing of fire lines in the forests**

Fire lines are gaps in a contiguous forest. They break the continuity of the forest floor with combustible material. These could be of natural origin like streams, rivers, lakes and ponds or man-made structures like roads, canals etc. In addition, fire lines are formed to break the contiguity of vegetation and availability of inflammable material on the forest floor. Fire lines are also used for patrolling and perambulation. In the state of Tamil Nadu February to May is the peak fire season. Fire lines are formed prior to start of fire season, that is during the winter season itself as per the prescriptions of the Management Plans/ Working Plans of the forests with the available fund resources (Figure 5.1)

6. **Wireless Communication**

Proper maintenance of walkie–talkies should be done. DFO shall ensure that field staff and patrol teams shall carry and use the wireless walkie talkie device so that when fire occurrence is noticed, it is informed to the base stations and passed on for quick response to the District Forest Fire Control Centre for immediate fire control action. In remote forest areas where mobile network is not well established, wireless network being the mainstay of communication special care should be taken to ensure fully functional wireless communication which may be strengthened if required.

7. **Rotational Burning/Controlled burning of forest floor litter**

Fire depending on where, when and why it occurs can be either an essential factor or otherwise, in the ecological cycle, it is a destructive unnatural threat. Rotational and



Figure 5.1 - Before and after Fire Line Clearing at Chengalpattu

controlled burning is the established silvicultural and forestry management practice. Conservator of Forests/District Forest Officer shall decide as per necessity to burn the forest litter to reduce the fuel load and fire risk. Any control burning operations planned to be carried out shall be informed to the State Forest Fire control Centre (SFFCC) in advance so that the concerned authorities are informed in case a fire alert is generated. The details of the area, time and date of control burning shall be intimated to the SFFCC.

Depending on the fire return interval for each area controlled burning cycle should be fixed. The areas to be control burnt will be based on vulnerability of the area as per studies made by GIS Cell as well as field staff. These areas must be inspected and approved by the District Forest Officer/Wildlife Warden/Deputy Director, latest by 15th November and the controlled burning must be completed by the end of December. No area should be taken for controlled burning after 31st December.

8. Awareness generation Programmes

Training / Workshop to frontline staff, meetings of Village / Block / District level Fire protection Committees, Distribution of publicity pamphlets had been taken up for awareness generation. At fringe villages, Village level and Block level and meetings are conducted to sensitize the people. Other methods used for awareness towards prevention and reporting of forest fires were pamphlets, hand bills, banners, fire-protection week, sensitization through local TV channels, use of multimedia, video film etc (Figure5.2).

9. Local community participation

All the Panchayat (local bodies) / Village Forest Councils / Joint Forest Management Committees / Eco Development Committees / Self Help Group / Non-Government Organisations / Voluntary Organisations working in the area and youth groups are mobilized to control the forest fires in their respective areas. Workshop, rallies, meetings and distribution of extension/publicity material had been taken up for awareness generation by the Tamil Nadu Forest Department (Figure 5.3).

Engaging local community, creating awareness in forest fringe villages, training to seasonal fire watchers, engaging JFMCs in fire management for improved ground-based information on forest fire and such other activities will be taken up in each division. Trainings on first aid and rescue shall be organized.



Figure 5.2– Engagement of local villagers for fire management works along with front line forest staff at Chengalpattu

10. Role of each personnel of Tamil Nadu Forest Department

In case of fire, agencies other than forest department available and to be involved, role of each such outside agency/government department involved in fire prevention and firefighting should also be pre-determined and well defined. Mock drills will compulsorily be conducted especially in vulnerable areas.



Figure 5.3: Training on first aid and rescue done at Attur Division

11. Financial Planning

Most importantly, budget required should be worked out, sought for with full justification and prioritized work taken up with available budget. As the fire season is spread over two financial years, adequate financial resources for the purpose of fire control shall be placed at the disposal of the concerned during both the last quarter of the current year and first quarter of the following year.

12. Special strategy for Forest Fire Sensitive areas (Forest fire prone areas – FFPA)

The beats showing high or very high sensitivity/vulnerability to forest fire need specific targeted protection approach. This should be reflected in each action plan which should also be annually updated based on new data.

13. Review and Monitoring

The Chief Conservator of Forests/ Conservator of Forests in each circle shall ensure availability of adequate funds, allotment of seasonal fire watchers, timely completion of works/schemes which are aimed at forest fire preparedness. Seasonal fire watchers may be allotted to each division at least at the rate of one fire watcher per beat for highly vulnerable divisions. Additional allotment for fuel shall be ensured. The CCF/CF shall monitor every aspect of preparedness for fire control and ensure effective communication, enhanced management effectiveness, capacity building, training for field staff and stakeholders, community involvement, awareness generation and so on.

Additional Principal Chief Conservator of Forests (APCCF) P&V shall monitor availability of financial resources, manpower, transport facilities and fire-fighting equipment prior to the fire season. The officer will also ensure that necessary timelines for action against forest fires is followed.

14. Other measures

I. Establishing coordination with line departments like Police, Fire & Rescue, Revenue, PWD, Health and local body.
II. Engaging fire watchers on daily wage basis as per requirement
III. Maintenance & mobilizing of rescue material and equipment's,
IV. Identification of Vehicles requirement for movement and transport of crew/ equipment's.

15. Annual Plan of Operation for Forest Fire

The tentative calendar of activities shall be as a Table 5.1

Months	Activity
October	Financial Resource allotment
November	Procurement of firefighting equipment's
	Fireline clearing and other works
	Training/Mock drill
	Registering with FSI for fire alert
	Inventory preparation & resource mapping
December	Fireline clearing and other works
	Training/Mock drill
	Registering with FSI for fire alert
January to March	Engaging seasonal fire watchers
	Regular patrolling
	Awareness creation
April	Financial Resource allotment
	Engaging seasonal fire watchers
	Regular patrolling
May & June	Engaging seasonal fire watchers
	Regular patrolling

Table 5.1 – Annual plan of Forest Fire operation

16. Strategy to combat forest fires

- Well established coordination between SFFCC in the office of the Principal Chief Conservator of Forests and the DFFCC at Divisions to ensure quick and continuous flow of information during forest fire season.
- Establishment of Rapid Response Team in each Range along with local volunteers and maintenance of 24X7 vigil during fire season.
- Deployment of fire fighters in the rapid response team and in the field.
- Equipment, machinery and vehicles for prevention and control of fire in each range of the division of the State.
- Deployment of forest fire watchers during fire season besides existing forest front line field staff (based on the available resources)
- Fire observation post/Watch towers to watch forest fire and on sighting the fire to inform and direct the RRT to the location for on-field action

- Seeking people support from forest fringe villagers
- All the Panchayat (local bodies) / Village Forest Councils / Joint Forest Management Committees / Eco Development Committees / Self Help Group / Non-Government Organisations / Voluntary Organisations working in the area and tribal, volunteers, youth groups are mobilized to control the forest fires in their respective areas.
- Availability of water in water holes, shoulder mounted pumps and tankers etc. to spray over fire.

5.2. Assessment of Forest Fire Prone Areas

Forest fire risk zonation provides a scientific basis for identifying areas of priority for management interventions, allocating resources to priority areas, and monitoring the effectiveness of measures to reduce or control fire risk. These risk zones shall be reviewed and updated at least once every five years to respond to any changes in the above-mentioned factors.

Frequency of detected forest fires in an area over a period of time indicates proneness of the area to forest fires. Map showing forest area in different classes of fire proneness can be an effective management tool for controlling forest fires. Such map can be used for optimally utilizing scarce resources available for controlling forest fires in fire season. Increased vigil in highly fire prone forest areas may effectively prevent forest fires. Considering usefulness of mapping fire prone forest areas, analysis of the detected forest fire points has been done for Tamil Nadu. The basic data for the study is the record of accumulated forest fire points (FFP) which have been detected by FSI in the last 9 years since 2016. These FFPs may not be exactly the number of forest fire occurrences in the country as these FFPs include repeated detections due to continuance of forest fires at many places. The data of FFPs may not be uniform for all the years because threshold value of confidence for detecting forest fires and also forest fire season has not been kept same in all the past thirteen years. Nevertheless, record of FFPs accumulated in the past nine years is an unbiased data which is strongly correlated with fire proneness of an area.

Tamil Nadu Forest Department, with the facility available at the State Forest Fire Control Centre, has analysed the MODIS/VIIRS fire data and mapped fire sensitive zones based on the FFPs from 2016-2024. The fire sensitive area has been identified at beat level based on fire data received from FSI and NRSC. The data was processed

at the Centre at the office of the Principal Chief Conservator of Forests, Chennai. The report is attached as **Appendix-I.**

With the decadal MODIS/VIIRS data, based on forest fire incidents in each beat, the forest beats were classified into 5 fire sensitive classes for the whole State. During the decade 2006-2015, 8649 fire incidents were detected within geographical area of the State of Tamil Nadu. Of these, 3272 fire incidents were detected within the notified forests of the state.

During 2016-2024, about 15,106 fire incidents within the forest area in Tamil Nadu was detected. At an average, around 1600 fire incidents per annum was detected during the assessment period 2016-2024 (Table 5.2). The total frequency of forest fire points in each beat has been determined by the summing the frequency of forest fire points observed in the respective beats which ranges from 1 to 204. The maximum frequency of fire occurrence has been 204 times over the period of 9 years (2016-2024) in Paricombai West Beat in the Mannavanur Range of Kodaikanal division, Gudiyur Beat in Denkanikottai Range of Hosur Division with 185 times, and Perumpallam Beat in Perumpallam Range of Kodaikanal Division with 158 times. The minimum frequency is "1" in about 551 beats during this period. Average annual frequency of observed forest fire in each beat has been computed by dividing total frequency by number of years i.e. 9. The average number of fire incidents was calculated by dividing the total number of fire incidents by 9 (number of years). Then the frequency class was divided into five classes adopting the same classification used in previous years. Based on the distribution of the frequency data (specific to the assessment period 2016-2024), the five different fire sensitive classes were identified as below the Table 5.2.

Fire Sensitivity Class	Frequency Range
Very High	Average frequency of forest fire (12 & above)
High	Average frequency of forest fire (9 – 12)
Moderate	Average frequency of forest fire (6 – 9)
Low	Average frequency of forest fire (3-6)
Very Low	Average frequency of forest fire (0-3)

Table 5.2: Fire Sensitivity class (based on FFPs data 2016-2024)

5.3. Fire Sensitive Beats in TN

During the assessment period 2016-2024, about 917 reserved forests have recorded to have had fire incidents out of 2094 based on the FSI data. This includes both the SNPP and MODIS data points. Based on this, the fire sensitive beats are also identified, so that priority can be given to such beats for effective fire management. As beats are the smallest administrative unit in the forest administration, fire sensitive beats are identified to have focused approach. Here "Fire sensitivity" refers to the frequency of the fire incidents detected and reported by FSI.

The analysis shows that about 90 beats are fire sensitive. Among these, there are about 20 – very high fire sensitive beats, 24 – high fire sensitive beat and 46 – moderately fire sensitive beats.

The MODIS and VIIRS detected fire incidents, of 2016 to 2024, were overlaid on the forest map of the state to assess the frequency of fire occurrence at beat level. As per analysis, at least one fire incident had been detected in 272 reserved forests. Based on number of fire detections in the beats the sensitivity is classified into five classes' viz. Very Low, Low, Moderate, High and Very High. The range of the class may vary with number of years and the data range. The number of beats in different fire sensitive class is as following table of 5.3.

Forest Fire Sensitivity Class	Fire frequency based on 2016 - 2024 forest fire alert data	No of Beats where fire incidents were detected
Very Low	0 to 3	785
Low	3 to 6	134
Moderate	6 to 9	46
High	9 to 12	24
Very High	12 & above	20
	TOTAL	**1009**

Table 5.3: Distribution of beats across the 5 Fire Sensitivity classes (FFPs data 2016-2024)

The list of the 44 (20+24) – very high and highly fire sensitive beats and 46 – moderately fire sensitive beats is available in Appendix I. The distribution of these fire sensitive beats was done with respect to circles Chart 5.1 and divisions Chart 5.2; accordingly, it can be inferred from Chart 5.3 that Hosur, has maximum number of fire sensitive beats, followed by Kodaikanal, Vellore, Kanyakumari, Nilgiris and WL ATR Tirupur.

Extending the analysis further to the Division level, Table 5.4 shows the distribution of fire sensitive beats across various divisions. Chart 5.2 shows the divisions with greater number of forest fire sensitive beats.

- Hosur
- Kodaikanal
- Vellore
- Kanyakumari
- The Nilgiris
- WL, ATR Tiruppur
- Theni
- Tirupattur
- Dindigul
- Salem
- Tiruvallur
- WL, ATR Pollachi
- WL, MTR Udhagai
- Dharmapuri
- Namakkal
- Tiruvannamalai &
- WL, STR Hassanur

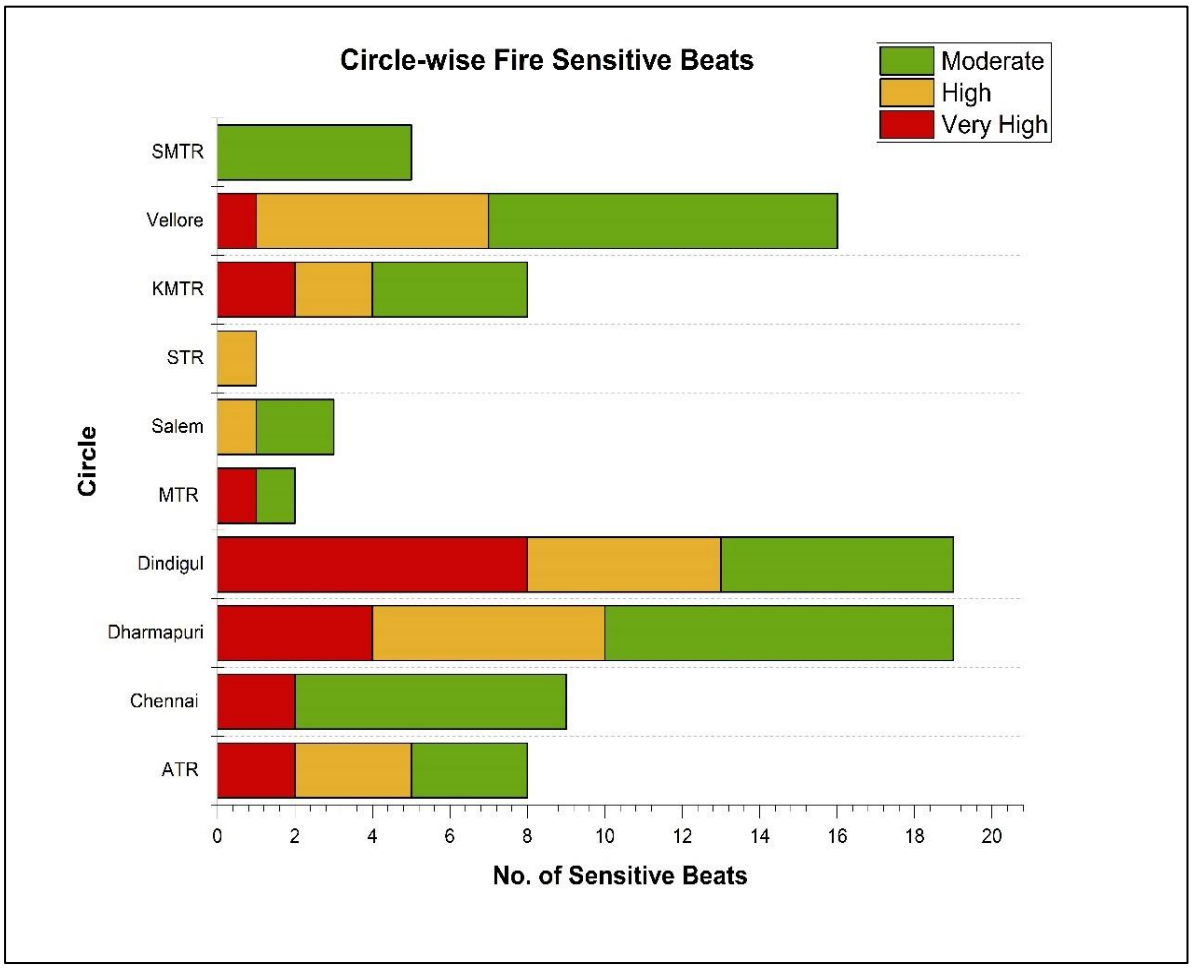


Chart 5.1: Circle wise number of Very High and High fire Sensitive beats (FFP data 2016 – 2024)

S.NO	Division	Fire Sensitivity Class (Based on 2016 - 2024 FSI Data)			
		No of Very High Fire Sensitive Beats	No of High Fire Sensitive Beats	No of Moderate Fire Sensitive Beats	Total
1	Dindigul	0	1	1	**2**
2	Dharmapuri	0	0	1	**1**
3	Hosur	4	6	8	**18**
4	Kanyakumari	2	2	4	**8**
5	Kodaikanal	8	4	5	**17**
6	Namakkal	0	0	1	**1**
7	The Nilgiris	1	0	6	**7**
8	Salem	0	1	1	**2**

9	Theni	0	0	5	**5**
10	Tirupatur	0	1	4	**5**
11	Tiruvallur	1	0	1	**2**
12	Tiruvannamalai	0	0	1	**1**
13	Vellore	1	5	4	**10**
14	WL, ATR Pollachi	0	1	1	**2**
15	WL, ATR Tiruppur	2	2	2	**6**
16	WL, MTR Udhagai	1	0	1	**2**
17	WL, STR Hassanur	0	1	0	**1**
Total		**20**	**24**	**46**	**90**

Table 5.4: Divisions with greater number of Forest fire sensitive beats (2016-2024)

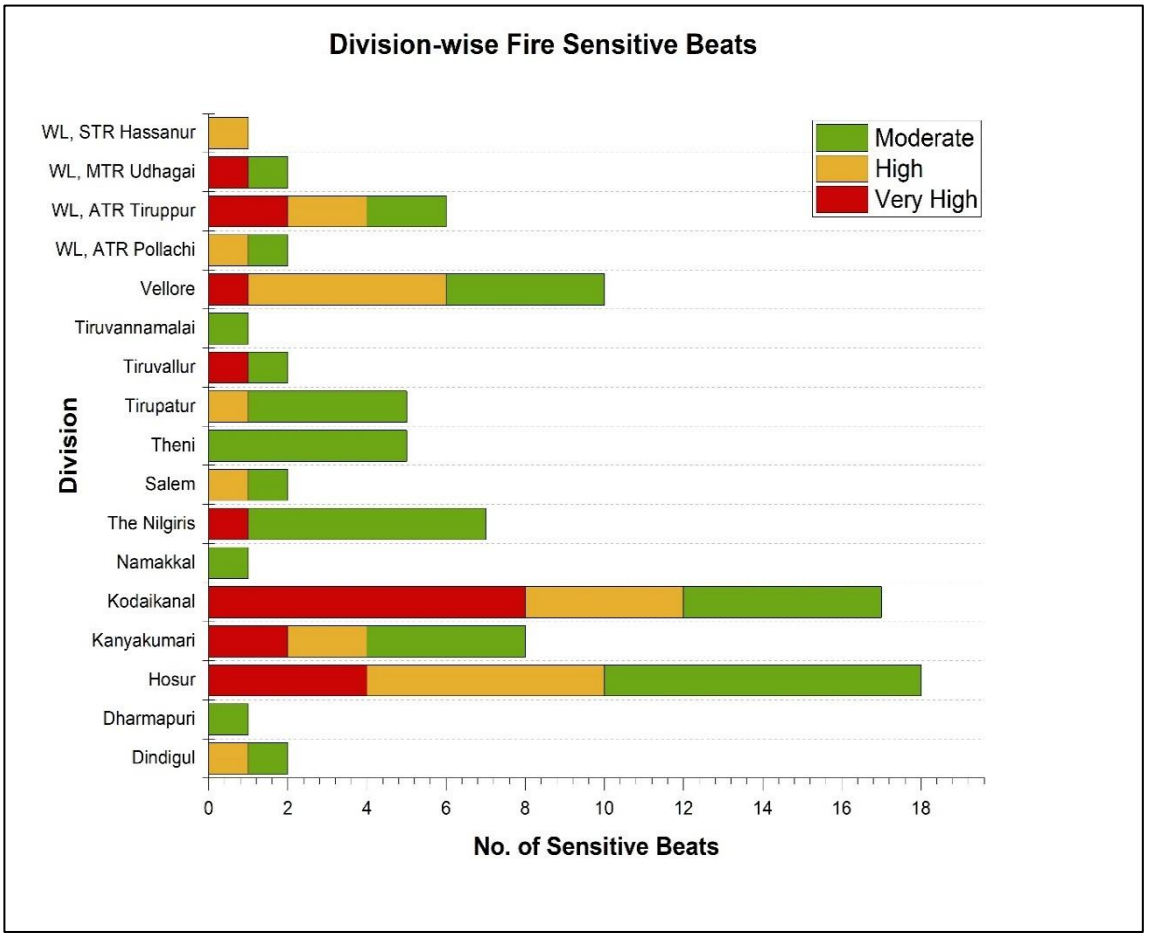


Chart 5.2: Division with more forest fire sensitive beats (FFP data 2016 – 2024)

5.4. Fire Sensitive Circles and Divisions in TN

From the total number of fire incidents reported by FSI between 2016 to 2024(fire seasons) through SNPP-VIIRS and MODIS is used for this analysis which is done at Circle and Division level. The average annual fire incidents are calculated by dividing the total fire incidents during the assessment period. Based on the range of the data between minimum and maximum value, the fire sensitivity class is determined. The details of the classification are provided in Table 5.5 and average annual fire indicated by FSI Chat 5.4. From the data it can be clearly inferred that about 60.5% of fire incidents in the state of Tamil Nadu is reported from only 8 divisions which are – Hosur, Vellore, Kodaikanal, Theni, Kanyakumari, Tirupattur, Tiruvannamalai and ATR Udumalaipettai. The Divisions that fall under the category of High and Moderately fire sensitive class reports about 32% of state's fire incidents (Figure 5.4). Therefore, special focus in terms of resource allocation and close monitoring is required for these 22 divisions. Amongst the Circles, Vellore reports maximum number of fire incidents in a year followed by Dharmapuri, SMTR, KMTR and Dindugal. In the 5 tiger reserve units, SMTR & KMTR are highly sensitive to forest fires. The other three tiger reserves also demand attention because their average annual fire incidents are above 100 within their respective jurisdiction.

Fire Sensitivity Class	Number of average annual fire incidents	No of Divisions based on 2023-24	% of Fire incidents detected
Very high	>100	9	65.01
High	>50 <100	5	13.90
Moderate	>25 <50	9	13.40
Low	>10 <25	6	4.36
Very low	<10	16	3.33

Table 5.5: Fire Sensitive class for Divisions and Circles (2016-2024)

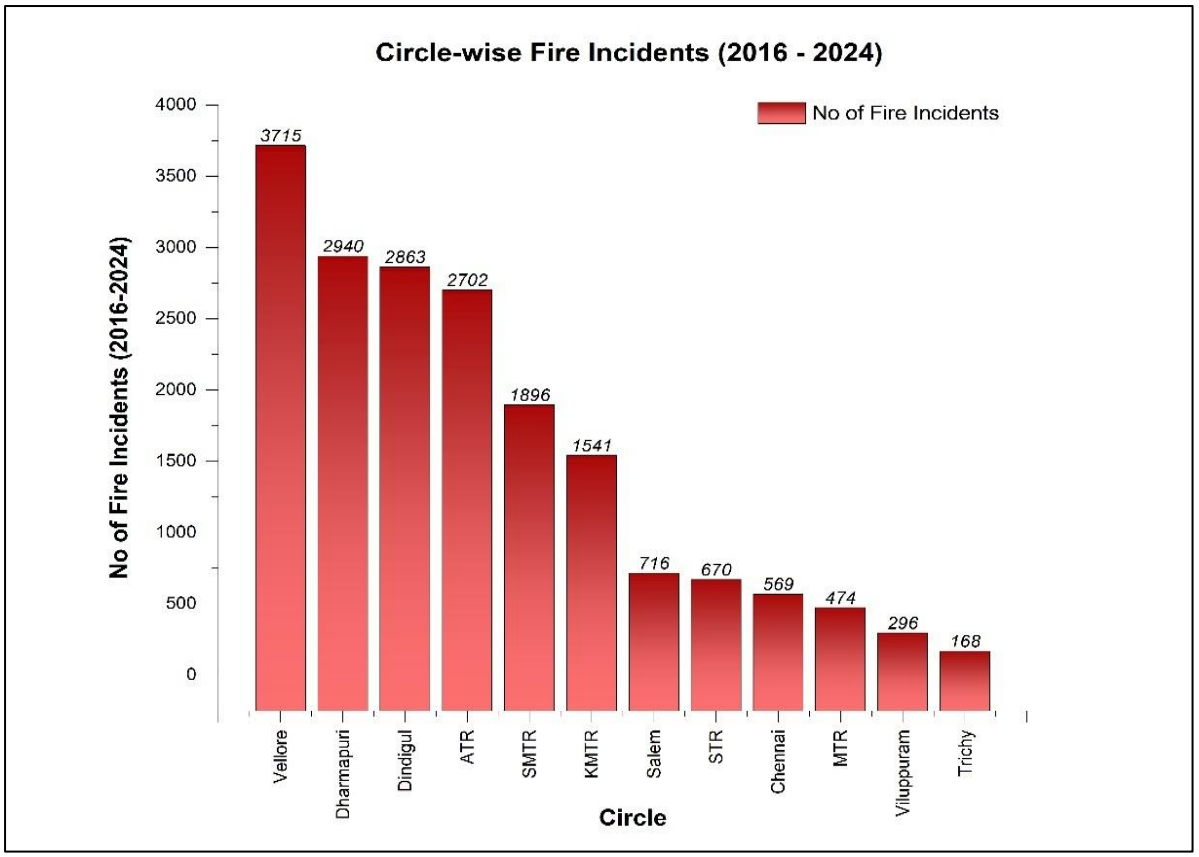


Chart 5.3: Circle wise data on average annual fire incidents detected by FSI (2016-2024)

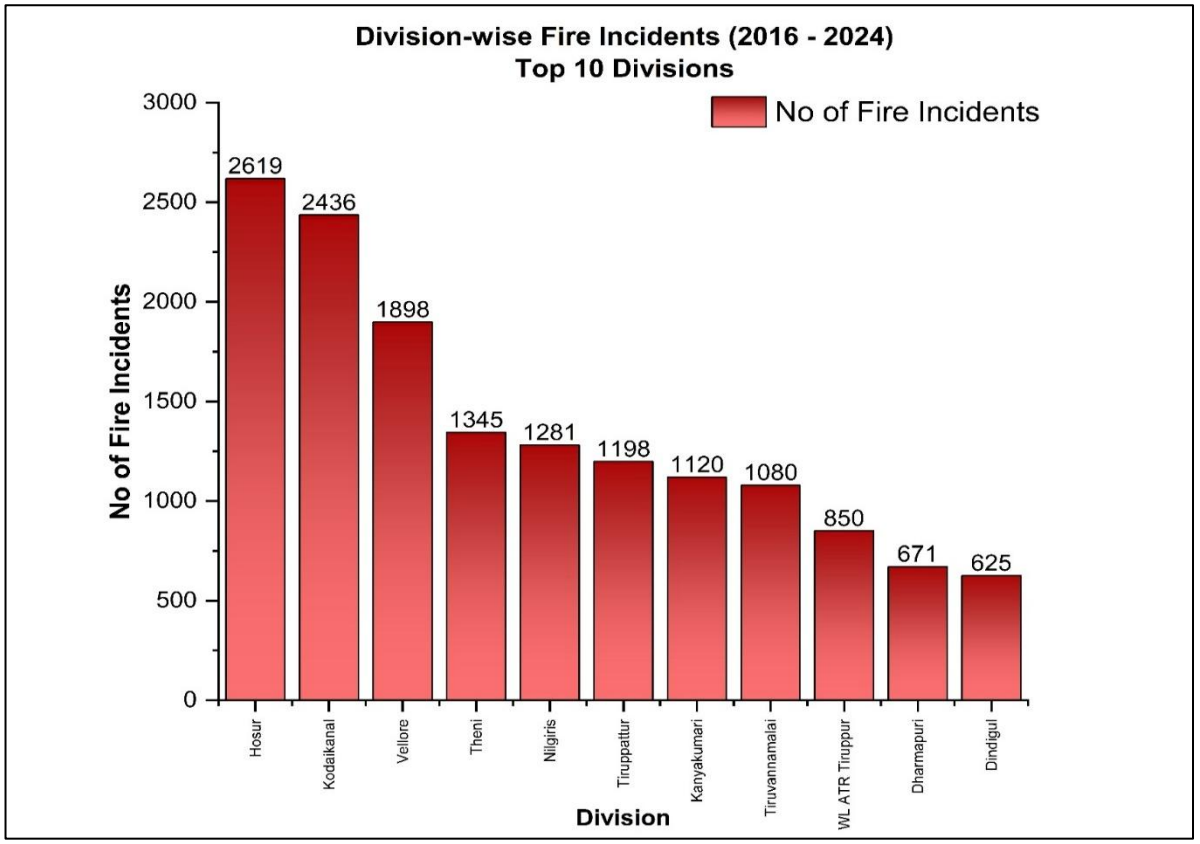


Chart 5.4: Top 10 Division data on average annual fire incidents detected by FSI (2016-2024)

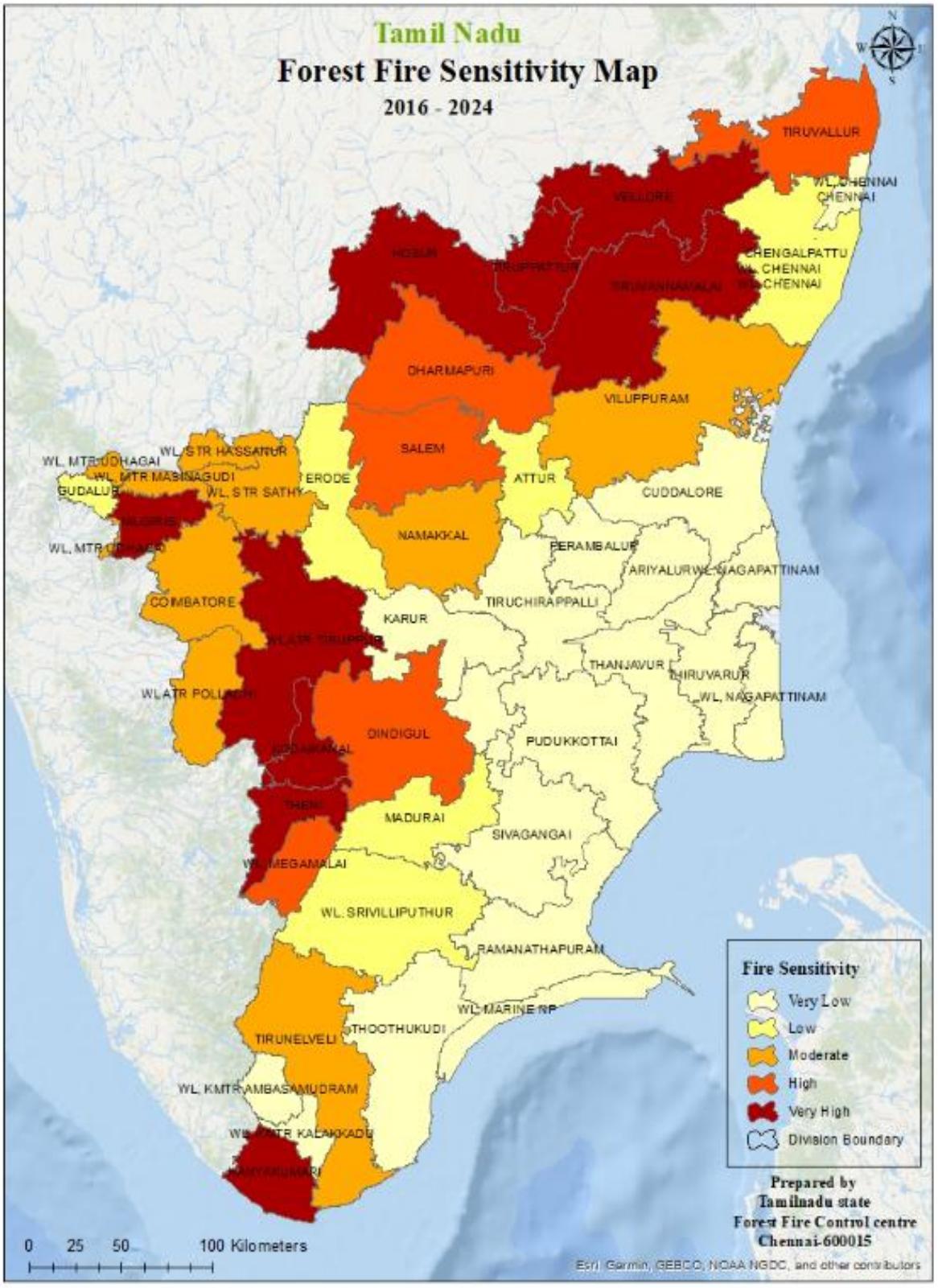


Figure 5.4: Forest Fire Sensitivity of Tamil Nadu

5.5. Guidelines for Fire Management in Vulnerable Areas

Increasing the resilience of forests to fires Management interventions for increasing resilience to forest fires may be planned according to the vulnerability to forest fires. Preparedness in forest fire management leads to effective response to fire disasters resulting in reduced impact and quicker recovery. The following steps shall be adopted during the pre-fire season in the forest fire sensitive areas (Figure 5.5.)

a. Moisture and water conservation

As fire hazard is more in drier and deciduous habitats and areas with predominance of grasses, management action would need to aim at moisture retention for longer time after rains and appropriate preventive measures to ensure that minor fire incidences do not escalate into major fire events. A long-term plan for improving the water regime the forest areas based on opportunities and feasibility will be useful in reducing vulnerability to fires. Several existing programs for eco-rehabilitation and catchment area treatment plans provide scope for this kind of work.

b. Promoting greater adoption of the Forest Fire Alert System

DFO shall encourage the involvement of all field functionaries in the same, so that the forest fire alert system can percolate down to beat level in least possible time.

c. Improving Ground based Detection

Even with the advances in new remote sensing technologies for fire detection, ground-based detection should continue to be essential and should be sufficiently resourced. The DFO shall perform an assessment of the efficacy of the existing network of watchtowers by a review of the level of functionality and operational use of the existing towers. New watch towers may be proposed in new locations that are vital for fire watchtowers based on coverage, visibility, ignition sources, and other relevant factors.

d. Strengthening engagement with local communities

Local communities are often the first to spot fires and alert the forest department. Locally suitable mechanisms should be identified by the DFOs for sourcing reliable and quick information from local communities.

e. Dedicated Phone line

A toll-free telephone number for fire detections and other required support needs to be established at District level to obtain information on forest fires from tourists, passersby and local people. This telephone facility to be manned 24X7 during the forest fire season at the District Forest Fire control Centre. All the call details received on this telephone line shall be recorded with detail of the informer, contact number and location.



Figure 5.5: Pre fire season workshop for coordination with community, Elected bodies and NGOs conducted at Chengalpattu Forest Division

f. Wireless network

As mobile telephone network is not well developed in most remote forest areas, the frontline staff shall be supplemented by a dedicated wireless network.

g. Digitize the location of critical resources and assets

District Forest Fire control centre shall conduct inventory mapping of critical resources for forest fire prevention and management and make relevant information available to the range offices. Resources and assets to be inventoried may include forest department resources, such as watchtowers, ground crew stations, controls rooms and fire lines as well as non-department resources, such as the locations of fire stations, fire tenderers and National and State Disaster Response Forces, and army and paramilitary camps. They may also include important infrastructure such as roads, railways, and telecommunications networks and natural resources such as water bodies and natural fire breaks that could assist in preparedness and planning for response to forest fires.

h. Forest Fire Lines

State Forest Fire Control Centre may undertake the mapping and digitizing of the location of existing fire lines and other infrastructure such as roads, transmission lines, and rail lines that may function as fire breaks for all the sensitive divisions.

- A review of the maintenance status, functionality, and adequacy of these fire lines, and an assessment of the need for new fire lines, may be undertaken considering past fire data, forest types, habitations, and other relevant factors.
- Proposals for new fire lines should be made on a scientific basis considering their potential efficacy in reducing fire risk and their proximity to people, property, and areas of special concern (e.g., protected areas).
- Plantations should not be raised on existing or proposed fire lines.

i. Control Burning

Control burning may be necessary in some places for preventing spread of fire.

Prioritization of areas for control burning as part of the fire risk zonation analysis and development of site-specific guidelines for control and prescribed burns to be developed and revised as may be necessary (Figure 5.6).

Apart from the previous year forest fire occurrence data, there are other local parameters that can also contribute to the forest fire risk. The following factors, among other locally relevant, may be considered for identifying and quantifying fire risks:

i. Fuels, including forest cover and type as a broad indicator of fuel type. Optionally, states may perform field-based studies to measure fuel load and type.

ii. Proximity to infrastructure, property, and other assets, including roads, habitations and other buildings, agricultural lands, transmission lines, and railways.

iii. Topography, including slope, aspect, elevation, terrain ruggedness and other characteristics.

iv. Social indicators, including local dependence on forests for livelihoods, poverty, and traditional land use practices.

v. Historic fire occurrence and patterns may be used to identify areas that are most prone to fires.

vi. Areas of special ecological or cultural importance, including protected areas, historic sites, designated heritage sites, temples, pilgrimage routes, etc.; and

vii. Special ecological conditions, for example, bamboo flowering, may be considered and provided weights



Figure 5.6: Control burning carried out under the monitoring of forest officers

Need to identify the fire risk zones at Division level

The results of the forest fire risk zonation shall be translated into concrete management actions under the District Fire Management plan. The Working Plan Officers (DFOs in the case of Plans already in operation) shall identify activities or interventions to mitigate fire risks or reduce impact of the fire hazards in high-risk areas. These may include creation of additional fire lines, watch towers and other infrastructure in vulnerable areas. The same shall be examined speedily by the appropriate authorities for approval and making provisions for financing the approved activities. The Annual Plan of Operations for all forest divisions and circles, and protected areas, shall include the approved activities and interventions mentioned above. The state planning and finance departments shall prioritize resource allocation for forest fire management.

5.6. Early Warning Alerts for Forest Fire

Forest fires are difficult to predict in advance, as almost all fires are caused by people in our country, unlike the case in many Western countries for example Canada where only 60% of forest fires are manmade and the rest are caused by natural factors. Forest fires can thrive only when sufficient fuel is available and weather conditions are suitable for its initiation and spread. Accordingly, countries such as USA, Australia and Canada have Fire Danger Rating Systems (FDRS) in place to provide accurate advance warning of fires to foresters and communities based on current weather and fuel information. The experience of countries such as Indonesia, Croatia, indicate that straightaway adoption of FDR from another country without customization to local conditions can lead to failures.

Therefore, Forest Survey of India, with years of experience with the repository of fire related data, developed in 2016, an indigenous “Early Warning Alert System for Forest Fire”. The alerts to State Forest departments are based on parameters like Forest Cover, Forest Type, Climatic Variables (Temperature and Rainfall) and recent fire incidences over the area. The GIS layers of these parameters are overlaid and intersect areas above threshold values are chosen and communicated as pre warning forest fire alerts in the form of KML files through email to the nodal officer of the State Forest Departments. These alerts which are generated based on short term weather variables, are valid for the ensuing week. This process was further refined in 2017 wherein, small areas which are vulnerable to fires were also alerted.

In the year 2017, the analysis was shifted to a grid-based system (5km x 5km) allowing parameters to be quantified and represented within these grids. Certain additional

parameters were also included to make the "Early Warning Alert System for Forest Fire" more robust. The parameters currently used in the Pre-Warning System are as follows:

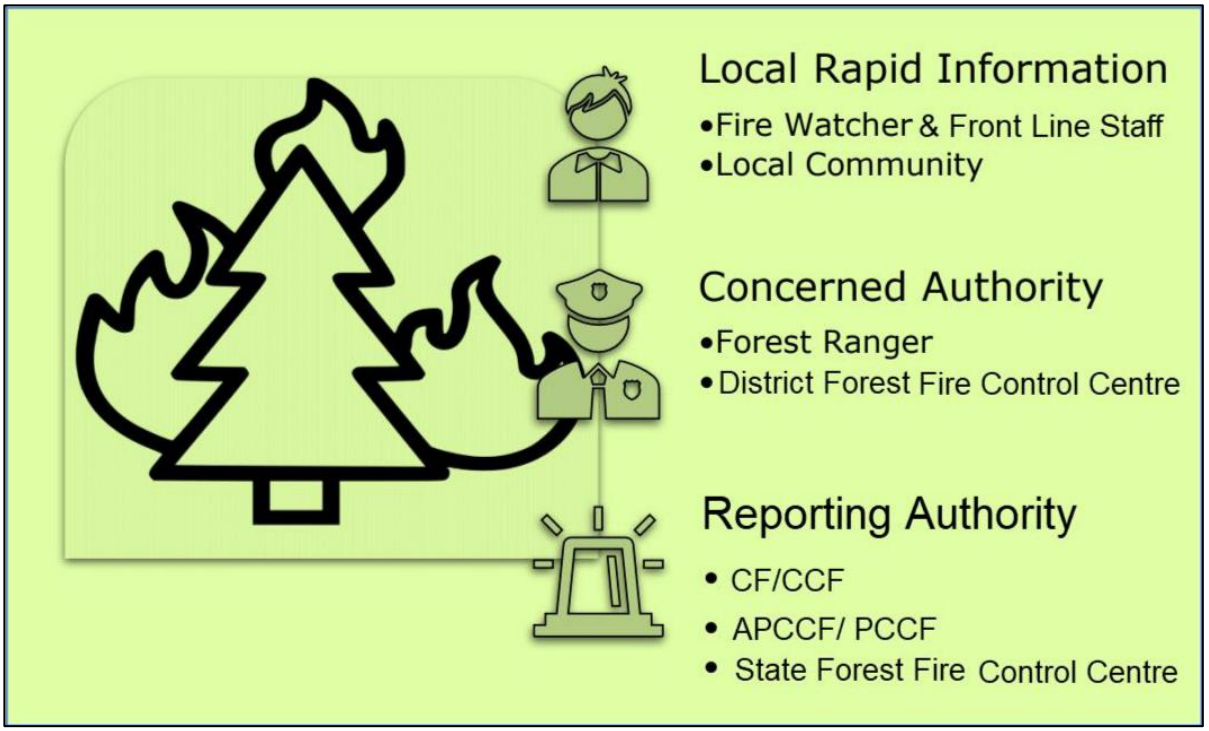
1. Forest Cover Density Classes
2. Forest Type Groups
3. Daily Relative Humidity
4. Daily Maximum Temperature
5. Rainfall (Both of recent past and forecast)
6. Fire Alert database (2004 to 2016)

Forest cover density and Forest Type indirectly denote availability and type of fuel load respectively. Daily Maximum Temperature and corresponding Relative Humidity from Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC) was used to denote the moisture content of fuel and prevalent drought conditions over the area. Rainfall data of the previous 7 days obtained from Customized Rainfall Information System (CRIS) of India Meteorological Department (IMD) and short-term Rainfall forecast from Indian Institute of Tropical Meteorology (IITM), Pune was used to mask out areas receiving adequate rainfall so that such grids are not alerted.

The TN State Forest Fire Control Centre at Chennai, shall take up similar initiative in collaboration with FSI and technical guidance from other nationalized institutions, to develop an early warning forest fire detection for the state at the beat level. This will help the local forest administration to initiate appropriate action in advance to reduce the intensity of the fire and also helps to increase the level of preparedness.

6. During Fire - Forest Fire Alert & Fire Control Guidelines

Detection of forest fires is one of the most important factors for early control since it is very difficult to control forest fires from spreading unless detection and firefighting start early. Conventional methods of detection involve the construction of watch towers at vantage points, communication through a network of wireless sets, and engaging fire watchers. Sometimes, due to the remoteness of the tract, forest fires may remain undetected for a day or two during which time they spread to an uncontrollable extent. Thus, adequate measures have to be taken for the early detection of outbreaks of forest fires. Sometimes due to lack of coordination, non-availability of manpower or communication systems, large areas get affected by fire. This issue should be methodically addressed.



6.1. Guidelines for Fire Suppression

Immediate response to forest fires after receipt of information is of utmost importance. DFOs must develop a culture of emergent response to fire alerts under which all

available resources are used to douse the fire. This needs intense training at all levels, strengthening of infrastructure, and coordination with other relevant agencies.

I. Training for field staff, firewatchers, and community firefighters

The principal need for forest fire suppression is to have an adequate competent, trained, and equipped workforce on the ground, ready to respond and take immediate action. Training should be provided to field officers, seasonal firewatchers, and community volunteers involved in firefighting. All these firefighters should understand the basic principles of forest fire management for using the most effective suppression technique at their disposal and know when retreat is necessary. The type of training provided to firefighters should be tailored according to the landscape, the nature of the terrain, their level of responsibility and their role in the command structure in responding to fires.

I. A modern and standardized training curriculum should be developed by TNFD. Other agencies involved in fire response, including the National Disaster Management Authority (NDMA), NDRF, and the State Disaster Management Authorities may be involved in a consultative role.

II. Mock drills should be organized before fire season at various fire prone areas involving all the stakeholders such as District Administration, Police, Fire Department, NDRF, SDRF personnel, community organizations etc. for identification of gaps in the existing mechanism and better preparedness during crisis time (Figure 6.1).



Figure 6.1 – Mock drill conducted at Kodaikanal, Source: DFO Kodaikanal

III. Provision of training, equipment, and coordination should extend beyond government departments and staff to community institutions in those divisions which are identified as Fire Sensitive Divisions

II. Equipping the firefighters

I. The firefighting squad including field staff, seasonal firewatchers, and community firefighters should be provided with adequate firefighting equipment including leaf litter blowers, and protective clothing.

II. There should be sufficient practice sessions for the firefighting personnel in the use of the firefighting equipment including leaf litter blowers, and protective clothing to enhance their efficiency in actual firefighting.

III. All such equipment should be well maintained and should be tested well in the pre-fire season. DFOs have to ensure this equipment testing activity.

III. Development of adequate infrastructure for fire suppression

I. An effective communication network should be ensured in all fire prone forest areas using wireless where necessary.

II. DFOs to ensure prompt access to field vehicles from nearby forest divisions for movement of firefighting personnel to the fire spots at the earliest.

III. Advance technologies such as use of drones shall be explored in identification of exact location of fire points, to assess the intensity & direction of fire to facilitate fire extinguishment at the earliest.

IV. Forest road network should be properly maintained for quick movement of firefighting forces to the fire site.

IV. Arrangements for adequate manpower in fire prone areas

I. The vacancies at the fire sensitive beats should be filled immediately whenever any such vacancy arises, especially at the level of frontline forest officials in the fire prone areas on priority basis.

II. Trained manpower may also be mobilized from other agencies such as Police, District Fire services, NDRF, SDRF etc.

III. The Communities living near the fire prone areas should also be sensitized and may be incentivized towards fire suppression activities.

IV. There should be a mechanism for mobilization of forest fire fighting volunteers and providing them with adequate training. The District Forest Fire Control Centre should ensure that all of these guidelines are adhered to in a time-bound manner. A database of the firefighting volunteers should be maintained by the District Forest Fire Control Centre.

V. Quick response to the Fire information

I. Apart from the FSI fire alerts which is received through SMS or mail, the Division officer shall ensure that all staff have access to the Tamil Nadu Forest Fire Management Information System which is the only platform used to communicate the status of forest fires.

II. Detection of forest fire incidents shall also be through information gathered from local sources, patrolling teams on watch towers, district forest toll free service, FSI / MODIS based satellite data and other sources.

VI. Managing forest fire at the site

I. The information related to fire, fire-fighting team (Crew / Mobile) team moves to the reported area of fire incidence, seeks assistance from local villagers, if available and required (Figure 6.2 and 6.5). These teams try to extinguish the fire with help of tools, equipment and locally available resources. (Appendix)

II. Counter fire, if required shall be considered.

III. Beating the ground fire by brushwood and removal or clearing of forest hazard fuel load and dry fallen leaves.



Figure 6.2: Forest Fire Management Rapid Response Team at Kodaikanal

VII. Mechanism to combat forest fires in large scale fires/emergencies (Crisis Management)

In case of large-scale fires/emergencies, highest degrees of coordination amongst various agencies of the Government (Forest Department, District Administration, Police, Fire Brigade, Public Works Department, Health etc.) and local groups/institutions is ensured. Help of State Disaster Management Authority, Para-Military Forces, National Disaster Rescue Force, State Disaster Rescue Force, Eco-Task Force, Army, Police and Administration will be sought (Figure 6.6).

In the case forest fires spread outside forests, mechanism to be adopted shall include –

- Warning to the public and community near the fire spread area.
- Caution zone will be declared in and around human habitation (in coordination with District administration if necessary)
- Additional manpower shall be deployed to control the fire (DFFCC shall be responsible for this, in consultation with CCF/CF/DFO
- Organizing the community into groups and supplying equipment to combat fire.
- If necessary, evacuation of the public to a safe zone
- Adequate efforts will be made to protect the public, human life & livestock, their property

- Top priority for safeguarding human life, livestock

VIII. **Engaging local community**

All the Local bodies / Village Forest Councils / Joint Forest Management Committees/ Eco Development Committees/ Self Help Group / Non-Governmental Organisations/ Voluntary Organizations working in the area and youth groups, volunteers, tribal and Forest dwellers residing in the vicinity of forest areas, shall be encouraged to help the department in dousing the fire. Prescribed safety measures for personnel life have to be followed. Adequate drinking water, first aid kit and medical camp must be available (Figure 6.4,6.5 and 7.6).

IX. Involving other departments

- Fire & Rescue Department - for fire extinguishing operation
- Police - to maintain law & order, rescue works
- Panchayats - in providing logistics as and when required.
- Revenue - for evacuation, logistics to public rescue crew, regarding prevention of forest fire, preparation of strategies, its execution & proper monitoring.
- Medical Service/Hospitals - for emergency medical facility, ambulance service in case of any emergency.

IX. Standard Operating Procedure (SOP) for smooth co-ordination among the stakeholders – NDMA issued orders for chain of command

The National Disaster Management Authority (NDMA) of India often issues guidelines and Standard Operating Procedures (SOPs) for efficient disaster management. Here's an outline of what an SOP for smooth coordination among stakeholders, particularly related to forest fires and disaster management. Purpose of establish a clear chain of command, roles, and responsibilities among stakeholders for effective prevention, detection, and mitigation of respective chain command agency for standard operating procedure of forest fire given the table below 6.1.

Level	Agency	Status of Forest Fires	Fire Category Description
1	Forest Beat/Range/Division	• All Surface fires	Suppression of Ground Fire, depending on the terrain, forest types, circumstances, situation, and nature of forest fire
2	Forest Division	• Large Forest Fire (LFF) until 3 days	Suppression of Ground Fire, depending on the terrain, forest types, circumstances, situation, and nature of forest fire
3	DDMA	• Large Forest Fire (LFF) for 4-6 days crown fires until 2days	SDRF will be called if such fires continue in Protected Areas (PAs), depending on the terrain, forest types, circumstances, and nature of forest fire
4	SDMA/ SDRF	• Large Forest Fire (LFF) beyond 6 days crown fires >2-4 days	NDRF will be called if such fires continue in PAs. Indian Air Force (IAF) may be involved, depending on the terrain, forest types, circumstances, and nature of forest fire
5	NDMF/ NDRF	• Large Forest Fire (LFF) beyond 10 days Multiple LFFs in a Forest Division or Multiple LFFs across a State/UT crown fires beyond 4 days	Indian Air Force (IAF) may be involved, depending on the terrain, forest types, circumstances, and nature of forest fire

Table 6.1: Standard operating procedure

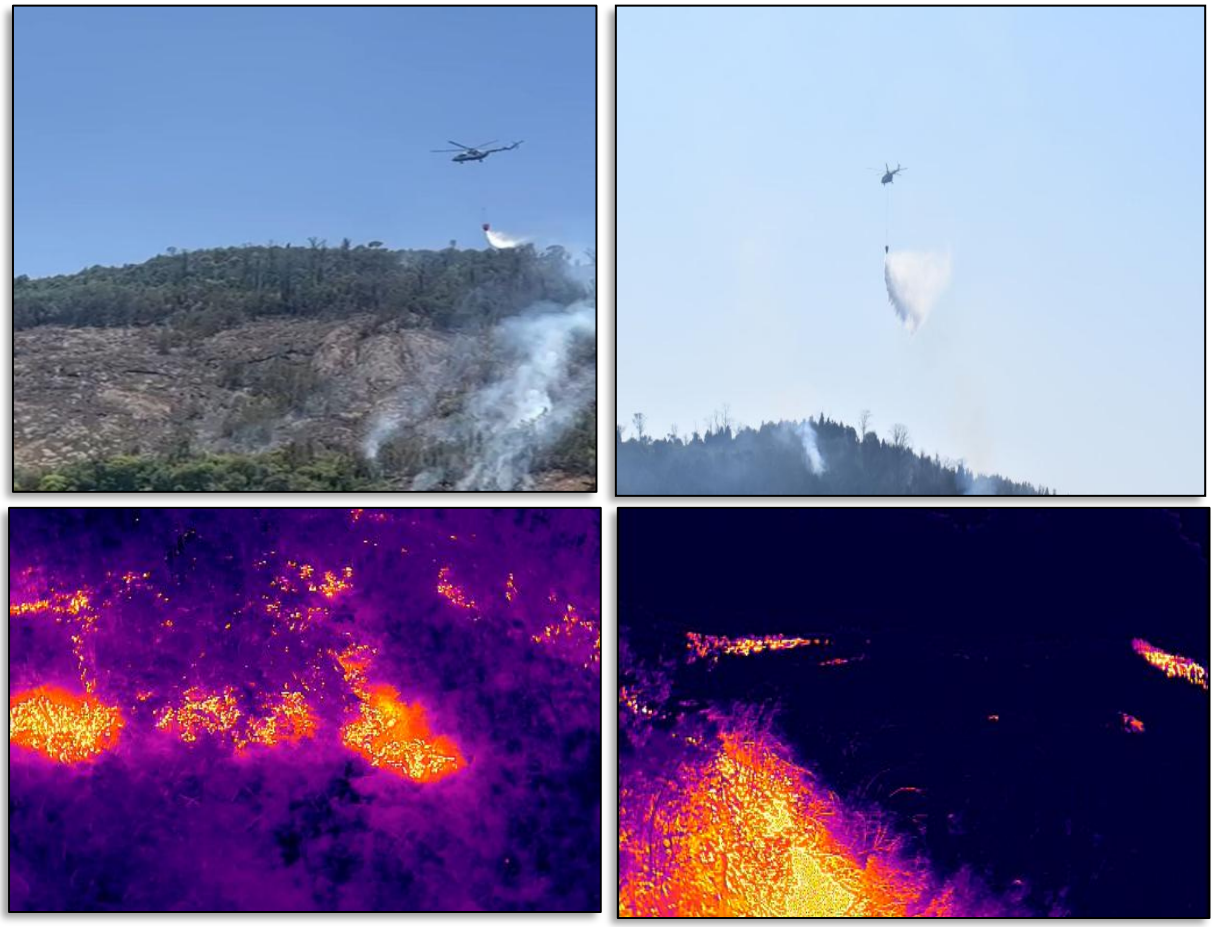


Figure 6.3: Fire suppression using Heli-bucket and Drone

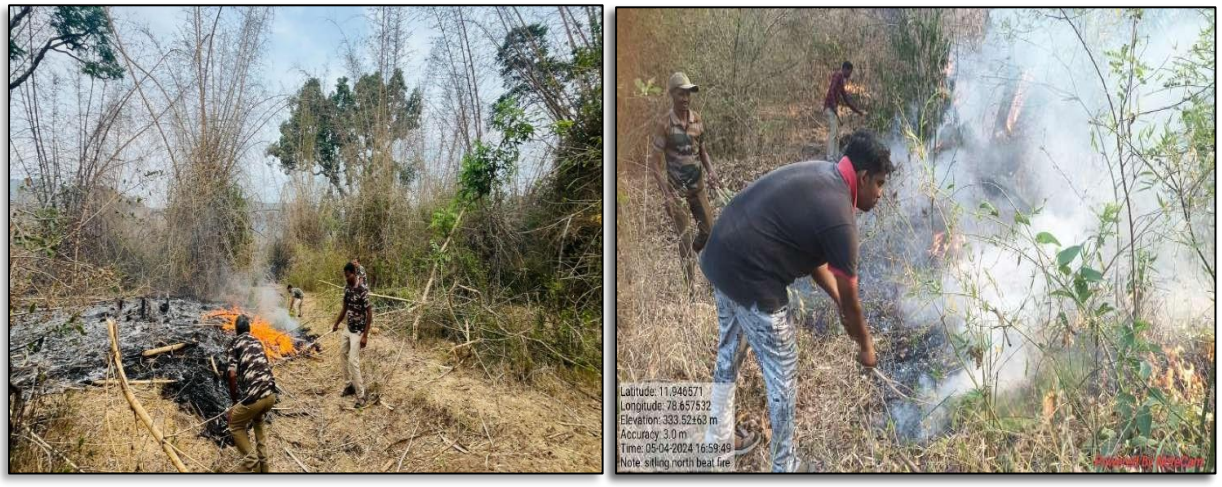


Figure: 6.4: Fire extinguishing carried out by forest staff in assistance with villagers at various fire



Figure: 6.5: Fire extinguishing carried out by forest staff in assistance with villagers at various fire



Figure 6.6: Fire extinguishing carried out by forest staff in assistance with the Police and Medical camp

7. Infrastructure & Crisis Management

Tamil Nadu Forest Department has established State level Forest fire control centre for fast flow of information and coordination of activities during the forest fire incidents

Address: Tamil Nadu State Forest Fire Control Centre, Panagal Maaligai, Saidapet Chennai -15

State Forest Fire Control Centre and the District control centres are expected to provide adequate support for the forest fire management at three different levels viz.

1. Pre fire (preparatory planning for fire control),
2. during fire (Fire detection, spread and control planning) and
3. Post fire (mitigation, Damage assessment and planning).

The State Forest Fire Control Centre will receive the near real time fire information from FSI/NRSC/MODIS/NASA/VIIRS/SNPP, integrate the data with State Forest Administration GIS database and communicate to the respective Divisions over Email/Phone for on-field fire control measures. Each Forest Division is provided with Forest Fire Risk/Sensitivity beats details to prioritize fire prevention, monitoring and planning mitigation measures.

7.1. State Forest Fire Control Centre

Tamil Nadu Forest Department had established a “State Forest Fire Control Centre” (SFFCC) for fast flow of information and coordination of activities during the crisis of fire. The objective of Tamil Nadu Forest Fire State Control Centre is to function as a command centre for the district forest fire control centre and shall coordinate with the nationalized organisations/institutions and the state authorities on the subject of forest fire. SFFCCs is operated by the Protection and Vigilance wing which takes care of the fire management activities at the State level (Figure 7.1).

TAMILNADU STATE FOREST FIRE CONTROL CENTRE

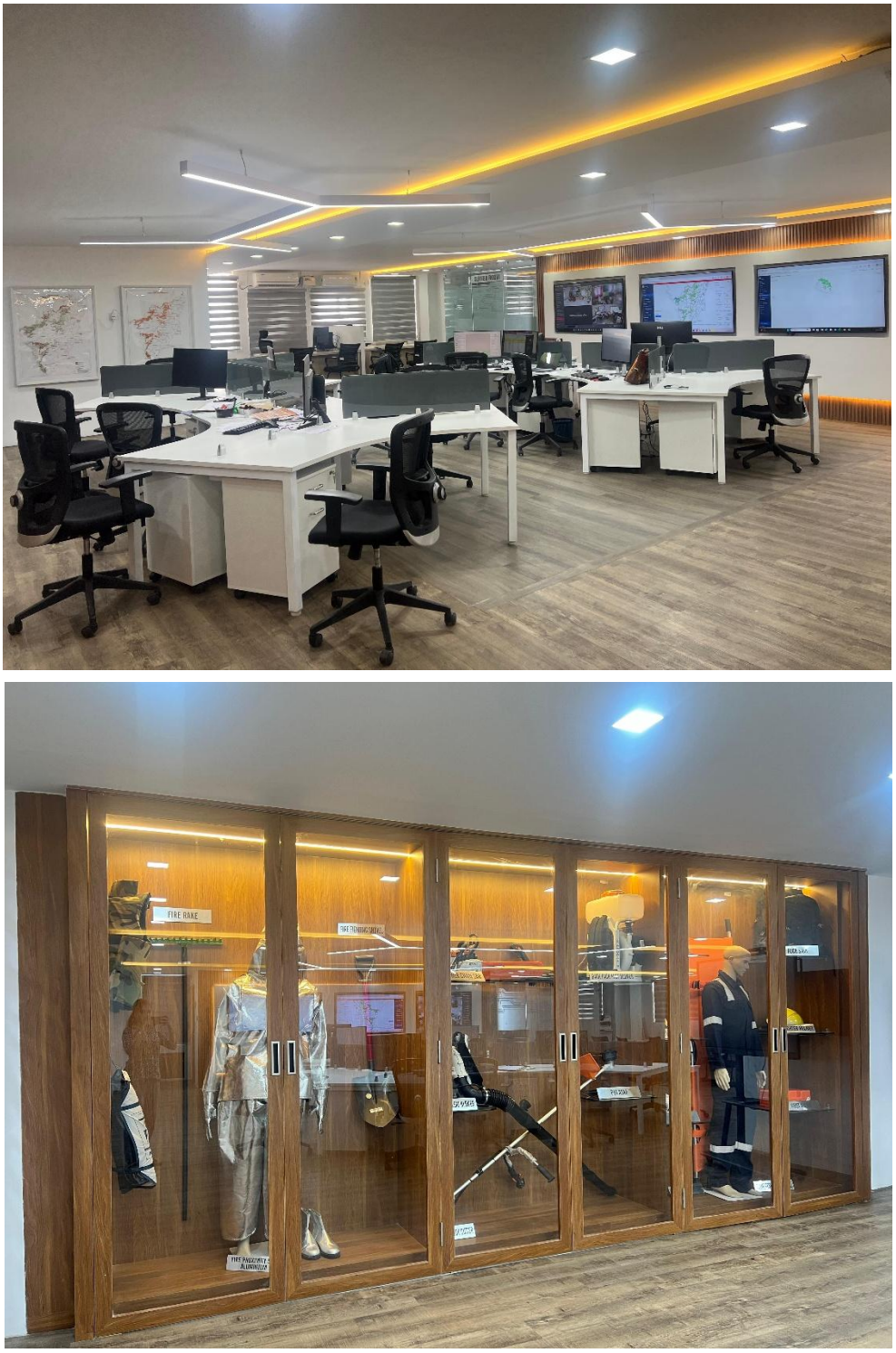


Figure: 7.1: Tamil Nadu State Forest Fire Control Centre

7.1.1. Tamil Nadu Forest Fire Management Information System

The Tamil Nadu Forest Department is using the Tamil Nadu Forest Fire Management Information System (TNFFMIS) as a Web Dashboard and a Mobile Application to monitor and manage forest fires. The system is designed to receive alerts from MODIS/SNPP VIIRS satellite sensors and send them to registered personnel through the Web and Mobile Application. The officers can then create reports that are recorded and stored in a central repository.

The main purpose of the forest dashboard is to provide real-time monitoring, recording, and analysis of forest fires. This helps to streamline the process for reporting and make it more efficient, as they no longer have to rely on paper reports. The dashboard allows for seamless monitoring and response, improving the ability of the department to manage forest fires (Figure 7.2,7.3 and 7.4).



Figure: 7.2: Tamil Nadu Forest Fire Management System

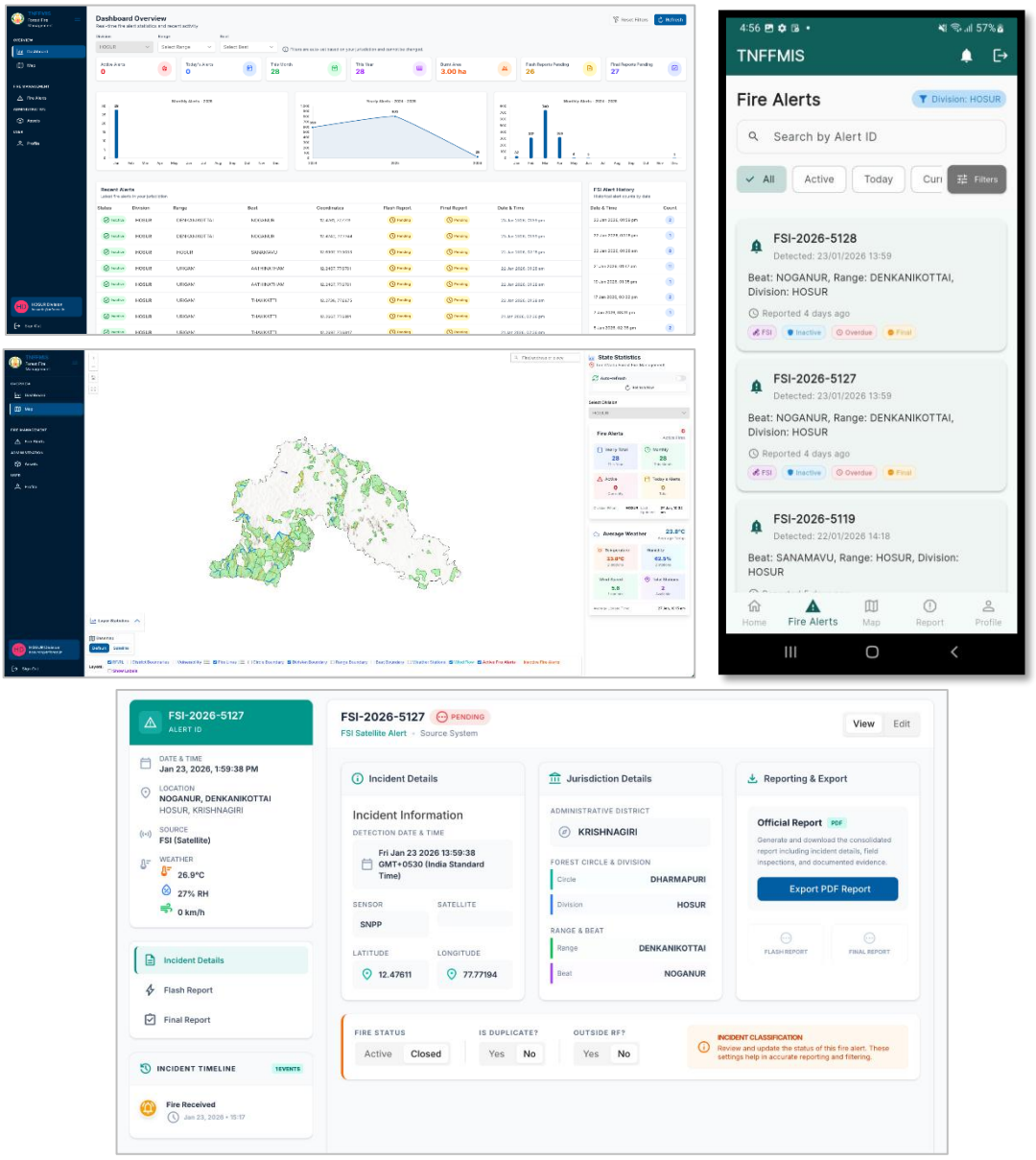


Figure: 7.3: Tamil Nadu Forest Fire Management Information System Dashboard

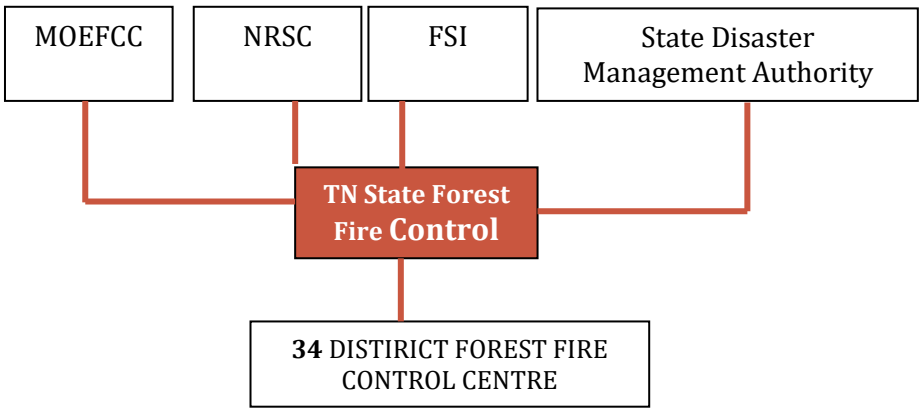


Figure: 7.4: Structure of Tamil Nadu Forest Fire Management System

Duties of SFFCC

The duties to be performed by the Tamil Nadu State Forest Fire Control Centre (SFFCC)are,

1. The centre will receive the real time fire information from FSI/NRSC/MODIS/NASA/VIIRS/SNPP,
2. Integrate the data with the State Forest Administration GIS database and communicate to the respective District Forest Fire Control centre.
3. To get regular updates from all the Forest Division on the status of the forest fire and also to gather details to prioritize fire prevention, monitoring and planning mitigation measures.
4. To render guidance regarding the fire location
5. To coordinate between nationalised institutions, state authorities and district centres
6. To keep Nodal Officers updated about the fire and action being taken
7. To render assistance in carrying out the burnt area assessment
8. To carry out data analytics on the forest fire, prepare vulnerability reports, identify sensitive beats.
9. To adopt latest ICT technologies for effective forest fire management
10. To act as communication and command centre for forest fire management

Functioning of State Forest Fire Control Centre – Roles & Responsibilities

1. **Forest Fire Alert System - Real Time Fire information from FSI/NRSC:**

   Fire Alerts received from FSI and NRSC will be immediately viewed at the centre. Though the forest staff and officers have registered for the fire alerts in the FSI portal, this centre will be intimated of all the alerts through the Tamil Nadu Forest Fire Management Information System which has been developed by the IT wing of TNFD. Presently the alerts are generated four times in a day based on the satellite passing and the fire alerts are received as SMS on the registered mobile. Sometimes, there are chances for the field personnel to miss these alert messages, but the centre will immediately respond to the alert through the 24 hours manned

personnel (during forest fire season) and the respective district and field officers will be alerted which will ensure the immediate response to the forest fire.

2. **Forest Fire Response Tracking, Reporting and Data Analysis**

The centre will be using Tamil Nadu Forest Fire Management Information System for tracking the status of each forest fire case that is reported. The status will be followed up as and when the concerned district officer updates the status from the field. Daily reports will also be generated with the updated status. This will help to assess and arrange for required support to the concerned District Forest team to douse the forest fire at the earliest possible. When the final report is generated, the respective forest fire comes to an end, after which the district forest team has to provide the burnt area assessment details. Necessary technical support will be provided in terms of geo-spatial technology assistance to the district forest team. The staff availability at this centre shall be - one Forest Range Officer, two foresters, one GIS expert, two technical assistants and one assistant. These works will be carried out under the guidance of APCCF PV and DCF GIS.

Regular updating of database from the field such as extent and distribution of the fire affected areas, the total area burnt, type of damage, etc. which is useful for forest managers for mitigation planning shall be carried out. Fire mapping with fire reports compilation is thus an important activity after fire. The centre will have dedicated forest personnel to work on the fire data, carry out data analysis, assess vulnerabilities, burnt area, predictive index for forest fire etc.,

3. **Dedicated Toll-Free Number for Forest Fire Reporting**

Presently a toll-free number is operated for the people to report the forest fire and the number is 18004254409. The toll-free number shall be manned by two staff on regular duty during fire season. The information received on the call will be quickly communicated to the field staffs and the truth of the information will be assessed. All the call information along with the name, contact number of the caller and the location of the caller will be recorded. The fire will be tracked from that point and the status will be updated in the Tamil Nadu Forest Fire Management Information System. Two channels to communicate information with forest officers on field and other parts of the State will be available at the SFFCC

In case the fire is detected when fire watcher/patrol teams or other informers detect forest fires at field, they can reach out to the SFFCC to spread this information to the local response team. The SFFCC will maintain a record with the details of the name, address and contact number of the local response team for each range and division. SFFCC will trigger alert messages to all the local response team in case of any fire alert or case reported through the District Control centre. SFFCC will also help the local team get further assistance and mobilise resources based on their request.

4. **Coordination with Nationalised Institutions and State Authorities**

There is a continuous flow of information from MOEFCC, FSI and NRSC related to forest fire. SFFCC will be the nodal centre of the state to coordinate on the forest fire alert with the national level organisations and institutions. It will engage in works to collect the satellite images, carrying out assessments, collating forest fire data, developing guidelines, generating annual state forest fire reports based on the district reports. The centre will develop its expertise in using latest ICT tools and geo-spatial technologies for the effective forest fire management. SFFCC will also work along with the State Disaster Management Authority in the matters of forest fire.

SFFCC will work closely with FSI with respect to the Pre-Warning Alert system developed by FSI which is generated based on short term weather variables, is valid for 1 week and communicated to the District SFFCC. It will in turn ensure intensification of patrolling and monitoring for fire sensitive beats indicated by the pre-alert for the week

5. **Forest Fire – Centre of Excellence**

SFFCC shall be the repository of information on forest fires which also includes display of forest firefighting equipment and rescue kits to sensitize the front-line forest staff. It will gather all relevant information on the forest fire and will develop expertise on forest fire management. SFFCC will work towards becoming a centre of excellence for Forest fire.

7.2. District Forest Fire Control Centre

District Forest Fire Control Centre (DFFCC) is established for fast flow of information and co-ordination of activities during forest fire season at the district forest headquarters in the state (Figure 7.5). The objective of District Forest Fire State Control Centre is to function as a command centre to coordinate with the field staff during the forest fire events and also act as local unit in collating data on fire occurrences, updating fire data and to coordinate the activities under the guidance of TN forest fire State control centre.



Figure: 7.5: 34 District Forest Fire Control Centre

Duties of DFFCC

The following are identified as the duties of the District Forest Fire Control Centre,

1. To act as nodal centre of the division/district in handling forest fires.
2. To respond to the fire alters and sending quick communication to field staff and fire volunteers to address the fire.
3. To coordinate with the local staff and rendering support to arrange for additional support while fighting the fire
4. To update the status of forest fire in the TN Real time Forest fire Dashboard
5. To be equipped with adequate firefighting and rescue kits to support the field staff during crisis.
6. To generate reports with respect to forest fire and to carry out burnt areas assessments after the fire occurrence.

Functioning of DFFCC – Roles & Responsibilities

1. **Response to Fire Alerts**

   The DFFCC will immediately respond to the fire alerts received either from FSI or SFFCC. The centre shall ensure that all the field staff and local volunteers are registered for fire alerts in the FSI portal. On receiving any information on a fire incident, quick communication shall be sent to the concerned field staff and the local fire volunteers. The DFFCC shall compile and display the contact information of all the field staff, volunteers, district fire officers, senior forest officers and the disaster management teams. The centre will ensure that the forest field staff have reached the location of the fire and shall get continuous updates from the field.

   There shall be a dedicated district level toll free number or contact number for the public to report the fire incidences. The information received shall be compiled along with the caller details like name, phone number, location, time of call etc., During the Forest fire season- the centre should be operating 24 X 7 to ensure quick and immediate response to the alerts.

2. **Action on Fire**

   A Rapid Response Team (RRT) shall be formed for each Division at the range level who will respond to all information pertaining to fire and galvanize into action for fire control without delay. The concerned Range officer shall be the nodal point of contact to coordinate the field operations under the guidance of DFO/DD. The FRO shall also update the status of action to the DFFCC. Personnel at the DFFCC shall ensure that the real time status updation in the Tamil Nadu Forest Fire Management Information System dashboard.

3. **Support to Local Forest staff**

   The DFFCC shall arrange for local support to the firefighting team by means of available firefighting equipment, rescue kits or human assistance by pooling staff from adjacent ranges and divisions, volunteers, district fire rescue team etc.,

4. **Tracking response & real time updation in the dashboard**

   DFFCC shall ensure that the Tamil Nadu Forest Fire Management Information System is updated on real time basis with required information like location details,

photos, personnel attending to the fire etc, The DFFCC shall engage in constant updation of the dashboard, generating reports and assisting the local forest staff in calculating the burnt area after the fire is doused.

5. **Coordination with SFFCC**

The DFFCC being the district nodal centre for forest fire shall be in constant touch with the TN State Forest Fire Control Centre to get timely inputs from the state centre and to have effective coordination.

The following facilities are identified as preliminary requisites for the DFFCCs,

1. **IT infrastructure**

   In order to carry out the above-mentioned functions, the required IT infrastructure includes,

   a. One dedicated Workstation with the advanced configuration to operate the dashboards and GIS software.
   b. Software – Access to Real Time Forest fire Dashboard, Toll free number dashboard, ArcGIS (desktop version), Google Earth Engine, Anti-virus and Internet security software, Software for documentation and reporting.

2. **Duties of Nodal officer for DFFCC**

   a. The District Forest Officer shall be the District Nodal Officer for the respective district to deal with the crisis of forest fires in the district and shall coordinate with IRTs, district administration and other government agencies to mobilize resources and manpower in the event of outbreak of forest fire.
   b. They will also inform the Circle Level Rapid Response teams and call for assistance of Forest Elite Force based on the status of the fire incident.
   c. Fire and Rescue Services, Police, Medical, Animal Husbandry and Revenue departments shall be called upon to work in tandem with forest department when so required.
   d. The Headquarters Range Officer shall be in charge of the DFFCC who will work under guidance of DFO/DD. One Forester and one forest guard with basic computer knowledge and documentation skills shall be posted at this DFFCC.

e. Based on the availability of funds, one technical assistant shall be engaged to carry out the technical works in handling/updating the dashboards on real time, generating reports, carrying out analysis using GIS tools.
f. The centre will be functioning 24X7 during the forest fire season.
g. The technical assistant will also be attending to the calls received in the toll-free number.
h. Telephone connection for the local district toll free number and the seamless hi-speed internet connection should also be available.

7.3. Forest Fire as Disaster - State Nodal Officer

During the crisis of forest fire disaster, the State Forest Fire Control Centre (SFFCC) shall function as Incident Command Centre. In case of fire in the proportion of a disaster, Additional Principal Chief Conservator of Forests (P&V) shall be the State Nodal Officer who will take over operations from head office or as directed by the Principal Chief Conservator of Forests (HoFF), assisted by APCCF(WL) in case of fire in Protected Areas and APCCF(IT) for ICT inputs and assistance of SFFCC. The State Nodal Officer shall coordinate with other government agencies at District, State and National levels for activating their support in mobilizing resources and manpower.

In such circumstances when forest fire is declared or identified as a disaster, a war room shall be established at the Circle office to coordinate with neighbouring forest divisions /circles to mobilize resources during crisis. The Chief Conservator of Forests /Conservator of Forest of that respective circle shall be the Nodal Officer for the respective circle who shall correspond with higher officials, neighbouring region and other government departments for assistance and resource to deal with disaster like situation. They shall coordinate closely with the State Nodal Officer for collaborative action to control the crisis situation. In case of a major fire with a propensity towards disaster the Rapid Response teams and the war room at the Circle/Tiger Reserve under the chairmanship of the Chief Conservator of Forests of the Circle/Conservator of Forests (comprising the District/Divisional Forest Officers, Assistant Conservator of Forests as members), which will monitor the actions, will

take leadership role at circle level in ensuring better communication and quick action to control the crisis.



Figure 7.6 –Planning and Consultative Meetings with local volunteer

7.4. Role of Circle Officers

Tamil Nadu Forest Department is divided into 12 Forest Circles for administration. Sanctuaries, Birds sanctuaries and National Parks, other than those included in tiger Reserves are also included in the respective circles.

i. Chennai Circle, Chennai
ii. Vellore Circle, Vellore
iii. Dharmapuri Circle, Dharmapuri
iv. Villupuram Circle, Villupuram
v. Salem Circle, Salem
vi. Tiruchirappalli Circle, Tiruchirappalli
vii. Dindigul Circle, Dindigul
viii. Anamalai Tiger Reserve, Pollachi, Coimbatore
ix. Kalakkadu-Mundanthurai Tiger Reserve, Tirunelveli
x. Mudumalai Tiger Reserve, Nilgiris
xi. Sathyamangalam Tiger Reserve, Erode
xii. Srivilliputur Meghamalai Tiger Reserve

Social Forestry/functional divisions are included in the respective Territorial Circles for administration. Arignar Anna Zoological Park circle, Research divisions or any other special divisions shall take assistance from the respective geographical Circles/Divisions in the event of any fire crisis/disaster in their respective jurisdiction. The list of circles, divisions and ranges is provided in **Appendix III.**

The Chief Conservator of Forests/ Conservator of Forest shall monitor the fire management works carried out at the divisions. The officer shall play the role of facilitator in coordinating support from other sources in the following scenarios,

1. when the forest fire continues for more than 2 days
2. in case of large forest fire adjoining division boundaries
3. Circumstances when there is a deficit of resources – personnel or firefighting equipment

8. Post Fire Guidelines

8.1. Need for Post Fire Analysis

The burnt area assessment assumes importance in terms of local, national and global relevance. The burnt area information in terms of area, location and its spatial spread will give required database for forest managers and scientific community at different levels. Satellite Remote Sensing based damage assessment may provide ample information for temporal monitoring and fire recurrence assessment, identification and prioritization of sensitive areas, understanding the impacts, fire risk zonation etc. Fire burnt areas give unique spectral signatures as compared to green or defoliated canopies due to loss of vegetation and black carbon left on the ground. Such areas are mapped for precise burnt area assessment.

There is need for continuous updation of database from the field such as extent and distribution of the fire affected areas, the total area burnt, type of damage, etc. which is useful for forest managers in mitigation planning. Fire mapping with fire reports compilation is thus an important activity after fire. DFOs will therefore furnish detailed report to Head Office in the proforma format through the Tamil Nadu Forest Fire Management Information System dashboard.

8.2. Activities to be carried out Post Fire

1. Assessment of loss due to forest fires

SFFCC may develop a state level database for burnt area assessment on a yearly basis after the fire season. A report with the finding of the analysis shall be published every year as a regular activity. This report will act as a wonderful tool to plan the tree planting and eco-restoration activities.

In consultation with ICFRE, standard methodologies for assessing losses due to forest fire including loss of intangibles such as ecosystem services may also be carried out depending on the availability of sufficient funds by engaging technically qualified persons. State Forest Department may plan to organize adequate training programs for forest officials at various level for this purpose.

2. Proper investigation of the causes

The SFD shall ensure that the causes for every fire incident are properly investigated, and adequate measures taken immediately including legal actions where necessary.

3. Restoration of fire affected areas

- A proper restoration plan should be prepared for the fire affected areas with the objective of restoring to its natural profile. Appropriate silviculture practices should be prescribed taking into account the ecological successional dynamics.
- Adequate soil moisture conservation measures may be taken up in the fire affected areas for enhancing the moisture retention capacity of the land.
- Indigenous vegetative barriers may be identified and planted around the fire affected areas

4. Publicity and extension

Post fire season is the ideal period to carry out publicity and extension by engaging the local community through e.g. pamphlets, handouts, circulars, posters and media programs through TV, radio, video tapes, etc. Promotion of people's participation- Through involvement of NGOs, Voluntary Organisations, Village Forest Committees (VFCs) etc.

5. Training and education

During post fire season, trainings in the form of exposure visits, workshops and hand on sessions can be organized for front line forest staff, local communities' sand other volunteers. Scope of the advanced technologies in forest fire management can also be a topic for skill development of the forest personnels. Designing syllabus for planning, management and ground level firefighting courses in Forestry Institutions.

6. Research and development

This period shall be ideal for strengthening the existing and carrying out new R&D works in the subject of forest fire management.

8.3. Forest Burnt Area Analysis

The objective of Forest fire burnt area assessment is very important for damage assessment and mitigation planning. The burnt area information in terms of area, location and its spatial spread will give required database for forest fire management and mitigation planning. The National Action plan for Forest Fire recommends for assessment of loss due to forest fire.

In the State of Tamil Nadu, each year January to June is longest dry spell and fire sensitive period with mid-January to April being the peak fire season. At the end of the fire season Satellite image-based fire burnt area is assessed for every year. MoEFFCC in their NAPFF has also emphasized for burnt area assessment on yearly basis. Fire burnt Area assessment up to 2018 detected by unsupervised classification of satellite image using ERDAS Imagine software with the help of FSI fire alert data (SNPP-VIIRS) was done by the Geomatics centre. Similar assessment for the remaining years will also be carried out.

Fire burnt areas give unique spectral signatures as compared to green or defoliated canopies due to loss of vegetation and black carbon left on the ground. Such areas are mapped for precise burnt area. Fire burnt area assessed is 15,171ha and 2048ha on 06th March and 30th March of 2018 respectively, after the removal of overlapping of fire occurrences then Fire Burnt Area of 2018 is 16,620ha and it occupies 1% of the total area of RF/RL in Tamil Nadu.

As per spatio-temporal decadal forest fire analysis for the State of Tamil Nadu, moderately dense forests, Moist and Dry deciduous forests are highly sensitive for fire. Both Eastern Ghats and Western Ghats are sensitive for fire and 3rd week of January to 3rd week of April is the Fire Sensitive period in the State.

8.3.1 Spatial Burnt Area Assessment 2024

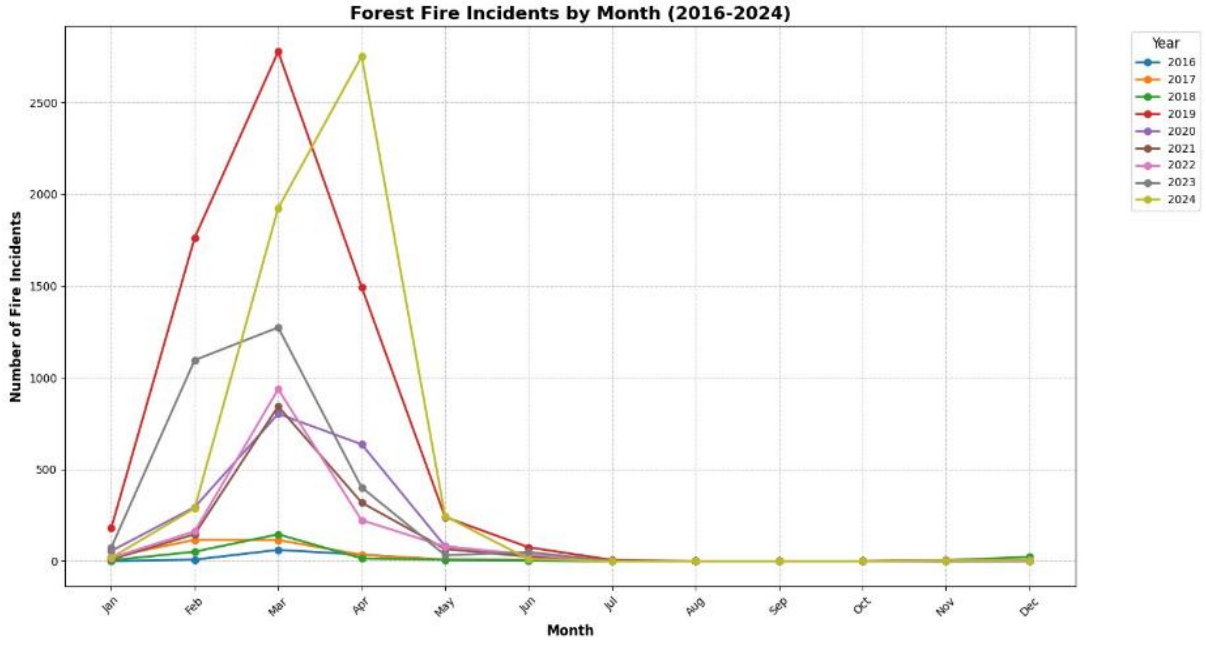
Multispectral satellite images are invaluable tools for assessing forest burnt areas, enabling precise detection and mapping of fire-affected regions. By capturing data across multiple spectral bands, these images reveal variations in vegetation health, soil properties, and burn severity that are not visible to the naked eye. High-resolution satellite platforms like Landsat OLI and Sentinel-2, with spatial resolutions of 30 meters and 10 meters respectively, provide detailed imagery suitable for analysing burnt areas.

Freely accessible through platforms such as USGS Earth Explorer, Copernicus, and ISRO's Bhuvan, these datasets support rapid and accurate assessment of forest fire impacts. The insights derived from these images are critical for forest management, disaster response, and ecological restoration efforts.

In 2024, the spatial burnt area was assessed using 10% open-source cloud-cover satellite imagery, supplemented by ground-truthing conducted by the Tamil Nadu State Forest Fire Control Centre. For forest burn assessments utilizing Landsat-8 OLI, the recommended bands included Band 2 (Blue), Band 3 (Green), Band 4 (Red), Band 5 (NIR), and Band 7 (SWIR). The analysis covered path and row combinations 142/051, 142/052, 142/053, 143/051, 143/052, 143/053, 143/054, 144/051, 144/052, and 144/053 to ensure comprehensive area coverage.

Using Google Earth Engine, a forest fire severity index was generated, following the methodology and threshold values established by the Forest Survey of India (FSI) in ISFR 2023. To validate the results and eliminate overlapping areas caused by tone and texture similarities of cloud, shadow, barren rocks in satellite imagery, supervised classification was done by giving training sites. Additional ground-truthing was conducted for better accuracy.

The findings revealed that a total of 38,169.2 hectares were affected, accounting the Reserved Forest (RF) and Reserved Land (RL) in Tamil Nadu in 2024. This equates to approximately 1.5% of the state's forest total area, indicating an increasing trend in forest fires in Tamil Nadu from 2018 to 2024. Furthermore, data from the FSI shows a gradual



rise in fire alerts from 2016 to 2024, as illustrated in the accompanying chart. The detailed analysis on Spatial-burnt area assessment was given in Annual Report on Forest Fires 2024.

Below table 8.1 shows the Division-wise Spatial-Burnt Area for the year 2024;

Spatial Burnt Area Assessment - 2024				
SI. NO	**Forest Divisions**	**Burnt Area in ha**	**Burnt Area in Sq.km**	**Burnt Area in %**
1	NILGIRIS	5660.2	56.6	14.41%
2	HOSUR	4284.3	42.8	10.91%
3	VELLORE	3820.3	38.2	9.72%
4	KODAIKANAL	3462.3	34.6	8.81%
5	TIRUVALLUR	2280.2	22.8	5.80%
6	TIRUVANNAMALAI	2082.4	20.8	5.30%
7	DINDIGUL	1625.8	16.3	4.14%
8	KANYAKUMARI	1546.8	15.5	3.94%
9	THENI	1466.1	14.7	3.73%
10	WL ATR TIRUPPUR	1360.7	13.6	3.46%
11	VILUPPURAM	1198.2	12.0	3.05%
12	THOOTHUKUDI	1062.9	10.6	2.71%
13	WL, MTR MASINAGUDI	877.9	8.8	2.23%
14	WL, SRIVILLIPUTHUR	832.1	8.3	2.12%
15	WL, KMTR AMBASAMUDRAM	822.4	8.2	2.09%
16	PERAMBALUR	639.5	6.4	1.63%
17	TIRUPPATTUR	534.7	5.3	1.36%
18	WL, STR HASSANUR	508.7	5.1	1.29%
19	WL, STR SATHY	490.1	4.9	1.25%
20	WL, MTR UDHAGAI	479.6	4.8	1.22%
21	ERODE	466.6	4.7	1.19%
22	SALEM	384.4	3.8	0.98%
23	NAMAKKAL	322.8	3.2	0.82%
24	ATTUR	301.8	3.0	0.77%
25	TIRUNELVELI	265.7	2.7	0.68%
26	COIMBATORE	243.3	2.4	0.62%
27	DHARMAPURI	237.6	2.4	0.60%
28	CHENGALPATTU	237.3	2.4	0.60%
29	PUDUKKOTTAI	236.5	2.4	0.60%
30	CUDDALORE	224.4	2.2	0.57%
31	WL, MEGAMALAI	213.9	2.1	0.54%
32	ARIYALUR	212.2	2.1	0.54%

33	CHENNAI	171.6	1.7	0.44%
34	WL, KMTR KALAKKADU	169.0	1.7	0.43%
35	MADURAI	125.8	1.3	0.32%
36	WL ATR POLLACHI	109.4	1.1	0.28%
37	SIVAGANGAI	102.4	1.0	0.26%
38	TIRUCHIRAPPALLI	101.6	1.0	0.26%
39	WL, NAGAPATTINAM	35.7	0.4	0.09%
40	KARUR	30.4	0.3	0.08%
41	GUDALUR	21.5	0.2	0.05%
42	THANJAVUR	19.0	0.2	0.05%
43	RAMANATHAPURAM	10.7	0.1	0.03%
44	THIRUVARUR	8.2	0.1	0.02%
45	WL, MARINE NP	0.6	0.0	0
	TOTAL	39287.6 ha	392.87 sq.km	100%

Table 8.1: Division wise spatial burnt area - 2024

9. Fire Equipment's & Its Applications

9.1 Backpack Leaf Blower

The use of backpack leaf blowers in fighting forest fires has become a key tool in fire management because of its multiple advantages over conventional firefighting tools. The backpack leaf blower (simply a blower) is a very popular and useful garden tool that has been in great use since the 1970s. The backpack leaf blower works by propelling air out of it through a nozzle. The blower has a motor and a fan that has many blades. When the engine turned on and the motor starts to run and spin the fan. When the fan inside the machine spins, it draws in outside air which builds up in the machine due to the centrifugal force and forces it out of the fan body through a long air tube. The effectiveness of a blower depends on the airspeed. The advantages of using the four-stroke engine blower are that the machine is lighter, easy to operate and carry; less expensive and offers optimum performance as it can work at any angle without problems. The blower also is effective in pushing smaller woody debris off the line of fire. These features augur well for the difficult forest terrains of the state of Tamil Nadu wherein the proximity of fire and logistics facilities are often not on the same page.

Specifications	Details
Prime Mover	Air Cooled Petrol Engine
Power Capacity	3.7 or above
Engine Cycle	4 Stroke
Drive Mode	Direct Drive
Max Speed (in RPM)	2000 and above
Length of Tornado Tip	1.3 Meter
Blowing Force	32 N or above
Accreditation	ILAC
Brand/Make	Stihl/Husqvarna/Honda/ Hyundai/Bosch/Hitachi
Product Warranty	12 Month
Service Warranty	36 Month



9.2 Fire Leaf Blowers (Husqvarna 578btf)

The machine is designed for removal of combustible material and to control smaller grass fires.

Specifications	Details
Cylinder	75.6 cm^3 displacement
Power output	3.14 kW
Fuel tank volume	2.2 l
Fuel consumption	410 g/kWh
Maximum power	8,000 rpm speed
Idling speed	2,000 rpm
Weight	10.5 kg



9.3 Fire Blower 75.6 Cc

This equipment is used for removal of combustible material, to control and douse smaller fire

Specifications	Details
Displacement	75.6cc
Power	3.0/7200kw/r/min
Fuel consumption	544g/kw.h
Fuel Capacity	3L
Weight	12.6kg



9.4 Fire Blower with Br 600

These backpack blowers from are ideal for tending large areas. Leaves, grass cuttings and debris are moved easily with the powerful air stream. Even larger items such as paper cups and cans are swept up thus mitigating the extent of fire.



Specification	Details
Displacement	64.8 cc (3.95 cu. in.)
Engine Power	2.8 kW (3.8 bhp)
Weight	9.8 kg (21.6 lbs.)
Fuel Used	Petrol
Fuel Capacity	1400 ml
Blowing Force	32 Newtons
Average Air Velocity	89 m/sec (199 mph)

Maximum Air Velocity	106 m/sec (238 mph)
Air Volume at Nozzle	1150 m^3/h (677 cfm)

9.5 Handheld Brush Cutter

Brush cutters are powerful enough to cut through overgrown brush in fire prone areas. They also cut in hard-to-reach areas where larger machines can't enter which is often the case in forest areas. brush cutters have a straight shaft and anti-vibration features to reduce operator fatigue; thus, the fire fighters/watchers/frontline staff would feel less fatigue. Using a harness also helps control the machine and lightens the load on the fire fighters/watchers as they work. Brush cutters can be used with several blade attachments, allowing them to be used on a range of materials. Having a brush cutter eliminates the need to purchase multiple tools for eliminating naturally occurring elements that may directly or indirectly influence the events of fire. Brush cutters are made to cut through the woody, overgrown brush & can also effectively work in confined spaces where a larger piece of equipment won't fit because of the range of blade alternatives.

Specification	Details
Displacement Capacity	35 CC or above
Power Capacity	1.3 HP or above
Engine Cycle	4 Stroke
Fuel Type	Petrol
Cutter Diameter (in mm)	300 or above
Shaft Length (in mm)	1500 or above
Shaft Type	Stainless Steel
Blade Material	Hardened Steel/Carbon Steel
Brand/Make	Stihl/Husqvarna/Honda/Hyundai/Bosch/Hitachi/Bajaj
Product Warranty	12 Month
Speed Control	Variable



9.6 Power Chain Saw

In Forest firefighting, chain saws are used to cut hampering trees, snags and to clear fire lines. The chain saws are a handy tool for forcible entry into an otherwise inaccessible place in the wild during fires. This tool is effective in clearing fallen trees and debris in the aftermath of Forest fires. Wildland firefighters in areas with heavy timber will need a power chain saw so as to safely and quickly navigate to the heartland of the fire zone and

to begin efforts to douse the same. During events of fire Chain saws can be sharpened in the field with a file, or they can be easily replaced. Used chains can be sharpened for later use. Thus, Chain saws are an essential and effective tool in fighting fire in the wild



Specification	Details
Cylinder Displacement	74 CC or above
Power Capacity	5.5 HP or above
Engine Type	2 Stroke (Air cooled petrol driven)
Cutter Rate	20 mm/minute or above
Length of Guard	18 Inch or above
Blade Type	Carbide Tipped Blade (one piece construction)
Fuel Type	Petrol
Standardization	EN/DIN/US Equivalent Standards
Brand/Make	Stihl/Husqvarna/Honda/Hyundai/Bosch/Hitachi
Product Warranty	2 Years
Adjustable Depth of Cut	8 Inch or above

9.7 Water Mister

Water misters are fire suppression systems that are useful in dousing fire with small water droplets. These droplets are effective at controlling fires while using less water.

Specification	Details
Weight	12 kg
Displacement	62 cm3
Power Output	2.8 kW
Discharge Liquid	4 L Per Min



9.8 Solar Power Generator Power Oak 1200 Watt

This item is widely used outdoor in areas of fire as portable power bank to charge the devices from the appliance to the outside. This item can easily be powered by the solar charger and supply AC Wall.

Specification	Details
Item Weight	10 Kilograms
Voltage	54 Volts
Engine Displacement	418 Cubic Centimetres
Total Power Outlets	2
Frequency	50 Hz



9.9 Smoke Proof Googles

Firefighter Goggles are designed to protect the wearers eyes from harsh conditions caused by fires and bush fires including fire, heat, smoke, wind and steam. The design of Fire Fighting Goggles reduces eye irritation caused by these harsh conditions and improves visual comfort. Fire Fighting Goggles resist the effects of humid air (caused by fighting fires and bush fires with water), combating lens fogging and ensuring lens clarity.

Specification	Details
Colour	Clear Lens
Item Weight	0.28 grams
Lens Colour	Clear
Material	Polycarbonate
Material Feature	Heat Resistant
Size	6.5" x 2.5" Viewing Area
Special Features	Flame Resistant Strap



9.10 First Aid Kit

In the event of injuries in course of fighting the fires, first aid kits serve as the first line of defense in treating the injuries and nursing the fire fighters back to safety.

Specification	Quantity
Sterilized Dressing Long	2 Nos.
Sterilized Dressing Medium	3 Nos.

Sterilized Dressing Small	4 Nos.
Burn Dressing long	2 Nos.
Cotton 15grm	3 Nos.
Roller Bandage	4 Nos.
Adhesive Roll	1 Nos.
Crape Bandage	1 Nos.
Eye Pad	2 Nos.
Eye Wash Cup	1 Nos.
Scissors 5”	1 Nos.
Forceps 5”	1 Nos.
Splint Set (wooden)	1 Nos.
Safety Pin	1 Nos.
Melco chrome	1 Nos.
Savlon 50 ml.	1 Nos.
Salvola tiles 50 ml.	1 Nos.
Snakebite Plate	1 Nos.
Band Aid	8 Nos.
Potassium Parg	1 Nos.
Moov Spray	2 Nos.
Tourniquet	1 Nos.



9.11 Fire Safety Leather Boots

These boots help fire fighters to stay agile on their feet, and protect what is often the point of contact with dangerous debris and flames on the floor. The boots are designed to resist fire and heat.

Specification	
Outsole Material	PVC
Usage	Fire Safety
Ankle Type	High Ankle
Colour	Black
Features	Heat Resistant



9.12 Flame Resistant Coverall

Specification
Sleeve Type Full Sleeves
Gender Men
Material Nylon
Wear Type Reflective



9.13 Water Proof Back Pack (Dry Bag)

Specification	Details
Height	46cm / 18.1“
Width	28cm / 11“
Depth	24cm / 9.4"
Capacity	1800 cubic inch
Weight	0.84kg



9.14 Fire Proximity Suit (Aluminium)

Number of Layer	4
Usage/Application	Application of aluminized suit is Molten metal, firefighting furnace safety
Type	3 Layer, Fire Fighting Suit, Fire Proximity Suit
Material	Aluminised
Features	Heat Resistant Aluminised suit



9.15 Emergency Rescue Stretcher

These emergency stretchers are foldable and easy to carry. They are useful in transporting the injured persons from the fire zone to a safer area.

Specification	Details
Packing size	91.5x36x36.5CM.
Folding size	2 or 3fold
Gross weight	12.3KG
Net weight	10.4KG
Loading	≤159KG
Material	Compound plastic



9.16 Tent

These tents are easy to set up and protect victims and helpers against sunlight from the side, whirling dust, and fumes outside during fire. At the same time, sidewalls also provide discretion during a firefighting deployment and obstruct the view of events. Helpers can then work with full concentration and without distractions. Also, the victim's privacy rights can be protected better with a concealing screen.

Specification	Details
Sleeps	2
Weight	4.2 kg
Packed Dimensions	30 x 7 x 7"
Centre Height	59"
Floor Area	90" x 84" (7.5' x 7')
Floor Material	70D Hybri-lite Ripstop
Fly Material	Polyester Taffeta



9.17 Ruck Sack

These Ruck Sacks are useful for carrying emergency supplies and basic equipment to the fire.

Specification	Details
Model	12mm x 50 m nylon rope
Length	50 m
Material	Nylon



9.18 Fire Fighter Shovel

Fire Fighting shovels are specifically designed for use in constructing a fire line; has a tapered blade with both edges sharpened for scraping, digging, grubbing, cutting, and throwing. During fire the shovel is used to dig out burning roots, logs, and to bury smouldering fires. The Firefighting shovels are easy to carry, lightweight & corrosion resistant. Owing to their ease of access, they remain a rudimentary yet preferred tool in preventing the occurrence of fire and also dousing fire. A shovel can be the most useful basic fire suppressant tool on hand as small surface or grass fires can be beaten down

with a shovel. A shovel can also be used to create a small fire break in the path of a fire, and soil can be quickly shovelled on a fire to smother it. A shovel can be used to break up large smouldering embers into smaller chunks, which can then be covered in soil. Due to the simplicity of this tool, it requires no special training for the fire fighters to employ the usage of the shovel in dousing the fire.



9.19 Fire Fighting Broom

In forests when the element of fire is Grass fires in short grass and/or leaves then the broom can be used to attack and douse the fire directly. In some cases, the broom can be used to approach the flanks of the fire area, on both sides if possible, and while working towards the head or front of the fire, sweep the burning embers back into the burned area. When the fire occurs on the surface under tall timber, the fire broom may be used as in grass and leaf fires. In fires involving undergrowth or tall timbers, the fire broom is limited to patrolling fire breaks.



9.20 Pulaski

The Pulaski is a special hand tool used in fighting wildfires, which combines an axe and an adze in one head. it has a rigid handle of wood, plastic, or fiberglass. The Pulaski is used for constructing firebreaks, able to both dig soil and chop wood. It is also well adapted for trail construction, and can be used for excavation and digging holes in root-bound or hard soil which are prevalent in Forest areas. The design of this tool is highly helpful for chopping, grubbing, and digging fire lines in brush-filled or rocky terrain. A common use for the Pulaski is in creating fire breaks in sections of land devoid of vegetation which can help contain forest fires. Fire fighters chop down trees with the axe side, cut away roots and shrubs with the end of the adze blade, and dig barriers with the wide portion of the blade. Thus, the tool also helps in forward navigation.



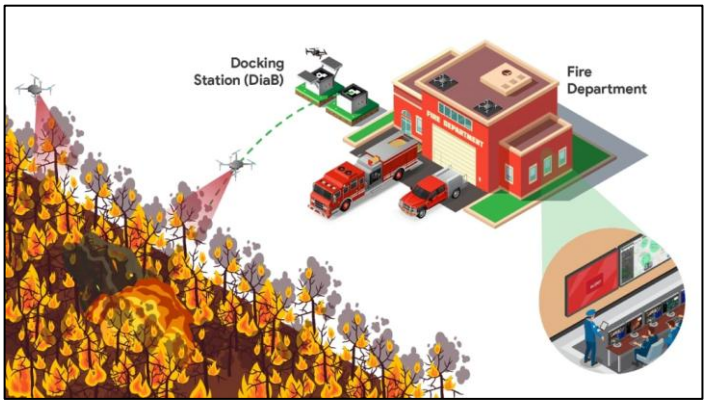
9.21 Fire Rake

In instances of Forest Fire, the rake quickly clears a path of leaves and is an efficient tool in areas where there is little brush, and the primary material burning is leaves. A rake with large triangular cutting teeth is helpful in fire-line digging. The rake generally consists of four mowing machine cutter blades riveted to a steel frame. Apart from general terrain, the rake is a handy fire-line digging tool which is instrumental on mountainous and rocky terrain. This tool can be a bit heavy but are sturdy enough to do the job of beating and smothering out fires caused by airborne embers floating across the fire line in forest areas.



9.22 Thermal and Infra-red Drone (JOUAV PH-7E)

Thermal imaging camara and Infrared sensors can be used to capture information that may be either less visible or completely invisible to regular electro-optical cameras. They may be used for wildfire detection in the initial stages, providing a greater chance of controlling them before they spread further. By analysing the infrared radiation given off by different parts of the fire, they can be used to figure out where hotspots are, allowing fire crews to focus their efforts on the most effective areas. Unlike visible cameras, thermal cameras can also see through smoke and haze and are also effective during night-time operations. In addition to dealing with the fire itself, these capabilities make them highly suited to detecting people and animals who may be trapped and informing search and rescue teams of their locations.





The JOUAV PH-7E quadcopter combines portability with advanced features, making it an indispensable asset for Forest fire. Its foldable and lightweight design enables easy

transportation and quick deployment in emergency situations. With a battery life of 63 minutes and a flight range of 15km. Equipped with the PDL-1K thermal imager, a high-resolution infrared detector, a 48 MP zoom camera, and a 1500m laser rangefinder, this drone excels in search and rescue operations. The temperature measurement function and powerful computing capabilities enhance target recognition, motion analysis, and image processing. Additionally, it is waterproof design allows for operations in harsh weather conditions.

Specification	**Details**
Flight Time	63 minutes
Cruising Speed	8 km/h (sport mode, horizontal, no wind)
Transmission & Control Range	15 km
Payload Capability	3 kg
Visible Light Camera	4K (3840x2160)
Thermal Camera	1280x1024 pixels
AI Features	Identification and tracking
Operating Temperature	-20°C to 50°C
Obstacle Avoidance	Yes

10. Appendix

APPENDIX– I

10.1 Fire Sensitive Beats (Based On 2016-2024 FSI Data)

CIRCLE	DIVISION	RANGE	BEAT
DINDIGUL	KODAIKANAL	MANNAVANUR	PARICOMBAI WEST
DHARMAPURI	HOSUR	DENKANIKOTTAI	GUDIYUR
DINDIGUL	KODAIKANAL	PERUMPALLAM	PERUMPALLAM
MTR	WL, MTR	MUKURTHY	AVALANCHE(WL)
ATR	WL ATR TIRUPPUR	UDUMALAIPETTAI	KOMBU WEST
MTR	NILGIRIS SOUTH	KORAKUNDAH	UPPER BHAVANI
VELLORE	VELLORE	ARCOT	PUNGANUR NORTH
DINDIGUL	KODAIKANAL	POOMPARAI	POOMPARAI WEST
CHENNAI	TIRUVALLUR	THIRUTTANI	MADDUR
DHARMAPURI	HOSUR	DENKANIKOTTAI	GULLATTI EAST
DHARMAPURI	HOSUR	DENKANIKOTTAI	THULUVABETTA EAST
ATR	WL ATR TIRUPPUR	UDUMALAIPETTAI	THIRUMOORTHIMALAI
DHARMAPURI	HOSUR	DENKANIKOTTAI	AYYUR
DINDIGUL	KODAIKANAL	POOMPARAI	PARICOMBAI EAST
DINDIGUL	KODAIKANAL	PALANI	KALAYAMPUTHUR
DINDIGUL	KODAIKANAL	PERUMPALLAM	PANNAIKADU
KMTR	KANYAKUMARI	AZHAGIAPANDIPURAM	THADIKARANKONAM SOUTH
DINDIGUL	KODAIKANAL	PERUMPALLAM	VADAKAVUNJI
KMTR	KANYAKUMARI	AZHAGIAPANDIPURAM	ASAMBU
DINDIGUL	KODAIKANAL	KODAIKANAL	PERUMALMALAI(K)
DHARMAPURI	HOSUR	JAWALAGIRI	JAWALAGIRI
DINDIGUL	KODAIKANAL	PERUMPALLAM	MELPALLAM
VELLORE	VELLORE	ARCOT	PUNGANUR SOUTH
STR	WL, STR HASSANUR	HASSANUR	GEDDESAL
DHARMAPURI	HOSUR	DENKANIKOTTAI	THOLUVABETTA EAST
DINDIGUL	KODAIKANAL	PALANI	BALASAMUDRAM EAST
KMTR	KANYAKUMARI	AZHAGIAPANDIPURAM	AZHAGIAPANDIPURAM
DHARMAPURI	HOSUR	DENKANIKOTTAI	BETTAMUGILALAM
DHARMAPURI	HOSUR	DENKANIKOTTAI	GALIGATTAM
DHARMAPURI	HOSUR	DENKANIKOTTAI	KEMPAGARAI
DINDIGUL	DINDIGUL	KANNIVADY	SITHAYANKOTTAI
DINDIGUL	KODAIKANAL	KODAIKANAL	MACHUR
DINDIGUL	KODAIKANAL	PALANI	KAVALAPATTY
VELLORE	VELLORE	GUDIYATHAM	RANGAMPETTAI
VELLORE	VELLORE	ODUGATHUR	AGARAM
ATR	WL ATR POLLACHI	VALPARAI	AKKAMALAI
ATR	WL ATR TIRUPPUR	UDUMALAIPETTAI	KOKKANAMALAI
DHARMAPURI	HOSUR	DENKANIKOTTAI	BELLATTY

SALEM	SALEM	SHERVAROY SOUTH	KURUMBAPATTY
KMTR	KANYAKUMARI	KALIYAL	KALIYAL
ATR	WL ATR TIRUPPUR	AMARAVATHI	KEELANAVAYAL
VELLORE	VELLORE	VELLORE	PALAMADI
VELLORE	TIRUPPATTUR	SINGARAPETTAI	SINGARAPETTAI EAST
VELLORE	VELLORE	GUDIYATHAM	NAICKENERI(VLR)
DHARMAPURI	HOSUR	DENKANIKOTTAI	THOLUVABETTA WEST
VELLORE	VELLORE	ARCOT	AMMUR
DINDIGUL	KODAIKANAL	MANNAVANUR	MANNAVANUR NORTH
SMTR	THENI	BODI	ARUNGULAM EAST
MTR	NILGIRIS NORTH	SEGUR	SIROOR SOUTH
MTR	WL, MTR	MASINAGUDI	KARADIBETTA
VELLORE	VELLORE	ODUGATHUR	ASANAMPETTAI
SMTR	THENI	UTHAMAPALAYAM	THEVARAM SOUTH
DHARMAPURI	HOSUR	JAWALAGIRI	ULIBANDA
KMTR	KANYAKUMARI	KULASEKARAM	PECHIPARAI
ATR	WL ATR TIRUPPUR	AMARAVATHI	MANJAMPATTI SOUTH
SMTR	THENI	THENI	TAMBIRANKANAL
DHARMAPURI	HOSUR	DENKANIKOTTAI	GULLATTI WEST
KMTR	KANYAKUMARI	VELIMALAI	CHELLAMTHURUTHI
KMTR	KANYAKUMARI	VELIMALAI	SURULACODE
VELLORE	TIRUPPATTUR	TIRUPPATTUR	SWAMIMALAI(VLR)
SMTR	THENI	UTHAMAPALAYAM	KOMBAI
SALEM	SALEM	SHERVAROY SOUTH	GUNDUR EAST
CHENNAI	TIRUVALLUR	PALLIPATTU	PUDUR
DINDIGUL	KODAIKANAL	PALANI	PALLANGI EAST
MTR	NILGIRIS SOUTH	KUNDAH	THAISHOLAI
DHARMAPURI	HOSUR	DENKANIKOTTAI	KODAGARAI(HOS)
DINDIGUL	KODAIKANAL	PALANI	PALLANGI WEST
VELLORE	TIRUPPATTUR	ALANGAYAM	VELLAKUTTAI
MTR	NILGIRIS NORTH	UDHAGAI NORTH	SHOLUR
DHARMAPURI	DHARMAPURI	HARUR	NOCHIKUTTAI
DHARMAPURI	HOSUR	DENKANIKOTTAI	MARANDAHALLI NORTH
VELLORE	VELLORE	ARCOT	MAHIMANDALAM
ATR	WL ATR TIRUPPUR	UDUMALAIPETTAI	KOTTAIYARU
DINDIGUL	DINDIGUL	SIRUMALAI	KODAI ROAD
VELLORE	VELLORE	GUDIYATHAM	SATHGUR
DINDIGUL	KODAIKANAL	PALANI	BALASAMUDRAM WEST
DINDIGUL	KODAIKANAL	KODAIKANAL	PERAMBUKANAL
MTR	NILGIRIS NORTH	KATTABETTU	BIKKAPATHI
DHARMAPURI	HOSUR	URIGAM	KESTHUR
SALEM	NAMAKKAL	NAMAKKAL	NADUCOMBAI
DHARMAPURI	HOSUR	HOSUR	KOTTASATHANA PALLI
VELLORE	TIRUVANNAMALAI(S)	CHENGAM	CHEYYAR

ATR	WL ATR POLLACHI	VALPARAI	GRASS HILLS
DHARMAPURI	HOSUR	JAWALAGIRI	THALI NORTH
KMTR	KANYAKUMARI	VELIMALAI	VELIMALAI NORTH
MTR	NILGIRIS NORTH	SEGUR	SIROOR NORTH
MTR	NILGIRIS NORTH	UDHAGAI NORTH	GLENMORGAN
SMTR	THENI	BODI	KURANGANI SOUTH
VELLORE	TIRUPPATTUR	AMBUR	ARANGALTHURGAM
VELLORE	TIRUPPATTUR	TIRUPPATTUR	MAMBAKKAM

APPENDIX II

10.2 List of Circle, Division, Range

SI.No	Circle	Division	Range
1	Chennai	Chennai	Pallikaranai
			Tambaram
			Head Quarters
			Anna Nagar Spl Range
			Tambaram Spl Range
			Velachery Spl Range
		Chengalpattu Division	Chengalpattu
			Tiruporur
			Sriperumbudur
			Mathuranthagam
		Tiruvallur	Tiruvallur
			Redhills
			Gummidipoondi
			Tiruttani
			Pallipet
			Tiruttani SF
			Ponneri SF
			Forest Station
			Enforcement
			Publicity Officer
		Chengalpattu SF	Chengalpattu
			Membakkam
			Sriperumbudur
			Maduranthagam
			Uthiramerur
			Walajabad
2	Vellore	Vellore	Gudiyatham
			Pernampet

			Arcot
			Vellore
			Odugathur
			Amirthi
		Tirupattur	Ambur
			Tirupattur
			Singarapettai
			Alangayam
			Vaniyambadi
		Thiruvannamalai	Thiruvannamalai
			Thanipadi
			Sathanur
			Chengam
			Pudhupalayam
			Polur
			Santhavasal
			Arani
			Jamnamarathur
			Nadanur
			Melpet
3	Dharmapuri	Dharmapuri	Dharmapuri
			Pennagaram
			Palacode
			Hogenakkal
			Harur
			Kottapatty
			Morappur
			Theerthamalai
		Hosur WL	Anchetty
			Urigam
			Jawalagiri
			Denkanikottai
			Hosur
			Rayakotta
			Krishnagiri
4	Salem	Salem	Shervarayan South
			Shervarayan North
			Danishpet
			Yercaud
			Mettur
			Valapadi
			DLO SW Depot

			SLO SW Depot
			Kurumbapatti Zoo
			FE Sidder koil
			Salem SF
			Mettur SF
			Sankari SF
			Omlaur SF
			Edapady SF
			Vazhapady SF
		Attur	Attur
			Thumbal
			Gengavalli
			Thammam patti
			Kalrayan
			Pethanaickan Palayam SF
			Attur SF
			Gengavalli SF
			Survey & Demarcation
		Namakkal	Namakkal
			Rasipuram
			Mullakurichi
			Kolli Hills
5	Dindigul	Dindigul	Sirumalai
			Ayyalur
			Natham
			Alagarkoil
			Batlagundu
			Kannivadi
			Oddanchatram
		Karur	Karur
		Kodaikanal	Kodaikanal
			Perumpallam
			Poombarai
			Mannavanur
			Berijam
			Devathanapatty
			Palani
			IDP (Tourism range)
6	Trichy	Tiruchirappalli	Tiruchirappalli
			Thuraiyur
			Manapparai
			Thuvarankurichi

		Thanjavur	Thanjavur
			Kumbakonam
			Pattukkottai
			Pattukkottai
			Muthupet
		Thiruvarur	Mannargudi
			Thiruvarur
		Nagapattinam	Nagapattinam
			Vedaranyam
			Sirkali
		Perambalur	Perambalur
			Veppanthattai
		Pudukkottai	Pudukkottai
			Arantangi
			Ponnamaravathi
			Keeranur
			Tirumayam
		Ariyalur	Ariyalur
7	Villupuram	Villupuram	Kallakurichi
			Vellimalai
			Gomuzhi
			Innadu
			Palapattu
			Cherapattu
			Ulundurpet
			Gingee
			Villupuram
			Tindivanam
		Cuddalore	Cuddalore
			Chidambaram
			Vrithachalam
			Shelter belt range,Cuddalore
			Social Forestry Range, Neyveli
			Publicity range, Neyveli
8	ATR, Coimbatore	ATR, Tiruppur	Udumalpet
			Amaravathi
			Kangayam
			Vandharavu
			Kolumam
		ATR, Pollachi	Ulandy
			Manambolly
			Pollachi

			Valparai
		ATR, Coimbatore	Madukkarai
			Bolampatti
			P.N.Palayam
			Coimbatore
			Karamadai
			Mettupalayam
			Sirumugai
9	MTR, Udhagai	Mudumalai Tiger Reserve, Udhagai.	Nelakkottai
			Mudumalai
			Theppakkadu
			Kargudy
			Mukurthy
		Mudumalai Tiger Reserve, Masinagudi.	Segur
			Singara
			Nilgiri Eastern Slope
			Masinagudi
		Nilgiris Forest Division	Naduvattam
			Pykara
			Parsons valley
			Governor shola
			Korakundah
			Kundah
			Udhagai South
			Udhagai North
			Coonoor
			Kotagiri
			Kilkotagiri
			Kattabettu
		Gudalur Forest Division	Gudalur
			Cherambady
			Bitherkadu
			Pandalur
			O'Valley
			Nadugani
10	STR, Erode	Erode Forest Division,Erode	Anthiyur
			Bargur
			Thatakarai
			Chennampatti
			Erode
		Sathyamangalam	Sathyamangalam
			T.N.Palayam

			Bhavanisagar
			Talamalai
			Kadambur
			Vilamundi
		Hasanur	Hasanur
			Germalam
			Thalavadi
			Jeerahalli
11	SMTR, Madurai	Sivagangai	Sivagangai
			Thiruppathur
		Ramanathapuram	Ramanathapuram
			Sayalkudi
		Srivilliputhur WL	Rajapalayam
			Srivilliputhur
			Watrap
			Saptur
		Megamalai	Chinnamanur
			Cumbum East
			Gudalur
			Varushanadu
			Megamalai
			Gandamanur
		Ramnad WL	Ramnathapuram
			Keelakarai
		Theni	Theni
			Periyakulam
			Bodi
			Uthamapalayam
			Cumbum West
			Andipatty
		Madurai	Madurai
			Sholavandan
			Usilampatty
12	KMTR, Tirunelveli	Tirunelveli	Tirunelveli
			Courtallam
			Kadaiyanallur
			Sankarankovil
			Sivagiri
		Kanyakumari	Boothapandy
			Velimalai
			Kaliyal
			Azhagiyapandiyapuram

			Kulasekaram
		Thoothukudi	Thoothukudi
			Srivaikundam
			Tiruchendur
			Kovilpatti
		Ambasamudram	Ambasamudram
			Papanasam
			Mundanthurai
			Kadayam
		Kalakad	Kalakad
			Thirukkurungudi
			Upper Kothaiyar
		Eco Development Division	Kalakad Eco Range
			Thirukkurungudi Eco Range
			Ambasamudram Eco Range
			Papanasam Eco Range
		Forest Protection Squad, Tirunelveli	NIL
		KMTR Squad wing, Tirunelveli	
		Forest Station, Tirunelveli	

APPENDIX III

10.3 Fire Incident Final Report

1	Date of fire occurrence	
2	Name of the forest land (RF/RL/Plantation area in respect to non-forest area)	
3	Name of the Range	
4	Name of the Section	
5	Name of the Beat	
6	Name of the Area	
7	Time of fire occurrence	
8	Time of the departure of forest officials and villagers assisting in fire fighting	
9	Time of the arrival of forest staff and villagers at the site of the fire	
10	Reporting Time	
a,	Time of the extinguishing fire	
b,	Time of return to head quarters	
11	Fire affected area (in hectares)	
12	Day of inspection by the Forester	
13	Cause of fire	
14	Action taken by the Forest Officials to extinguish fire	
15	Government loss	Yes/ No
a,	Physical (kind of vegetation, property damaged etc.,)	
b,	Financial in Rupees	
16	Date of inspection by Forest Range Officer	
17	Whether enclosures attached as follows:	
a,	Location sketch	Yes/ No
b,	Survey sketch of fire burnt area with GPS readings	Yes/ No
c,	Photographs (if any)	Yes/ No

Signature of District Forest Officer

APPENDIX IV

10.4 Standard Operating Procedure for Forest Fire Management- G.O.(Ms) No.11

Introduction

Forest fires play a crucial role in nutrient recycling and tree regeneration in natural ecosystems. However, with increasing human populations and over-extraction of resources, fires have become more frequent and destructive. Climate change has intensified this issue by drying biomass and increasing organic buildup, leading to larger, more harmful fires. In India, especially in Tamil Nadu, where 23.71% of the state's land is covered by forests, these fires threaten biodiversity, wildlife habitats, and local communities. The growing intensity of forest fires also contributes significantly to carbon emissions, worsening climate change.

Tamil Nadu has nine major forest types, ranging from wet evergreen forests to grasslands and scrub forests. The Western Ghats, the longest hill range in the state, is a global biodiversity hotspot. The forest fire season in Tamil Nadu is identified from **January to July**. As summer progresses, decreasing moisture levels and increasing fuel loads heighten the risk of forest fires. Over the past five years, Tamil Nadu falls under the moderate category of forest fire sensitivity, though fires remain a critical threat due to the proximity of human habitations to forest boundaries. Forest fire management stands at three different levels - Pre fire (preparatory planning for fire control), During fire (Fire detection, spread and control planning), Post fire (Mitigation, Damage assessment and Planning).

To effectively address these challenges, this Standard Operating Procedure (SOP) is established to provide comprehensive guidance for field-level units in Tamil Nadu. It aims to outline a structured framework for preparing for, managing, and responding to forest fires, as well as conducting post-fire management activities. The SOP delineates specific activities required from field units, the standards to be adhered to, and defines the roles and responsibilities of Divisional units, Range units, and firefighting field teams. By implementing these operational procedures, the SOP seeks to enhance the effectiveness of forest fire management efforts in the region, ultimately contributing to the protection of biodiversity and the sustainability of forest resources.

Objectives

- To provide information for effective management of forest fires in the state
- Minimize the occurrence and effect of forest fires by informing, enabling and empowering forest fringe communities and all stakeholders by participatory approach and encouraging them to work in tandem with the forest department.
- Substantially focusing on the reduction of the vulnerabilities of forests across the diverse forest ecosystems in the Tamil Nadu against fire hazards, especially in the forest fire sensitive areas
- Enhancing the capabilities of forest, other personnel and institutions in fighting fires, and speed up recovery after a fire event.
- To coordinate in an effective manner during the occurrence of forest fire in efficiently managing the incident through collective effort.

1. Preventive measures- Pre-Fire Season

1. Financial Planning for Fire Preparedness

- **State Level:**
  - The Additional Principal Chief Conservator of Forests (APCCF) Planning & Vigilance shall ensure the availability of financial resources, manpower, transport facilities, and firefighting equipment prior to the fire season.
  - Necessary steps are to be taken to conduct periodical review of number of registrations with the Forest Survey of India's (FSI) forest fire alert system.
  - The APCCF shall review that all stakeholders, including VFC members, local volunteers, fire rescue services, SDRF, Police, and Revenue Department, to register for forest fire alerts.
  - Budget requirements should be planned for both the current financial year and the first quarter of the following year. Justify fund requirements to ensure sufficient resources for fire control measures.
- **Circle Level:**
  - **Conservators of Forests** will ensure that resources are available for fire management in their circles and coordinate funding needs with the state-level authorities.
- **Division Level:**
  - **DFOs** will align division-level financial planning with state and circle-level plans, ensuring sufficient resources for fire control activities within the division.

2. Registration for Forest Fire Alerts

- **State Level:**
  - Conduct regular reviews of the number of registrations with the **Forest Survey of India's (FSI) forest fire alert system**. Ensure all stakeholders, including **VFC members, local volunteers, fire rescue services, SDRF, Police, and Revenue Department**, are registered for fire alerts.
- **Circle Level:**
  - **Conservators of Forests** will ensure that all frontline staff and local stakeholders (volunteers, SDRF, Police) in their circle are registered with the FSI forest fire alert system.
- **Division Level:**
  - District Forest Officers (DFOs), Wildlife Wardens, and Deputy Directors are responsible for ensuring that frontline staff register with FSI's forest fire alert system. The Division head should ensure that all relevant stakeholders in the division are registered for forest fire alerts. They should also ensure that other stakeholders in their jurisdiction, including local youth/fire volunteers, SDRF, and police, are encouraged to register for alerts. Special drives are to be initiated to increase the registration in their division limits.
- **Range Level:**

- **RFOs** will coordinate with local authorities to facilitate registration drives and ensure all community members and frontline staff are registered for fire alerts.

3. Awareness Generation & Community Engagement Programs

- **State Level:**
  - Tamil Nadu State Forest Fire Control Centre shall develop statewide awareness campaigns template and calendar of events including training workshops for staff and public awareness programs using pamphlets, banners, fire-protection weeks, local media, and multimedia.
  - Coordinate with various districts to ensure consistent delivery of these campaigns.
- **Circle Level:**
  - **Conservators of Forests** will coordinate awareness programs at the district level, focusing on schools, local communities, and fire prevention in collaboration with district administrations.
- **Division Level:**
  - **DFOs** will implement village-level meetings, distribute materials, and ensure active participation in fire awareness programs. Ensure frontline staff and volunteers are trained in fire prevention and emergency response procedures.
- **Range Level:**
  - **RFOs** will conduct community meetings and engage local self-help groups (SHGs), schools, and youth clubs in fire awareness and prevention activities.

4. Clearing and Maintenance of Fire Lines

- **State Level:**
  - The **Principal Chief Conservator of Forests (PCCF)** will oversee the creation and maintenance of fire lines (3m, 6m, and 12m) statewide, ensuring they are consistent with national and state fire management plans. Coordinate with **Compensatory Afforestation Fund Management and Planning Authority (CAMPA)** for funding.
- **Circle Level:**
  - **Conservators of Forests** will ensure all divisions in their circle maintain a comprehensive inventory of fire lines, and that the clearing of fire lines is completed before the fire season. Special focus should be on **Forest Fire Sensitive Areas (FFSA)**.
- **Division Level:**
  - **DFOs** will ensure that fire lines in all ranges are properly cleared and maintained before the fire season. Inspect the status of fire lines in **FFSAs** and report progress to the **TNSFFCC** by November.
  - Each division must maintain an inventory of forest fire lines and ensure that these fire lines are cleared according to the Management Plans before

the fire season. The clearing should be completed by the end of winter. Ensure that all ranges in the division have a comprehensive inventory of fire lines (3m, 6m, and 12m) and that the clearing of fire lines is completed before the fire season. Special focus on FFSA and the status of the fire lines in these areas are to be inspected and reported to the TNSFFCC before November of every year.

- **Range Level:**
  - **RFOs** will oversee day-to-day fire line maintenance, ensuring brush is cleared, and firebreaks are functional. They will coordinate with local labour groups and fire watchers.

5. Implementation of Controlled Burning Practices

- **State Level:**
  - The **State Forest Department** will establish a controlled burning policy as part of the state action plan for fire prevention. Ensure the policy is uniformly applied across all divisions.
- **Circle Level:**
  - **Conservators of Forests** will approve controlled burning plans and ensure compliance with safety and environmental guidelines. Report the completion of controlled burns to the **TNSFFCC** by December 31st.
- **Division Level:**
  - **DFOs** will plan and execute controlled burns in collaboration with **RFOs**, targeting areas with heavy fuel loads. Consult local communities to ensure safety during controlled burns.
  - DFOs, Wildlife Wardens, or Deputy Directors should select areas for controlled burning based on vulnerability assessments. All control burns must be completed by December 31st and communicated to the TNSFFCC.
- **Range Level:**
  - **RFOs** will conduct local controlled burns under direct supervision. Ensure that communities are informed, and volunteers are trained to assist with fire containment during burns.

6. Surveillance and Monitoring Systems

- **State Level:**
  - The **TNSFFCC** will provide real-time data to support local surveillance efforts through **GIS systems** and satellite alerts.
- **Circle Level:**
  - **Conservators of Forests** will oversee the identification and maintenance of lookout points, watchtowers, and fire detection systems in their jurisdiction, ensuring these are operational before the fire season begins.
- **Division Level:**
  - **DFOs** will ensure the maintenance of watchtowers and other fire detection systems and identify new locations for lookout points to enhance fire surveillance.

- **Range Level:**
  - **RFOs** will manage local surveillance operations and ensure watchtowers are manned, operational, and capable of detecting fires early.

7. Local Community Participation and Joint Forest Management Committees (JFMCs)

- **State Level:**
  - The **State Forest Department** will formalize the role of **Village Forest Committees (VFCs), Panchayats, and NGOs** in fire prevention and firefighting. Offer rewards or social recognition for communities successfully preventing fires.
- **Circle Level:**
  - **Conservators of Forests** will engage **JFMCs** and other local bodies in fire prevention activities, ensuring workshops and training programs are conducted in collaboration with community leaders.
- **Division Level:**
  - **DFOs** will coordinate with JFMCs, offering resources like firefighting equipment and protective gear. Ensure JFMC members are trained in fire detection and response.
- **Range Level:**
  - **RFOs** will mobilize JFMCs during fire incidents and ensure they are adequately equipped to respond effectively to fire emergencies.

8. Review and Monitoring of Fire Preparedness

- **State Level:**
  - The **APCCF** will conduct regular reviews of fire preparedness activities, including the availability of seasonal fire watchers, completion of fire prevention tasks, and monitoring of community engagement efforts.
- **Circle Level:**
  - **Conservators of Forests** will monitor the fire preparedness measures in their circles and communicate with divisions to ensure the timely completion of required tasks.
- **Division Level:**
  - **DFOs** will monitor the availability of fire watchers, the completion of fire prevention works, and the involvement of local communities. Regular reports should be submitted to **circle-level authorities**.
- **Range Level:**
  - **RFOs** will monitor and review fire preparedness at the local level, ensuring fire prevention tasks are completed, and staff and volunteers are ready for the fire season.

9. Coordination with Other Departments

- **State Level:**
  - The **TNSFFCC** will establish policies for coordination between the Forest Department and other state agencies like **Police, Fire & Rescue, Disaster Management**, and health services for fire management.

- **Circle Level:**
  - **Conservators of Forests** will ensure inter-departmental coordination at the district level, facilitating joint operations with local law enforcement and health services.
- **Division Level:**
  - **DFOs** will establish coordination with local departments (Police, Fire & Rescue, and Health) and engage fire watchers as needed.
  - Engage daily wage fire watchers as needed and ensure that all rescue materials and firefighting equipment are available and mobilized.

10. Risk Assessment and Fire Risk Zonation

- **State Level:**
  - The **GIS cell** will perform state-level forest fire risk zonation using satellite data and historical fire incidents, collaborating with scientific institutions and organizations like **FSI**.
  - TNSFFCC shall update the annual action plans to incorporate specific strategies for forest fire-sensitive areas based on new data, including targeted protection measures for areas with high or very high vulnerability.
- **Circle Level:**
  - **Conservators of Forests** will identify priority zones based on state-level risk maps and ensure risk zones are updated every five years.
- **Division Level:**
  - **DFOs** will review and refine risk maps at the local level, considering forest type, topography, and human activities. Collaborate with local stakeholders to adjust firebreaks accordingly.
- **Range Level:**
  - **RFOs** will conduct detailed risk assessments in vulnerable forest patches and submit data to divisional offices. Monitor local community activities that may increase fire risk, like grazing or shifting cultivation.

11. Equipment Readiness and Procurement

- **State Level:**
  - The **State Forest Department** will ensure the procurement and distribution of firefighting equipment (hoses, water tanks, vehicles, etc.) across Tamil Nadu, and conduct checks before the fire season.
- **Circle Level:**
  - **Conservators of Forests** will ensure that firefighting equipment in their circles is checked regularly and in working condition. Any damaged or outdated equipment must be replaced before the fire season.
- **Division Level:**
  - **DFOs** will manage equipment inventories within divisions, ensuring that all equipment is operational and accessible before the fire season starts.
- **Range Level:**

- **RFOs** will check the readiness of local firefighting equipment and ensure all resources are available for immediate use during fire incidents.

12. District Fire Management Plan

The District Fire Management Plan will be prepared at Division/District level by the concerned DFO. It is a comprehensive document comprising strategy for fire management, resources available, logistics, facilities & operations of District Forest Fire control room, base stations at high-risk areas, communication system, details of fire sensitive areas, formation of committees, assignment of roles and responsibilities at different levels, alerting health services, requirement of resources etc., in a comprehensive manner. Each district has to prepare a comprehensive fire management plan, which will be endorsed by the concerned Circle Conservator of Forests and shall be submitted to the State Forest fire control centre (SFFCC) in Chennai.

Action plan for smaller units of Range and beat will be prepared wherein strategies and techniques for prevention and control will be given in detail based on criteria given below:

- Fire sensitivity / fire vulnerability.
- Previous year fire occurrences and present status.
- Fuel load position in entire beat.
- Fire exit point in the beat taking current year position.
- Sources of water (to be recorded separately for drinking and other purpose) available during fire season in each beat.
- Inventory of equipment's and other facilities such as hand tools, improved fire-resistant clothing and fire tenders, first aid kits, etc. available within the department and in neighbouring government and non-government agencies, hospitals, etc.
- Strength of labour force in surrounding villages and villagers to be covered for awareness.
- Contacting awareness programs and elaborate causes and consequences of forest fire to schools, colleges and circulate notice to the public.

The action plan should also chalk out details of preparatory works to be taken up such as extent and location of fire lines to be traced, moisture retention work, etc. based on the above criteria.

13. Annual Plan of Operation for Forest Fire Management

Month	**Activity**
October	Financial Resource Allotment
November	Procurement of firefighting equipment
	Fireline clearing and other works
	Training/Mock drills
	Registering with FSI for fire alert
	Inventory preparation & resource mapping
December	Fireline clearing and other works
	Training/Mock drills
	Registering with FSI for fire alert
January - March	Engaging seasonal fire watchers
	Regular patrolling
	Awareness creation

April	Financial Resource Allotment
	Engaging seasonal fire watchers
	Regular patrolling
May & June	Engaging seasonal fire watchers
	Regular patrolling

This table outlines the key activities and their timing for effective forest fire management throughout the year in Tamil Nadu.

2. Fire suppression activities -During Fire Season

1. Quick Response to Fire Alerts

- **State Level:**
  - The Tamil Nadu State Forest Fire Control Centre (TNSFFCC) will monitor daily fire alerts from FSI and satellite systems, ensuring divisions respond promptly.
  - Submit daily reports to the PCCF HOFF and the state government as needed, ensuring coordination with SDMA, MOEFCC, and NDMA for additional support if required.
  - The TNSFFCC will monitor daily fire alerts using data from the Forest Survey of India (FSI) and satellite-based systems.
  - Ensure that divisions promptly respond to fire alerts and track the progress of fire suppression efforts across the state.
- **Circle Level:**
  - CFs will oversee fire alerts and ensure that division officers respond immediately to any fire alerts. Verify that all fire incidents are logged in the TN Forest Fire MIS and ensure appropriate follow-up actions.
- **Division Level:**
  - DFOs will monitor fire alerts through the TN Forest Fire Management Information System (TNFFMIS) and ensure immediate deployment of firefighting teams to the site. Mobilize local communities for assistance in extinguishing fires when required.
- **Range Level:**
  - RFOs will monitor fire alerts and ensure the rapid deployment of firewatchers and field staff to fire locations. Use local resources and volunteers to assist in quick suppression efforts and ensure timely response.
  - Communicate with local villagers and mobilize additional help if needed and use counter-fire techniques where appropriate.

2. Fire Suppression and Site Management

- **State Level:**
  - The TNSFFCC will coordinate with state and national agencies like SDMA, MOEFCC, NDMA, and NDRF for the mobilization of additional resources in large-scale fires. Provide logistical support for site management during fire suppression operations.

- During large-scale fires or emergencies, the state will coordinate with SDMA, MOEFCC, NDMA, and NDRF.
- The APCCF will mobilize additional resources, personnel, and support from central agencies and ensure coordination with local authorities.
- Designate caution zones and deploy rapid response units where necessary.

- **Circle Level:**
  - CFs will ensure that all fire suppression efforts within their jurisdiction are carried out promptly and efficiently, coordinating the deployment of resources where needed and ensuring that fire teams are mobilized immediately to high-risk areas.
  - In case of large-scale fires, the CF will coordinate with local District Administration, Police, and SDRF, and ensure that adequate resources are mobilized. Take necessary action in case the fire spreads beyond forest areas, including public warnings and potential evacuation measures.
- **Division Level:**
  - DFOs will ensure firefighting teams reach reported fire locations and manage the use of tools and techniques, including leaf blowers, counter-fire methods, and the removal of dry leaves and hazardous materials to prevent further spread.
  - DFFCC will monitor fire suppression activities at the division level and ensure adherence to fire suppression guidelines. Coordinate with local authorities, such as the Police and District Fire Services, for support during large-scale fires.
  - Firefighting teams from other ranges to be roped in if required to immediately proceed to the reported fire location and use available tools and counter-fire techniques to extinguish the fire.
  - Ensure the removal of dry fallen leaves and forest hazard fuel loads to prevent the fire from spreading further.
  - Roping in assistance from other line departments
  - Intimation of fire to District, Police, Revenue and Forest Headquarters to be done. Timely update on the status of the fire to be reported.
  - Issue advisories to prohibit people and tourist movement near the fire location within forest limits. District administration to be intimated and press release shall be given.
  - Seek assistance of Forest Elite force if required.
  - In case of large forest fire, after consultation with PCCF (HOD/HOFF), DFO to request for external agencies assistance i.e. SDRF, IAF as per the ground conditions to be done through District Collector with a copy marked to TNSFFCC, PCCF HOFF and Government.
  - Daily report on status of forest fire to be intimated to TNSFFCC
- **Range Level:**

- Upon reaching the fire location, FROs must manage the firefighting teams and guide them in suppressing the fire using tools, equipment, and counter-fire techniques. Ensure that all fires are effectively contained and monitor the site to prevent rekindling.
- Submit Flash report through TNFFMIS portal/app immediately on reaching the spot and quick assessment on the fire condition.
- To arrange for timely food, water and stay requirements.
- Rope in Water tankers from other line departments and local communities
- Create new fire lines (only if required) on approval from DFO using local resources.
- Arrange for fire volunteers and youths from local communities to engage in fire suppression
- Report the fire status to DFO on hourly basis
- Quick ocular estimation of the losses
- Once fire is suppressed, quick ground estimation of fire affected area and the loss to be reported in the final report

3. Coordination with Other Departments and Agencies

- **State Level:**
  - The TNSFFCC will ensure seamless coordination with other state and national agencies such as SDMA, MOEFCC, NDMA, NDRF, and Police to manage large-scale fires and emergencies.
  - Establish a crisis management team and deploy rapid response units to designated caution zones as necessary.
- **Circle Level:**
  - CFs will coordinate with the District Administration, Police, and SDRF during forest fires, ensuring that additional resources are available, and that public warnings or evacuations are conducted if the fire spreads beyond forest areas.
- **Division Level:**
  - DFOs will maintain coordination with local departments such as Police, Fire & Rescue, and Health, ensuring that additional resources are available for firefighting operations. Coordinate the movement of firewatchers, equipment, and community volunteers.
- **Range Level:**
  - RFOs will coordinate with local authorities and mobilize help from villagers and other local stakeholders for fire suppression. Ensure timely communication with the DFO and District Forest Fire Control Unit (DFFCC) for additional support if required.

4. Early Detection Systems

- **State Level:**

- The TNSFFCC will use satellite-based forest fire alerts from FSI and other agencies for early detection of fire incidents. Operate a 24/7 control room during fire season for real-time monitoring of fire alerts across Tamil Nadu.
- Toll free number for reporting fire incidents to be made operational and wide publicity to be given through air and social media to reach larger section of people.

- **Circle Level:**
  - CFs will ensure that district-level control rooms are established and made operational to disseminate fire alert information quickly to all relevant divisions. Regularly test detection and reporting systems and review the response time.
- **Division Level:**
  - DFOs will coordinate local ground-based detection systems such as watchtowers and patrolling teams. Ensure that prompt communication between field staff and control rooms is maintained to detect fires early.
  - Local communication for people to report fire incidents to be set up.
- **Range Level:**
  - RFOs will mobilize local firefighters, watchtowers, and community volunteers upon receiving fire alerts to ensure a quick response. Implement continuous monitoring of fire-prone areas using available resources.

5. Equipment Readiness and Deployment

- **State Level:**

  The Tamil Nadu Forest Department (TNFD) will ensure the development and implementation of a modern, standardized training curriculum, in consultation with the National Disaster Management Authority (NDMA), National Disaster Response Force (NDRF), and State Disaster Management Authorities (SDMA).
  - Training programs will be organized to ensure field staff, seasonal firewatchers, and community volunteers are well-equipped with the knowledge and skills required for fire suppression.
  - Conduct statewide mock drills and simulations to assess preparedness, involving all necessary stakeholders, including District Administration, Police, and community organizations.
  - The APCCF will oversee the distribution and testing of firefighting equipment, ensuring that all divisions have the necessary tools like leaf blowers, protective gear, and water tanks. Conduct routine review on status of equipment to ensure readiness throughout the fire season.
- **Circle Level:**
  - CFs will ensure all firefighting equipment within their circle is functional and available for use during fire incidents. Coordinate the maintenance of forest road networks for easy access to fire-prone areas.
- **Division Level:**

- DFOs will verify that all firefighting tools, such as leaf blowers and protective clothing, are ready for deployment before the fire season.
- Conduct regular maintenance checks and replenish stocks when necessary.
- The District Forest Fire Control Unit (DFFCC) will oversee fire reporting and ensure proper communication between the Division Forest Officers (DFOs) and the Tamil Nadu State Forest Fire Control Centre (TNSFFCC). Ensure timely submission of flash reports and final fire reports by divisions using the TN Forest Fire MIS system.

- **Range Level:**
  - RFOs will ensure that frontline staff, firewatchers, and community volunteers are equipped with necessary firefighting gear. Perform regular practice drills to maintain readiness and ensure equipment is always functional.

6. Mobilization of Firewatchers and Volunteers

- **State Level:**
  - The TNSFFCC will maintain a statewide database of trained firefighting volunteers and ensure their timely deployment in fire-prone areas during the fire season. Mobilize additional resources when large-scale fires occur.
- **Circle Level:**
  - CFs will ensure that adequate firefighting resources, including trained volunteers and firewatchers, are mobilized within their jurisdiction and deployed to fire-prone zones during the fire season.
- **Division Level:**
  - DFOs will manage the deployment of firewatchers and community volunteers to assist in firefighting. Maintain a roster of volunteers and ensure they are placed in strategic locations during high-risk periods.
  - DFFCC will assist divisions in mobilizing firefighting volunteers and additional resources when needed.
  - Maintain a database of trained volunteers and ensure they are deployed in fire-prone areas during the fire season.
- **Range Level:**
  - RFOs will manage the deployment of firewatchers and local volunteers to respond to fire incidents. Ensure volunteers are placed at critical points to monitor and respond to fires.

7. Reporting and Communication

- **State Level:**
  - The TNSFFCC will receive real-time reports from divisions through the TN Forest Fire MIS and ensure all relevant information is communicated to the PCCF HOFF and state government as required.
  - The TNSFFCC will daily monitor fire alerts across the state, using data from FSI and other satellite-based systems.

- Ensure that divisions are responding promptly to fires, verify the status of ongoing fire suppression, and receive updates from concerned divisions through the TN Forest Fire MIS system.
- Submit daily reports to the Principal Chief Conservator of Forests (PCCF) Head of Forest Force (HOFF) and the state government when required.
- Coordinate with SDMA, MOEFCC, and NDMA for high-level decision-making during crises and to request additional support if needed.

- **Circle Level:**
  - CFs will ensure timely submission of flash reports and final fire incident reports to the TNSFFCC. Follow up on fire suppression efforts and update reports as needed.
- **Division Level:**
  - DFOs will ensure that all fire-related activities are accurately documented in the TNFFMIS system, providing timely updates and final reports to the TNSFFCC.
  - DFOs must submit timely flash reports and detailed final reports of fire incidents through the TNFFMIS system, ensuring that all fire-related activities are accurately documented.
  - Coordinate with the District Forest Fire Control Unit (DFFCC) for efficient reporting and seek their assistance during large-scale fire events.
- **Range Level:**
  - RFOs will submit real-time updates on fire suppression activities through the TNFFMIS, ensuring all relevant data is communicated promptly to the DFO and DFFCC.
  - Flash reports and final reports with all relevant details are to be submitted through TNFFMIS portal/ app.

3. Post Fire Management

1. Post-Fire Review and Assessment

- **State Level:**
  - The State Forest Fire Control Centre (SFFCC) will develop a state-level database for burnt area assessment annually after the fire season.
  - The SFFCC will publish an annual Post-Fire Review Report based on the findings, which will be used for planning tree planting, eco-restoration activities, and improvements in fire suppression strategies.
  - In consultation with the Indian Council of Forestry Research and Education (ICFRE), the Tamil Nadu Forest Department (TNFD) will develop standard methodologies for assessing forest fire losses, including intangible losses such as ecosystem services.
- **Circle Level:**
  - Conservators of Forests (CFs) will consolidate reports from the division and submit a comprehensive post-fire assessment for their circle, ensuring the analysis of the extent of fire damage and losses.
  - CFs will ensure that post-fire review meetings are held to identify gaps in suppression efforts and recommend solutions for future fire seasons.
- **Division Level:**
  - DFOs will conduct detailed post-fire damage assessments in their division, preparing recovery plans, ecological impact reports, and other necessary recommendations.
  - DFOs will organize review meetings with the division team to evaluate gaps in fire suppression efforts and suggest improvements for future seasons.
- **Range Level:**
  - RFOs will assess damage in their respective ranges and submit reports to the DFOs, focusing on the impact on flora, fauna, and soil.
  - Participate in review meetings to provide ground-level feedback and suggest improvements for future firefighting efforts.

2. Assessment of Loss Due to Forest Fires

- **State Level:**
  - The SFFCC will establish a statewide burnt area assessment system using GIS and satellite data to map fire-affected regions annually.
  - The Ministry of Environment, Forest and Climate Change (MoEFCC) emphasizes burnt area assessment in its National Action Plan for Forest Fire (NAPFF). The state will align its annual fire burnt area assessments with these national recommendations.
- **Circle Level:**
  - CFs will gather burnt area data from divisions and review the fire damage reports.

- Coordinate with DFOs to ensure that assessments of both tangible and intangible fire losses are completed, including the loss of ecosystem services.

- **Division Level:**
  - DFOs will conduct division-level burnt area assessments using satellite images, GIS tools, and local data. Prepare detailed reports covering area, location, spatial spread, and overall fire damage.
  - Submit burnt area reports to the circle level for further consolidation.
- **Range Level:**
  - RFOs will conduct on-ground surveys of burnt areas within their range and provide preliminary data to the DFOs.
  - Ensure accurate data collection on burnt areas, including measurements and the extent of forest damage.

3. Proper Investigation of Fire Causes

- **State Level:**
  - The TNFD will ensure that each fire incident is investigated properly and that legal actions are taken where necessary.
  - Develop training programs to improve the investigation skills of forest officials at various levels.
- **Circle Level:**
  - CFs will supervise the investigation of fire incidents within their circle, ensuring that all causes are thoroughly examined.
  - CFs will initiate necessary actions based on investigation reports and ensure accountability for the causes of forest fires.
- **Division Level:**
  - DFOs will lead investigations into the causes of fire incidents and ensure proper documentation of findings.
  - Implement legal actions if necessary and report findings to the CF.
- **Range Level:**
  - RFOs will assist in investigating fire causes at the range level and gather evidence where required.
  - Provide reports to the DFOs, ensuring all fire incidents are accurately investigated.

4. Restoration of Fire-Affected Areas

- **State Level:**
  - The TNFD will develop state-level restoration plans for fire-affected areas, focusing on restoring the natural ecological profile.
  - Establish guidelines for soil moisture conservation, silviculture practices, and vegetative barriers around affected areas.
- **Circle Level:**

- CFs will review the division's restoration plans and ensure the implementation of soil conservation measures, silviculture practices, and the planting of indigenous vegetative barriers in fire-affected areas.

- **Division Level:**
  - DFOs will lead the restoration of fire-affected areas, focusing on damage assessment, flora restoration, reforestation, and soil moisture conservation.
  - Implement silviculture practices in fire-affected areas to restore them to their natural profile and ensure replanting of local species of plants and grasses to support the local ecosystem.
- **Range Level:**
  - RFOs will oversee on-ground restoration activities, including replanting, soil moisture conservation, and implementing silviculture practices as per division guidelines.
  - Monitor restoration progress and report to DFOs regularly.

5. Publicity and Extension Activities

- **State Level:**
  - Post-fire season is an ideal period for the TNFD to launch publicity and extension activities, engaging the local community through pamphlets, handouts, posters, and media programs (TV, radio, etc.).
  - NGOs, Voluntary Organizations, and Village Forest Committees (VFCs) will be engaged to promote community participation.
- **Circle Level:**
  - CFs will ensure that publicity programs are conducted in collaboration with local communities, targeting fire-prone areas with extension activities like public meetings and awareness programs.
- **Division Level:**
  - DFOs will distribute informational material (pamphlets, posters) to local communities and conduct meetings to raise awareness about fire prevention and restoration efforts.
  - Work with VFCs and local NGOs to ensure public participation in post-fire activities.
- **Range Level:**
  - RFOs will engage local villagers, schools, and VFCs in post-fire awareness programs and ensure they understand their role in forest fire prevention and management.

6. Training and Education Programs

- **State Level:**
  - During the post-fire season, the TNFD will organize training programs such as exposure visits, workshops, and hands-on sessions for frontline forest staff, local communities, and volunteers.

- Focus on advanced forest fire management technologies and skill development.
- Collaborate with Forestry Institutions to design syllabi for planning, management, and firefighting courses.

- **Circle Level:**
  - CFs will ensure that forest staff and community volunteers within their circle receive post-fire season training on advanced firefighting techniques and restoration strategies.
  - Conduct workshops and exposure visits to educate the community about sustainable forest management post-fire.
- **Division Level:**
  - DFOs will organize training workshops and skill development programs for firewatchers, community volunteers, and division staff, focusing on post-fire management, eco-restoration, and advanced firefighting methods.
- **Range Level:**
  - RFOs will conduct local training sessions and encourage community participation in forest management activities, teaching firewatchers and volunteers about fire prevention techniques and forest restoration.

7. Burnt Area Assessment

- **State Level:**
  - The TNFD GIS cell will conduct satellite-based burnt area assessments at the end of each fire season, using remote sensing tools to assess the location, area, and spatial spread of burnt areas.
  - The assessment will be aligned with the MoEFCC's National Action Plan for Forest Fire (NAPFF) guidelines for burnt area evaluation.
- **Circle Level:**
  - CFs will oversee the burnt area assessments conducted at the division level and ensure the information is integrated into the state database.
  - Coordinate with divisions to ensure that all fire-affected areas are properly mapped and assessed for future planning.
- **Division Level:**
  - DFOs will ensure that all burnt areas are assessed using GIS and remote sensing data. Submit detailed assessment reports, including the area, location, and extent of the damage.
  - Incorporate burnt area data into division-level planning for future fire prevention and mitigation.
- **Range Level:**
  - RFOs will gather data on the ground for burnt area assessments and ensure accurate information is submitted to the division office.
  - Participate in mapping exercises to assist in the spatial evaluation of fire-affected areas.

4. Chain of Command

Standard Operating Procedure (SOP) for co-ordination among the stakeholders – chain of command

(NDMA Directions)

Level	Agency	Status of Forest Fires	Fire Category Description
1	Forest Beat/Range/Division	• All Surface fires	Suppression of Ground Fire, depending on the terrain, forest types, circumstances, situation, and nature of forest fire
2	Forest Division	• Large Forest Fire (LFF) until 3 days	Suppression of Ground Fire, depending on the terrain, forest types, circumstances, situation, and nature of forest fire
3	DDMA	• Large Forest Fire (LFF) for 4-6 days i. Crown Fires until 2 days	SDRF will be called if such fires continue in Protected Areas (PAs), depending on the terrain, forest types, circumstances, and nature of forest fire
4	SDMA/ SDRF	• Large Forest Fire (LFF) beyond 6 days j. Crown Fires >2-4 days	NDRF will be called if such fires continue in PAs. Indian Air Force (IAF) may be involved, depending on the terrain, forest types, circumstances, and nature of forest fire
5	NDMF/ NDRF	• Large Forest Fire (LFF) beyond 10 days k. Multiple LFFs in a Forest Division l. Multiple LFFs across a State/UT m. Crown Fires beyond 4 days	Indian Air Force (IAF) may be involved, depending on the terrain, forest types, circumstances, and nature of forest fire

5. Summary of Roles and Responsibilities

Forest Headquarters Level

State Nodal officer

- During the crisis of forest fire disaster, the State Forest Fire Control Centre (SFFCC) shall function as Incident Command Centre.
- In case of fire in the proportion of a disaster, Additional Principal Chief Conservator of Forests (P&V) shall be the State Nodal Officer who will take over operations from head office or as directed by the Principal Chief Conservator of Forests (HoFF), assisted by APCCF(WL) in case of fire in Protected Areas and DCF GIS for the operations of SFFCC.
- The State Nodal Officer shall coordinate with other government agencies at District, State and National levels for activating their support in mobilizing resources and manpower.

Protection and Vigilance (PV) Wing:

- The **PV wing under Tamil Nadu Forest Department**, designated as the nodal wing for forest fire management, will be responsible for **allocating necessary funds** for forest fire management across divisions, ensuring sufficient resources are available for field units.
- The PV wing will ensure the functioning of the forest fire control room at the state headquarters (TNSFFCC) from 1st January through the entire fire season, supporting district and division control units

Tamil Nadu State Forest Fire Control Centre - TNSFFCC

- The **TNSFFCC** at the Tamil Nadu Forest Headquarters will ensure **seamless transmission of fire alert data**, received from sources like **FSI (Forest Survey of India)**, to the field units. It will track fire incidents using the **Tamil Nadu Forest Fire Management Information System (TN-FFMIS)** and maintain all relevant forest fire-related data.
- The TNSFFCC will provide **technical support to field functionaries** regarding fire data interpretation and the use of **TN-FFMIS** in on-ground forest fire management.
- TNSFFCC will ensure the integration and processing of real-time fire alerts and mobilize quick responses by coordinating with other agencies such as the Tamil Nadu State Disaster Management Authority, MOEFCC & NDMA

Circle Level

Conservator of Forests (CF):

- In such circumstances when forest fire is declared or identified as a disaster, a war room shall be established at the Circle office to coordinate with neighbouring forest divisions /circles to mobilize resources during crisis. The Chief Conservator of Forests /Conservator of Forest of that respective circle shall be the Nodal Officer for the respective circle who shall correspond with higher officials, neighbouring region and other government departments for assistance and resource to deal with disaster like situation. They shall coordinate closely with the State Nodal Officer for collaborative action to control the crisis. In case of a major fire with a

propensity towards disaster the Rapid Response teams and the war room at the Circle/Tiger Reserve under the chairmanship of the Chief Conservator of Forests of the Circle/Conservator of Forests (comprising the District/Divisional Forest Officers, Assistant Conservator of Forests as members), which will monitor the actions, will take leadership role at circle level in ensuring better communication and quick action to control the crisis.

- The CFs will provide **guidance for implementing the District Action Plan for Forest Fire Prevention and Management (DAP-FFPM)** and make frequent field visits to ensure that fire control strategies are being implemented effectively during the fire season.
- The CF will conduct a **periodical review** of the fire situation in the circle, prepare and submit reports to the **PCCF** (Principal Chief Conservator of Forests), and ensure that **resources are redistributed** between divisions, if necessary.

Division Level

Divisional Forest Officer (DFO):

- The DFO will organize coordination and **inception meetings** with the District Collector, Revenue, Police, Fire Services, and other departments for the formulation or revision of the **District Action Plan for Forest Fire Prevention and Management (DAP-FFPM)**.
- Mobilize funds for forest fire management from the **District Administration** and other line departments, leveraging various schemes for convergence with other government activities.
- Prepare a **fire prevention and management plan** for the division, giving special attention to **fire-prone areas** to prevent repeat fire occurrences. Aim for **zero repeat fire points** in the upcoming fire season.
- Hold **monthly coordination meetings** with relevant stakeholders, including the Revenue Department, Police, PRI members, Village Forest Committees (VSS), Self Help Groups (SHGs), and other departments to discuss mitigation measures for forest fires
- Ensure **vacant positions** in fire-prone beats and sections are filled before the fire season begins.
- Ensure the **procurement of fire-fighting equipment**, such as VHF radios for non-network areas, fire hoses, and first-aid kits. At least one **mock drill** should be held in January and February.
- Provide **emergency funds** to Forest Guards or Foresters for transporting equipment to inaccessible areas in case of fire.
- **Notify and display prohibited activities** in forest areas during the fire season as per legal provisions for public awareness
- Ensure that District Forest Fire Control Units act as **24x7 fire prevention control room** at the division headquarters under the supervision of a Range Officer from 1st January to 30th June.

- Ensure **official mobile numbers** are registered on the **FSI website** to receive fire alerts, and display control room contact information at Beat, Section, and Range offices, as well as public places
- Designate one **Assistant Conservator of Forests (ACF)** to specifically handle forest fire issues during the fire season.
- Conduct **weekly monitoring and reviews** of fire control operations within the division, ensuring timely submission of fire reports to higher authorities

Assistant Conservator of Forests (ACF):

- Prepare and distribute Dos and Don'ts for forest fire management to all Range Officers, Foresters, Forest Guards, Village panchayats, VFCs, and other stakeholders.
- Regularly inspect the **Forest Fire Register** maintained at the divisional control room and supervise daily operations related to forest fire management.
- Oversee the functioning of the **division-level Forest fire control room** for fire management on a daily basis.
- Conduct **specific fire-fighting operations** as per instructions from the DFO and other senior officers.
- Utilize **social media platforms** to raise awareness about forest fire prevention and report the actions taken by the forest department during fire incidents.

Range Level

Forest Range Officer (FRO):

- **Preventive Measures**:
    - Maintain **fire lines**, repair **forest roads**, and ensure the upkeep of **boundary and compartment lines**.
    - Identify locations for **fire-fighting ramps** and construct **machans** for fire detection.
    - Select and assign members for the **firefighting squads** or volunteer groups.
- Implement the **DAP-FFPM** in the range and pay special attention to **repetitive fire points** or high-risk areas of FFSA.
- Organize **monthly meetings with VSS members**, PRI representatives, and other local stakeholders to ensure coordination during the fire season.
- Conduct **public awareness programs**, such as rallies and oath-taking events, and ensure the proper display of **signboards and banners** that communicate important information regarding forest fire prevention.
- Coordinate with **VSS, youth clubs, and PRI members** to organize fire prevention activities, including mock drills and training sessions with local fire squads.
- Deploy fire squads at **strategic locations** and assign specific duties to staff during the fire season.

- Investigate each **fire incident**, assess the damage, review the actions taken by the forest staff, and submit detailed reports.
- Recommend incentives and awards for **VFC members and fire squad personnel** who contribute significantly to fire control efforts.
- Assist with the **rescue and rehabilitation of wildlife** affected by forest fires.



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