

ANNUAL REPORT ON FOREST FIRES IN TAMIL NADU 2025

Tamil Nadu Forest Department
Tamil Nadu State Forest Fire Control Centre



TAMIL NADU FOREST DEPARTMENT

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2025



EXECUTIVE SUMMARY

The *Annual Report on Forest Fires in Tamil Nadu – 2025* presents a detailed assessment of forest fire trends, spatial patterns, response efficiency, technological interventions, and ecological impacts across the state. The year 2025 marks a significant improvement in forest fire management outcomes when compared to 2024, reflecting the combined influence of favourable meteorological conditions, strengthened preparedness, and enhanced operational response by the Tamil Nadu Forest Department.

During 2025, a total of 2,023 forest fire incidents were recorded across Tamil Nadu in the fire-sensitive period from January to June, representing a nearly 64% reduction from 5,595 fire incidents recorded during the same period in 2024. This decline indicates a notable moderation in both fire frequency and spread, largely attributed to improved rainfall distribution, reduced fuel dryness, and intensified pre-fire season preparedness.

The fire-sensitive season remained concentrated between February and May, with March emerging as the most vulnerable month, recording 1,180 fire incidents. Although March 2025 continued to show peak fire activity, it represented a 46% reduction compared to 2,174 incidents in March 2024. April showed the most dramatic improvement, with fire incidents reducing sharply from 2,788 in April 2024 to just 144 in April 2025, demonstrating the effectiveness of early warning systems, timely rainfall, and proactive field interventions. February 2025 recorded 583 incidents, while May and June recorded 35 and 54 incidents respectively, indicating residual vulnerability during transitional climatic periods.

Spatial analysis revealed that forest fire occurrences in 2025 continued to be concentrated in historically vulnerable landscapes. Divisions such as Hosur, Vellore, Tirupattur, Dindigul, Kodaikanal, and Wildlife landscapes including ATR Pollachi and Megamalai experienced relatively higher fire incidence. At the division level, Hosur Forest Division recorded the highest number of Large Forest Fires (LFFs) with 41 incidents, followed by Vellore (21) and Tirupattur (11). These areas are characterized by dry deciduous vegetation, steep terrain, invasive species, and significant anthropogenic pressures such as grazing, pilgrimage, tourism.

In 2025, Tamil Nadu recorded a total of 112 Large Forest Fire (LFF) incidents, comprising 1,277 active fire pixels, marking a 48.6% reduction compared to 218 LFFs recorded in 2024. This substantial decline reflects improvements in early detection, faster response, and effective field-level containment. The naming and tracking of LFF events at the range level enabled better incident documentation and operational accountability.

Fire response efficiency showed remarkable improvement in 2025. Approximately 95% of forest fires were doused within 24 hours, compared to 69% in 2024. Only 4.4% of fires required up to two days, 0.5% extended up to three days, and just 0.1% lasted beyond four days. Importantly, no large forest fire in 2025 exceeded prolonged multi-week duration, a stark contrast to 2024, where extended fires were observed under severe dry conditions. This improvement underscores the effectiveness of rapid response teams, better coordination between control centres, and real-time decision support systems.

Technological integration continued to play a central role in forest fire management. The Tamil Nadu Forest Fire Management Information System (TNFFMIS) functioned as the primary real-time monitoring and response platform, integrating fire alerts from FSI, MODIS, and SNPP-VIIRS satellite systems. These alerts enabled near real-time detection, spatial validation, and swift communication with district and field units. In parallel, thermal drones were extensively deployed in high-risk landscapes including Hosur, Salem, Coimbatore, supporting night-time surveillance, hotspot detection, and post-fire assessment.

Preventive infrastructure development remained a key focus area in 2025. A cumulative 8,499.69 km of fire lines were created and maintained across the state, comprising 6,686.49 km of 3-metre fire lines, 1,587.50 km of 6-metre fire lines, and 225.70 km of 12-metre fire lines. These physical fire barriers played a critical role in restricting fire spread, particularly in high-risk divisions and wildlife landscapes.

Community participation continued to strengthen Tamil Nadu's fire management framework. Over 5,600 individuals registered for the Forest Survey of India (FSI) SMS-based fire alert system, including forest staff, local communities, NGOs, and students. Village Forest Committees (VFCs) actively supported fire prevention, awareness generation, maintenance of fire lines, and initial fire suppression. Their involvement significantly contributed to early reporting and containment of fires before escalation into large events.

Spatial burnt area assessment using Sentinel-2A satellite imagery, validated through field-based ground truthing, estimated a total burnt area of approximately 201.80 sq.km for fire events assessed during 2025. The most affected forest divisions included Hosur, Vellore, Kodaikanal, ATR Pollachi, Wildlife Megamalai, and Kanyakumari. These fires primarily impacted dry deciduous forests and grassland ecosystems, resulting in localized vegetation loss, habitat disturbance, and increased vulnerability to soil erosion and invasive species.

The findings of the 2025 Annual Report highlight a clear transition from reactive fire control to proactive, technology-enabled fire management in Tamil Nadu. The combination of improved weather conditions, advanced geospatial tools, rapid response mechanisms, and strong community engagement has significantly reduced fire frequency, duration, and severity. However, the persistence of fires in specific vulnerable landscapes underscores the need for continued micro-level planning, fuel management, and ecological restoration.

With sustained investment in early warning systems, preventive infrastructure, institutional capacity, and community partnership, Tamil Nadu is steadily strengthening its resilience against forest fires.

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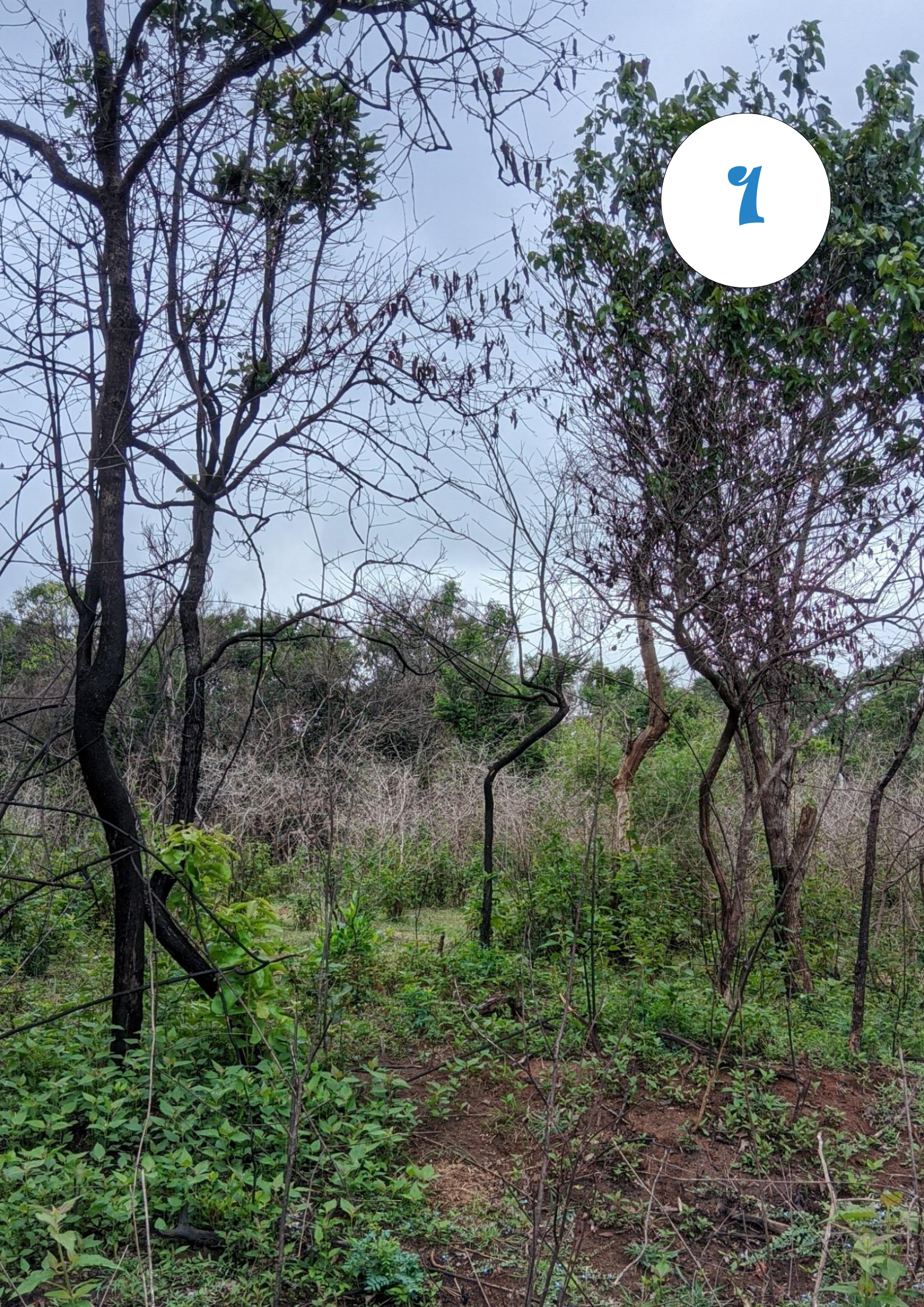
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CHAPTER 1: AN OVERVIEW OF FOREST FIRES

Introduction

Forest fires remain one of the most pressing environmental challenges threatening the long-term stability of Tamil Nadu's forest ecosystems. While fires have a limited ecological role in nutrient recycling and in aiding the regeneration of certain species, their destructive consequences far outweigh any benefits. Uncontrolled fires degrade forest resources, lead to the loss of biodiversity, diminish carbon sequestration capacity, cause soil erosion, and interrupt the ecological services that sustain local communities.

In Tamil Nadu, most fires are surface-level events, typically influenced by both climatic and anthropogenic factors. Extended dry periods, rising temperatures, and human-induced causes such as cattle grazing, the collection of Non-Timber Forest Products (NTFPs), negligence, and intentional burning contribute significantly to fire occurrences. The state's dry deciduous and scrub forests are particularly prone to such incidents, especially between January and June, which marks the peak fire season.

Acknowledging these challenges, the Tamil Nadu Forest Department has adopted a proactive, science-driven approach to forest fire management. This strategy integrates satellite-based detection systems, pre-fire vulnerability assessment, field-level preparedness, and community participation to ensure rapid response and minimize ecological damage. The annual analysis and reporting of forest fire occurrences serve as a scientific foundation for evaluating trends, assessing vulnerability, and reinforcing strategies aimed at protecting the state's valuable forest landscapes.

Global Perspective

The Global Forest Resources Assessment (GFRA, 2020) emphasizes that forests worldwide are facing increasingly adverse fire weather conditions, prolonged dry seasons, and frequent large-scale fires — trends strongly linked to climate change. These escalating events incur significant ecological and economic costs, including the loss of biodiversity, decline in ecosystem services, and heightened risks to human health and livelihoods.

Globally, around 98 million hectares of forests were affected by fires in 2015, representing nearly 3% of total forest area. The majority of these fires occurred in tropical regions, where about 4% of the tropical forest cover experienced burning. These events contribute heavily to greenhouse gas emissions, as stored carbon in trees is released during combustion, exacerbating global warming.

The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) estimates that exposure to smoke from wildfires results in 260,000 to 600,000 premature deaths annually. Additionally, forest fires emit between 2.5 and 4.0 billion tonnes of CO_2 each year, significantly adding to the atmospheric carbon burden.

Persistent hotter and drier conditions, combined with human-induced factors such as land conversion and unsustainable agricultural expansion, are accelerating the frequency of wildfires. According to the WWF International (2020), nearly 75% of all wildfires globally are

caused by human activities, and fire alerts in April 2020 alone increased by 13% compared to the previous year — which was already one of the most fire-intensive years recorded.

Between 2001 and 2022, the world lost about 126 million hectares of tree cover to fires and 333 million hectares to other causes. The peak year, 2016, saw 9.63 million hectares lost to fires — accounting for 32% of global tree cover loss for that year. The countries most severely affected were Russia (2.54 Mha/year), Canada (1.28 Mha/year), and the United States (0.56 Mha/year).

National Perspective: India

Across India, severe forest fires are most frequent in dry deciduous regions, while evergreen and montane forests tend to be less affected (FSI, 2015). As reported in the India State of Forest Report (ISFR 2021), over 36% of India's forest cover is considered vulnerable to recurring fires, with 2.81% classified as extremely fire-prone and 7.85% as highly fire-prone.

Research by Pandey et al. (2016) estimates that nearly 275 million rural residents in India depend on forests for their livelihood and daily needs. Local communities rely extensively on NTFP collection and forest-based resources, and unsustainable extraction practices, coupled with increasing human presence, elevate the risk of forest fires.

In central, northern, and eastern India, the collection of tendu leaves (Diospyros melanoxylon) and mahua flowers (Madhuca longifolia) are major contributors to recurring fires. Nationwide, around 4.35 million hectares of forest area are affected annually by fires linked to shifting cultivation practices (Chandra and Bhardwaj, 2015). In the North-Eastern region, shortened Jhum cultivation cycles result in repeated burning of forest patches, intensifying the frequency and severity of fires across ecologically sensitive zones. Human-induced Forest Fires in India typically cluster in four key regions:

a) Western Himalayas (Jammu & Kashmir, Uttarakhand, Himachal Pradesh) — fires associated with pine forests and pastoral movements.
b) Western India — driven by dry vegetation and extensive grasslands.
c) Central India and the Western/Eastern Ghats — linked to large-scale NTFP collection.
d) North-Eastern India — primarily due to shifting cultivation practices.

Recognizing the serious ecological and socio-economic consequences, the National Disaster Management Authority (NDMA) classified forest fires as a national disaster in 2019. The National Programme on Forest Fire Management (NPFFM), jointly developed by NDMA and the Ministry of Environment, Forest and Climate Change (MoEF&CC), offers a comprehensive framework for integrated forest fire management. The programme's goal is to enhance the resilience of India's forests, reduce vulnerability, and promote sustainable practices to mitigate fire risks (NDMA, 2023).

State Perspective: Tamil Nadu

Tamil Nadu, located in southern India, encompasses a wide variety of forest ecosystems — from tropical dry deciduous and thorn forests to evergreen forests in the Western Ghats.

These forests are vital for conserving biodiversity, moderating local climate, and supporting community livelihoods. However, forest fires remain a recurring environmental and management challenge in the state.

The dry deciduous and scrub forests are especially susceptible, with fires primarily triggered by extended dry conditions, rising temperatures, and human interference. Common causes include agricultural residue burning, cattle grazing, and NTFP collection. The accumulation of dry biomass further intensifies the risk of accidental ignition. The resulting fires lead to timber loss, wildlife habitat destruction, and long-term ecological degradation.

Beyond immediate damage, repeated fires in Tamil Nadu disrupt ecosystem balance, threaten endemic and endangered species, and cause soil erosion and moisture loss, ultimately affecting local microclimates. The Western Ghats, being a global biodiversity hotspot, are particularly at risk from these disturbances.

To address these challenges, the Tamil Nadu Forest Department has adopted a multi-pronged approach combining early warning systems, satellite-based monitoring, and local community engagement. Fire preparedness and quick response teams are supported through modern GIS-based tools for real-time tracking and assessment. The Department also continues to promote afforestation, reforestation, and restoration of degraded lands to reduce fire vulnerability.

The state's initiatives align with the National Programme on Forest Fire Management (NPFFM) and aim to strengthen the resilience and adaptability of forest ecosystems. By integrating advanced technologies with community-based traditional practices, Tamil Nadu is progressing toward a sustainable model of forest fire management that protects its ecological heritage while supporting the livelihoods of dependent communities.




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CHAPTER 2: FIRE PREPAREDNESS, INFRASTRUCTURE AND PRE-FIRE ACTIVITIES

Fire Response Mechanism

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 is located in Panagal Maaligai, 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.

- Pre fire (preparatory planning for fire control),
- During fire (Fire detection, spread and control planning) and
- 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/SNPP-VIIRS, 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.

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.

Duties of SFFCC

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

1. The centre will receive the real time fire information from FSI/NRSC/MODIS/NASA/SNPP-VIIRS
2. Integrate the data with 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

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 the 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 message 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

Forest Fire Response Tracking, Reporting and Data Analysis

The centre uses 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, one forester, one GIS expert, one technical assistant 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.,

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 FFCC. It will in turn ensure intensification of patrolling and monitoring for fire sensitive beats indicated by the pre-alert for the week.

Monitoring and Control Centre

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.

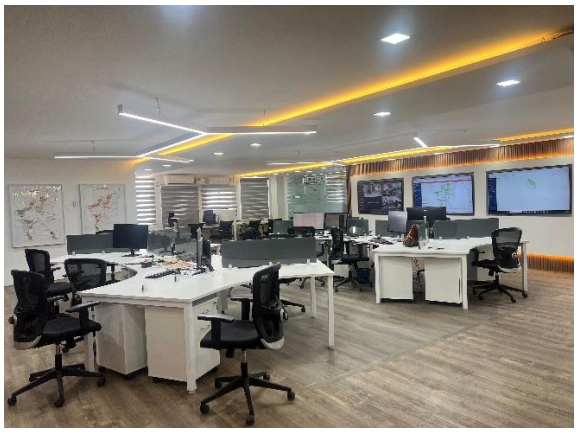




Figure 1: Tamil Nadu State Forest Fire Control Centre

District Forest Fire Control Centres

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. 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.

Duties of DFFCC

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

1. To act as a nodal centre of the division/ district in handling forest fires.
2. To respond to the fire alerts 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 Tamil Nadu Forest Fire Management Information System (TNFFMIS)
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

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.

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 updating in the Tamil Nadu Forest Fire Management Information System dashboard.

Support to Local Forest staff

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

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.

Coordination with SFFCC

The DFFCC being the district nodal centre for forest fire shall be in constant touch with the TN Forest Fire state 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,

IT infrastructure

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

- One dedicated Workstation with the advanced configuration to operate the dashboards and GIS software.
- Software – Access to TNFFMIS Dashboard, ArcGIS (desktop version), Google Earth Engine Pro, Anti-virus and Internet security software, Software for documentation and reporting.

Duties of Nodal officer for DFFCC

- 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 Incident Response Teams, District administration and other government agencies to mobilize resources and manpower in the event of outbreak of forest fire.
- 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.
- 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.
- 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.
- 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.
- The centre will be functioning 24X7 during the forest fire season.
- The technical assistant will also be attending to the calls received in the toll-free number.
- Telephone connection for the local district toll free number and the seamless hi-speed internet connection should also be available.



Figure 2: 34 District Forest Fire Control Centre

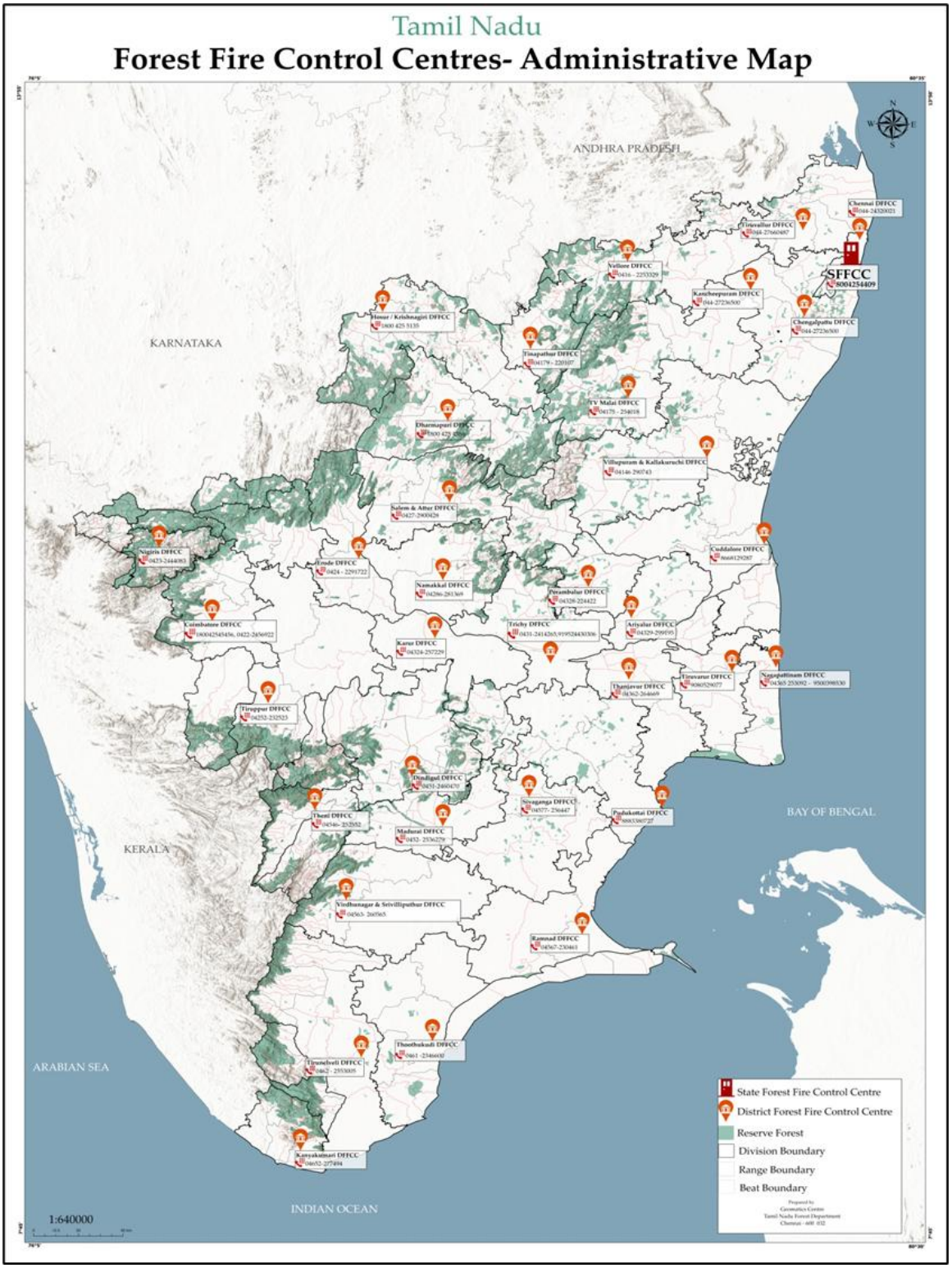


Figure 3: Administrative Map of Forest Fire Control Centre in Tamil Nadu

Inventory of Fire Equipment

Forest fires are unpredictable and dangerous natural events that can quickly spread across vast areas of land. To prevent the loss of life, property, and ecosystems, it is essential to use the right equipment for wildfire suppression. Firefighters rely on specialized tools and machinery to control and extinguish fires in forested areas, often under challenging conditions. This equipment is designed to combat the intense heat, difficult terrain, and large scale of forest fires.

The Advanced Forest Fire control equipment and rescue gears were purchased and supplied to 13 circle and identified 30 divisions in Tamil Nadu Forest Department at cost of Rs.170 lakhs during 2023-2024 under

Modernization of Forest Scheme. Further, a sum of Rs.60 lakhs have been provided to the divisions for the period of 2024-25 under CSS - Forest Fire Prevention and Management Scheme for the purchase of Forest Fire Control equipment and rescue gears.



Figure 4: Forest Firefighting equipment

Fire Lines

Fire lines are physical barriers created by clearing vegetation and other combustible materials from a strip of land. They may be dug out as trenches, ploughed by bulldozers, or cleared manually by firefighters. The idea behind a fire line is to remove or reduce the fuel in an area where a fire is expected to burn. Without fuel, the fire cannot continue to spread. Fire lines are generally established before a fire breaks out, but they can also be created during the course of a wildfire. In some cases, fire lines are used in combination with other tactics such as controlled burns (backburns) to ensure that the fire doesn't leap over the line. Through various schemes, the fire lines are created and maintained in Tamil Nadu forests (Details provided in the tables below). The below images depict the creation and maintenance of fire lines, controlled burning as a preparedness activity in Attur Division.

Type	Length (in Km)
3m Fire Line	6686.490
6m Fire Line	1587.495
12m Fire Line	225.700
Total length of Fire Line	**8499.685**

Table 1: Total length of fire line created and maintained in 2024-2025





S.NO	Circle	Division	Length of fire line created by Divisions during 2024 - 2025			Length of fire line maintained by Divisions during 2024 - 2025		
			3m fire-line (in Km)	6m fire-line (in Km)	12m fire-line (in Km)	3m fire-line (in Km)	6m fire-line (in Km)	12m fire-line (in Km)
1	Chennai	Chennai	0	8.6	0	0.9	0	0
2		Kanchipuram	4.4	0	0	0	0	0
3		Tiruvallur	0	0	0	124.3	36	10
4		SF Chengalpattu	0	0	0	0	0	0
		Total	**4.4**	**8.6**	**0**	**125.2**	**36**	**10**
5	Villupuram	Villupuram	0	0	0	105	0	0
6		Cuddalore	0	0	0	165	0	0
7		SF Kallakuruchi	0	0	0	0	0	0
		Total	**0**	**0**	**0**	**270**	**0**	**0**
8	Vellore	Vellore	11	3.84	0	0	6	0
9		Ranipet	0	0	0	0	10	0
10		Tirupathur	57.4	16.1	0	307.88	36.32	22.2
11		Tiruvannamalai	11	6.4	0	520	110	0
		Total	**79.4**	**26.34**	**0**	**827.88**	**162.32**	**22.2**
12	Dharmapuri	Dharmapuri	0	0	0	490.199	22.561	0
13		Hosur	15.36	15.37	0	412.23	120.5	0
14		SF Dharmapuri	0	0	0	0	0	0
15		SF Krishnagiri	0	0	0	0	0	0
		Total	**15.36**	**15.37**	**0**	**902.429**	**143.061**	**0**
16	Salem	Salem	0	0	0	221.1	13.8	0
17		Attur	0	0	0	177.1	10	0
18		Namakkal	10.75	13.44	0	202.2	20.85	0
19		SF Salem	0	0	0	0	0	0
		Total	**10.75**	**13.44**	**0**	**600.4**	**44.65**	**0**
20	Dindigul	Dindigul	0	0	0	286	0	0
21		Kodaikanal	0	0	0	123.146	12	0
22		Karur	0	0	0	72	0	0
		Total	**0**	**0**	**0**	**481.146**	**12**	**0**
23	Trichy	Trichy	0	0	0	170	5	0
24		Perambalur	0	0	0	75	0	0
25		Ariyalur	4.075	0	0	16	0	0
26		Pudukottai	0	0	0	8	0	0
27		Nagai	0	0	0	58.1	0	0
28		Tanjavur	0	0	0	8	0	0
29		Tiruvarur	0	0	0	0	0	0
		Total	**4.075**	**0**	**0**	**335.1**	**5**	**0**
30	SMTR	Madurai	0	0	0	55	0	0
31		Theni	0	0	0	188	35	0
32		Megamalai WL	0	0	0	110.1	30.74	0
33		Srivilliputhur WL	0	0	0	176.8	0	0
34		Ramnad WL	0	0	0	0	0	0

35		Ramanathapuram	0	0	0	0	0	0
36		Sivagangai	0	0	0	0	0	0
37		SF Virudhunagar	0	0	0	0	0	0
		Total	**0**	**0**	**0**	**529.9**	**65.74**	**0**
38	STR	Erode	2.6	4.5	0	215	20	0
39		Sathy TR	0	0	0	278.53	49.5	10
40		Hasanur TR	0	0	0	187.8	23.38	30
		Total	**2.6**	**4.5**	**0**	**681.33**	**92.88**	**40**
41	MTR	DD Udhagai	0	0	0	0	210	0
42		DD Masinagudi	0	0	0	0	265.7	0
43		Nilgiris	0	0	0	0	13	0
44		Gudalur	0	0	0	510	70	25.5
		Total	**0**	**0**	**0**	**510**	**558.7**	**25.5**
45	ATR	Coimbatore	0	0	0	420.2	0	7
46		ATR, Pollachi	0	0	0	203.52	105.044	71
47		ATR, Tiruppur	0	0	0	304.4	268.85	50
		Total	**0**	**0**	**0**	**928.12**	**373.894**	**128**
48	KMTR	Kalakkadu	0	0	0	56.5	4.4	0
49		Ambasamuthram	0	0	0	112	8	0
50		Kanyakumari	5	5	0	19.4	0	0
51		Tirunelveli	0	0	0	0	0	0
52		Thoothukudi	0	0	0	66	0	0
53		Tenkasi	13	7.6	0	11	0	0
54		SF Tirunelveli	0	0	0	0	0	0
		Total	**18**	**12.6**	**0**	**264.9**	**12.4**	**0**
Grand Total			**134.585**	**80.85**	**0**	**6551.905**	**1506.645**	**225.7**

Table 2: Details of Fire line created and maintained in Divisions



Figure 5: Fire Line Creation and Maintenance

FSI Portal – Status of Registration

The Forest Survey of India (FSI) has a system for individuals to receive SMS alerts directly on their mobile phones. To avail of this service, individuals must register with the FSI system. Registration ensures that users receive real-time updates tailored to their specific areas of concern. This initiative is particularly beneficial for people residing in vulnerable regions, as it empowers them with quick access to location, enabling better preparedness and response during emergencies.

From Tamil Nadu alone, around **5,600 persons** have registered for this service. This demonstrates the growing awareness and adoption of the SMS alert system among the public. As more people register, the effectiveness of the alert system in mitigating risks and ensuring safety will significantly improve.

1. Faster response to the fire detections due to the increased number of subscribers and subsequent management response might have resulted in decreased fire detections.

2. Active participation of the local communities apart from the SFDs might have controlled and doused the fires at the nascent stage even before their detection by the passing satellite. (Source: ISFR 2023)

STATE	DISTRICT	CIRCLE	DIVISION	RANGE	BLOCK	BEAT	TOTAL
628	439	705	1404	1629	142	653	5600

Table 3: Category-wise FSI Subscription

CIRCLE	NO OF REGISTERED USERS (CIRCLE)	DIVISION	NO OF REGISTERED USERS (DIVISION)
AAZP, VANDALUR	1	_	_
ATR	323	COIMBATORE	80
		WL ATR POLLACHI	66
		WL ATR TIRUPPUR	102
		DIVISION NOT MENTIONED	75
CHENNAI	107	CHENGALPATTU	28
		TIRUVALLUR	72
		DIVISION NOT MENTIONED	7
DHARMAPURI	585	DHARMAPURI	339
		HOSUR	181
		DIVISION NOT MENTIONED	65
DINDIGUL	415	DINDIGUL	155
		KARUR	12
		KODAIKANAL	208
		DIVISION NOT MENTIONED	40
KMTR	265	KANYAKUMARI	65
		THOOTHUKUDI	31
		TIRUNELVELI	86

		WL, KMTR	36
		DIVISION NOT MENTIONED	47
MTR	325	GUDALUR	92
		NILGIRIS	144
		WL, MTR	30
		DIVISION NOT MENTIONED	59
SALEM	535	ATTUR	136
		NAMAKKAL	116
		SALEM	162
		DIVISION NOT MENTIONED	121
SMTR	885	MADURAI	86
		RAMANATHAPURAM	30
		SIVAGANGAI	61
		THENI	260
		WL, MARINE NP	35
		WL, MEGAMALAI	244
		WL, SRIVILLIPUTHUR	102
		DIVISION NOT MENTIONED	67
STR, ERODE	261	ERODE	78
		WL, STR HASSANUR	26
		WL, STR SATHY	97
		DIVISION NOT MENTIONED	60
TRICHY	177	ARIYALUR	16
		PERAMBALUR	34
		PUDUKKOTTAI	23
		THANJAVUR	2
		TIRUCHIRAPPALLI	83
		WL, NAGAPATTINAM	7
		DIVISION NOT MENTIONED	12
VELLORE	514	TIRUPPATTUR	111
		TIRUVANNAMALAI	198
		VELLORE	86
		DIVISION NOT MENTIONED	119
VILUPPURAM	144	CUDDALORE	10
		VILUPPURAM	100
		DIVISION NOT MENTIONED	34
Grand Total	**4537**		
1063 - OTHERS (STUDENTS, NGOs, LOCAL COMMUNITY)			

Table 4: Division-wise FSI Registered Users

Capacity Building and Community participation

Effective forest fire management is a multi-faceted effort requiring advanced technology, robust institutional frameworks, and the active participation of individuals, organizations, and communities. Recognizing this, Tamil Nadu has prioritized capacity building and community engagement as key components of its sustainable forest fire management strategy. These efforts aim to equip stakeholders with the skills, knowledge, and resources necessary to prevent, detect, and respond to forest fires effectively.

Capacity Building Initiatives

Training Programs for Field Staff

Tamil Nadu places significant emphasis on training forest officials, fire watchers, and frontline staff to enhance their capabilities in managing forest fires. These programs focus on modern fire prevention, detection, and suppression techniques while introducing participants to advanced tools such as GPS devices, mobile applications like the Tamil Nadu Forest Fire Management Information System (TNFFMIS), and fire mapping technologies. The training ensures that staff are prepared to effectively handle fire incidents with both traditional and cutting-edge methods.

Mock Drills and Emergency Preparedness

Simulated fire scenarios are regularly organized to prepare field staff for real-life emergencies. These drills focus on improving team coordination, streamlining communication, and ensuring swift responses during actual forest fire incidents. Mock drills also help identify gaps in current strategies and equip staff with the confidence and practical experience needed to manage high-stress situations effectively.

Knowledge Dissemination

Workshops and seminars serve as platforms to share the latest advancements in forest fire management. These events cover topics such as scientific fire prediction methods, strategic firebreak planning, and controlled burning techniques. Collaborations with national and international organizations, including the Forest Survey of India (FSI) and the National Disaster Management Authority (NDMA), further enrich these programs by introducing global best practices and innovative approaches to fire management.

Resource Allocation

Adequate resources are vital for efficient firefighting. Tamil Nadu ensures that field staff are equipped with essential tools such as fire beaters, blowers, water tanks, and fire-resistant gear. Additionally, well-equipped fire control rooms have been established at strategic locations, enabling prompt coordination and rapid responses to fire incidents.



Figure 6: Capacity Building Initiatives

Community Participation

Involving Local Communities

Local communities living near forested areas play a pivotal role in early fire detection and initial response. Tamil Nadu actively involves these communities by training them to identify fire hazards, report incidents promptly, and participate safely in firefighting operations. This approach not only improves response times but also fosters a sense of shared responsibility for forest protection.

Village Forest Committees (VFCs)

Village Forest Committees are grassroots organizations that engage communities in fire management and forest conservation activities. These committees organize awareness campaigns on fire risks and prevention methods, such as controlled grazing and safe disposal of agricultural residues. By empowering communities to take proactive measures, VFCs enhance the overall resilience of forest ecosystems against fires.

Awareness Campaigns

Public awareness drives are conducted to educate communities about the causes and consequences of forest fires. These campaigns emphasize the critical role individuals play in fire prevention, from avoiding open flames near forests to responsibly discarding cigarette butts. By promoting safer practices and increasing awareness, these initiatives aim to reduce the incidence of accidental fires.

Joint Forest Management (JFM)

Under the Joint Forest Management framework, local communities collaborate with the forest department to create and implement fire management plans. This partnership emphasizes shared responsibilities and benefits, fostering trust and cooperation between communities and government authorities. JFM not only enhances fire management efforts but also strengthens the relationship between local stakeholders and the forest ecosystem.







Figure 7: Community Participation




3

CHAPTER 3: FOREST FIRE SCENARIO OF TAMIL NADU IN 2025

Trend Analysis of Forest Fire

The assessment of forest fire incidents for the year 2025 indicates a notable decline compared to 2024. Unlike the previous year, which recorded heightened fire activity due to prolonged dry conditions, the frequency and intensity of forest fires in 2025 have reduced across Tamil Nadu. This positive shift can be attributed to a combination of favourable weather conditions, ecological responses, and proactive management interventions undertaken by the Tamil Nadu State Forest Fire Control Centre (TNSFFCC).

Meteorological observations reveal that 2025 experienced more balanced rainfall distribution during the critical dry months, along with relatively moderate temperatures. These conditions improved soil moisture and reduced fuel dryness, thereby lowering the risk of fire ignition and spread. Additionally, lower wind speeds during the peak fire season contributed to restricting the rapid propagation of fires.

From a biological perspective, many forest areas that had been affected in 2024 exhibited natural regeneration and improved ground cover, which reduced the availability of highly combustible dry biomass. This ecological recovery further contributed to fire resilience.

Equally significant were the enhanced preventive and control measures implemented by TNSFFCC. The strengthening of early warning systems, improved dissemination of fire alerts, creation and maintenance of fire lines, deployment of fire watchers, and active community participation collectively played a vital role in minimizing fire outbreaks. Rapid response teams ensured that even when incidents occurred, fires were contained swiftly, preventing large-scale damage.

The decline in forest fire incidents in 2025 thus reflects a combination of favourable environmental factors and effective management practices, underscoring the importance of sustained monitoring, preparedness, and adaptive strategies to safeguard Tamil Nadu's forests in the years ahead.

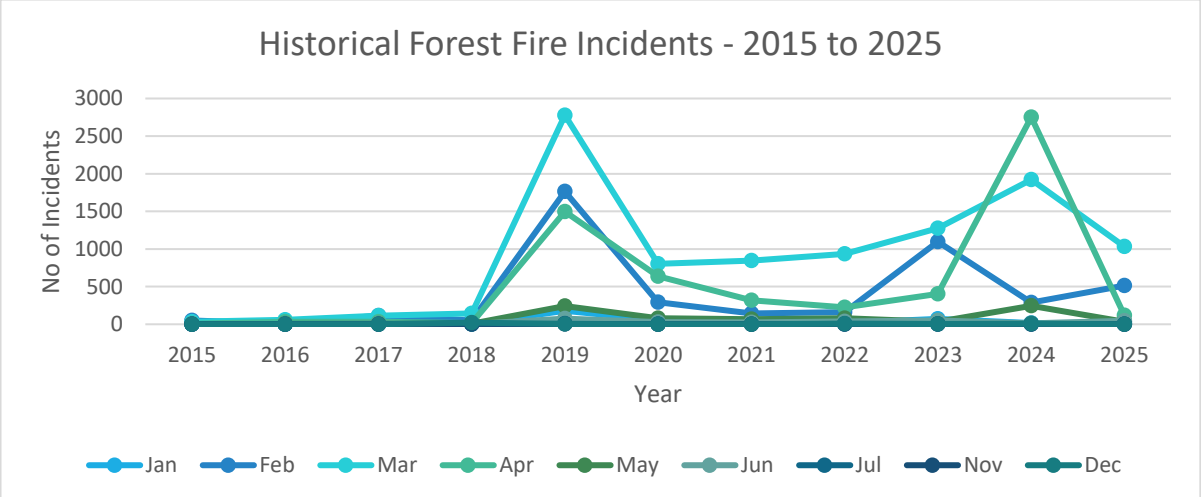


Figure 8: Historical Forest Fire Incidents from 2015-2025

Trend Comparison between 2024 and 2025: Fire-Sensitive Period

The month-wise distribution of forest fire incidents from January to June highlights a sharp contrast between the years 2024 and 2025. Overall, the analysis shows a significant decline in fire incidents in 2025, particularly during the peak fire months of March and April, which traditionally record the highest risk. This downward trend reflects the combined impact of favourable weather patterns, improved preparedness, and effective fire management interventions by the Tamil Nadu Forest Department and TNSFFCC.

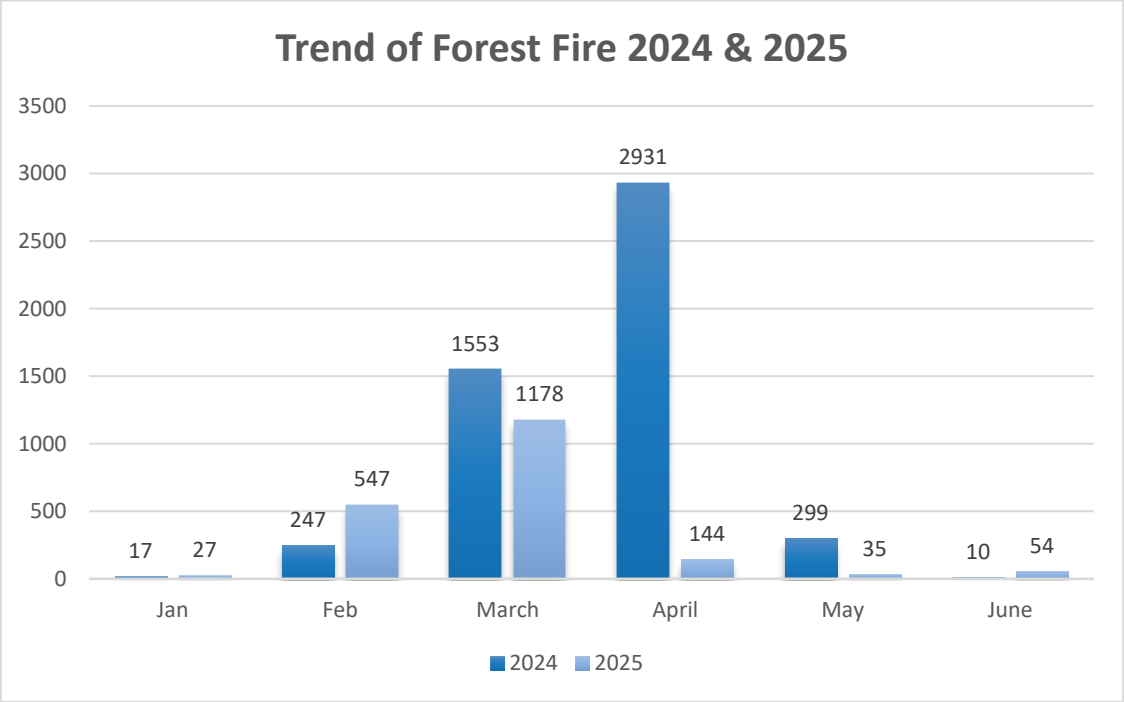


Figure 9:Trend of forest fire between 2024 and 2025

Month-wise Comparison

- **January**: Fire incidents increased slightly in 2025 (27) compared to 2024 (17). This early rise suggests enhanced detection and reporting mechanisms, along with intensified vigilance in the pre-fire season.
- **February**: A sharp rise is noted in 2025 (583) compared to 2024 (307). The increase can be linked to localized dry spells and accumulation of surface fuel. However, rapid containment ensured these incidents did not escalate into large fires.
- **March**: A critical turning point is observed, with **2024 recording 2,174 incidents** compared to **1,180 in 2025**. This nearly **46% reduction** underscores the impact of improved rainfall distribution and proactive fire prevention strategies, including creation of fire lines and deployment of rapid response teams.
- **April**: The most striking decline is seen in April, with **2,788 incidents in 2024** reduced drastically to **144 in 2025**. This reduction reflects both favourable climatic conditions

(timely summer showers) and strong institutional response, marking April 2025 as one of the lowest fire-prone Aprils in recent years.

- **May**: Fire incidents in May 2025 (35) were substantially lower than 2024 (299). The early arrival of pre-monsoon rains helped reduce ignition potential, while preventive measures further contained risks.
- **June**: Unlike 2024, which saw only 10 incidents, **2025 recorded 54 incidents**, likely due to localized dry spells before the monsoon fully set in. These were quickly addressed and had minimal impact on overall fire spread.

Key Takeaways

1. **Overall Reduction:** From 5,595 fire spots in Jan–Jun 2024 to 2,023 fire spots in Jan–Jun 2025, the total fire occurrences decreased by nearly 64%.
2. **Peak Season Improvement:** March and April, which usually witness the highest fire loads, saw a dramatic decline in 2025, proving the effectiveness of both climatic relief and TNSFFCC-led interventions.
3. **Localized Risks Remain:** February and June recorded relatively higher incidents in 2025 compared to 2024, indicating the need for continuous vigilance during transitional months.

Fire-Sensitive Period: March 2025

March 2025 emerged as the most fire-sensitive month of the season in Tamil Nadu, recording 1,180 fire incidents. While this figure reflects a notable reduction of nearly 46% compared to March 2024 (2,174 incidents), the month continued to represent the peak of fire activity within the January–June period.

Several factors contributed to March being the critical fire-prone month:

- **Climatic Conditions**: The transition from winter to summer brought elevated daytime temperatures (averaging above 34°C) combined with below-average rainfall, creating drier fuel loads in deciduous and scrub forests. Although less intense than in 2024, these conditions still favoured ignition.
- **Fuel Accumulation**: By March, substantial leaf litter and dry grasses had built up, particularly in dry deciduous belts of Dharmapuri, Krishnagiri, making these landscapes more susceptible to accidental or deliberate fires.
- **Wind Influence**: Moderate-to-high winds during the month facilitated quicker fire spread, especially in open forest tracts, where surface fires often expanded rapidly before suppression measures could be deployed.
- **Anthropogenic Pressure**: Human-induced causes remained significant. Activities such as collection of non-timber forest products (NTFPs), grazing, and negligence by fringe communities coincided with this period, adding to ignition risks.

- **Management Interventions**: Despite these challenges, the sharp decline compared to 2024 highlights the success of Tamil Nadu State Forest Force Control Centre initiatives along with supportive weather conditions. Early warning dissemination, pre-positioning of fire watchers, creation of fire lines, and rapid deployment of ground teams ensured that incidents were contained effectively, preventing escalation into large-scale fires.

Large Forest Fires of 2025 in Tamil Nadu

The concept of a **Large Forest Fire (LFF)** is defined based on the number of active fire pixels detected within a specific area and time frame. Criteria for declaring a Large Forest Fire is when **more than three active fire pixels** are detected in the same location or closely clustered areas. These active fire pixels indicate significant burning, which surpasses the threshold of smaller or isolated fires.

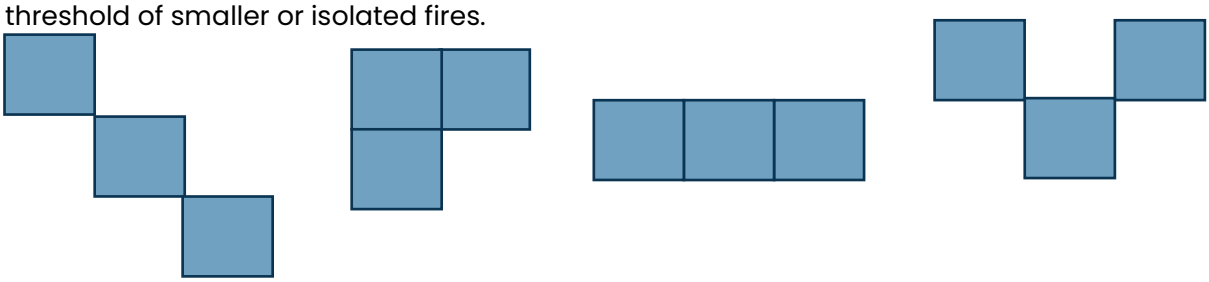


Figure 10: Candidate Large Forest Fire Detection in 3 Contiguous Pixels

Large forest fires (LFFs) represent one of the most severe threats to forest ecosystems, causing extensive damage to biodiversity, habitat integrity, and resources that support local livelihoods. Tamil Nadu witnessed a significant increase in large forest fires during 2024, with a total of 218 incidents, marking a 171% rise compared to 2022. These fires, which lasted multiple days in several instances, were concentrated in specific divisions and required coordinated response strategies to mitigate their impact.

In 2025, Tamil Nadu recorded a total of **112 large forest fires (LFFs)**, comprising **1277 active fire pixels**. These incidents highlight the growing challenges of forest fire management in the region. The several LFFs were reported in the **Hosur forest division**, where fires spread across the ranges. Several factors contributed to the prolonged duration of these fires:

- **Inaccessible Terrain**: Many of the affected areas were remote and challenging for ground teams to access, delaying containment efforts.
- **Difficult Fire Suppression**: Steep slopes, dense vegetation, and smoke in certain locations made dousing the fire particularly arduous.
- **Climatic Conditions**: Dry weather, high temperatures, and wind patterns likely exacerbated the spread and intensity of the fires.

A unique system for naming the large forest fire events has been developed. In every fire season, individual LFF event is recorded by the name of the Range of the State Forest Department where it was first detected. If the State has not provided the administrative boundary, the LFF event is recorded after the name of the district. In cases, where multiple LFF events are detected in the same Range, the numerical numbering is suffixed after the

name of the Range. For example, if 4th LFF event is detected in Range Anchetty, then this LFF event will be recorded as Anchetty - 4 in the large forest fire database.

Overview of Large Forest Fires in 2025

The analysis of large forest fire incidents in 2025 highlights the decreasing frequency and severity of such events. The primary contributors to the fall in large forest fires include seasonal rainfall and with the support of State Forest Fire Control Centre.

Key highlights:

- **Incidence Decrease**: Tamil Nadu reported 112 large forest fires in 2025, compared to 218 in 2024
- **Top Divisions Affected**: Hosur Division recorded the highest number of large forest fire incidents (41), followed by Vellore (21) and Tirupattur (11). These divisions are characterized by dry deciduous forests, dense forests which combined with human-induced factors, increase fire vulnerability

Analysis of Active Days and Fire Response

Large forest fires in Tamil Nadu during 2025 shows a significant decline compared to the previous year due to timely fire response and alerting by the TNSFFCC. Quick response and efficient suppression efforts helped mitigate their impact.

Response Time	Doused Percentage	
	2024	2025
Less than 24 hours	69	95
Less than 2 days	19	4.4
Less than 3 days	9	0.5
Less than 4 days/ more	3	0.1

Table 5: Response time took to douse fires in 2025

Response Time

The response time to douse forest fires is critical in mitigating their impact on ecosystems, property, and human life. The ability to contain a wildfire swiftly depends on various factors, such as the size and intensity of the fire, weather conditions, availability of resources, and the effectiveness of response strategies. The statistics for 2025 reveal significant data on response times for forest fires;

Month	No of Alerts	Total No of Incidents	No of Daily Fire	No of LFF	Response Time		No of Active Fire days in a month
January	27 (Alerts detected	9	9	0	Less than 24 hours	9	20 days
					Less than 2 days	0	

	Outside RF - 13)				Less than 3 days	0	
					Less than 4 days/ more	0	
February	547 (Alerts detected Outside RF - 48)	130	95	35	Less than 24 hours	117	25 days
					Less than 2 days	12	
					Less than 3 days	1	
					Less than 4 days/ more	0	
March	1178 (Alerts detected Outside RF - 5)	423	351	72	Less than 24 hours	405	31 days
					Less than 2 days	15	
					Less than 3 days	2	
					Less than 4 days/ more	1	
April	143(Alerts detected Outside RF - 10)	73	70	3	Less than 24 hours	73	25 days
					Less than 2 days	0	
					Less than 3 days	0	
					Less than 4 days/ more	0	
May	35(Alerts detected Outside RF - 3)	19	18	1	Less than 24 hours	19	11 days
					Less than 2 days	0	
					Less than 3 days	0	
					Less than 4 days/ more	0	
June	54(Alerts detected Outside RF - 6)	32	31	1	Less than 24 hours	32	18 days
					Less than 2 days	0	
					Less than 3 days	0	
					Less than 4 days/ more	0	

Table 6: Month-wise response time

Fires Doused in Less Than 24 hours

The **95%** response **within 24 hours** is a promising figure, indicating that the majority of fires are being detected early and tackled quickly. Rapid response in the first few hours is critical to prevent the fire from spreading. Several factors contribute to this quick turnaround,

a. **Early detection** through satellite technology, drones, and ground surveillance.
b. **Adequate resource allocation** and ground crews are often deployed as soon as the fire is reported.
c. **Strategic planning** for fire containment, where fire breaks and controlled burns are utilized to limit the fire's spread.

Fires Doused in Less Than 2 Days

In the current fire season, the overall response has been remarkably faster. Nearly **95% of the reported fire incidents were doused within 24 hours**, indicating quick detection and effective suppression efforts. The number of fires that extended up to two days has also reduced significantly — only **4.4%** of the total incidents fell under this category. In comparison, during the **2024 fire season**, about **19%** of the fire incidents took up to two days to be completely extinguished, reflecting slower containment at that time. This improvement highlights the enhanced coordination, timely alerts, and rapid field response achieved during the current year. Factors influencing are,

a. **Unpredictable weather** such as high winds and dry conditions can exacerbate fire spread, making it harder to control.
b. **Challenging terrain**, including dense forests or mountainous areas, can slow down the movement of ground crews and machinery.
c. **Fire behaviour** can be volatile, and certain fires may resist containment due to complex fuel sources, such as large swaths of dry timber or vegetation.

Fires Doused in Less Than 3 Days, 4 Days/More

The number of prolonged fire incidents has also been considerably reduced this year. Only **0.5%** of the fires took up to three days to be extinguished, and a mere **0.1%** lasted for four days or more. **Compared to the previous year**, when a higher proportion of incidents extended beyond two days, this marks a **notable improvement in response efficiency and containment capability**. Factors that contribute to fires taking up to 5 days to suppress include,

a. **High-intensity fires** that burn uncontrollably due to the sheer scale or combustible materials available.
b. **Resource limitations**, where more firefighting equipment, manpower, or funding might be needed.
c. **Delayed weather improvements**—in some cases, firefighting efforts depend on favourable weather, and without rain or a change in wind direction, efforts may not be as effective.





Figure 11: Large Forest Fire Incidents of 2025


4

CHAPTER 4: SPATIAL BURNT AREA ASSESSMENT USING SATELLITE IMAGERY

Overview

GIS (Geographic Information Systems) and Remote Sensing are powerful technologies used for forest fire management by enabling the detection, monitoring, prevention, and assessment of forest fires. These tools provide comprehensive spatial and temporal information, which is crucial for making informed decisions to reduce the devastating impacts of forest fires on ecosystems, human life, and property.

Roles of GIS and Remote Sensing

GIS integrates various datasets (like topography, vegetation, land use, climatic data) to create risk maps, analysis vulnerabilities, and support planning for preparedness and mitigation activities. Remote Sensing involves gathering data from satellite or airborne sensors to detect active fires, monitor changes over large spatial scales, and map burnt areas. These data help track fire progression, estimate fire severity, and assess ecological impacts post-fire.

Applications in Forest Fire Management

- Early detection and monitoring: Satellite imagery (e.g., Landsat -8, 9, Sentinel-2, LISS-III, IV) and AWiFS, MODIS, SNPP, provides near real-time detection of active fires and enables continuous monitoring even in remote or inaccessible areas.
- Fire risk zonation and mapping: By analysing factors such as vegetation, topography, proximity to human settlements, and historical fire incidents, GIS and Remote Sensing help identify high-risk zones for targeted prevention and resource allocation.
- Assessment and recovery: Post-fire satellite data allows for mapping burnt areas, measuring fire severity, and supporting rehabilitation strategies.

These systems are designed to detect active fires and monitor their progression. Satellite-based sensors such as MODIS (Moderate Resolution Imaging Spectroradiometer) and VIIRS (Visible Infrared Imaging Radiometer Suite) identify hotspots, including those in remote areas, by utilizing thermal spectral bands. The data derived from these sensors are processed to provide near real-time alerts to the relevant authorities, including the Forest Survey of India (FSI), for effective reporting and response to active fire incidents.

Materials/ Dataset used

Sentinel – 2A is an advanced Earth observation satellite that forms a key part of the European Copernicus Programme. it carries the Multi Spectral Instrument (MSI), which features 13 spectral bands covering the visible, near-infrared, and shortwave infrared portions of the electromagnetic spectrum. The spatial resolution of these bands varies, with four bands at 10 meters, six bands at 20 meters, and three bands at 60 meters. The satellite has a wide swath width of 290 Km, enabling rapid coverage of large areas. When paired

with Sentinel-2B, Sentinel-2A provides a revisit time of 5 days at the equator and 2 to 3 days at mid-latitudes. Each image scene covers an area of approximately 110 by 110 Km per tile, facilitating detailed and frequent Earth surface observations. (Open-source satellite data) provides 10-meter spatial resolution and 10% cloud cover dedicated to environmental monitoring and disaster management.

Band	Resolution	Wavelength (µm)	Description
B1	30 m	0.433 to 0.453	Coastal / Aerosol
B2	30 m	0.450 to 0.515	Visible blue
B3	30 m	0.525 to 0.600	Visible green
B4	30 m	0.630 to 0.680	Visible red
B5	30 m	0.845 to 0.885	Near-infrared
B6	30 m	1.56 to 1.66	Short wavelength infrared
B7	30 m	2.10 to 2.30	Short wavelength infrared
B8	15 m	0.50 to 0.68	Panchromatic
B9	30 m	1.36 to 1.39	Cirrus
B10	100 m	10.3 to 11.3	Long wavelength infrared
B11	100 m	11.5 to 12.5	Long wavelength infrared

Table 7: Bands of Landsat

Sentinel-2 Bands	Central Wavelength (µm)	Resolution (m)
Band 1 - Coastal aerosol	0.443	60
Band 2 - Blue	0.49	10
Band 3 - Green	0.56	10
Band 4 - Red	0.665	10
Band 5 - Vegetation Red Edge	0.705	20
Band 6 - Vegetation Red Edge	0.74	20
Band 7 - Vegetation Red Edge	0.783	20
Band 8 - NIR	0.842	10
Band 8A - Vegetation Red Edge	0.865	20
Band 9 - Water vapour	0.945	60
Band 10 - SWIR - Cirrus	1.375	60
Band 11 - SWIR	1.61	20
Band 12 - SWIR	2.19	20

Table 8: Bands of Sentinel

Software Used	Hardware Used
ArcGIS Enterprise platform and ArcGIS Pro, Google Earth engine, Basecamp, Global mapper, Microsoft	Workstation: Hp Intel core i7, Samsung Tablet (Location Tracker for Field Survey), Garmin GPS 72 Ha

Table 9: Software and Hardware used

Methodology

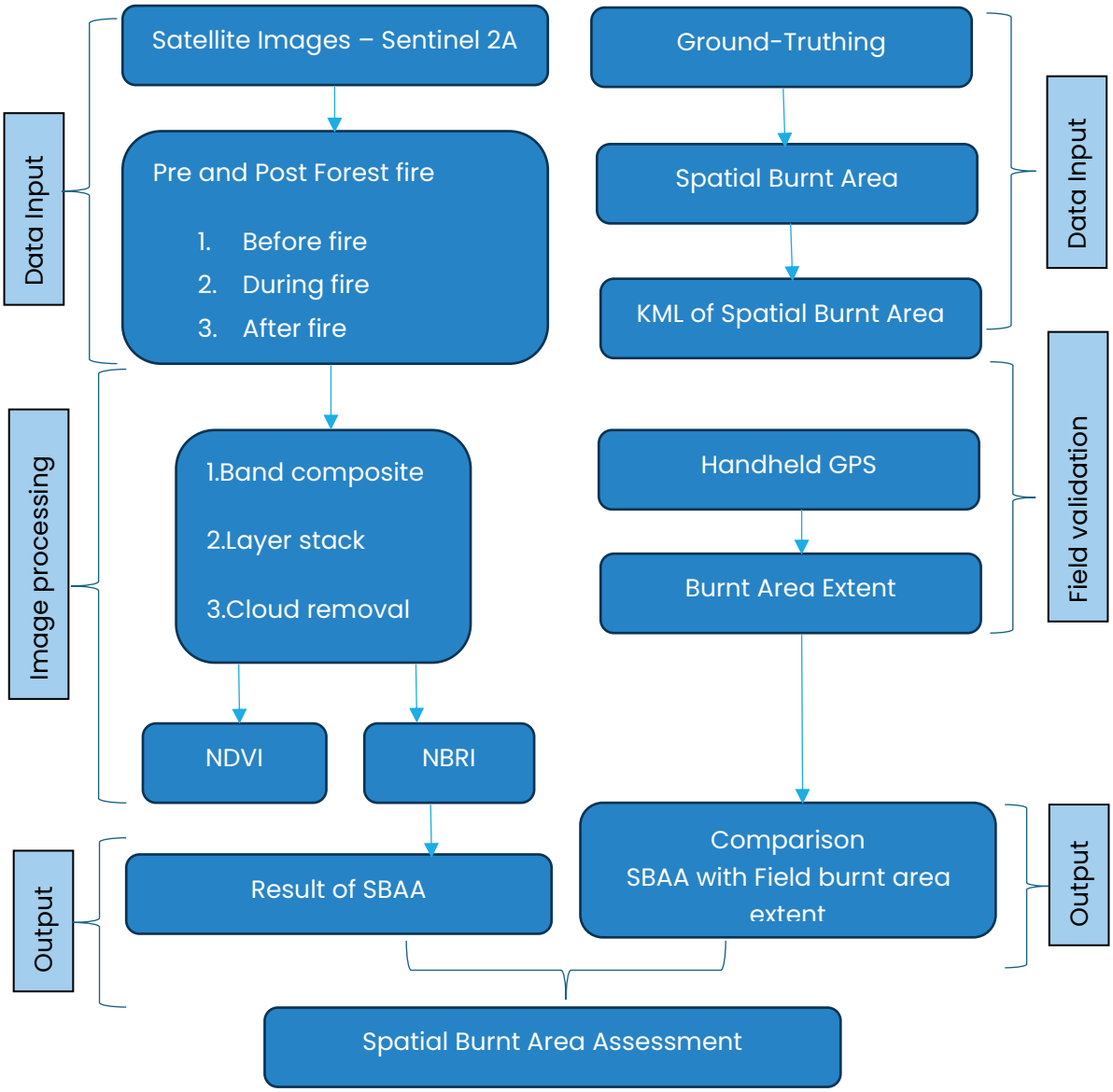


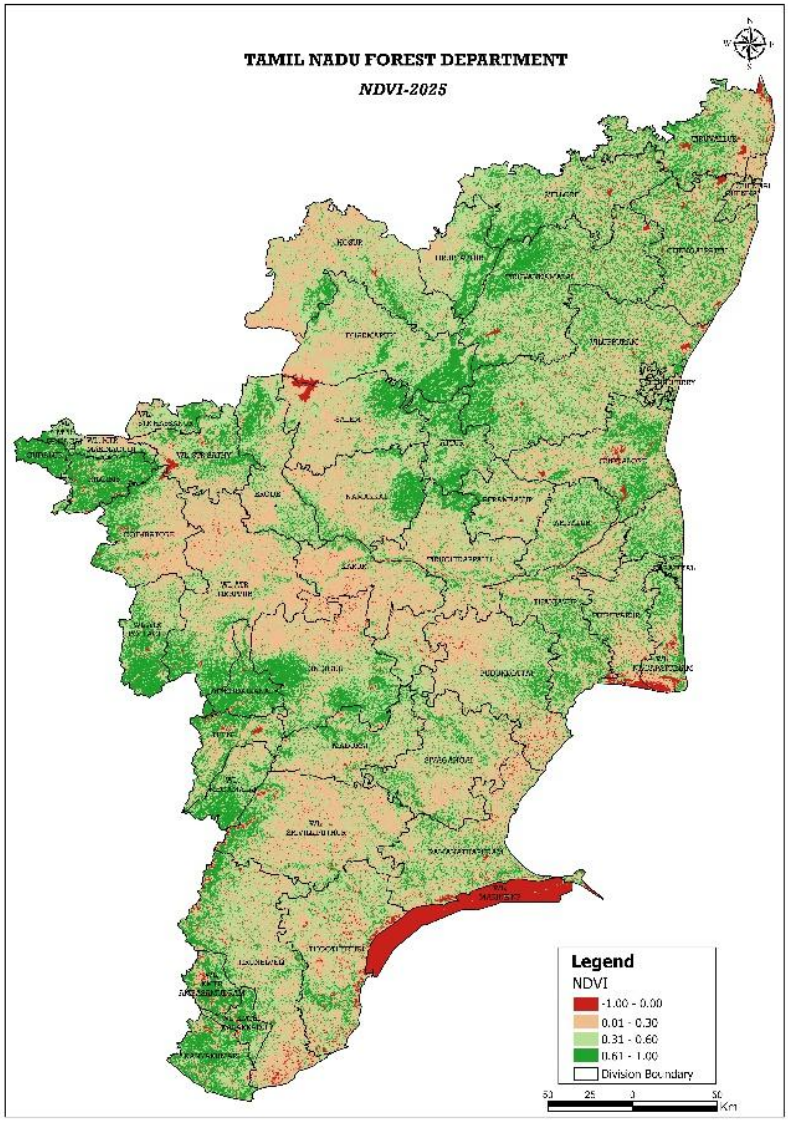
Figure 12: Methodology used for Burnt Area Assessment

Data Analysis

NBR is a spectral index used in remote sensing to distinguish burnt areas by comparing the reflectance properties of healthy vegetation and fire-affected land. Sentinel-2A offers high-resolution multispectral data, particularly Bands 8A (Near Infrared, NIR) and 12 (Shortwave Infrared, SWIR), essential for Normalized Burn Ratio (NBR) analysis.

NDVI (Normalized Difference Vegetation Index)

The Normalized Difference Vegetation Index (NDVI) is a widely used remote sensing metric for assessing vegetation health and density across landscapes. NDVI is calculated using spectral reflectance measurements from the red and near-infrared regions of the electromagnetic spectrum, typically captured by satellites or airborne sensors. The resulting index produces values between -1 and +1, with higher NDVI values indicating healthy, dense vegetation while low or negative values suggest sparse or stressed plants, urban areas, or water. NDVI plays a critical role in agriculture, forest and environmental monitoring, helping scientists and farm managers track plant growth, detect crop stress, measure land cover changes.



NDVI=(NIR+RED)/(NIR-RED)

NDVI=(B8+B4)/(B8-B4) – Sentinel 2A

NIR (Near Infrared) — vegetation reflects strongly (healthy vegetation → high reflectance). And RED (Red band) — vegetation absorbs strongly for photosynthesis.

Figure 13: Normalized Difference Vegetation Index - 2025

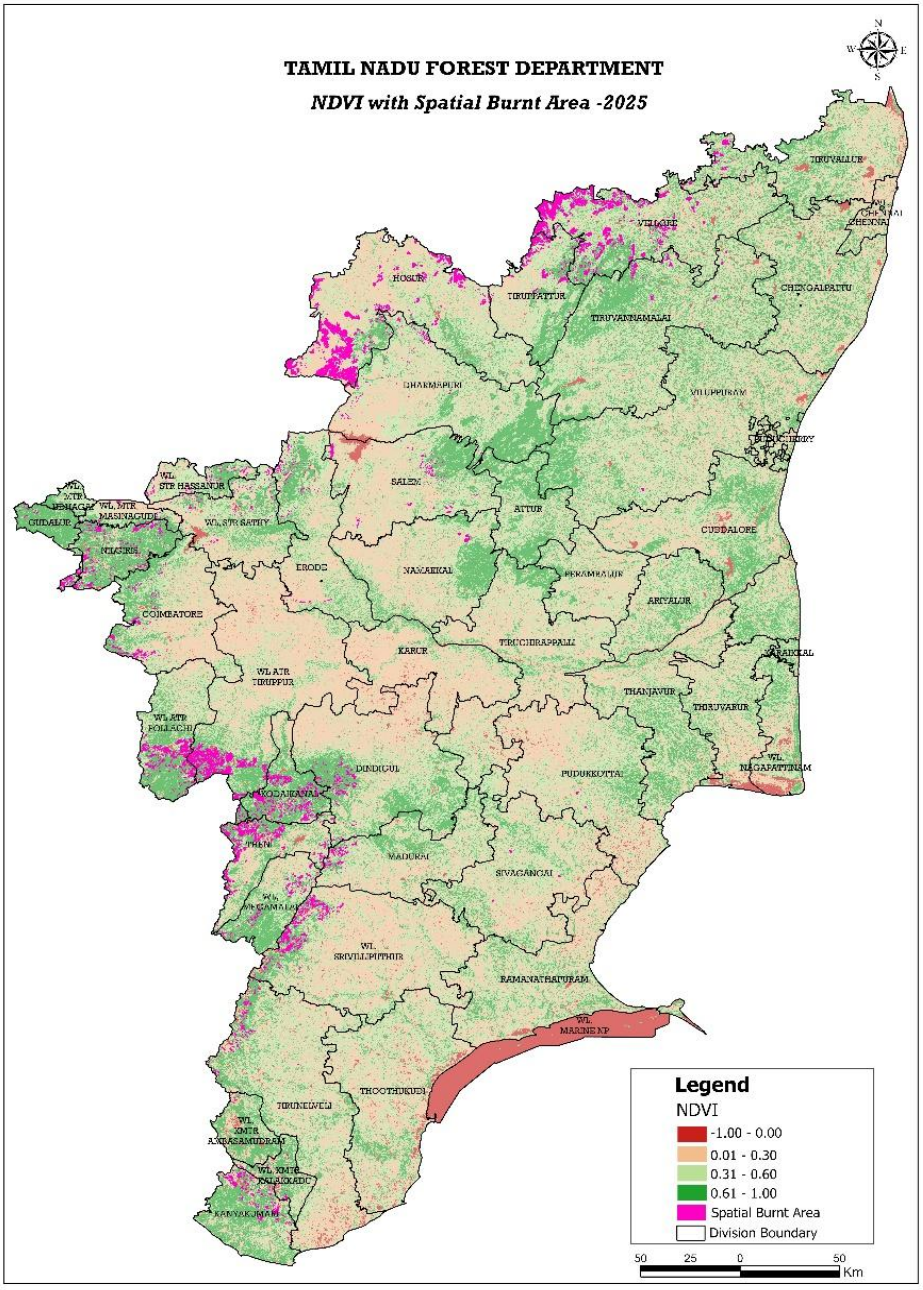


Figure 14: Spatial Burnt Area for the year 2025 overlaid on NDVI

The Normalized Difference Vegetation Index (NDVI) derived from Sentinel-2A for Forest Division wise in Tamil Nadu. Satellite imagery is a valuable tool for forest fire analysis, particularly in assessing vegetation health, burn severity, and post-fire recovery. NDVI is calculated using the near-infrared (NIR) and red (RED) spectral bands of Sentinel-2A, specifically Band 8 (842 nm) and Band 4 (665 nm), through the formula NDVI = (B8 – B4) / (B8 + B4). Healthy vegetation reflects strongly in the NIR band and absorbs in the red band, resulting in high NDVI values, whereas burned or non-vegetated areas produce low or negative values. Before a fire, NDVI helps identify areas with dense vegetation that may

serve as potential fuel sources, while after a fire, it is used to detect burned regions and evaluate the extent of vegetation loss.

The difference between pre-fire and post-fire NDVI values (ΔNDVI) highlights the magnitude of damage, with higher differences indicating more severe burns. In general, NDVI (Figure :14) values ranging from -1.00 to 0.00 indicate no vegetation or dry areas, 0.01 to 0.30 correspond to slightly dense vegetation, 0.31 to 0.60 represent moderately dense vegetation, and 0.61 to 1.00 indicate highly dense or healthy vegetation. To perform this analysis in ArcGIS Pro, Sentinel-2A images are first preprocess corrected for atmospheric effects, clipped to the area of interest, and aligned temporally. NDVI is then computed for pre-fire and post-fire scenes using the Raster Calculator.

Principle

The Normalized Burn Ratio (NBR) leverages the contrast in how vegetation and burnt land reflect light. Healthy vegetation typically shows high NIR reflectance and low SWIR reflectance. Burnt areas, by contrast, exhibit low NIR and high SWIR reflectance. NBR quantifies these differences, helping to distinguish burnt areas in imagery.

Normalized Burn Ratio

The process of NBR analysis using Sentinel-2A imagery begins with the acquisition of pre-fire and post-fire Level-2A (surface reflectance) satellite images for the designated study area. These images undergo atmospheric correction to remove the influence of aerosols and water vapor, and are further processed to mask out clouds and their shadows, ensuring that only clear land surface features are analysed.

The NBR is then calculated for both pre-fire and post-fire images using the formula:

$$NBR = \frac{(NIR - SWIR)}{(NIR + SWIR)}$$

where the Near Infrared (NIR) and Shortwave Infrared (SWIR) bands are sourced from Bands 8A and 12 of Sentinel-2A, respectively. In the resulting NBR images, healthy vegetation typically exhibits higher NBR values, while areas affected by fire tend to display much lower values due to the loss of vegetation and alteration of surface properties. Next, the change in NBR, or delta NBR (dNBR), is computed by subtracting the post-fire NBR from the pre-fire NBR

$$(\mathrm{dNBR} = \mathrm{NBR}_{\text{pre-fire}} - \mathrm{NBR}_{\text{post-fire}})$$

Positive dNBR values indicate regions that have experienced burning, and larger values correspond to greater burn severity. To further interpret the results, the dNBR values are classified based on established thresholds: values below 0.1 denote low severity, values between 0.27 and 0.44 indicate moderate severity, and values greater than 0.66 represent high severity of burning. This series of analytical steps facilitates the systematic detection, mapping, and quantification of burnt areas in the landscape, making NBR analysis with Sentinel-2A a reliable methodology for post-fire environmental assessment and management.

The Normalized Burn Ratio (NBR) technique for burnt area assessments integrates Forest Survey of India (FSI) fire alert coordinates specifying latitude and longitude with satellite imagery overlays to accurately pinpoint fire-affected locations within forests. Leveraging indices such as the NBR and Burned Area Index (BAI), which are calculated using Near-Infrared (NIR) and Short-Wave Infrared (SWIR) bands, remotely sensed data is systematically analysed to detect burnt areas by identifying distinctive colour tones linked to fire damage. Specialist software processes these spectral signatures throughout the imagery, ensuring precise, repeatable identification of burned regions.

ArcGIS Pro spatial analysis tools such as Reclassify allow categorization of BAI or NBR values, distinguishing burnt areas from unburnt ones based upon defined index thresholds. These raster results are then converted into vector format using a Raster to Polygon transformation, thus producing shapefiles that delineate the burn extent. These vector outputs can be overlaid with FSI fire alert data to validate detection accuracy. For final reporting and further geospatial analysis, the shapefiles are exported with complete metadata and assigned an appropriate projection coordinate system such as WGS 1984 North 44 zone ensuring compatibility and spatial integrity for forest fire assessment.

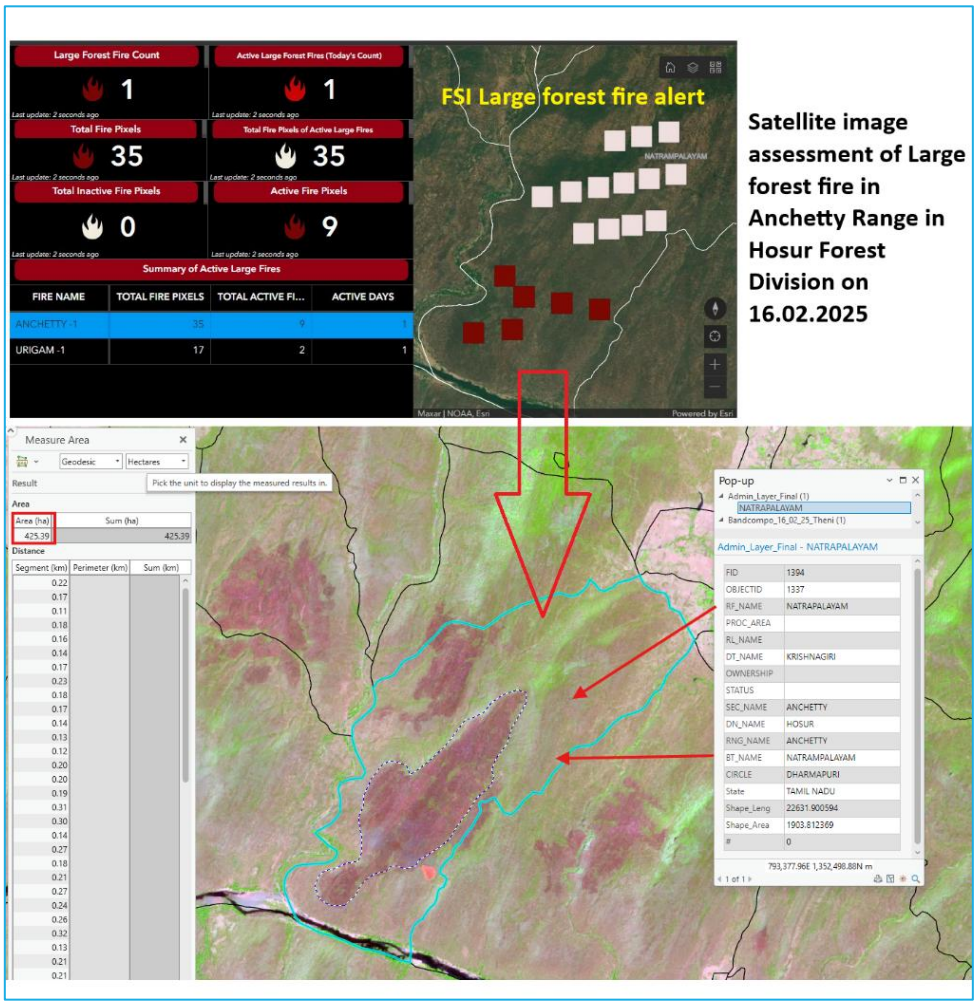


Figure 15: Satellite Image assessment of Large Forest Fire Incident in Anchetty Range, Hosur Division as on 16.02.2025

Forest fire alerts received from the **Forest Survey of India (FSI)** were validated using **Sentinel-2A satellite imagery** to determine the spatial extent and location of areas affected by the fire. The analysis of Sentinel-2A imagery revealed a total burnt area of approximately **425.39 hectares**, corresponding to the **FSI large fire alert** issued on **16 February 2025** in the **Natampalayam Reserved Forest**, **Natrampalayam Beat**, **Anchetty Range**, within the **Hosur Forest Division**. This validation process confirmed the accuracy of the FSI fire alert and provided a detailed spatial assessment of forest fire affected areas in division wise.

A robust alternative for burnt area detection is supervised classification, where an analyst generates custom spectral signatures by selecting training samples that represent burnt area colour tones. This user-guided approach allows for tailored classification models, increasing accuracy especially in heterogeneous or complex landscapes. By combining NBR-derived outputs and BAI classifications with FSI fire alert data, the spatial correspondence between ground-reported fire incidents and satellite-mapped burn signatures is enhanced, Satellite image Sentinel 2A Colour tone interpretation involves during and after fire composites, where burnt areas typically show a rapid change from green (healthy vegetation) to dark red or brown tones reflecting charred or combusted material.

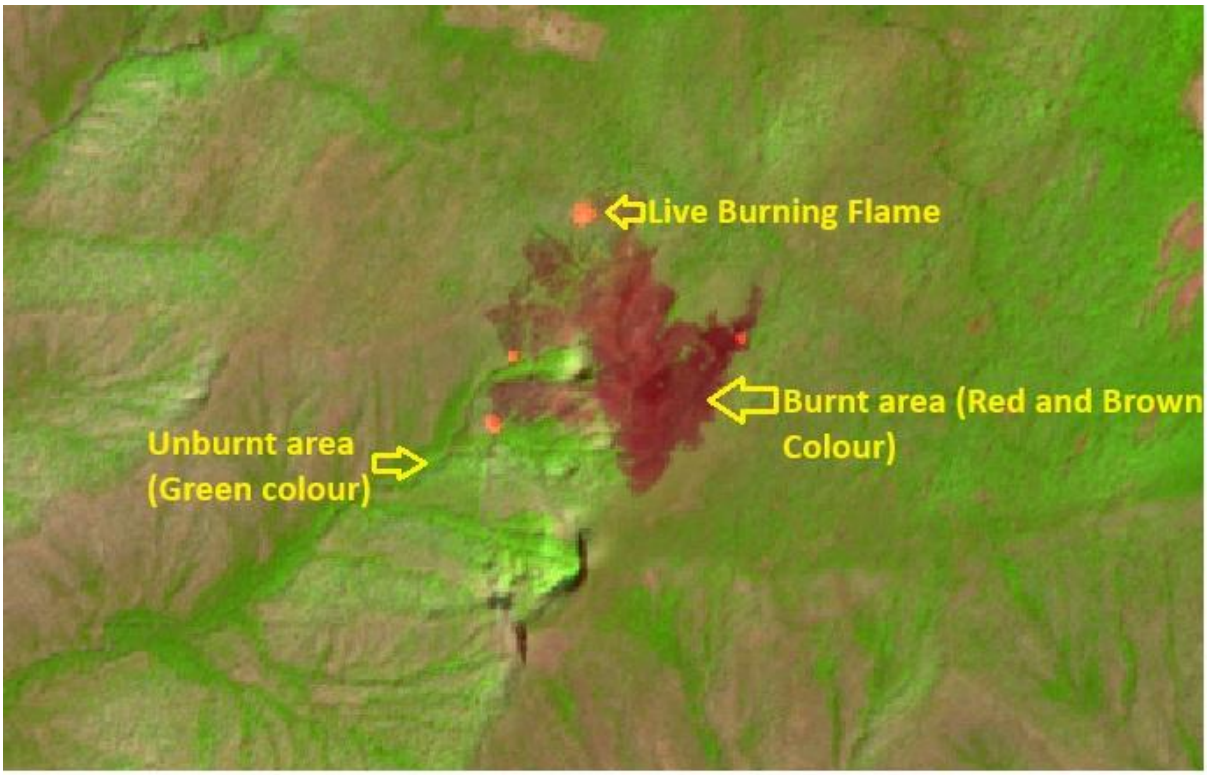


Figure 16: Fire affected area and active burning

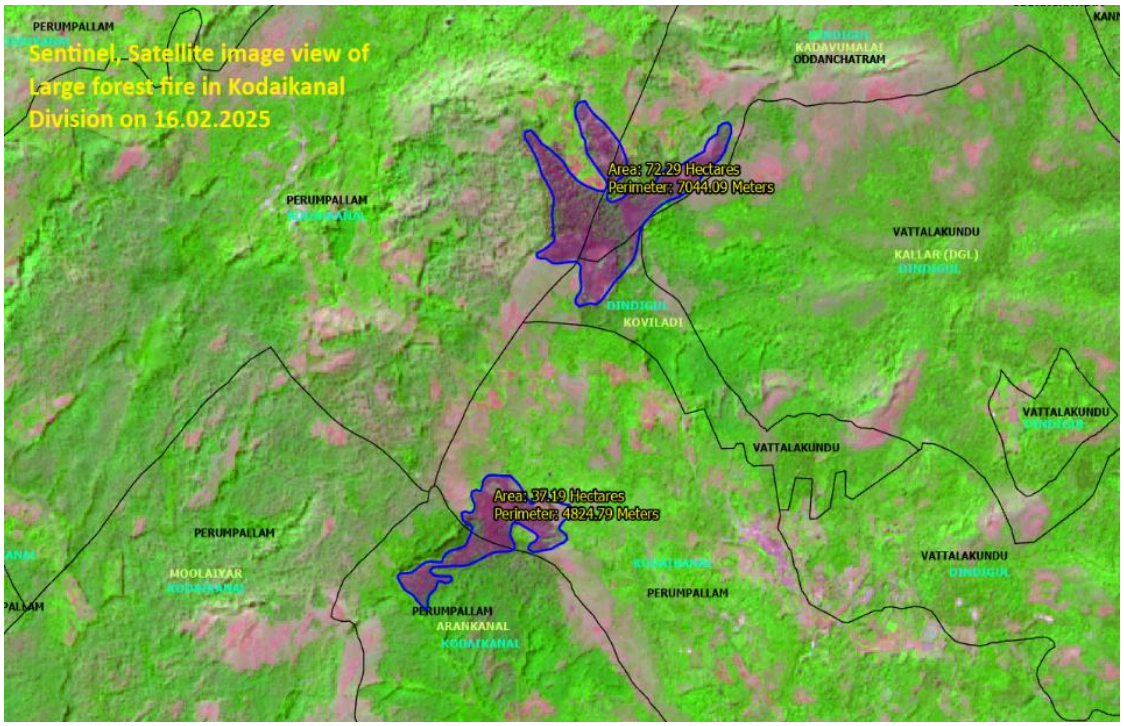


Figure 17: Sentinel Satellite image derived for Large forest fire in Arankanal Reserved Forest, Perumpallam Range in Kodikanal Forest Division on 16.02.2025

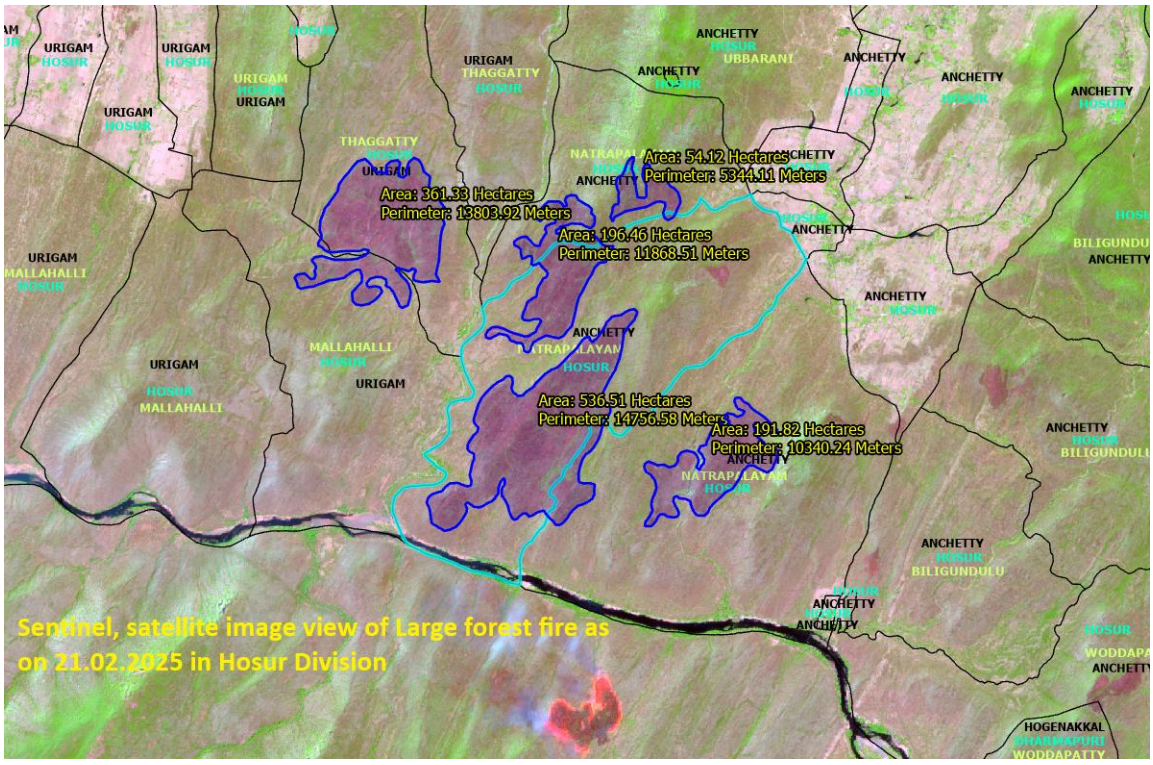


Figure 18: Sentinel Satellite image derived for large forest fire in Natrampalayam Reserved Forest, Urigam Range in Hosur Forest Division on 21.02.2025.

According to the spatial burnt area analysis conducted using **Sentinel-2A satellite imagery**, extensive forest fire incidents were observed across several forest divisions in **2025**. The analysis revealed that the **Hosur, Vellore, Wildlife Anamalai Tiger Reserve (ATR) Pollachi, Kodaikanal, Wildlife Megamalai,** and **Kanyakumari** Forest divisions were significantly affected, with large areas of vegetation burned. This assessment highlights the severity and spatial extent of forest fires during the period of 2025. A total of **201.80 sq.km** was observed as fire affected area spatially in 2025

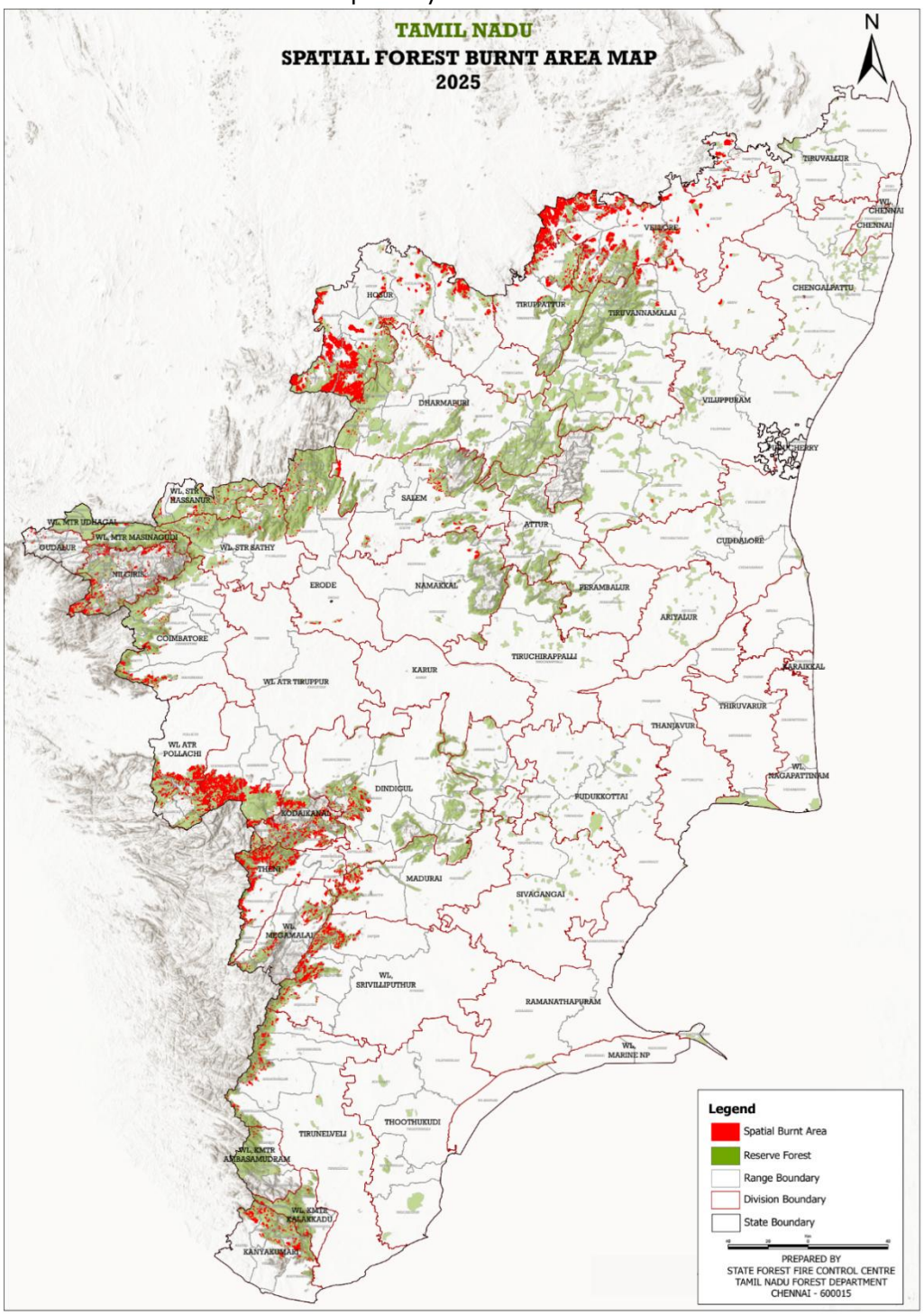


Figure 19: Spatial Forest Burnt Area- 2025

Change Detection

Change detection for forest fire burnt area assessment using ArcGIS Pro involves a systematic comparison of satellite imagery captured before and after a fire event to identify and measure the extent of burnt areas. The process begins by loading the pre-fire and post-fire images into the software while ensuring that both datasets possess consistent spatial resolution and coordinate projection settings. The pre-fire index raster is then subtracted from the post-fire index raster to generate a difference map that visually highlights areas impacted by the fire and changes in vegetation cover. This difference map is subsequently reclassified to establish clear thresholds that distinguish burnt, unburnt, and vegetation regrowth zones. Furthermore, incorporating different time-series satellite images enables the analysis of temporal changes, providing valuable insights into the progression of burnt areas and vegetation recovery over time. This method enhances the accuracy of post-fire evaluation and supports effective forest management and ecological restoration efforts.

The Sentinel-2A satellite image is highly effective for conducting **pre, during, and post-forest fire analysis** due to its high spatial, spectral, and temporal resolution. Operated under the European Space Agency's **Copernicus Program**, Sentinel-2A provides multispectral imagery with 13 spectral bands ranging from visible to shortwave infrared regions, allowing detailed observation of vegetation health, fire-affected areas, and post-fire regeneration.

According to the pre, during, and post-fire analysis conducted based on the Forest Survey of India (FSI) fire report (Alert) in the **Talamalai Reserve Forest, Gajalahatti Beat, Bhavanisagar Range** within the **Wildlife Sanctuary (WL), Sathyamangalam Tiger Reserve,** on **21 February 2025**, Highlighted the area of interest (AOI) in Yellow. Sentinel-2A satellite imagery was utilized to assess the temporal variation of the Fire affected area including Geometric corrections and the used the projection system of WGS 1984 UTM Zone 43N and the Data image processing techniques carried out ArcGIS Pro.

Pre- Forest Fire

The **pre-fire image**, dated **16 February 2025** Figure (20), represents the vegetation condition before the fire event.



Figure 20: Pre-forest fire

During – Forest Fire

The **during-fire image**, acquired on **21 February 2025** Figure (21), captures the active burning areas, fire scars, and the spatial extent of the flames.

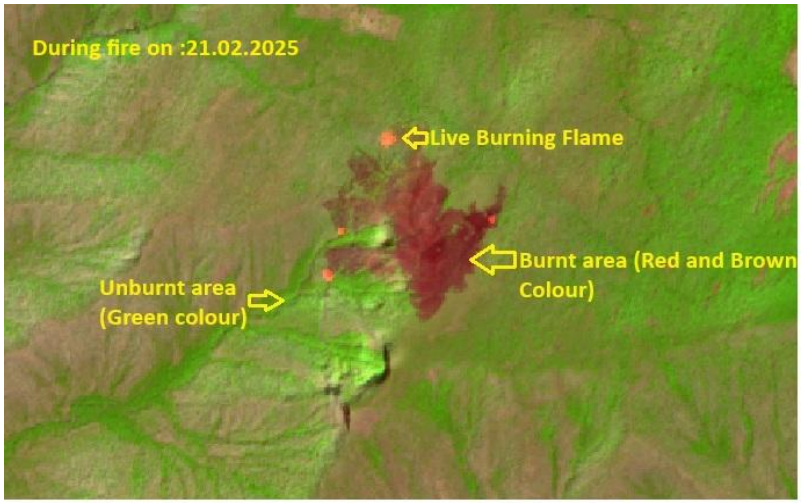


Figure 21: During Forest fire

Post – Forest Fire

and the **post-fire image**, dated **08 March 2025** Figure (22), illustrates the recovery and regeneration of vegetation after the incident.

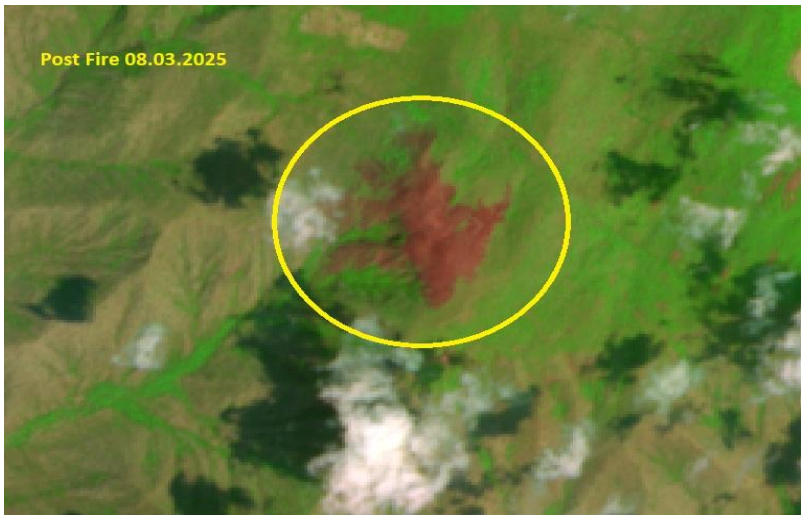


Figure 22: Post-forest fire

Regeneration

This temporal analysis enables a clear understanding of the changes in vegetation cover before, during, and after the fire, providing valuable insights into the burn severity, fire spread, and post fire ecological restoration processed within the Talamalai Reserve Forest on 29.09.205 Figure (23). Satellite image view of Regenerated fire affected area in Talamalai Reserved Forest in WL Sathiyamangalam Forest Division.

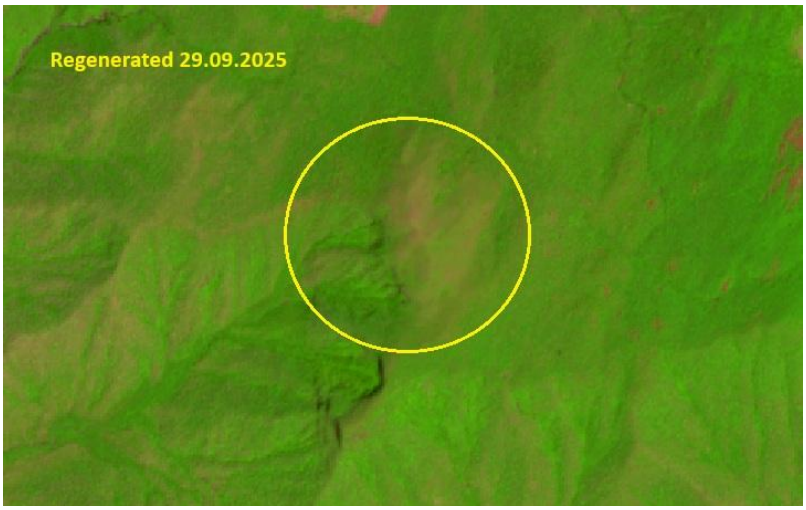


Figure 23: Regeneration of fire affected area observed

Field Data Collection

- Directly visit the selected sampling sites affected by Large Forest Fire with the help of KML layers (Spatial burnt area).
- Record precise GPS captures satellite signals to provide precise location data, enabling the mapping of fire-affected regions with an accuracy of less than 3 meters for handheld GPS devices. In burnt area assessments, GPS Survey instrument was utilized to ground-truth satellite imagery by recording the coordinates of specific fire-affected sites. This tool plays a crucial role in verifying the extent of burnt areas, capturing field data of Fire line, and integrating it with spatial datasets
- Collect qualitative and quantitative data such as burn severity (e.g., char height, canopy scorch), vegetation type, soil conditions, ash presence, and visible signs of fire damage.
- Capture photographic evidence to support observations and allow for later verification

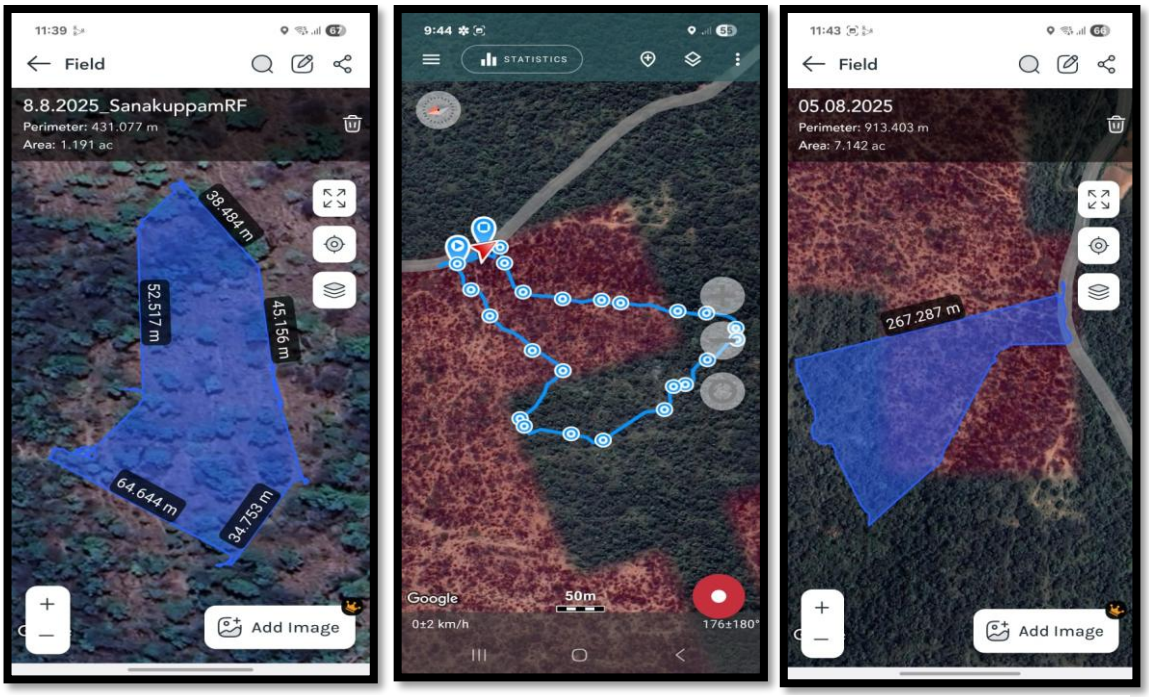


Figure 24: Field Data Collection using hand-held GPS

According to this methodology, field observations for the forest burnt area survey were conducted using a hand-held eTrax Montana 60, in combination with spatial burnt area KML layers, to accurately identify and delineate the extent of the affected regions, landscape and type of forest and forest covers (Moist deciduous and grass lands) observed during the fire assessment. This approach facilitated precise geospatial data collection and mapping of burnt areas across the Hosur, Dharmapuri, and Vellore Forest Divisions during 2025 (Figure 24). The integration of GPS-based field verification with

satellite-derived spatial layers ensured reliable assessment and supporting the evaluation of forest fire impacts in the fire affected divisions.

FIRMS- NASA: Fire information for Resource Management System

NASA's Fire Information for Resource Management System (FIRMS) provides near real-time data on large forest fires worldwide by using satellite instruments such as MODIS (aboard Terra and Aqua) and VIIRS (aboard Suomi NPP and NOAA-20/21) to detect active fires and thermal anomalies within three hours of satellite observation. FIRMS delivers this data as online interactive fire maps, downloadable files (CSV, KML, SHP), and fire alerts which can be accessed by resource managers, emergency responders, and the public for monitoring and managing large wildfire events.

Features of FIRMS for Large Forest Fires

- FIRMS can pinpoint active fire locations, magnitudes, and affected regions using data from high-resolution satellite sensors, providing information on the scale and severity of large forest fires.
- Fire maps and alerts are available for the past 24 hours, 48 hours, or 7 days, enabling timely response and continuous monitoring.
- Data from FIRMS can be integrated into GIS platforms and other analytical tools for further analysis, as well as used in conjunction with other fire monitoring systems such as the European Forest Fire Information System (EFFIS).
- FIRMS offers APIs and web map services for automated or large-scale access, supporting tactical and strategic wildfire management planning.

How to Access or Use FIRMS Data

- The main FIRMS Fire Map can be accessed via NASA's portal, where users can select filters for only large forest fires or focus on specific timeframes and regions.
- Fire alerts (immediate notifications of new large fires) can be subscribed to for specific geographic areas, making the system useful for governmental, organizational, and individual readiness.
- Data can be downloaded for historical analysis, which is useful for understanding fire trends, risk assessment, and resource allocation for large-scale wildfires.

Technical and Analytical Support

- FIRMS provides contextual information, such as fire radiative power (FRP) and confidence levels, aiding the classification of fires by size and severity.
- The platform supports data visualization tools and educational materials for enhanced analysis and interpretation.

Sentinel-2A satellite imagery was utilized to map the spatial extent of burnt areas resulting from forest fires in **2025**, while data from the **Fire Information for Resource Management**

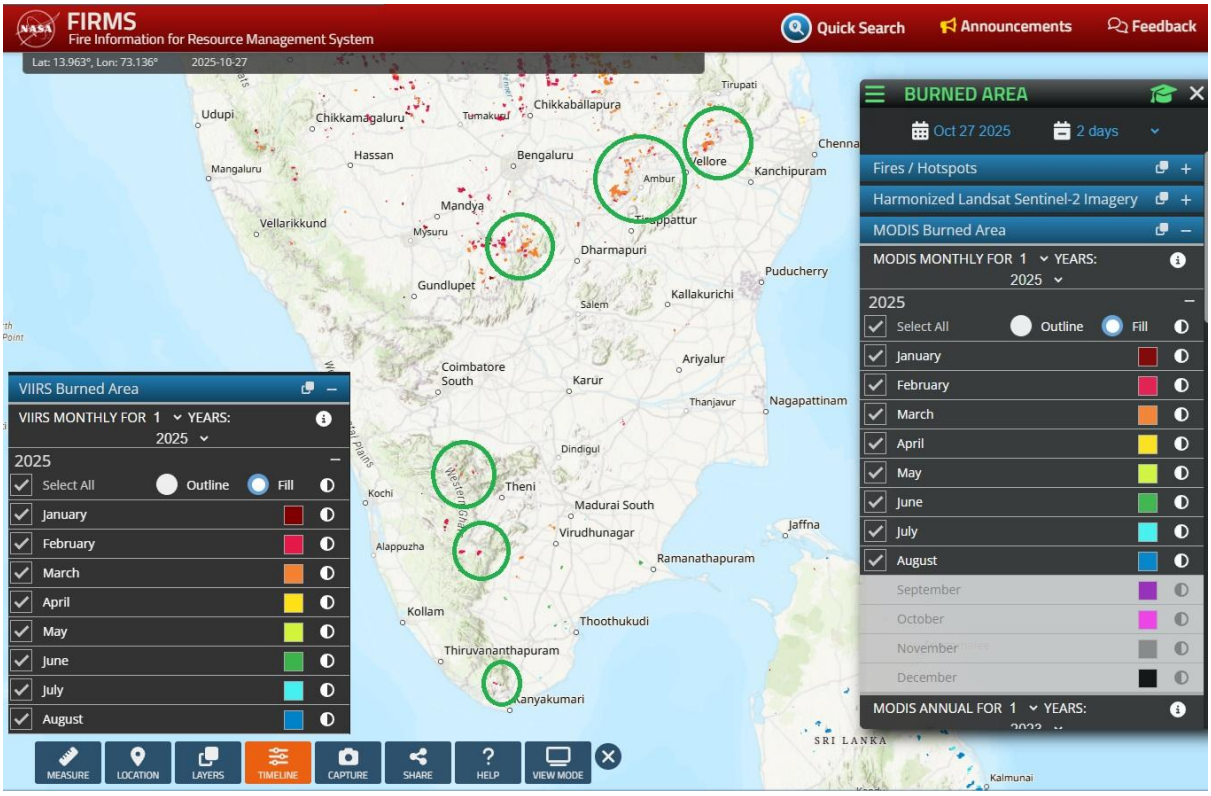


Figure 25: Fire Information for Resource Management System (FIRMS Portal)

System (FIRMS), incorporating **MODIS** and **VIIRS** satellite observations, were employed to detect and validate active fire locations during the same period. The results of the spatial burnt area analysis and FIRMS validation confirmed the occurrence and distribution of forest fires across several divisions, including **Hosur, Vellore, Kanyakumari, Wildlife Megamalai, Wildlife Anamalai Tiger Reserve (ATR) Pollachi, and Kodaikanal**. These fire affected zones were highlighted in **green** on the spatial maps to represent the burnt forest areas recorded during 2025 within the **Tamil Nadu Forest Divisions**. This integrated approach using Sentinel-2A and FIRMS data provided a comprehensive assessment of forest fire incidents, enhancing the accuracy of fire mapping and supporting effective forest management.


5

CHAPTER 5: MONTHLY ANALYSIS OF WEATHER PARAMETERS AND THEIR INFLUENCE ON FOREST FIRE (2022 - 2025)

Data sourced from the India Meteorological Department (IMD) reveals critical patterns in Temperature, Rainfall, Humidity, and Wind dynamics that directly influence fire Patterns in different geographic zones. The analysis identifies high risk forest divisions for effective forest fire management

Objectives

1. Synthesize cumulative meteorological data (2022-2025) from IMD to establish baseline forest fire risk areas.
2. Interpretation of Monthly Weather and their impact between 2022- 2025.
3. Analysis of spatial distribution of burnt areas across forest divisions for 2024 and 2025.
4. Identify high risk zones through correlation of weather variables and historical fire occurrence.

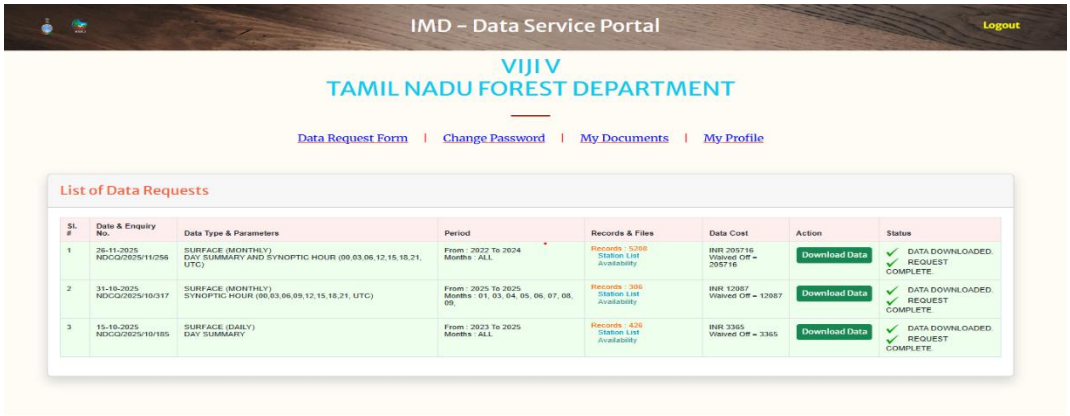


Figure 27: IMD Weather Data Service Portal for Tamil Nadu Forest Department

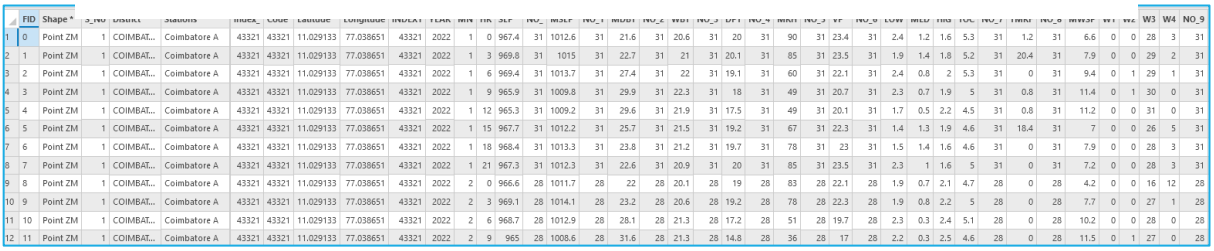


Figure 26: IMD Monthly Weather Data sets -2024-2025

Region wise classification of Forest Divisions for weather analysis

Using forest division jurisdiction, identified the following major divisions across Tamil Nadu

- **Western Region**: WL MTR Masinagudi, Gudalur, WL MTR Nilgris, WL STR Hassanur, WL ATR Pollachi, Coimbatore, Theni, WL Megamalai, divisions

- **Central Region**: Erode, Salem, Namakkal, Dharmapuri, Tiruppattur, Trichy, Karur, Attur, Perambalur divisions
- **North and Eastern Region**: Tiruvallur, Hosur, Vellore, Chennai, Chengalpattu Tiruvannamalai, Chengalpattu, Villupuram divisions
- **Southern Region**: Madurai, Dindigul, Theni, Sivagangai, WL KMTR Ambasamuthram WL, KMTR Kalakkadu, Kaniyakumari divisions
- **Coastal Region**: Wildlife sanctuaries, and Marine Protected Areas Tuticorin, Ramanathapuram divisions.

Each division demonstrates distinct temperature characteristics influenced by elevation, vegetation cover, and proximity to coastal regions.

Detailed Meteorological Analysis (2022–2025)

Temperature Patterns and Fire Risk Implications

Temperature dynamics significantly influence fire initiation and spread rates. Elevated temperatures reduce fuel moisture content and increase evapotranspiration, creating conditions favourable for fire.

January Temperature Patterns

Year 2022

- **Highest temperatures (28.21–31.5°C)**: Concentrated in South and western plateau regions, particularly affecting Kanyakumari, Madurai, WL KMTR, Kalakkadu, Ambasamuthram, Theni, WL Pollachi, Karur, Trichy, WL, Nagapattinam, Erode, Salem,Coimbatore, Nilgiris, and surrounding areas.
- **Moderate temperatures (23.07–28.20°C)**: Observed across central and eastern divisions
- **Lower zones (14.0–16.26°C)**: Isolated pockets in northern regions of Vellore, Tiruppattur, and Tiruvannamalai
- **Temperature range**: Approximately 17.5°C variation across the state

Year 2023

Year 2023 demonstrated a more moderate temperature distribution:

- **Peak temperatures**: Reduced to 30.3–30.9°C in isolated southern divisions and western pockets
- **Broader moderate zone (29.5–30.2°C)**: Extended across larger geographic areas
- **Cooler regions (16.4–28.9°C)**: More widespread in northern divisions and elevated zones
- **Overall pattern**: Relatively cooler January compared to 2022

Year 2024

Temperature distribution in January 2024 showed reversion to higher values:

- **Maximum temperatures (30.8–31.2°C)**: Concentrated in western plateau and central divisions (Dharmapuri, Salem, Namakkal, Tiruchirappalli)
- **Marked hotspot**: Division in Kanyakumari and surrounding regions
- **Temperature gradation**: Clear coastal-to-inland gradient with cooler zones along eastern coastal areas
- **Comparable to 2022**: Similar spatial distribution with slight variations in intensity

Year 2025

Preliminary January 2025 data (partial month)

- **Temperature range (16.4–30.8°C)**: Consistent with multiyear patterns
- **High temperature (27.1–30.8°C)**: North, south, and western divisions
- **Moderate temperatures (24.1–27.0°C)**: Central and coastal divisions
- **Hotspot intensification**: Hotspots developing in expected western and southern divisions

February Temperature Patterns

Year 2022

February 2022 temperatures showed significant spatial variation:

- **Hottest zones (32.1–33.1°C)**: Central regions, particularly around Namakkal and Dharmapuri divisions
- **Moderate belt (31.1–32°C)**: Northern and southern divisions
- **Coolest areas (29.1–30.2°C)**: Western elevated regions and coastal pockets
- **Distinguishing feature**: Pronounced central hotspot not observed in January

Year 2023

February 2023 demonstrated relative moderation:

- **Peak temperatures**: Reduced to 32.4–33.7°C in localized zones
- **Thermal range**: 16.4–33.7°C across state
- **More uniform distribution**: Gradual temperature gradation rather than sharp hotspots
- **Coastal influence**: Enhanced cooling in eastern regions around 16.4–30.2°C

Year 2024

February 2024 showed intensified temperature development:

- **Maximum temperatures (33.4–34.8°C)**: Exceeded previous years' February peaks
- **Central hotspot**: Clearly defined in Namakkal and Dharmapuri divisions
- **Spatial extent**: More concentrated than 2022 but higher intensity than 2023
- **Implication**: Accelerated warming trend entering peak pre-monsoon season

March Temperature Patterns

Year 2022

March temperatures marked intensification toward peak pre-monsoon conditions:

- **Extreme hotspots (34.2–35.9°C)**: Concentrated in central and north-central divisions

- **High temperature zone (30.4–34.1°C)**: Covering majority of state
- **Cooler fringes (14–22°C)**: Confined to coastal margins and highest elevations
- **Thermal stress indicator**: Temperature gradient steepening significantly

Year 2023

March 2023 showed moderated but still elevated values:

- **Peak temperatures (34.6–35.2°C)**: Slightly higher than March 2022 in hotspots
- **Broader high-temperature belt (33–34°C)**: Extensive coverage
- **Thermal pattern**: More uniform than 2022, fewer concentrated hotspots
- **Regional variation**: Enhanced coastal cooling observed (16.4–32.1°C)

Year 2024

March 2024 demonstrated continued warming intensity:

- **Maximum temperatures (36.3–37.1°C)**: Exceeding previous March records
- **Critical zone definition (34.9–36.3°C)**: Hotspots sharper and more intense than 2022 and 2023
- **Geographic focus**: North-central and western divisions most affected
- **Concern elevation**: Temperatures approaching dangerous thresholds for fire risk

Year 2025

March 2025 data (partial):

- **Extreme temperature (32.8–36.4°C)**: Consistent with multiyear March patterns in northern and central divisions (Vellore, Tiruvallur, Chennai, Tiruvannamalai, Erode, Sathiyamangalam, Coimbatore)
- **Low temperature (18.4–26.3°C)**: Western divisions of Nilgiris and Coimbatore
- **Moderate temperature (30.1–32.7°C)**: Central zones
- **Escalating trend**: Early March showing temperature development within expected range
- **Watch period**: Critical month for fire preparedness monitoring

April Temperature Patterns (Peak Pre-Monsoon Period)

Year 2022

April 2022 temperatures reached peak pre-monsoon conditions:

- **Highest temperatures (32.9–37.3°C)**: Concentrated in central and northern divisions
- **Widespread hot zone (28.6–32.8°C)**: Covering 60–70% of forested areas
- **Thermal gradient**: Sharp coastal-to-inland increase
- **Fire risk peak**: April typically represents the critical month for fire occurrence

Year 2023

April 2023 showed a comparatively moderated pattern:

- **Peak temperatures (36–37.1°C)**: Slightly lower than April 2022
- **More gradational thermal distribution**: Less pronounced hotspot concentration
- **Extended moderate zone (34.1–35.9°C)**: Broader than 2022
- **Coastal effect**: Enhanced moderating influence in eastern divisions (16.3–33.4°C)

Year 2024
April 2024 demonstrated significant warming:

- **Maximum temperatures (33.2–37.5°C)**: Exceeding previous April records
- **Extreme zone expansion**: Larger geographic area experiencing temperatures >35°C
- **Hotspot intensity**: Sharper and more defined in central plateau region
- **Critical concern**: Approaching physiological stress thresholds for vegetation

Year 2025
April 2025 data (partial/early):

- **Early season temperatures (33.2–37.5°C)**: Within expected April range
- **Developing hotspots**: Characteristic central region intensification beginning
- **Trajectory alignment**: Following 2024 warming pattern to date

May Temperature Patterns

Year 2022
May 2022 temperatures approached the monsoon transition period:

- **Hottest zones (35.3–36.9°C)**: Concentrated in north-central and eastern divisions
- **Temperature distribution**: Less uniformly hot than April, more concentrated hotspots
- **Cooling onset signal**: Southern and western regions showing temperature moderation (30.3–32.2°C)
- **Monsoon proximity**: Pre-monsoon conditions approaching transition

Year 2023
May 2023 showed pronounced spatial variation:

- **Peak temperatures (36.2–37.7°C)**: Comparable to 2022 hottest zones
- **More distributed heating**: Hotspots less sharply defined than 2022
- **Coastal cooling**: Enhanced in eastern and southern coastal divisions (16.4–33.5°C)

Year 2024
May 2024 demonstrated continued elevated temperatures:

- **Maximum temperatures (37–38.3°C)**: Exceeding May 2022 and 2023 levels
- **Broader high-temperature zone**: 35°C+ covering extensive areas
- **Persistent hotspot core**: Central and north-central divisions maintaining intense heating (34.9–36.9°C)
- **Declining monsoon signal**: Temperature patterns suggesting delayed monsoon onset impact

Year 2025
May 2025 data (limited/early):

- **High temperature range (31.3–36.1°C)**: Expected summer seasonal patterns in northern and southern divisions
- **Central divisions heating**: Western divisions showing low warming; north-central divisions showing increased heat

- **Moderate phase (25.2–29.6°C)**: Central divisions

June Temperature Patterns (Southwest Monsoon Onset)

Year 2022

June 2022 temperatures reflected monsoon season influence:

- **Thermal moderation**: Lowest June temperatures in analysis period (range: 6–11.5°C minimum)
- **Enhanced coastal zones (11.5–22.8°C)**: Southern and eastern coastal zones markedly cooler
- **Inland elevation (22.9–28.5°C)**: Central plateau maintaining moderate temperatures
- **Monsoon impact**: Southwest Monsoon arrival significantly reducing surface temperatures
- **Maximum temperatures (32–36°C)**: Northern and eastern divisions

Year 2023

June 2023 demonstrated variable monsoon conditions:

- **Low temperature ranges from (16.4°C)**: Higher than 2022, suggesting variable monsoon onset
- **High temperature pattern**: Some north and northeastern zones maintaining higher temperatures (30.8–37.2°C)
- **Coastal cooling pronounced (16.4–23°C)**: Monsoon influence evident in coastal regions
- **Mixed conditions**: Spatial heterogeneity reflecting monsoon variability

Year 2024

June 2024 showed complex monsoon influence:

- **Temperature distribution (32.2–35.1°C)**: Broad range reflecting monsoon transition complexity
- **Persistent heating**: Central regions and northern divisions
- **Strong coastal effect**: Southern coastal and western divisions notably cooler (29.8–30.7°C range)
- **Monsoon progression**: Spatial pattern suggesting variable monsoon progression across divisions

Year 2025

June 2025 data (partial/early):

- **Temperature range (18.4–39.2°C)**: Early June showing summer-like conditions
- **Monsoon delay signal**: Temperatures higher than corresponding 2022–2024 early June values
- **Awaiting complete data**: Full June data will clarify monsoon onset timing

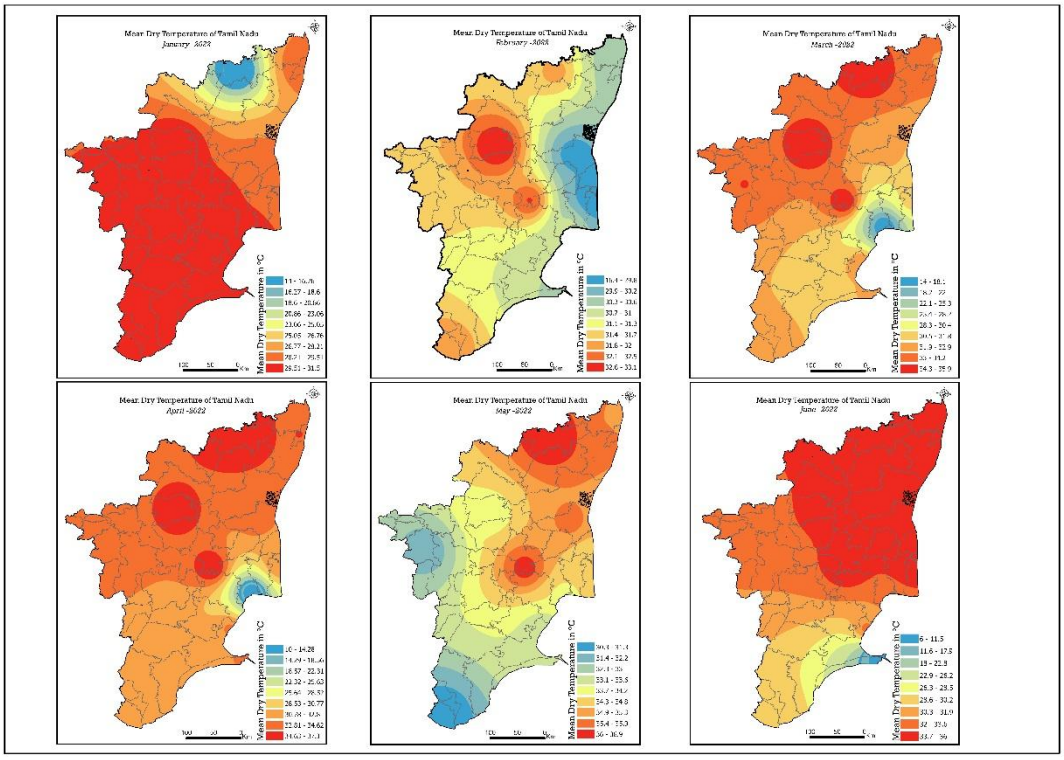


Figure 28: Monthly Mean Dry Temperature -2022

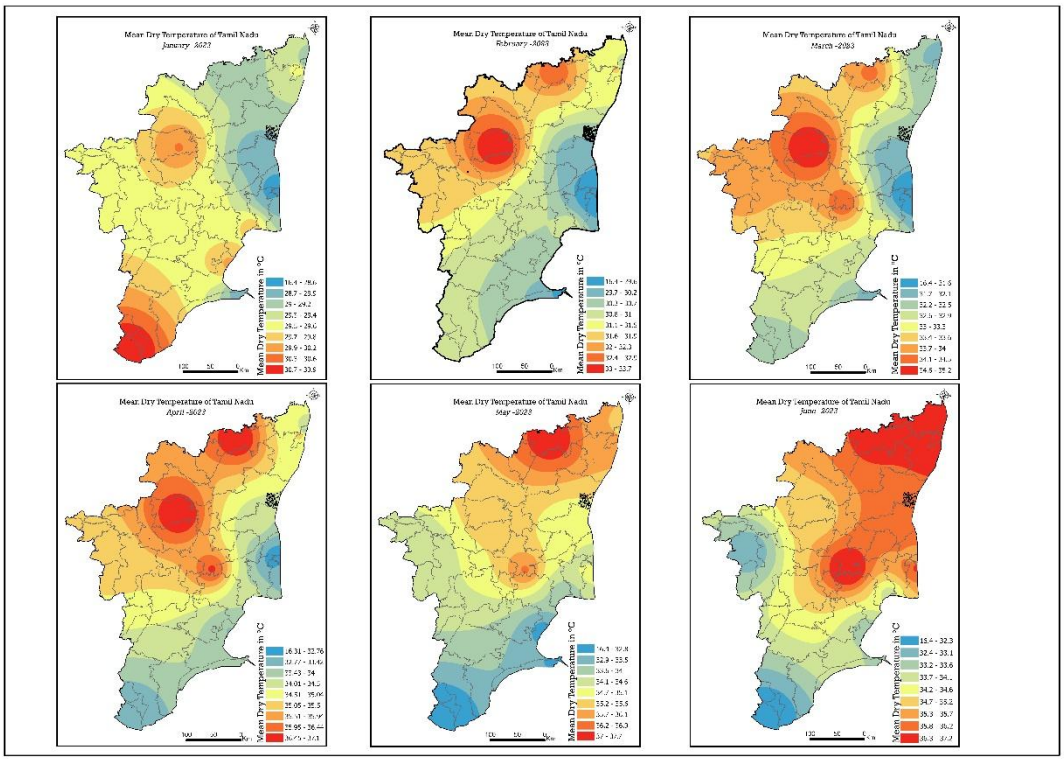


Figure 29: Monthly Mean Dry Temperature -2023

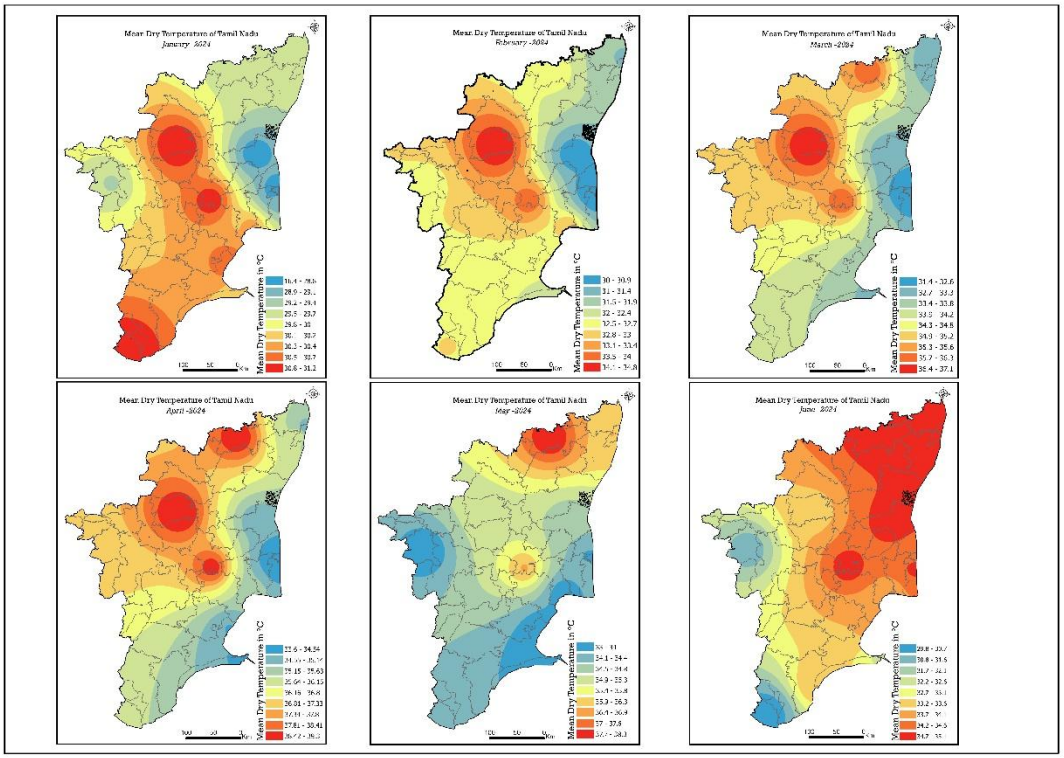


Figure 30: Monthly Mean Dry Temperature -2024

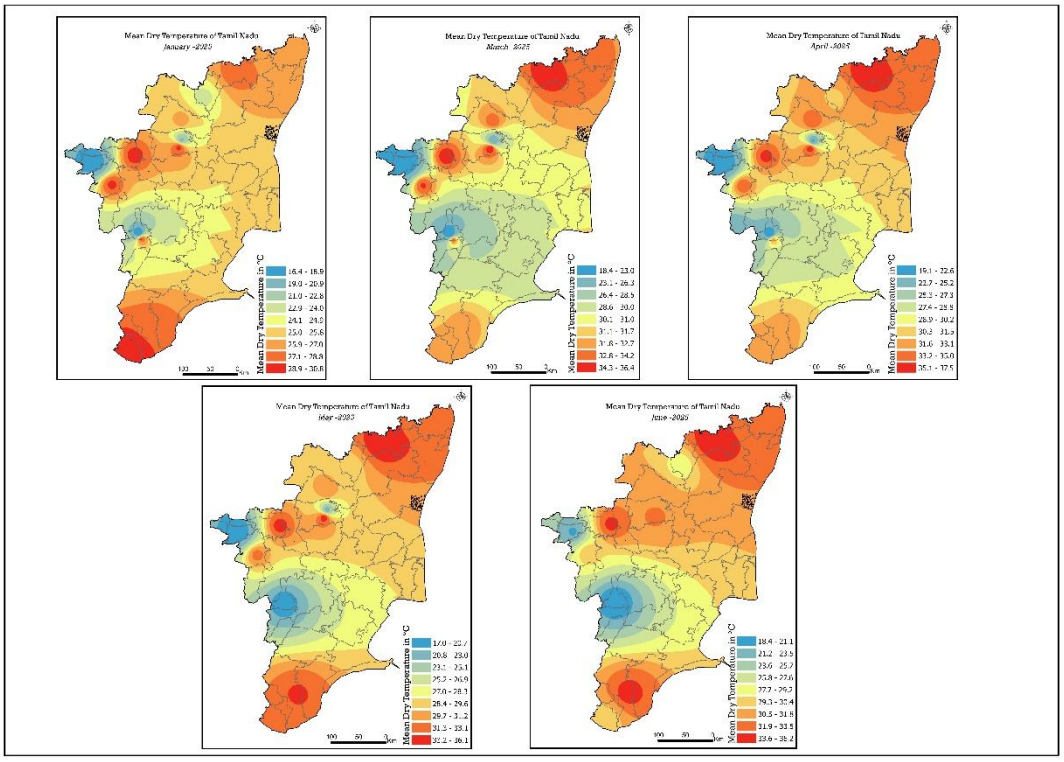


Figure 31: Monthly Mean Dry Temperature -2025

Rainfall Patterns and Fire Season Dynamics

Tamil Nadu forest divisions occupy diverse rainfall regimes with critical implications for fire vulnerability.

High Rainfall Zones (Annual: 1500–2500+ mm)

- **Western Ghats divisions**: Theni, Kodaikanal, Nilgiris, Aravankad (ATR) Pollachi, elevated portions
- **Characteristics**: Receive orographic enhancement from Southwest Monsoon
- **Fire risk**: Relatively protected from pre-monsoon fire danger despite elevation

Moderate Rainfall Zones (Annual: 800–1500 mm)

- **Coastal and eastern divisions**: Chennai, Chengalpattu, Tiruvallur, Cuddalore
- **Characteristics**: Benefit from Northeast Monsoon (October–December) and Southwest Monsoon
- **Fire risk**: More resilient to pre-monsoon drought stress

Low Rainfall Zones (Annual: 400–800 mm)

- **Central plateau and interior divisions**: Namakkal, Dharmapuri, Erode, central portions
- **Characteristics**: Limited pre-monsoon rainfall
- **Fire risk**: Highly vulnerable to fire danger during dry months

Very Low Rainfall Zones (Annual: <400 mm)

- **Southern interior**: Madurai, portions of Dindigul, Sivagangai, Ramanathapuram
- **Characteristics**: Highly variable monsoon influences
- **Fire risk**: Extreme fire danger potential in dry years

Seasonal Rainfall Analysis (2022-2025)

Northeast Monsoon (January–February)

- **January 2022**: Moderate rainfall in coastal divisions (4.4–8.2 mm); higher activity in Cuddalore, Chengalpattu, WL Ngapattinam and Ramanathapuram divisions
- **January 2023**: Increased northeast monsoon activity; southern Tamil Nadu divisions (Kanniyakumari, Tiruppattur, Ramanathapuram) recorded significant precipitation (2.6–4 mm mean)
- **January 2024**: Subdued monsoon onset; minimal rainfall across most divisions (0.2–6 mm); south coastal regions recorded maximum rainfall (18.2–32.4 mm)

- **January 2025**: Strong northeast monsoon activity in western (Kodaikanal, Theni, Nilgiris) and northeastern coastal divisions (Tiruvallur, Chennai, Vellore) with 46.8–64 mm

Analysis: Northeast Monsoon shows high inter annual variability (2022–2025). Coastal and southern forest divisions experience greater rainfall reliability than interior zones.

Dry Season (March–April)

This period represents the critical fire season with extremely low soil moisture and elevated Fire Danger Indices

- **March 2022**: Highly variable rainfall; coastal/northern divisions 0.3–5.2 mm; western zones (Coimbatore, Nilgiris, WL ATR Pollachi) 3.1–5.2 mm; April received 12.2–17 mm
- **March 2023**: Very dry conditions across most divisions (0–5.4 mm); northeastern zones showing localized activity (33.1–59.8 mm)
- **March 2024**: Minimal activity (0–0.7 mm); pre-summer heat intensification
- **April 2022–2025**: Critical dry season; rainfall <0.5 mm across most divisions; pre-monsoon convective activity confined to specific zones

Southwest Monsoon (May–June)

- **May–June 2022**: Strong monsoon onset; widespread activity 21.9–37.4 mm (western zones); eastern divisions received lower rainfall
- **May–June 2023**: Vigorous monsoon; western and central divisions 0.2–0.5 mm; southern zones 2.3–4 mm; eastern divisions (Cuddalore, Villupuram) 5.6–8.2 mm in June
- **May 2024**: Moderate monsoon activity; coastal concentrations (Nagapattinam, Tiruppattur toward Kanniyakumari) 14.7–24.1 mm; western zones 0–6 mm; June received 16.9–24 mm in western divisions
- **May 2025**: Active monsoon phase; widespread precipitation across northern and western divisions (195.4–276 mm); WL ATR Pollachi obtained <713 mm in June

Analysis: Southwest Monsoon is the primary rainy season for Tamil Nadu. May shows transition characteristics with high spatial variability. Coastal and western divisions receive peak moisture influx.

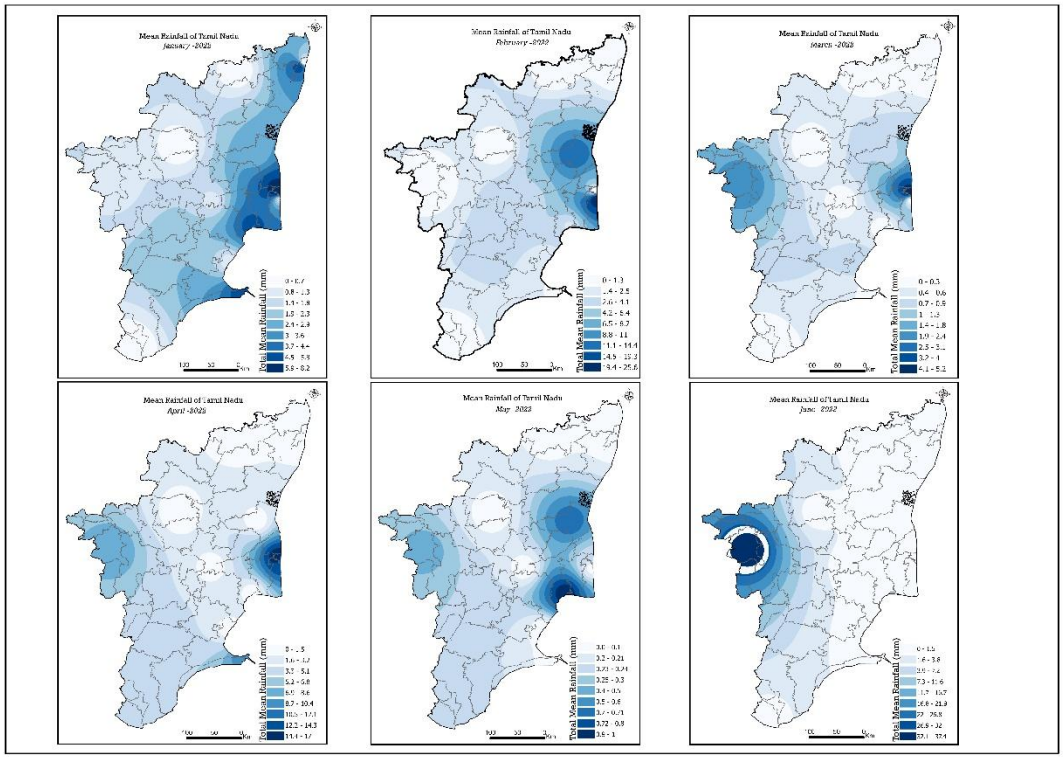


Figure 32: Monthly Mean Rainfall -2022

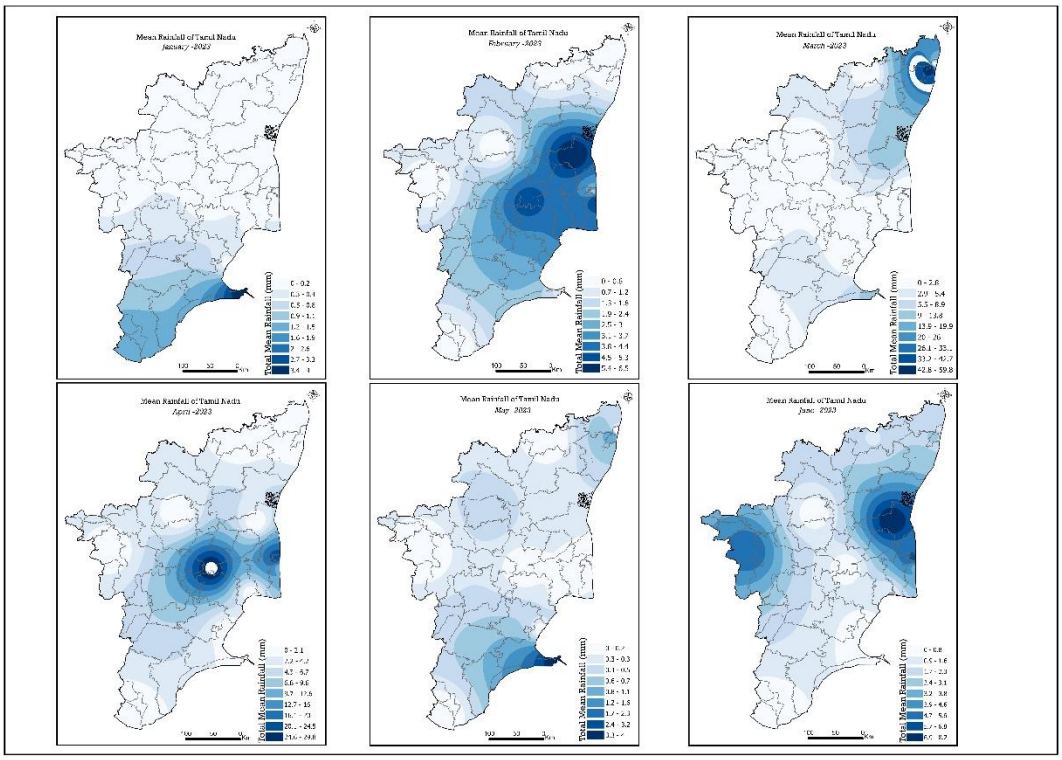


Figure 33: Monthly Mean Rainfall -2023

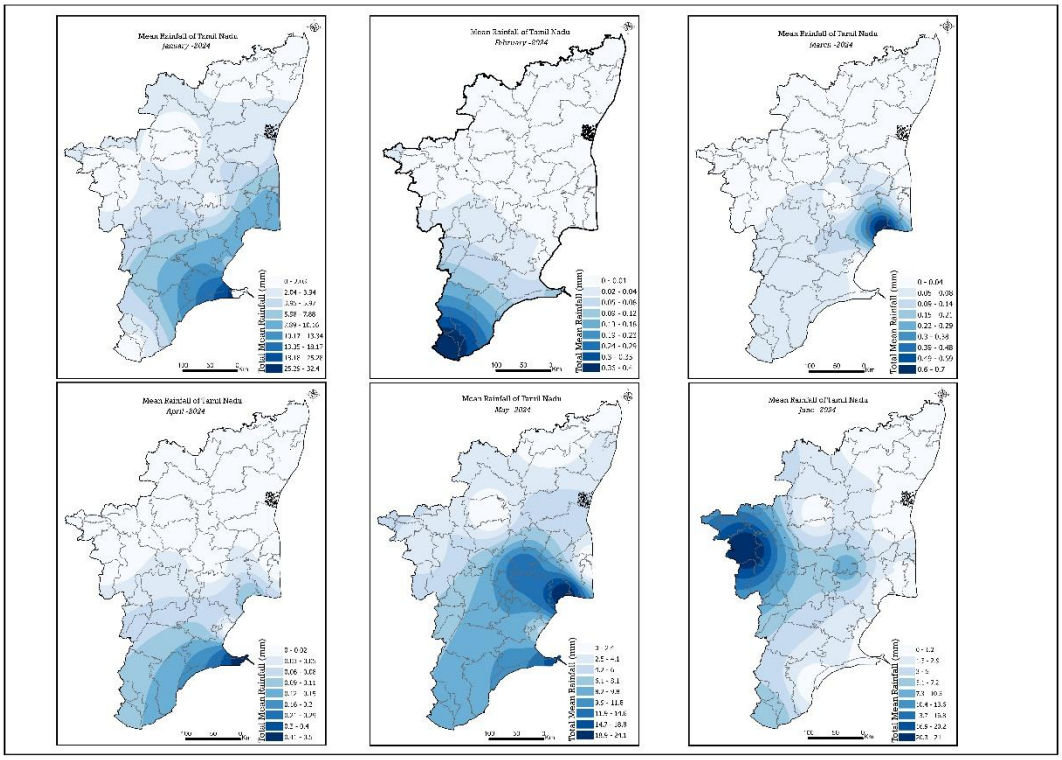


Figure 34: Monthly Mean Rainfall -2024

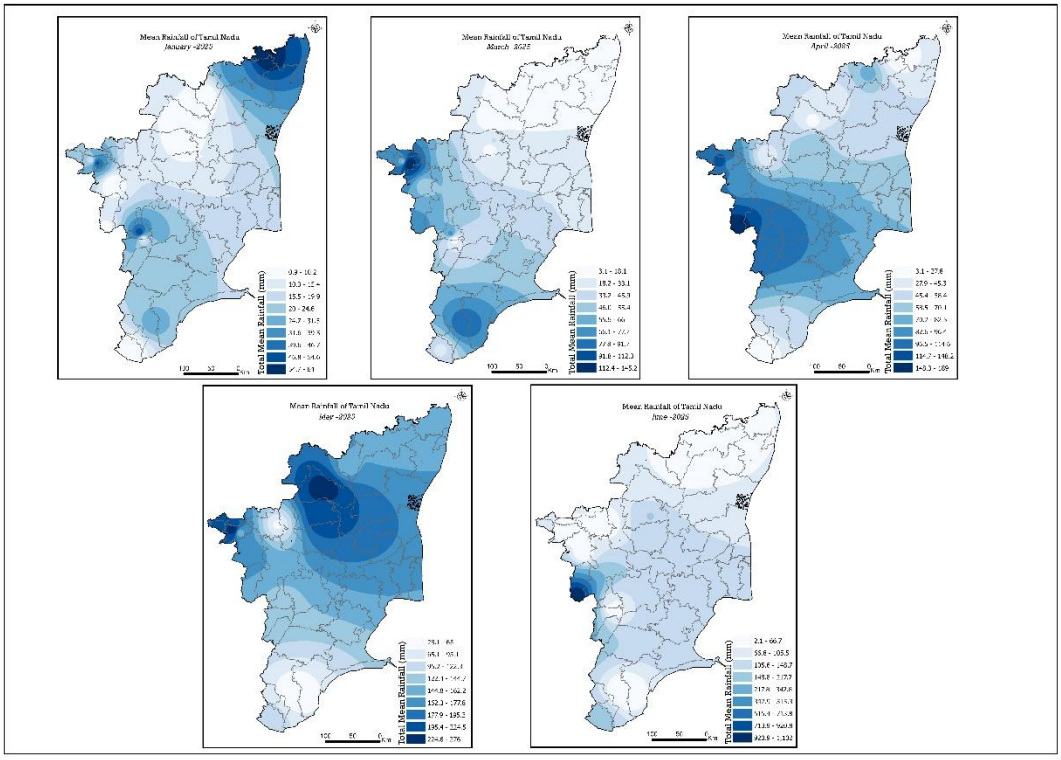


Figure 35: Monthly Mean Rainfall -2025

Relative Humidity Patterns and Fire Danger Classification

Forest divisions are categorized by geographic humidity regimes with direct implications for fire susceptibility:

High Humidity Zones (Coastal and Eastern Regions)

- **Divisions**: Chengalpattu, Villupuram, Cuddalore, (WL Nagapattinam)
- **Characteristic**: 50–80%+ RH throughout analysis period
- **Monsoon influence**: Enhanced Southwest Monsoon penetration
- **Fire risk**: Generally lower due to elevated moisture

Moderate Humidity Zones (Central and Eastern Plateau)

- **Divisions**: Vellore, Tiruppattur, Salem, Erode, Karur, Tiruchirappalli, Perambalur, Attur
- **Characteristic**: 40–65% RH seasonal variation
- **Monsoon influence**: Variable depending on seasonal progression
- **Fire risk**: Moderate with seasonal peaks

Low Humidity Zones (Western Plateau and Interior)

- **Divisions**: Coimbatore, WL, MTR, Masinagudi, Hosur, Dharmapuri, Namakkal, Salem, Erode.
- **Characteristic**: 25–55% RH with pronounced seasonal drying
- **Monsoon influence**: Delayed and variable
- **Fire risk**: Elevated, especially March–May period

Variable Humidity Zones (Southern Interior)

- **Divisions**: Madurai, Theni, Dindigul, Sivagangai, Ramanathapuram
- **Characteristic**: 35–65% RH with high inter-monthly variability
- **Monsoon influence**: Complex interaction of multiple weather systems
- **Fire risk**: Seasonal, concentrated March–May

Fire Danger Class	Relative Humidity	Fire Behavior
Extreme	<20%	Uncontrollable spread, extreme intensity
Very High	20–30%	Rapid spread, difficult suppression
High	30–40%	Active spreading, standard suppression efforts
Moderate	40–50%	Slow spread, effective suppression
Low	>50%	Minimal fire spread, containment easily achieved

Table 10: Relative Humidity Fire Danger Classification

Critical Humidity Transitions (2022–2025)

January

- **Coastal dominance (60–72%)**: Chengalpattu, Villupuram, Cuddalore showing elevated RH
- **Central moderate (45–64%)**: Vellore, Salem, Erode at 50–60% range
- **Interior drying (25–38%)**: Dharmapuri, Namakkal entering critical dry zone
- **Spatial gradient**: Clear eastward increase in humidity

February

- **Accelerated drying**: Coastal resilience (51–68%); central plateau drying (45–50%); critical zone (36–45%) in western and central divisions
- **Critical development**: February represents transition toward extreme fire danger conditions
- **Spatial concentration**: Dry zone intensifying in north-central plateau

March

- **Critical fire danger initiation**: Coastal divisions (42–68%); interior critical zone (11–31%); extreme drying in north-central plateau
- **Expanded low-RH zone**: Areas with RH 33–41% now covering 20–30% of state area
- **Fire risk apex approach**: Conditions approaching peak fire danger

April

- **Peak pre-monsoon conditions**: Coastal moderation (37–58%); interior critical zone (14–35%); April represents critical month for fire occurrence
- **Geographic hotspot**: North-central plateau experiencing worst drying
- **Spatial extent**: Critical zones covering 30–40% of forested areas

May

- **Monsoon influence initiation**: Coastal elevation (50–65%); interior persistent drying (42–57%); monsoon gradient evident
- **Transition period**: May represents shift toward monsoon-dominated conditions
- **Fire risk maintenance**: Despite monsoon arrival, interior regions maintaining critical dryness

June

- **Strong monsoon dominance**: Widespread elevation (50–65%); coastal dominant (66–76%); interior significant elevation (35–43%)
- **Fire danger mitigation**: June humidity levels representing effective fire risk reduction
- **Monsoon establishment**: Clear shift to moisture-dominated regime

Multi-Year Humidity Comparison: Years 2023–2025 generally followed similar patterns to 2022 (above given), with some notable variations. 2024 showed intensified interior drying during critical months (February–April), suggesting heightened fire vulnerability during peak fire season.

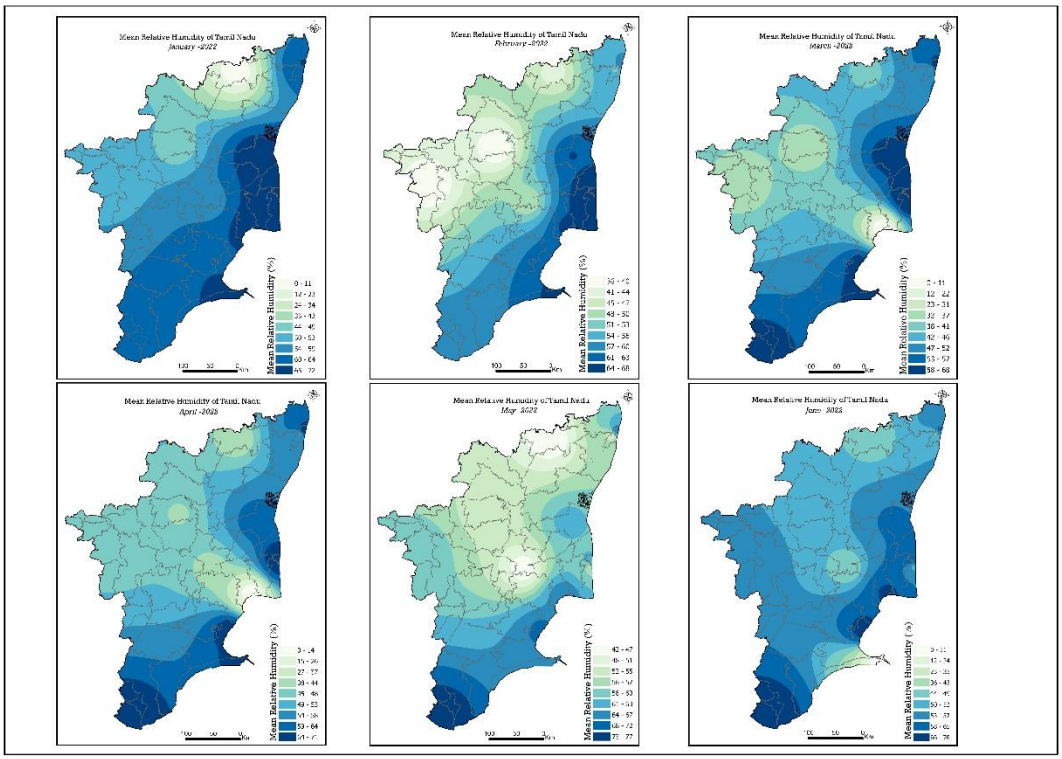


Figure 36: Monthly Mean Relative Humidity -2022

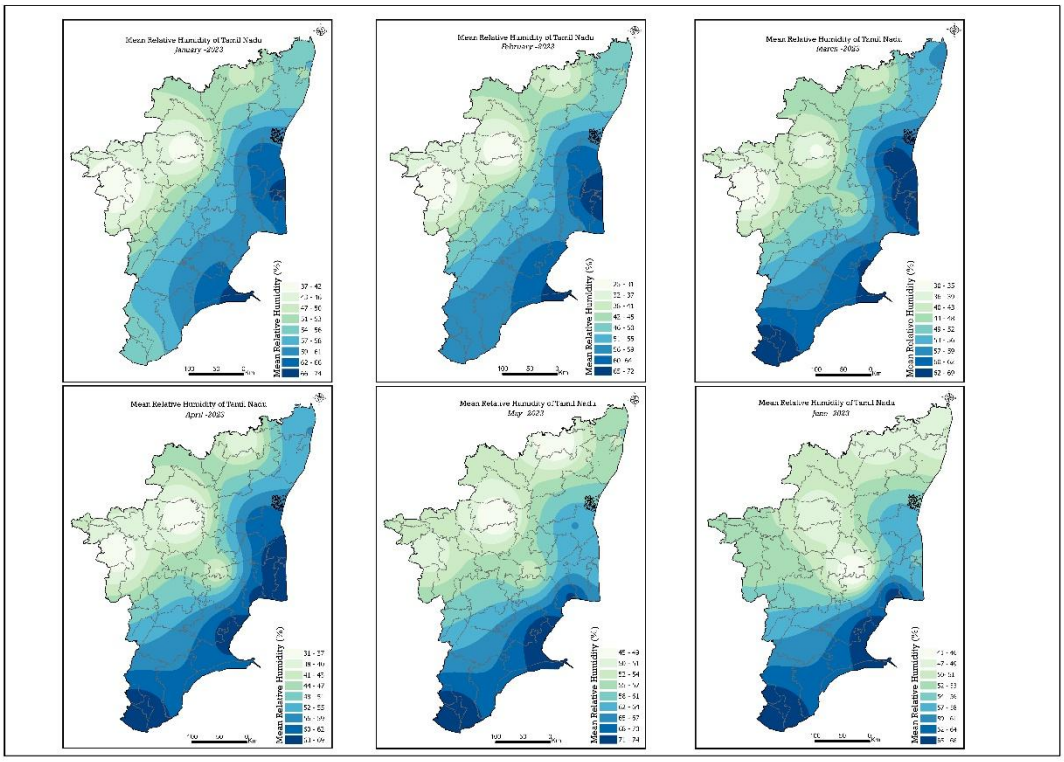


Figure 37: Monthly Mean Relative Humidity -2023

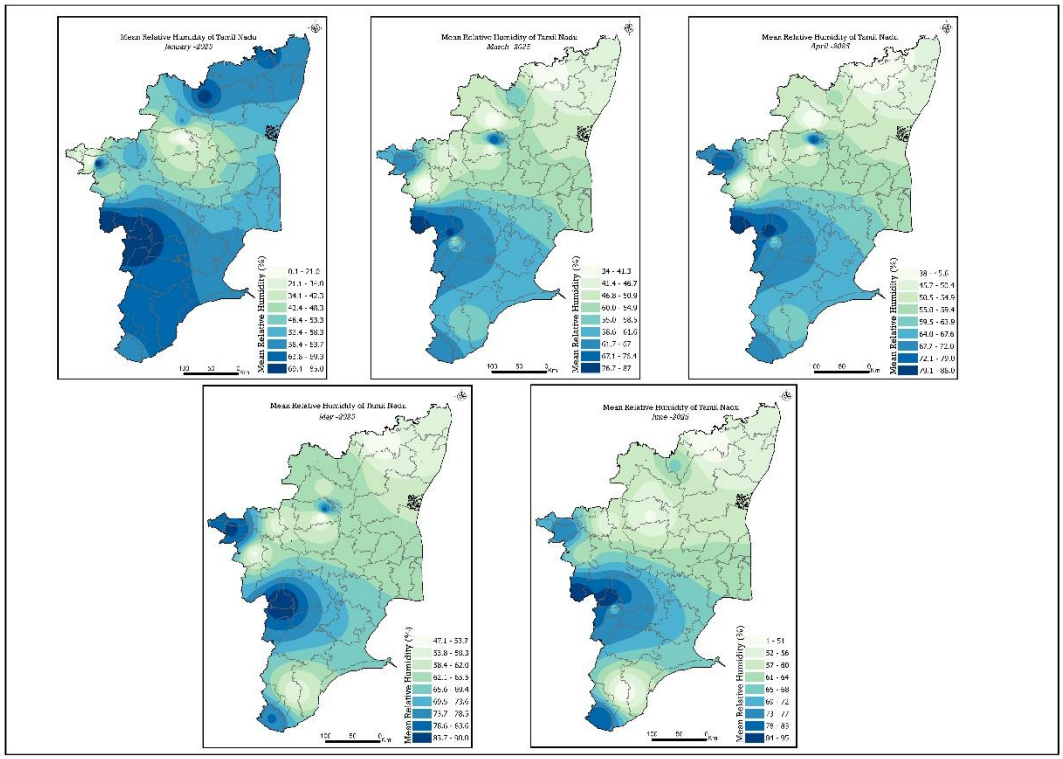


Figure 38: Monthly Mean Relative Humidity -2025

Wind Speed Dynamics (2022-2025)

Mean monthly wind speed data reveals distinct spatial patterns across Tamil Nadu's forest divisions:

High Wind Speed Zones (>9 km/h)

- **Nilgiris, Coimbatore, Kanniyakumari, Tiruchirappalli divisions**: Elevated wind speeds (9–12.6 km/h) across fire season
- **Eastern coastal areas**: Wind speeds 9–12 km/h, particularly in February

Low Wind Speed Zones (<8.3 km/h)

- **Hosur, Tiruppattur, Vellore, Dharmapuri divisions**: Consistently elevated wind speeds (0.9–8.3 km/h)
- **Western Ghats core areas** (Theni, Kodaikanal): Protected by topographic shadowing

Critical High-Risk Period: March–April

The March–April period demonstrates critical escalation in mean wind speeds coinciding with maximum fire incidence:

- **Nilgiris, Coimbatore, Kanniyakumari, Pudukottai, Tiruchirappalli**: March 2022 (9–13.1 km/h); March 2023 (7.83–12.7 km/h); March 2024 (8.4–11.5 km/h); April 2024 (9.8–12.6 km/h)

- **Kodaikanal Division**: March 2022 (7.6–8.9 km/h); sustained moderate-high wind speeds

Fire-Wind Interaction: The simultaneous occurrence of elevated wind speeds and high ambient temperatures during March–April creates optimal conditions for fire initiation. Forest fire incidents peak during this period, with Kodaikanal and Vellore reporting 95–280 and 62–142 incidents, respectively, across 2022–2025.

May–June Period (Post-Peak, Pre-Monsoon)

Wind speeds begin moderating as the Southwest Monsoon approaches:

- **Coimbatore, Nilgiris, WL ATR Pollachi divisions**: May 2022 (14.7–20.1 km/h); May 2023 (9.1–19.9 km/h); May 2025 (9.1–19.9 km/h)
- **Salem, Dharmapuri, Villupuram, Cuddalore divisions**: June 2024 (3–6 km/h)
- **Southern divisions**: Increasing southwestern flow beginning May, with variable local wind effects
- **Coastal areas**: Wind speed intensification due to land-sea thermal gradient

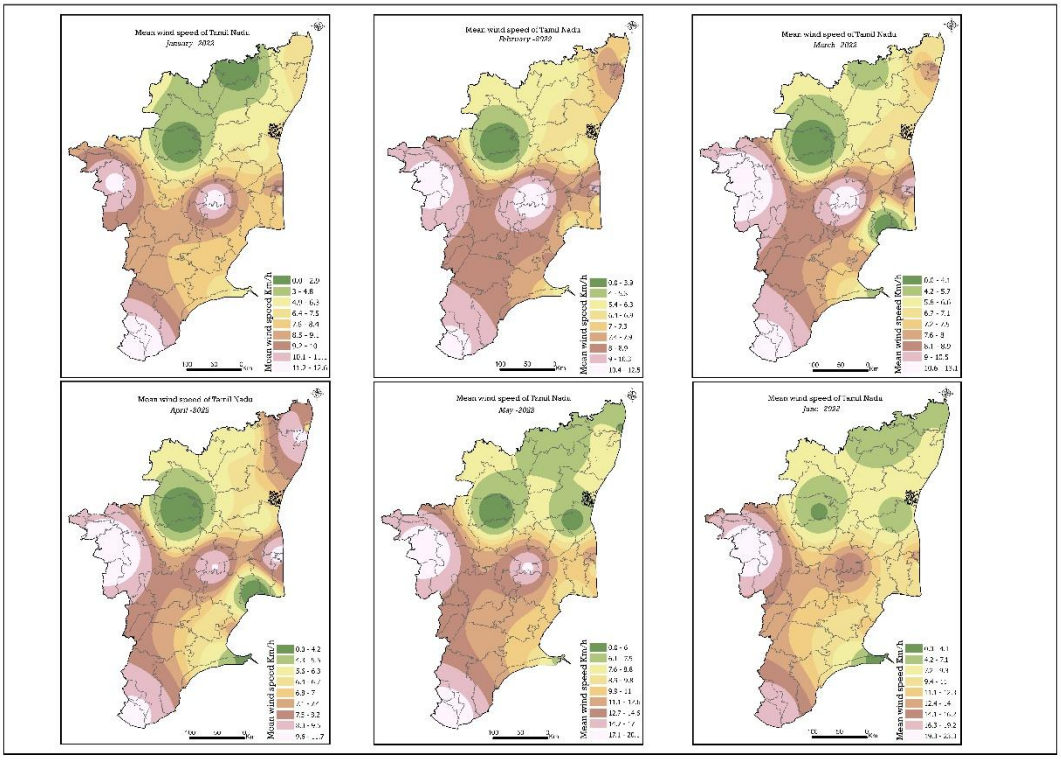


Figure 39: Monthly Mean wind speed -2022

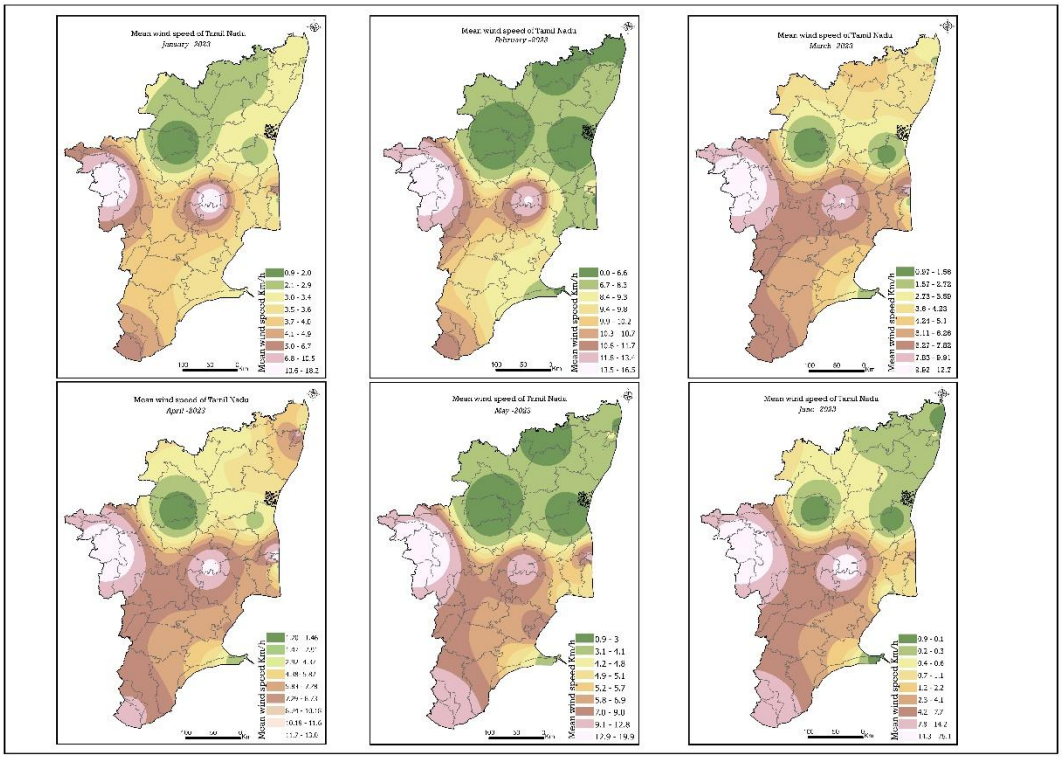


Figure 40: Monthly Mean wind speed -2023

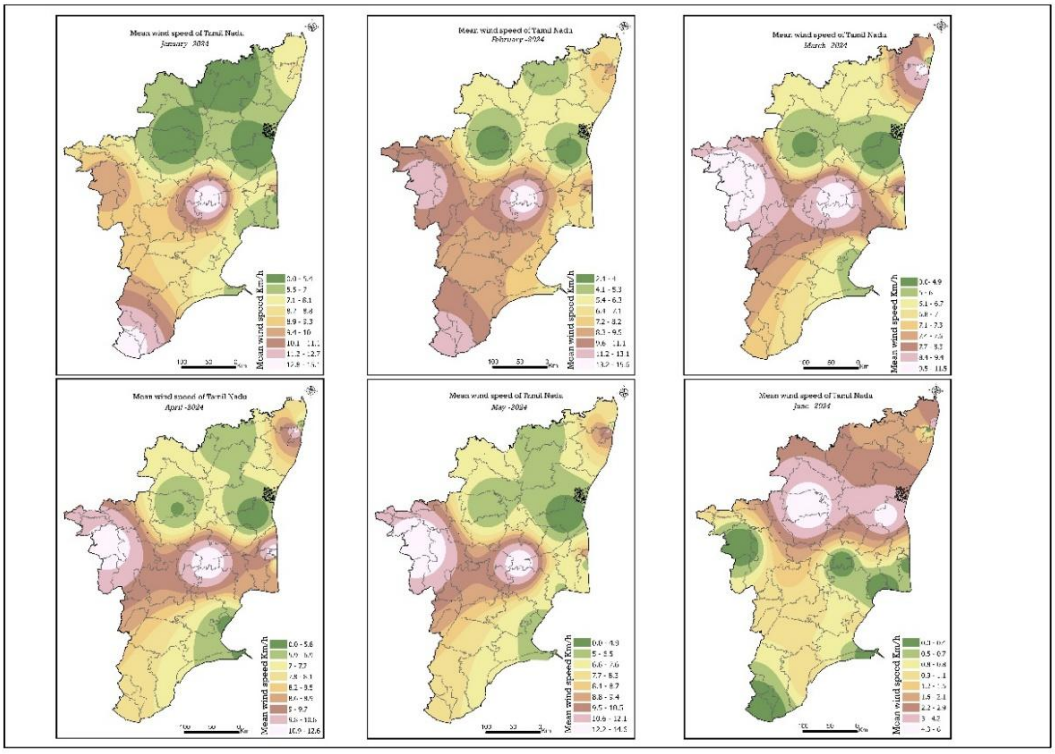


Figure 41: Monthly Mean wind speed -2024

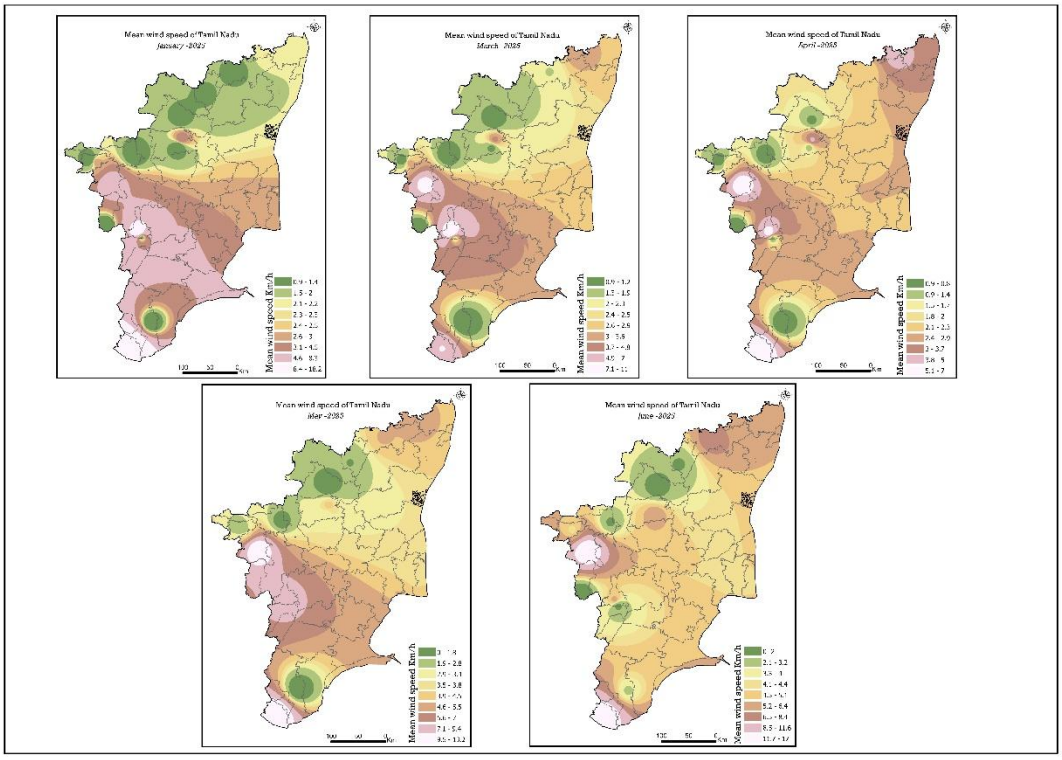


Figure 42: Monthly Mean wind speed -2025

Wind Direction Patterns and Forest Fire Progression

Wind direction patterns show consistent seasonal progression across 2022–2025 analysis period:

January–February: Post-Northeast Monsoon Transition

- **Coastal divisions**: Southeast (SE) to South-Southeast (SSE) dominance
- **Central plateau**: Variable Southeast to South (SE–S) patterns
- **Western plateau**: Variable SE to Southwest (SW) with local orographic effects
- **Southern interior**: Variable SE to S patterns

March–April: Pre-Monsoon Southwest Wind Development

- **Coastal divisions**: South (S) to South-Southwest (SSW) with southerly component strengthening
- **Central plateau**: Enhanced Southwest (SW) patterns; heating-driven SW component developing
- **Western plateau**: Strong SW patterns; pre-monsoon heating with topographic amplification
- **Southern interior**: Variable S to SW patterns; emerging SW components

Critical Fire-Wind Coupling: March–April wind shift toward Southwest coincides with peak fire season, exacerbating fire behaviour through favourable propagation.

May–June: Southwest Monsoon Wind Establishment

- **Coastal divisions**: Southwest (SW) to West-Southwest (WSW) with West (W) component; monsoon influence beginning
- **Central plateau**: Southwest to West patterns; monsoon transition accelerating
- **Western plateau**: West (W) to West-Southwest (WSW) patterns; monsoon flow enhanced by topography
- **Southern interior**: Variable SW to W patterns; monsoon influence with local variability

Multi-Year Wind Direction Consistency: Remarkable consistency between 2022–2025 directional patterns indicate stable seasonal wind direction progression, with no significant anomalies in directional transitions.

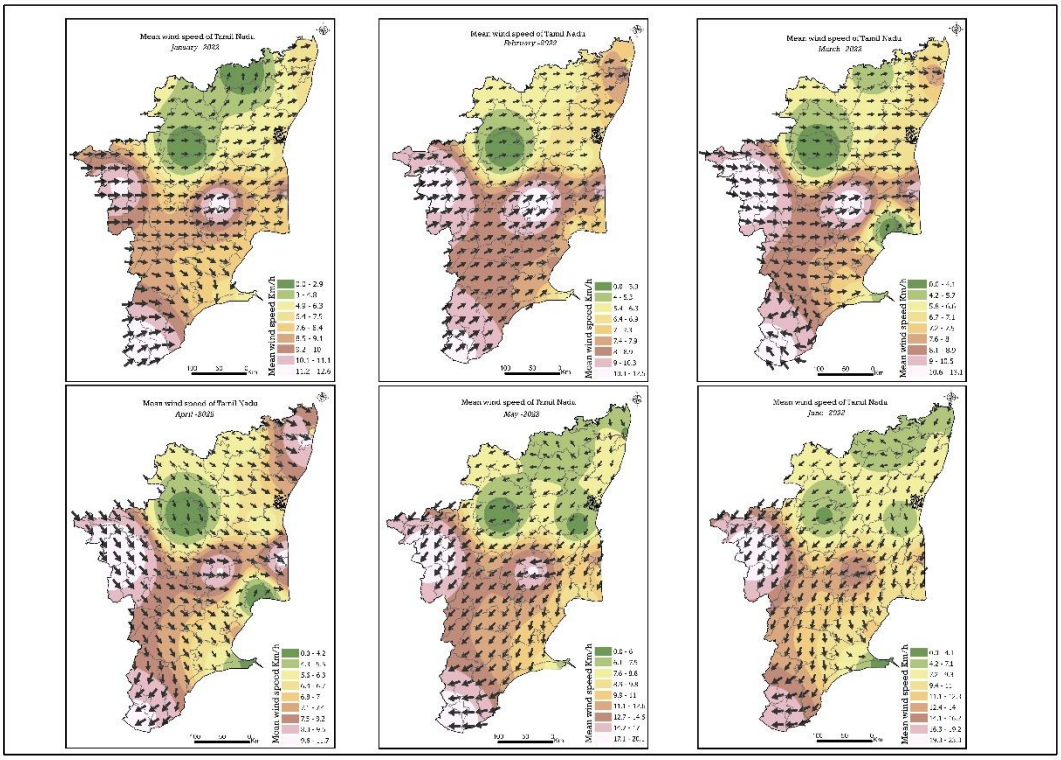


Figure 43: Monthly Mean wind speed and Flow Direction -2022

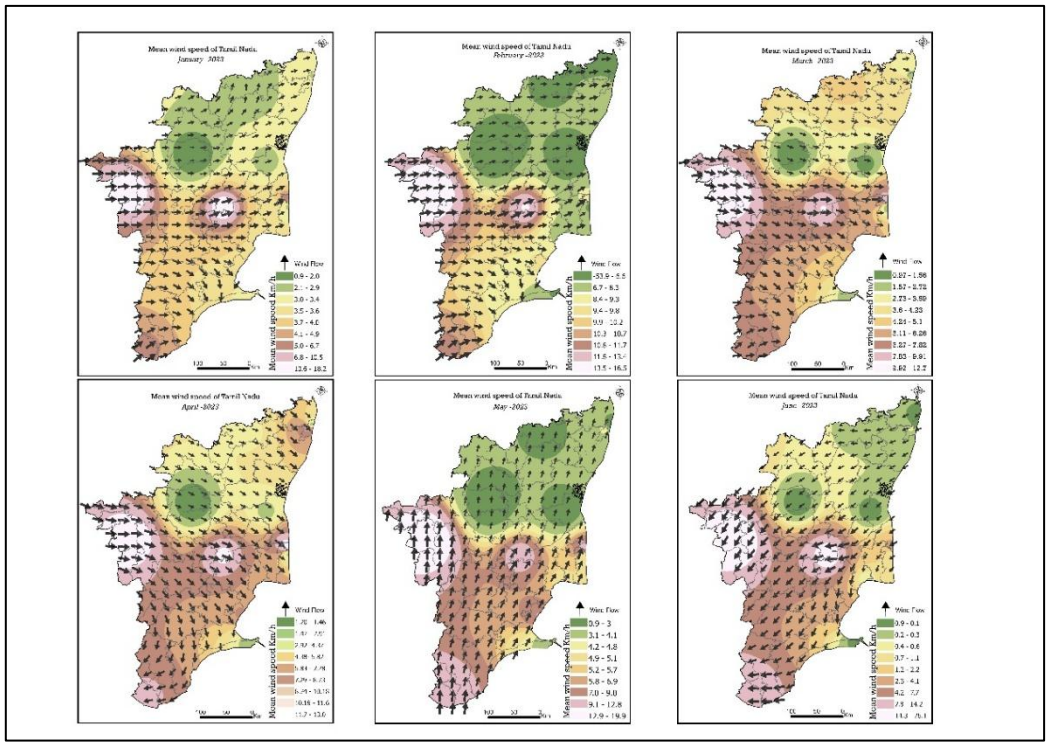


Figure 44: Monthly Mean wind speed and Flow Direction -2023

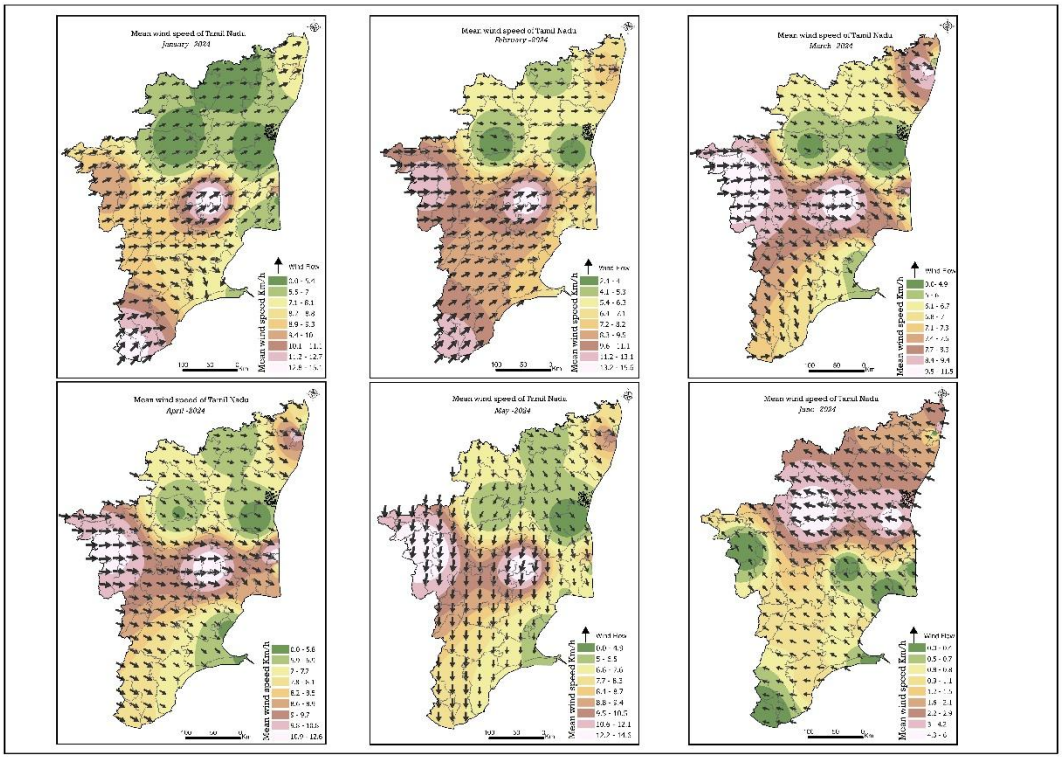


Figure 45: Monthly Mean wind speed and Flow Direction -2024

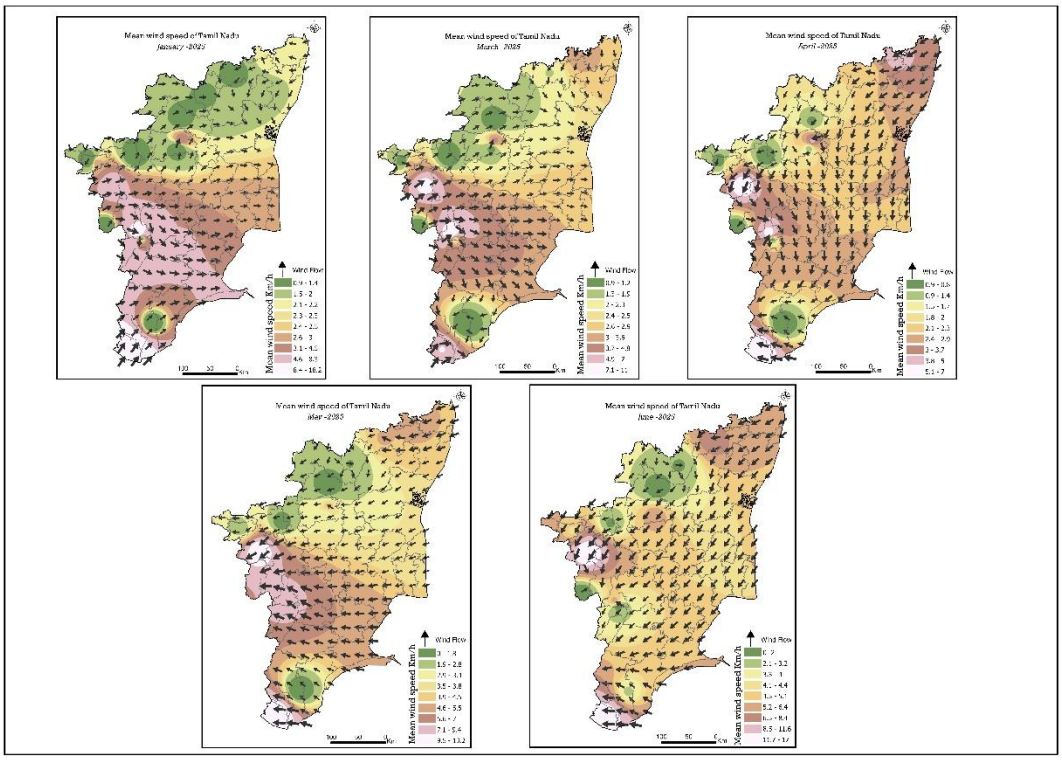
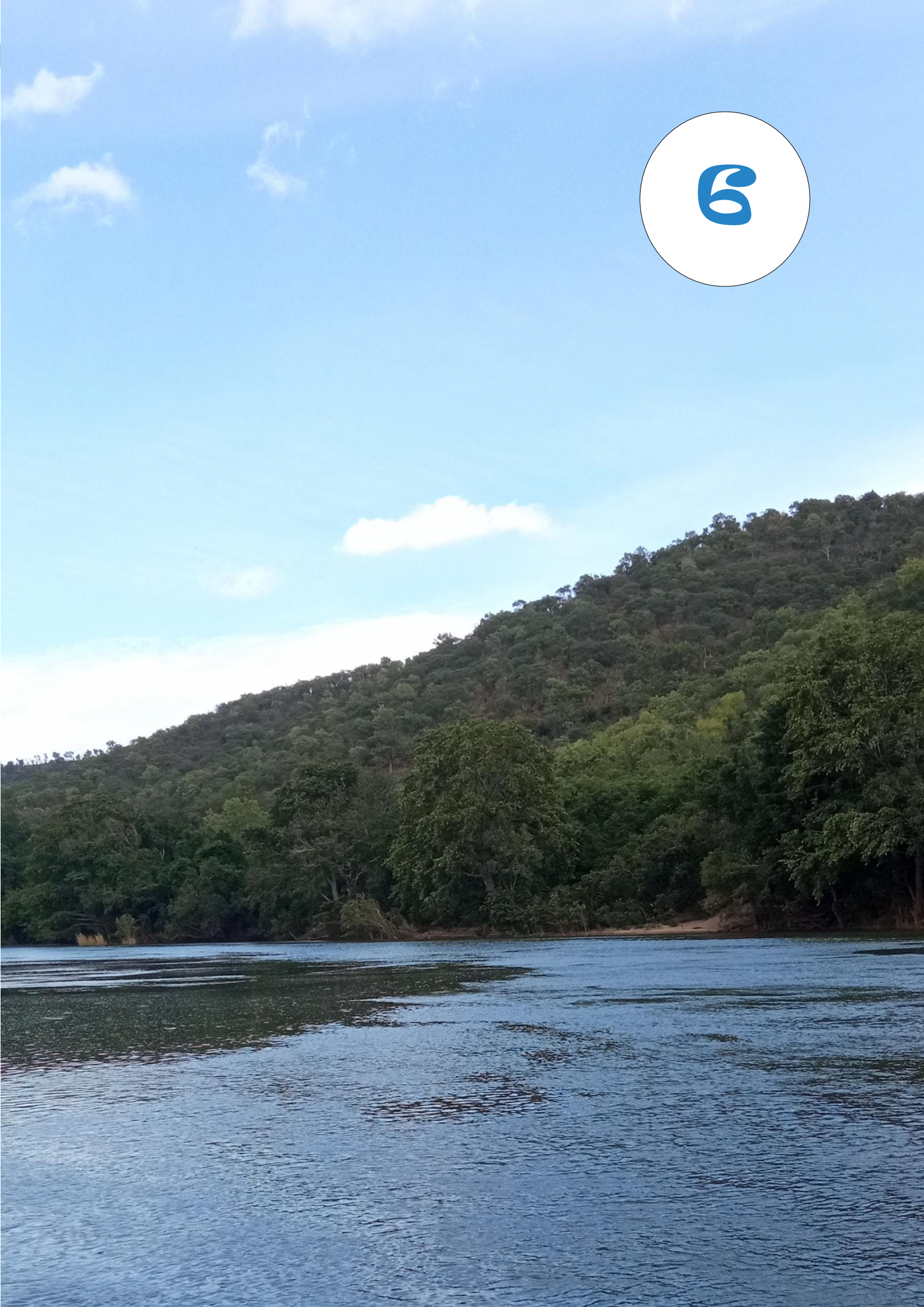


Figure 46: Monthly Mean wind speed and Flow Direction -2025





CHAPTER 6: CUMULATIVE METEOROLOGICAL ANALYSIS

Cumulative overall average monthly weather datasets for the period 2022–2025 were analysed to assess forest fire–relevant meteorological parameters, including Temperature, Rainfall, Relative humidity, and wind Speed with Flow Directions. The analysis was conducted on a division-wise spatial distribution basis to identify temporal variability and high-risk fire zones across the study area. The four-year aggregated dataset enabled systematic evaluation of climatic trends influencing forest fire susceptibility, supporting risk zonation and long-term fire management planning.

Temperature Patterns (2022-2025)

Moderate Temperature Zone (Coastal and Eastern Regions)

The India Meteorological Department data for average mean temperatures from January to June reveals distinct zonal patterns:

- **2022:** Temperature range of 25.4–31.8°C maintained moderate conditions in coastal divisions including Thiruvallur, Thanjavur, Nagapattinam, Thoothukudi, Tirunelveli, Kalakkadu, Kanyakumari, Megamalai, and parts of Theni and Ramanathapuram.
- **2023:** Elevated temperatures of 31.6–32.8°C in eastern coastal areas (Cuddalore, Ariyalur) and southern divisions, creating manageable but elevated fire risk conditions.
- **2024:** Relatively stable conditions (28.4–30.4°C) in western divisions of Nilgiris, Coimbatore, and northern areas including Hosur, Tirupattur, Vellore, Tiruvannamalai, Chengalpattu, Chennai, and Villupuram.
- **2025:** Anomalously low temperatures (18.3–25.9°C) due to monsoon influence in western divisions, reducing immediate fire risk.

High Temperature Zone (Western and Central Interior)

Interior regions consistently experience elevated temperatures creating severe fire conditions:

- **2022:** Severe desiccation conditions at 31.9–32.9°C in western and central divisions.
- **2023:** Extreme heat stress with temperatures reaching 32.9–33.7°C in western and central divisions.
- **2024:** Critical threshold temperatures of 30.5–34.1°C in central divisions.
- **2025:** Sustained extreme conditions (26.0–30.9°C) in northern and northeastern divisions.

Critical Temperature Thresholds

Temperatures exceeding 33.8°C combined with humidity below 45% create optimal fire conditions. Divisions consistently exceeding this threshold include:

- Northern divisions: Tiruvallur, Vellore, Tiruvannamalai, Tirupattur, Hosur
- Central divisions: Salem, Erode, Namakkal, Villupuram
- Western divisions: Coimbatore, Tiruppur, Pollachi, Theni, Kodaikanal
- Southern divisions (2025): Tirunelveli, Kanyakumari

The temperature differential of 5–8°C between coastal and interior regions, combined with humidity variations, creates exponentially higher fire intensity in interior divisions.

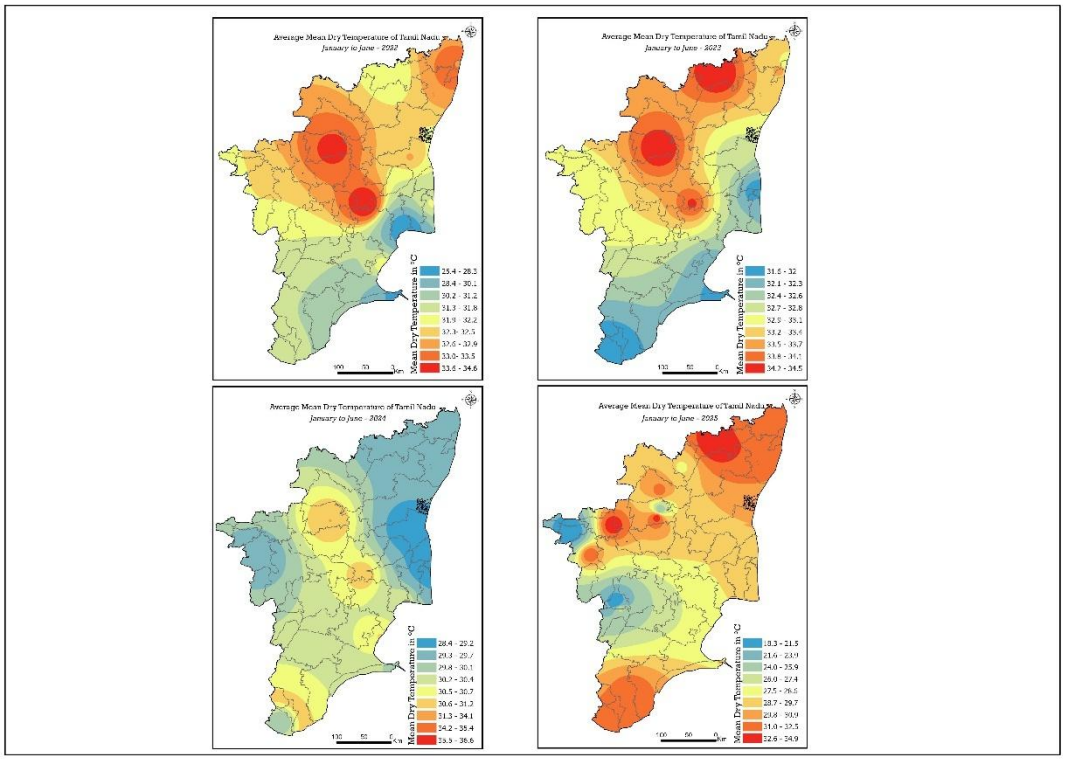


Figure 47: Average Mean Dry Temperature 2022-2025

Rainfall Patterns (2022-2025)

High Rainfall Zones (Coastal and Eastern Regions)

Adequate rainfall reduces fuel flammability and increases vegetation resilience:

- **2022:** Rainfall range of 6.0–8.2 mm with coastal concentrations.
- **2023:** Peak rainfall of 5.6–10.6 mm in eastern coastal areas.
- **2024:** Moderate rainfall (4.9–8.2 mm) with pronounced coastal gradient.

- **2025:** Annual cumulative rainfall of 90–309.8 mm, showing significant monsoon impact in coastal regions.

Low Rainfall and Critical Drought Zones (Northern and Interior Divisions)

Severe drought conditions prevail in interior divisions during dry months:

- **2022:** Extreme drought conditions with 0–3.1 mm in central divisions including Namakkal, Thiruvarur, Thanjavur, and northern divisions (Hosur, Vellore, Tiruvallur, Chennai, Chengalpattu, Tirupattur, Dharmapuri, Tiruvannamalai).
- **2023:** Persistent water deficit of 0.1–3.1 mm in interior regions of southern, western, and northern divisions.
- **2024:** Continued water deficit of 0–3.1 mm in northern and northeastern divisions.
- **2025:** Variable deficit patterns (34.7–90 mm) showing continued low rainfall except in western divisions.

Fire Risk Implications of Rainfall Deficit

The 4–5 mm rainfall differential between coastal and western regions represents a critical fire-susceptibility threshold. Low rainfall zones require enhanced surveillance and preventive fire management measures.

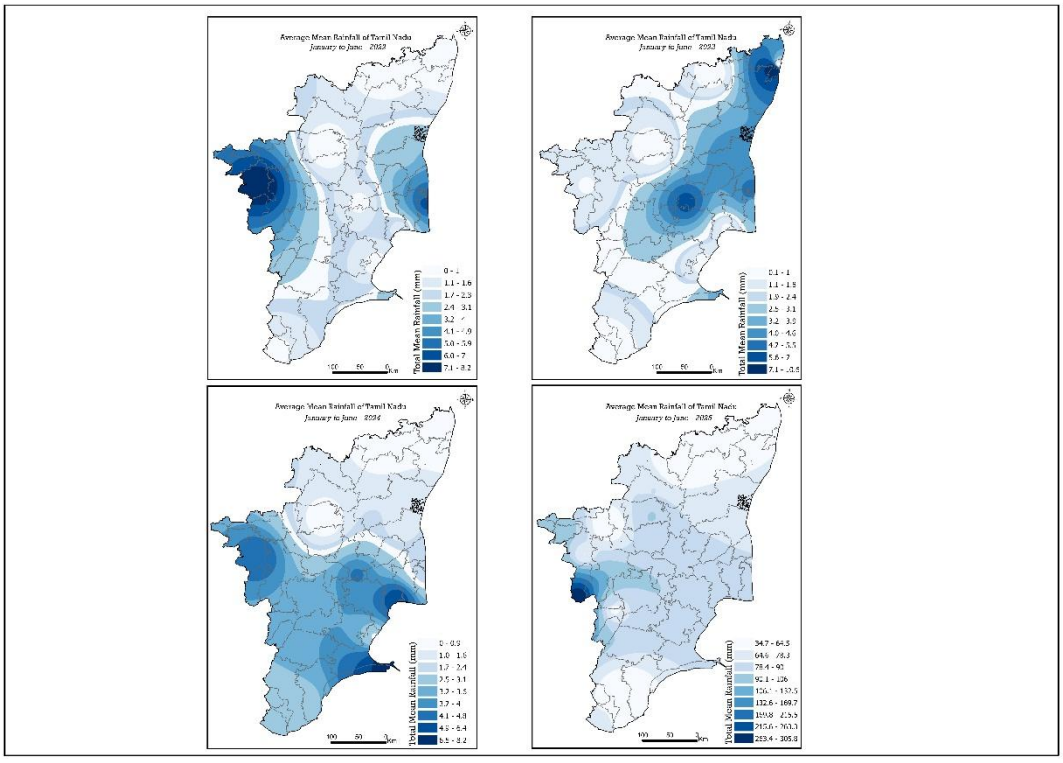


Figure 48: Average Mean Rainfall 2022-2025

Relative Humidity and Fuel Moisture (2022-2025)

High Humidity Zones (Coastal and Southern Regions)

High humidity reduces fuel moisture content and combustibility:

- **2022:** Moisture-buffering humidity of 59.7–67.3% in coastal regions.
- **2023:** Moisture-rich conditions maintained at 60–68%.
- **2024:** Consistent high-humidity environment of 57.6–68.8%.
- **2025:** Exceptional moisture levels of 73–86% in coastal-southern areas.

Low Humidity Zones (Western and Central Interior)

Critical dry conditions persist in interior divisions:

- **2022:** Critical dry conditions at 34.5–49.6% humidity.
- **2023:** Persistent low-moisture environment of 36.8–50.5%.
- **2024:** Desiccated fuel conditions at 34–48.6% humidity.
- **2025:** Slight improvement to 45.2–61%, but remaining critically low.

Critical Humidity Threshold

Humidity levels below 45% represent acute fire hazard conditions. Divisions maintaining <45% humidity throughout the study period include:

- Northern divisions: Tiruvallur, Vellore, Tiruvannamalai, Tirupattur, Hosur, Dharmapuri, Villupuram
- Western divisions: Nilgiris, Coimbatore, Tiruppur, Pollachi, Theni, Kodaikanal
- Central divisions: Salem, Namakkal, Erode

These divisions show sustained fire vulnerability due to persistently low fuel moisture content.

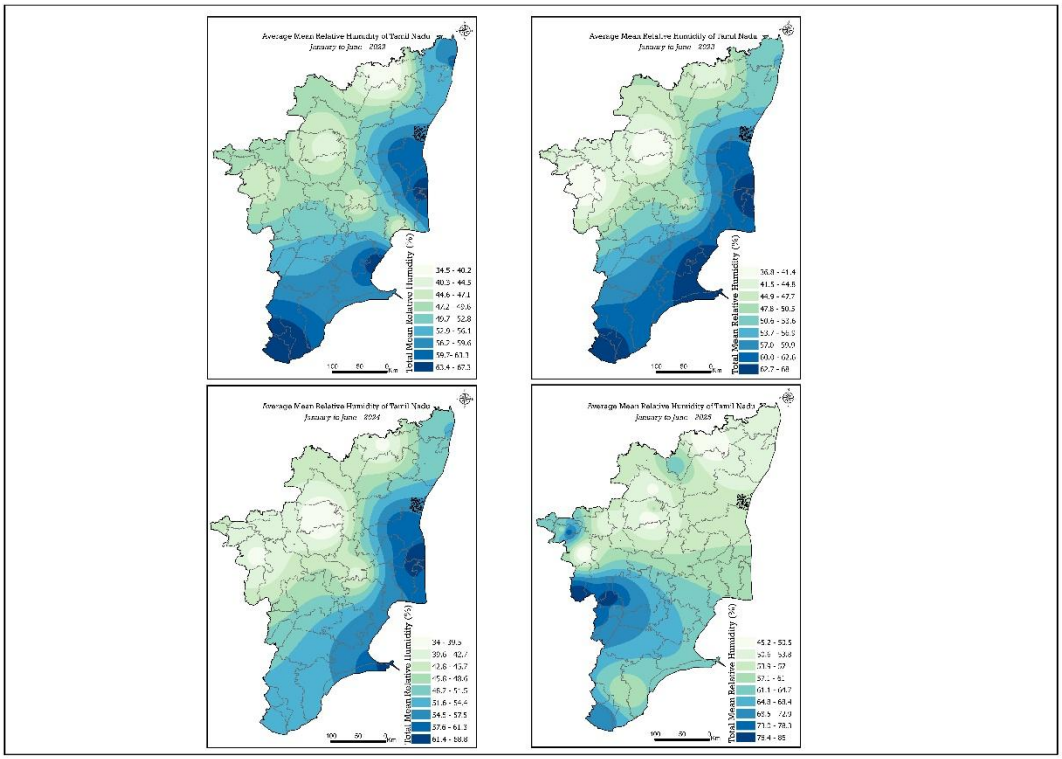


Figure 49: Average Mean Relative Humidity 2022-2025

Wind Speed and Direction Analysis (2022-2025)

Low Wind Zones (Eastern and Coastal Regions)

Lower wind speeds provide better fire containment conditions:

- **2022:** Wind speeds of 0.0–8.4 km/h in Salem, Dharmapuri, Tirupattur, and Vellore divisions.
- **2023:** Manageable wind conditions of 3.5–8.9 km/h in Tiruvannamalai, Salem, Dharmapuri, Tirupattur, Vellore, Chennai, Tiruvallur, and Chengalpattu divisions.
- **2024:** Moderate wind regime of 3.3–6.1 km/h in Vellore, Cuddalore, and Salem.
- **2025:** Relatively calm conditions of 0.5–3.4 km/h in Nilgiris, Sathyamangalam, and Dharmapuri divisions.

High Wind Zones (Western, Southern, Interior, and Northern Divisions)

Extreme wind conditions accelerate fire spread:

- **2022:** Extreme wind velocity of 11–15.2 km/h in western, southern, and interior divisions.
- **2023:** Severe wind stress of 13–15.5 km/h in western, central, and southern divisions.

- **2024:** Sustained high-speed winds of 8.6–11.5 km/h in western and central divisions.
- **2025:** Extreme variability of 6.3–17.1 km/h with exceptional peaks in Vellore, Hosur, Tiruvannamalai, Coimbatore, Tiruppur, Pollachi, Kodaikanal, and Megamalai.

Wind Direction Patterns (Vector Analysis)

IMD provided Average wind speed with wind flow directions of North, North east, East, South east, South, South west, West, North west.

Where:

- w_i = frequency (number of days)
- θ_i = angle corresponding to direction
    - North = 0°
    - North-East = 45°
    - East = 90°
    - South-East = 135°
    - South = 180°
    - South-West = 225°
    - West = 270°
    - North-West = 315°

Wind directions are angular data, so the correct mean must use circular statistics

Mathematical approach for wind direction analysis

$$\overline{\theta} = \arctan\ 2\left(\sum\ w_i \sin\left(\theta_i\right), \sum\ w_i \cos\left(\theta_i\right)\right)$$

Where w_i represents frequency (number of days) and θ_i represents the angle corresponding to direction.

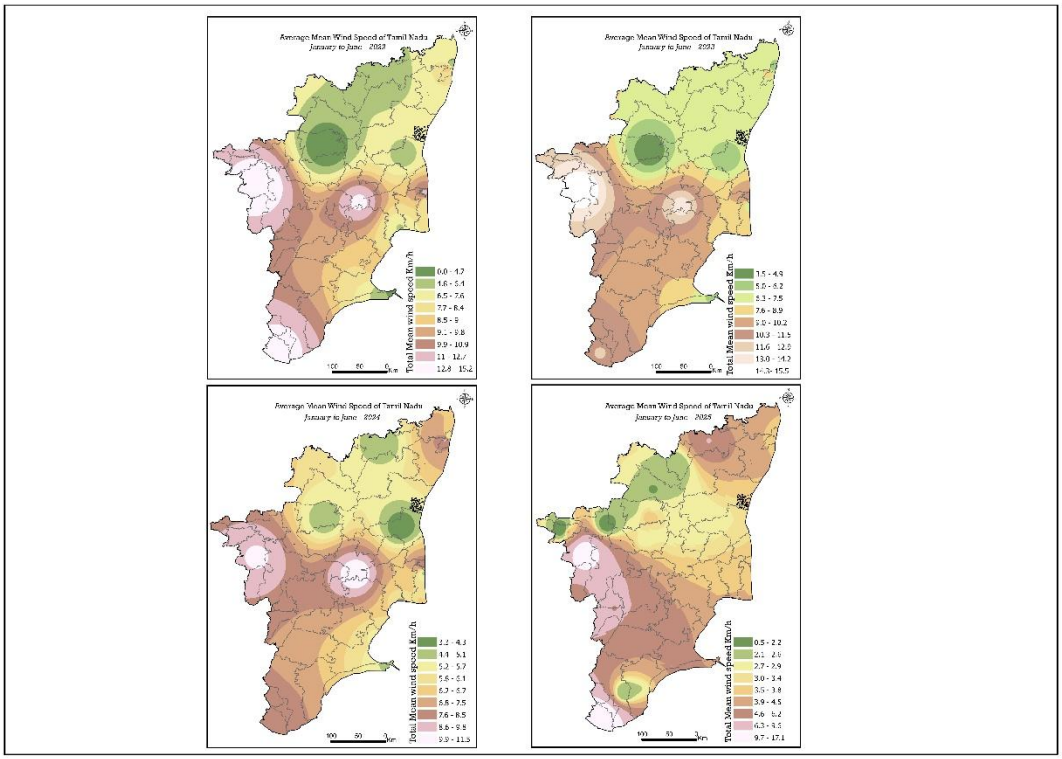


Figure 50: Average Mean Wind Speed 2022-2025

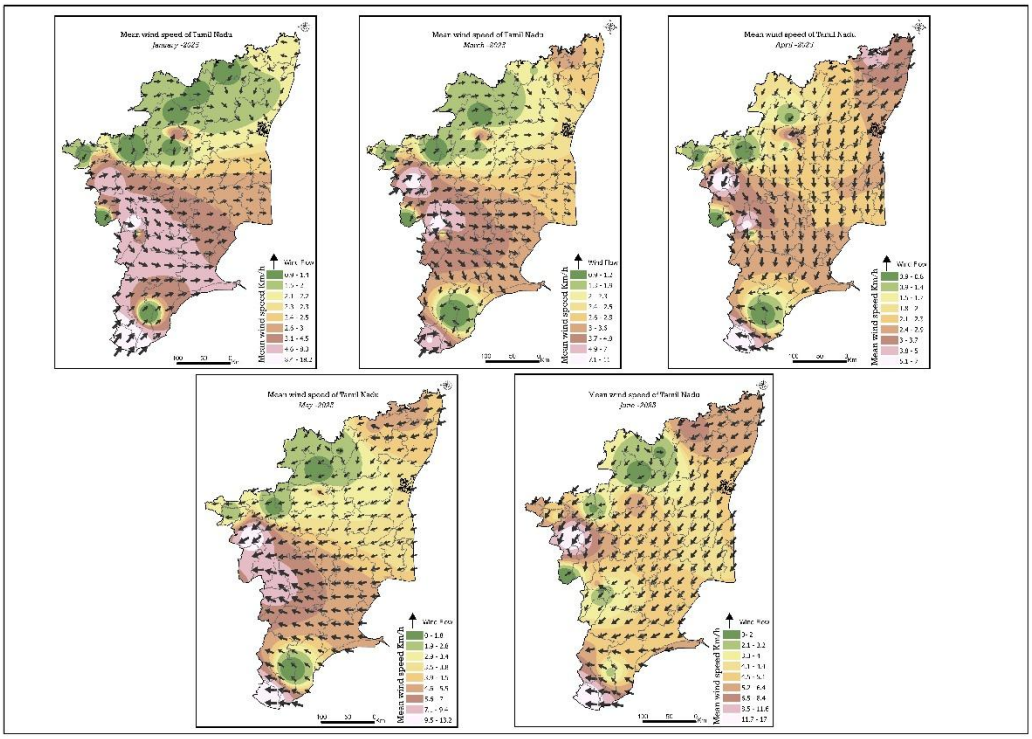


Figure 51: Average Mean Wind Speed and Flow Direction 2022-2025

Wind flow analysis reveals consistent directional patterns affecting fire spread:

- **Northern divisions:** Predominantly northwest flow (320–340°) in Tiruvallur, Vellore, Tiruvannamalai, Tirupattur, Hosur, Dharmapuri
- **Central divisions:** Variable flows with southwest dominance (200–230°) in Salem, Namakkal, Villupuram, Ariyalur, Tiruchirapalli
- **South and Western divisions:** Strong south west to westerly dominance (210–270°) in Madurai, Tirunelveli, Kanyakumari, Coimbatore, Theni, Kodaikanal, and other wildlife sanctuary areas

Wind zones exceeding 10 km/h paired with low fuel moisture create extreme fire spread scenarios. Western divisions consistently experience >11 km/h winds, enabling rapid fire propagation.

Critical Fire Risk Thresholds

Division wise Critical fire risk in below table.

Critical Threshold	Trigger Value	Status	High-Risk Divisions	Years
Temperature Threshold	>33.8°C	**CRITICAL**	Coimbatore, Tiruppur, Theni	2022-2024
			Salem, Namakkal, Erode	2022-2024
			Vellore, Tiruvannamalai	2022-2024
Humidity Threshold	<45%	**CRITICAL**	Coimbatore, Tiruppur, Pollachi	2022-2025
			Nilgiris, Kodaikanal, Theni	2022-2025
			Salem, Namakkal, Erode	2022-2025
			Vellore, Tiruvannamalai	2022-2025
Rainfall Deficit	0-3.1 mm	**CRITICAL**	Hosur, Vellore, Dharmapuri	2022-2024
			Salem, Namakkal, Coimbatore	2022-2024
			Tiruppur, Theni, Madurai	2022-2024
Wind Speed	>11 km/h	**EXTREME**	Coimbatore, Tiruppur, Pollachi	2022-2024
			Nilgiris, Kodaikanal, Theni	2022-2024
Combined Critical	Temp + Humidity	**EXTREME**	Coimbatore, Tiruppur, Salem	2022-2024

Conditions	+ Low Rainfall		Namakkal, Theni, Kodaikanal	
	+ High Wind		Vellore, Tiruvannamalai	

Table 11: Critical Fire Risk Thresholds and Affected Divisions (2022-2025)

Critical Fire Risk Zones

Based on four years of meteorological data analysis, the following divisions are identified as High Fire Risk Zones:

Risk Category	Risk Level	Divisions
TIER 1 - EXTREME RISK	Consistently Critical	Coimbatore, Tiruppur, Pollachi
		Theni, Kodaikanal, Nilgiris
		Salem, Namakkal, Erode
		Tiruvannamalai, Vellore, Tirupattur, Hosur
TIER 2 - MODERATE-HIGH RISK	Frequent Critical Conditions	Tiruvallur, Dharmapuri, Villupuram
		Kanyakumari, Tirunelveli (2025)
		Madurai, Dindigul
TIER 3 - LOW RISK	Minimal Critical Events	Thiruvarur, Thanjavur, Nagapattinam
		Thoothukudi, Cuddalore, Ariyalur

Table 12: Division-wise Fire Risk Classification (2022-2025 Analysis)

Key Meteorological Drivers

1. **Temperature-Humidity Interaction:** The combination of temperatures >33.8°C with humidity <45% creates optimal fire conditions. This is especially critical in western and central divisions where both factors regularly coincide.

2. **Rainfall Deficit:** The 4–5 mm differential between coastal (adequate) and interior (critical deficit) rainfall zones directly correlates with fire susceptibility. Interior divisions receive insufficient moisture for fuel moisture retention.

3. **Wind Amplification:** Wind speeds exceeding 10–11 km/h in western and central divisions, combined with low fuel moisture, enable rapid fire spread. The consistency of southwest to western winds (210–270°) in these zones exacerbates fire propagation.

4. **Temporal Patterns:** Fire risk is most critical during January to June (pre-monsoon period) when temperatures peak, rainfall is minimal, humidity drops, and wind patterns intensify.

Division-wise Strategic Recommendations

For Extreme Risk Divisions (Coimbatore, WL ATR Pollachi, Tiruppur, Theni, Megamalai, Kodaikanal, Tiruvannamalai, Vellore, Hosur, Dharamapuri, Salem, Namakkal, Erode, WL STR Satiyamangalam Nilgiris, WL, KMTR and Kaniyakummari)**:**

- Enhanced surveillance and ground patrolling from January to May
- Strategic pre-positioning of firefighting equipment
- Implementation of fuel reduction measures during monsoon periods
- Regular monitoring of weather forecasts for critical threshold combinations

For Moderate-High Risk Divisions:

- Standard surveillance protocols with enhanced monitoring during March-May
- Capacity building for rapid response capabilities
- Community awareness and prevention programs

For Coastal and Eastern Divisions:

- Standard monitoring protocols
- Emphasis on prevention and community engagement during occasional high-risk periods

Conclusion

The meteorological analysis from 2022–2025 demonstrates that Tamil Nadu's western and central interior divisions face consistent and sustained forest fire risk.

1. **Persistent high temperatures** (frequently >33.8°C)
2. **Chronic rainfall deficit** (0–3.1 mm during critical months)
3. **Persistently low humidity** (<45% in interior divisions)
4. **Strong consistent wind patterns** (>11 km/h with directional consistency)

These factors act synergistically to create highly flammable conditions in specific geographic zones. The coastal and eastern divisions maintain relative safety due to higher rainfall, elevated humidity, and lower wind speeds, despite occasional temperature elevations.

2025 Outlook: Early data suggests improved rainfall in western divisions and lower temperatures due to monsoon influence, potentially reducing immediate fire risk. However, the continuation of critical humidity thresholds in interior divisions warrants maintained vigilance.

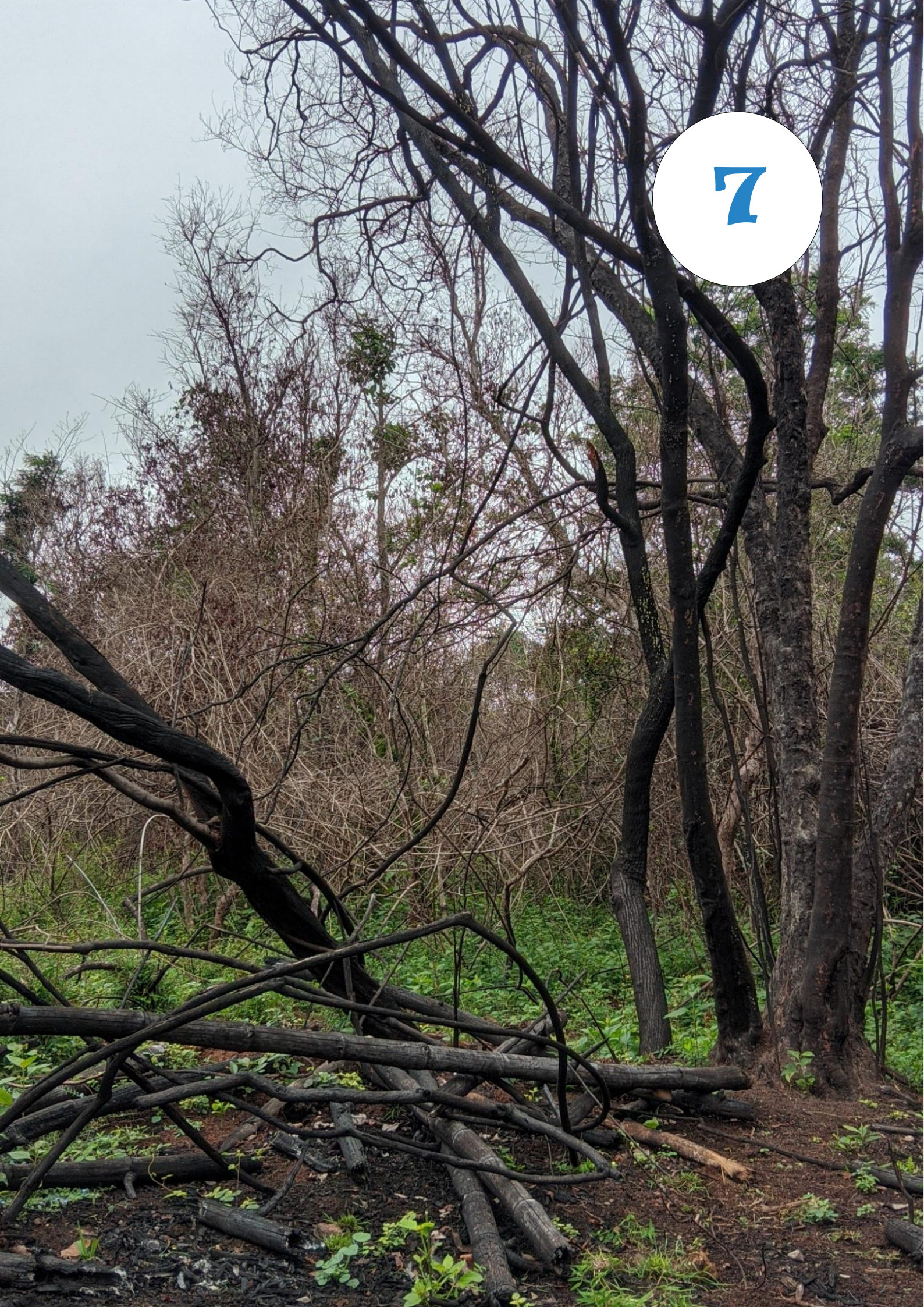
Data-Driven Fire Management Strategy

A geographically tiered fire management approach is recommended:

- **Intensive management zone:** Western and central interior divisions with equipment, personnel, and planning resources concentrated in high-risk areas
- **Standard management zone:** Northern-central border divisions with seasonal intensification
- **Baseline management zone:** Coastal and eastern divisions with standard protocols

Implementation of this strategy, supported by this meteorological evidence, will optimize forest fire management resources and improve protection outcomes for Tamil Nadu's forest resources.

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CHAPTER 7: GROUND TRUTHING OF BURNT AREA ASSESSED USING SATELLITE IMAGERY

Introduction

Ground truthing is the process of conducting **on-site verification of remotely sensed data** to ensure the accuracy of spatial analyses and interpretations. In the context of forest fire management, ground truthing plays a critical role in validating **satellite-derived burnt area estimates** by physically visiting the affected locations, assessing vegetation condition, and recording actual field measurements.

This process bridges the gap between **remote sensing outputs** (such as burnt area polygons derived from satellite imagery) and **real-world conditions**, providing reliable, actionable information for forest managers. Ground truthing also enables the identification of **fire causes**, assessment of **fire prevention measures**, and evaluation of **post-fire ecological recovery**.

Importance of Ground Truthing

1. **Accuracy Verification** – Remote sensing techniques, although highly advanced, are subject to limitations such as cloud cover, shadow effects, mixed pixels, and spectral confusion. Ground truthing helps confirm whether the detected burnt areas truly correspond to field reality.
2. **Fire Cause Assessment** – By examining accessibility, vegetation type, and signs of human activity, field surveys can help determine whether a fire was natural (e.g., lightning) or anthropogenic (intentional or accidental).
3. **Fire Management Planning** – Accurate field data supports the design of preventive measures, such as fire line placement, early warning systems, and patrol route optimization.
4. **Post-Fire Regeneration Monitoring** – Ground truthing enables the tracking of vegetation recovery over time, allowing forest department to decide on interventions like regeneration or soil moisture conservation.
5. **Policy and Reporting Support** – Reliable ground-based evidence is essential for official fire incident reports, funding proposals for restoration projects, and compliance with environmental regulations.

Methodology

The ground truthing process for burnt area assessment typically involves the following steps:

Pre-Field Preparation

i. Identification of potential burnt areas using **satellite-derived burnt area layers** generated from Sentinel-2, Landsat, or MODIS imagery.

ii. Selection of survey points using **GIS platforms** (e.g., ArcGIS Pro) based on fire alerts, burnt area extent, and accessibility.

iii. Preparation of **field maps, GPS devices, and data collection forms** (digital via Survey123 or paper-based).

Field Data Collection

i. Travel to identified locations and map the burnt boundary using **GPS polygon/track recording**.

ii. Record **vegetation type, condition, and dryness level** of the location

iii. Document presence/absence of **fire lines**, accessibility routes, and signs of human activity.

iv. Capture **photographic evidence** for visual documentation.

v. Note any **regeneration indicators** such as sprouting or greening of vegetation.

Data Validation and Comparison

i. Compare **field-measured burnt area** with satellite-derived estimates.

ii. Integrate validated field data into GIS for final burnt area mapping.

Reporting and Recommendations

i. Summarize findings, highlight probable causes of fire, and assess the effectiveness of existing preventive measures.

ii. Provide recommendations for **future fire management** and **ecological restoration**.

Location 1

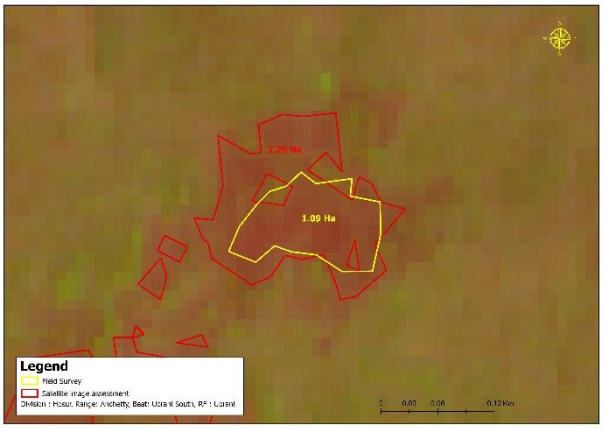
Division: Hosur

Range: Anchetty

Beat: Ubbrani South

Reserved Forest: Ubbrani

Date of Visit: 04.08.2025



Field Observations

1. The surveyed area exhibited **very dry ground conditions**, with vegetation dominated by **Lantana camara**, a known invasive alien species. The presence of Lantana was dense in several patches, contributing to a high **fuel load** in the area. Such conditions significantly increase the fire susceptibility, as dry Lantana stems and leaves ignite and burn rapidly, sustaining high-intensity flames.

2. No **fire line or fire prevention barrier** was observed in the vicinity, indicating an absence of immediate structural measures to limit fire spread. The terrain was relatively flat near the entry point, with a gradual **decrease in elevation** as the team moved towards the survey site. This downward slope could have influenced the movement of fire and smoke patterns during the incident.
3. The combination of **dry vegetation, invasive species dominance, and high fuel load** creates an environment with heightened fire risk, especially in the absence of preventive infrastructure.

Results

The field measured area was approximately **1.09 ha**, based on GPS mapping conducted during the survey. The satellite-derived burnt area was estimated at **2.29 ha**, as determined through spatial analysis using Sentinel-2. The difference between the field measurements and satellite estimates was minimal, confirming the high accuracy of remote sensing–based burnt area detection for this site.



Figure 52: Location-1 Field Observations

Location 2

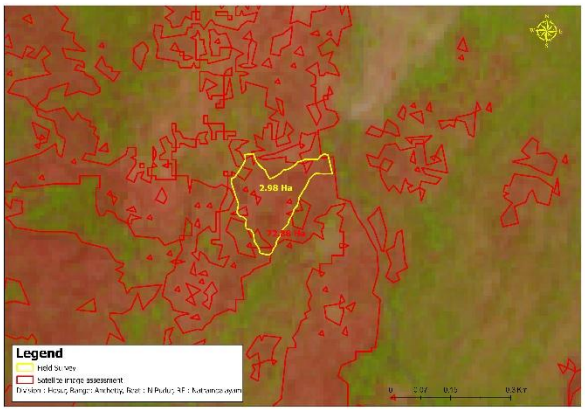
Division: Hosur

Range: Anchetty

Beat: N Pudhur

Reserved Forest: Natrampalayam

Date of Visit: 05.08.2025



Field Observations

1. During the ground truthing survey, the area exhibited sparse vegetation cover dominated by highly desiccated grass and shrub species. The vegetation dryness was pronounced, indicating prolonged moisture deficit conditions. The accessibility of the site directly from the roadside strongly suggests the possibility of anthropogenic ignition (man-made fire), as human movement and activity in the area would have been relatively unimpeded.
2. No evidence of fire line construction or maintenance was observed within or around the burnt patch. This absence may have contributed to the uncontrolled spread of the fire within the localized area.
3. Additionally, there was no visible sign of vegetation regeneration at the time of the visit. The burnt vegetation remnants were still in a brittle, dry state, with no sprouting or greening of ground flora detected.

Results

The field measured area was approximately **2.98 ha**, based on GPS mapping conducted during the survey (part of the area was surveyed). The satellite-derived burnt area was estimated at **72.88 ha**, as determined through spatial analysis using Sentinel-2.





Figure 53: Location-2 Field Observations

Location 3

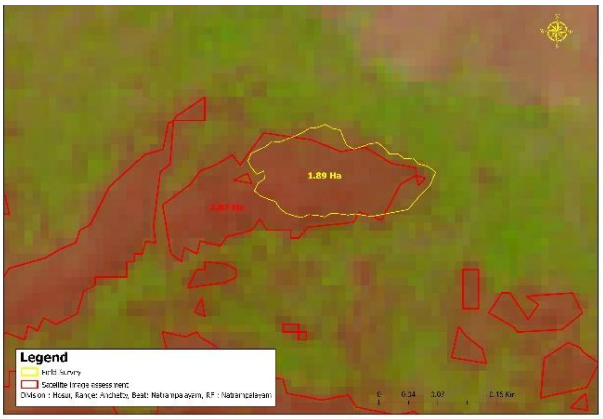
Division: Hosur

Range: Anchetty

Beat: Natrampalayam

Reserved Forest: Natrampalayam

Date of Visit: 05.08.2025



Field Observations

1. The surveyed location had **no fire line** or any other fire prevention infrastructure in place. The burnt patch was situated **adjacent to agricultural land**, indicating the possibility of fire spreading from nearby cultivation areas.
2. While the site was **not directly connected to major road networks**, it was still **accessible to local residents** through informal footpaths and agricultural tracks. This accessibility raises the likelihood of anthropogenic influence, such as stubble burning, open flame usage, or accidental ignition by people working or moving through the area.
3. Vegetation in the burnt patch consisted mostly of mixed dry grass cover and low shrubs. The charred remains and ash layer indicated a complete burn of ground

vegetation, leaving little to no immediate signs of regeneration at the time of the survey.

Results

The field measured area was approximately **1.89 ha**, based on GPS mapping conducted during the survey. The satellite-derived burnt area was estimated at **2.87 ha**, as determined through spatial analysis using Sentinel-2. The difference between the field measurements and satellite estimates was minimal, confirming the high accuracy of remote sensing–based burnt area detection for this site.



Figure 54: Location-3 Field Observations

Location 4

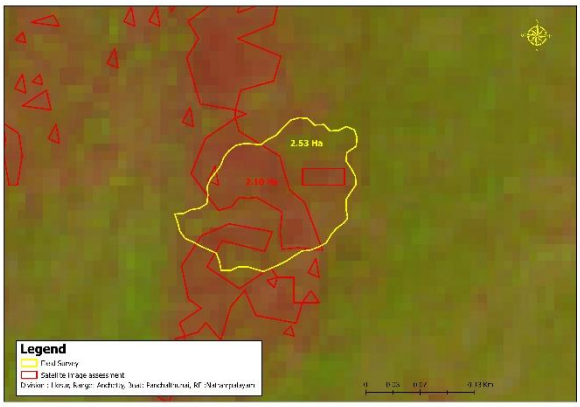
Division: Hosur

Range: Anchetty

Beat: Panchalthunai

Reserved Forest: Natrampalayam

Date of Visit: 05.08.2025



Field Observations

1. The surveyed location had **no fire line** or any other fire prevention infrastructure in place. While the site was **not directly connected to major road networks**, it was still **accessible to local residents** through informal footpaths and agricultural tracks. This accessibility raises the likelihood of anthropogenic influence, such as stubble burning, open flame usage, or accidental ignition by people working or moving through the area.
2. Vegetation in the burnt patch consisted mostly of mixed dry grass cover and low shrubs. The charred remains and ash layer indicated a complete burn of ground vegetation, leaving little to no immediate signs of regeneration at the time of the survey.

Results

The field measured area was approximately **2.53 ha**, based on GPS mapping conducted during the survey. The satellite-derived burnt area was estimated at **2.10 ha**, as determined through spatial analysis using Sentinel-2. The difference between the field measurements and satellite estimates was minimal, confirming the high accuracy of remote sensing–based burnt area detection for this site.





Figure 55: Location-4 Field Observations

Location 5

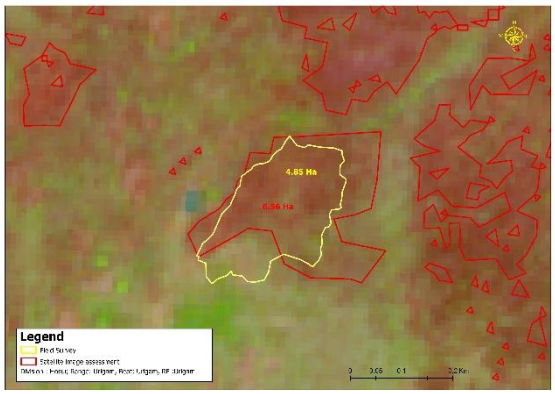
Division: Hosur

Range: Urigam

Beat: Urigam

Reserved Forest: Urigam

Date of Visit: 06.08.2025



Field Observations

1. The surveyed site had no fire line or other fire preventive structures in place. The vegetation in the area was predominantly dry, with extensive burnt remnants covering a large portion of the landscape. In contrast to the completely burnt patches, visible regeneration was noted in certain areas, with fresh shoots emerging from the soil.
2. A significant presence of bamboo clumps was observed across the site. Given that bamboo is highly flammable, particularly when dry, its abundance would have contributed to the rapid spread and intensity of the fire. The burnt area was extensive, covering nearly half of the beat area, making it one of the largest affected zones.

Results

The field measured area was approximately **4.85 ha**, based on GPS mapping conducted during the survey. The satellite-derived burnt area was estimated at **6.56 ha**, as determined through spatial analysis using Sentinel-2. The difference between the field measurements and satellite estimates was minimal, confirming the high accuracy of remote sensing–based burnt area detection for this site.



Figure 56: Location-5 Field Observations

Location 6

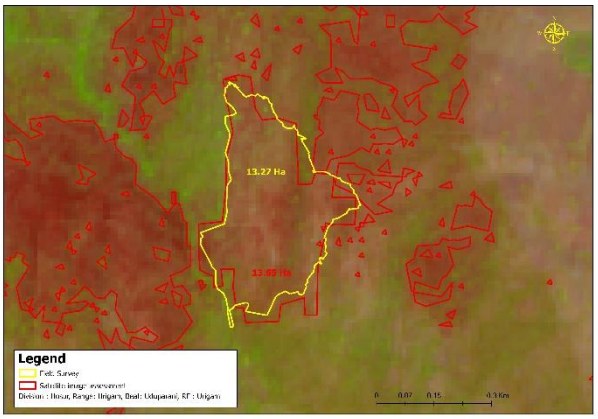
Division: Hosur

Range: Urigam

Beat: Ududarani

Reserved Forest: Urigam

Date of Visit: 06.08.2025



Field Observations

1. The burnt patch was located adjacent to agricultural land, indicating a potential link between farming activities and the fire's ignition. The vegetation in the area was dry and moisture-deficient, creating a highly flammable fuel base that would have facilitated the rapid spread of fire once ignited.
2. The burnt area contained charred remnants of grass and shrubs, with sparse regeneration observed in scattered patches. The regeneration mainly consisted of early-stage grass shoots emerging from the soil surface, but coverage was minimal and inconsistent across the site.
3. No fire line or preventive barrier was observed in the vicinity, leaving the forest edge unprotected from potential agricultural fire spillover. The site was accessible via

agricultural tracks and footpaths used by local residents, further increasing the likelihood of human influence on the fire incident.

Results

The field measured area was approximately **13.27 ha**, based on GPS mapping conducted during the survey. The satellite-derived burnt area was estimated at **13.65 ha**, as determined through spatial analysis using Sentinel-2. The difference between the field measurements and satellite estimates was minimal, confirming the high accuracy of remote sensing–based burnt area detection for this site.



Figure 57: Location-6 Field Observations

Location 7

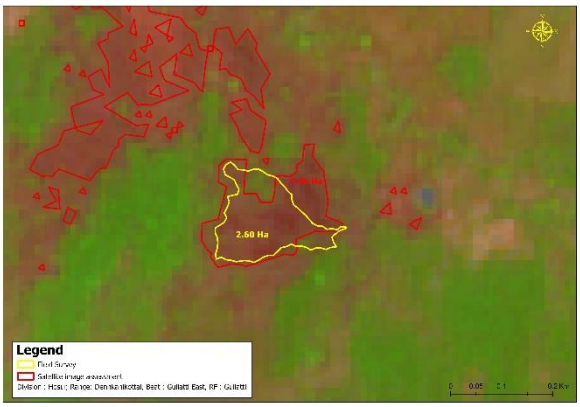
Division: Hosur

Range: Denkanikottai

Beat: Gullatti East

Reserved Forest: Gullatti

Date of Visit: 07.08.2025



Field Observations

1. The surveyed site had been burnt very heavily, leaving behind extensive visible fire scars and a thick layer of burnt remnants. The entire patch was a dense bamboo stand, and the fire had consumed almost the entire area, leaving minimal unburnt vegetation.
2. Bamboo, being highly flammable—especially when dry—would have significantly intensified the heat and rate of fire spread in this location. Despite the severe burn, early-stage regeneration of bamboo shoots was observed in small patches, indicating the species' natural ability to recover after fire incidents.
3. The site was not easily accessible to local residents, with no direct footpaths or roads leading into the burnt area. Access was primarily through interior forest routes, which are less frequently used by nearby communities. This reduces the likelihood of casual anthropogenic ignition but does not rule out the possibility of intentional or accidental fire spread from other forest activities.

Results

The field measured area was approximately **2.60 ha**, based on GPS mapping conducted during the survey. The satellite-derived burnt area was estimated at **2.46 ha**, as determined through spatial analysis using Sentinel-2. The difference between the field measurements and satellite estimates was minimal, confirming the high accuracy of remote sensing–based burnt area detection for this site.





Figure 58: Location-7 Field Observations

Location 8

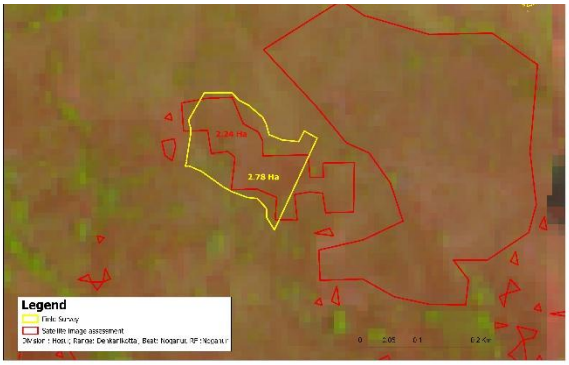
Division: Hosur

Range: Denkanikottai

Beat: Noganoor

Reserved Forest: Noganoor

Date of Visit: 07.08.2025



Field Observations

1. The surveyed location contained a mixture of **invasive alien species** and bamboo stands. The bamboo was present in scattered patches, while the rest of the site was covered with **sparse, dry vegetation**.
2. Post-fire conditions showed that the area had **regenerated well overall**, with healthy new growth of grasses and shrubs visible across most of the site. However, some bamboo patches showed limited or no regeneration, likely due to the severity of burning in those specific clumps.

3. The dominance of invasive alien species in certain parts of the site could pose future fire risks, as these species often have high flammability and can alter natural regeneration patterns.

Results

The field measured area was approximately **2.78 ha**, based on GPS mapping conducted during the survey. The satellite-derived burnt area was estimated at **2.24 ha**, as determined through spatial analysis using Sentinel-2. The difference between the field measurements and satellite estimates was minimal, confirming the high accuracy of remote sensing–based burnt area detection for this site.





Figure 59: Location-8 Field Observations

Location 9

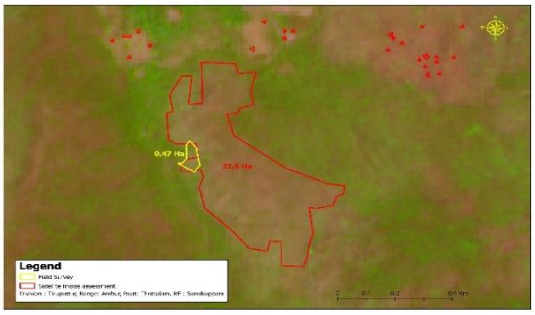
Division: Tirupattur

Range: Ambur

Beat: Thottalam South

Reserved Forest: Sanankuppam

Date of Visit: 08.08.2025



Field Observations

1. The surveyed site displayed excellent post-fire regeneration, with the area now dominated by healthy, green vegetation. The ground cover was dense and thriving, and soil conditions appeared to have good moisture retention, which would help reduce the likelihood of fire recurrence in the immediate future.
2. Only small, scattered burnt remnants were observed, indicating that the fire had been localized or of low intensity in certain spots. The overall vegetation condition suggested that the fire event occurred some time ago, allowing sufficient time for natural regrowth.
3. A well-maintained fire line was present in the area, serving as an effective preventive measure to limit the spread of fire. The combination of good vegetation recovery and existing fire management infrastructure makes this site relatively low-risk compared to another site.

Results

The field measured area was approximately **0.47 ha**, based on GPS mapping conducted during the survey (part of the area was surveyed due to inaccessibility). The satellite-derived burnt area was estimated at **22.9 ha**, as determined through spatial analysis using Sentinel-2. The difference between the field measurements and satellite estimates was minimal, confirming the high accuracy of remote sensing–based burnt area detection for this site.



Figure 60: Location-9 Field Observations

Location 10

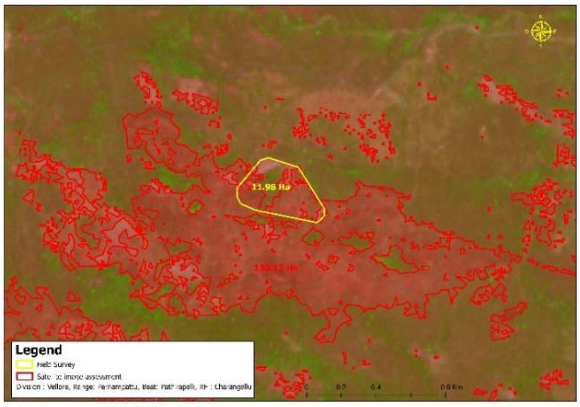
Division: Vellore

Range: Pernambut

Beat: Pathirapalli

Reserved Forest: Charangallu

Date of Visit: 07.08.2025



Field Observations

1. The surveyed site was located along the **border with the Andhra Pradesh forest area**. Field observations and discussions with local staff indicated that **most of the fire incidents in this location were the result of fire spreading from the Andhra side**, likely due to cross-boundary ignition events.
2. The site was **easily accessible from the roadside**, which increases the likelihood of both monitoring and potential human-induced ignition. Most of the area was **well regenerated**, with healthy green vegetation covering the site, and only a **very small burnt patch** was visible, suggesting limited fire impact during the recent event.

Results

The field measured area was approximately **11.98 ha**, based on GPS mapping conducted during the survey. The satellite-derived burnt area was estimated at **15.03 ha**, as determined through spatial analysis using Sentinel-2. The difference between the field measurements and satellite estimates was minimal, confirming the high accuracy of remote sensing–based burnt area detection for this site.



Figure 61: Location-10 Field Observations

Inferences

1. The ground truthing exercise confirmed that Sentinel-2–based satellite burnt area assessments are highly accurate, with only minimal variation from field measurements. However, several critical issues were observed during field visits. Many sites lacked fire prevention infrastructure such as fire lines, allowing uncontrolled spread of fires.
2. The dominance of invasive alien species like *Lantana camara,* and bamboo significantly contributed to higher fuel loads, intensifying the severity of fire events. In areas adjacent to agricultural land and roadside patches, evidence strongly indicated anthropogenic ignition sources, highlighting the role of human activity in triggering forest fires.
3. Fire impact and recovery varied across sites, while some locations such as Tirupattur and Noganoor showed good regeneration with healthy vegetation growth, others displayed poor or no regeneration due to prolonged dryness, severe burning, or invasive dominance. Cross-boundary fire spread, especially at the Andhra Pradesh border, also emerged as a major concern requiring coordinated management.
4. In light of these findings, several measures are recommended for field-level forest fire management. Construction and regular maintenance of fire lines must be prioritized, especially in high-risk zones bordering agricultural lands and invasive-dominated patches.
5. Systematic management of fuel load through removal of *Lantana* and controlled bamboo thinning is essential to reduce fire intensity. Field staff should intensify patrolling during peak dry months, make effective use of satellite alerts and mobile reporting applications, and promptly verify fire signals.
6. Community engagement through awareness programs and involvement of local villagers as first responders will play a vital role in prevention and control. Cross-boundary coordination with neighbouring divisions should be strengthened to address fire spread beyond administrative limits.
7. Post-fire regeneration must be closely monitored, with soil and moisture conservation measures adopted in degraded patches to accelerate recovery.
8. Finally, staff safety and capacity building should be ensured through training in firefighting techniques, provision of protective equipment, and adequate firefighting tools to enable safe and effective suppression operations.




8

CHAPTER 8: STRATEGIC OUTLOOK OF THE STATE FOREST FIRE CONTROL CENTRE

Overview

The Tamil Nadu State Forest Fire Control Centre (TNSFFCC) was formally instituted in 2024 under the financial assistance of the NABARD scheme as part of the Tamil Nadu Forest Department's commitment to modernizing its forest fire management strategies. Functioning under the Protection and Vigilance Wing of the Principal Chief Conservator of Forests, the TNSFFCC has been designed to act as the nerve centre of all forest fire prevention, monitoring, and management operations in the state. This initiative marks a crucial institutional milestone in Tamil Nadu's conservation history, aligning state-level forest management efforts with national mandates from the Forest Survey of India (FSI) and the Ministry of Environment, Forest and Climate Change (MoEFCC).

TNSFFCC operates as a central coordinating authority overseeing 34 District Forest Fire Control Centres (DFFCCs) distributed across Tamil Nadu. These district centres serve as decentralized operational units working under the direction and technical support of TNSFFCC. Together, this network ensures seamless information flow and operational command from the state-level control room to the ground-level forest ranges and beats. The TNSFFCC is tasked with receiving real-time satellite-based fire alerts, coordinating district responses, managing spatial data analysis, evaluating fire vulnerability, issuing public communications, and facilitating post-fire assessments. Its strategic importance has been further underlined through its role as the primary liaison with central agencies such as FSI and NRSC, thereby integrating Tamil Nadu's forest fire response within national frameworks.

Reduction in Forest Fire Incidents and Large Fire Events

Following the establishment of TNSFFCC, a significant transformation has occurred in the scale, frequency, and containment of forest fire incidents across the state. While the overall number of fire detections has seen a rise, primarily driven by climatic variations such as extended dry spells, delayed monsoons, and increasing ambient temperatures, the capacity to mitigate and manage these fires has improved considerably. In 2024, Tamil Nadu recorded a total of 218 Large Forest Fires (LFFs), which was a notable increase from 156 such events in 2023 and a significant increase from the 80 incidents reported in 2022. However, despite this surge, the effective containment and rapid response strategies ensured that a majority of these fires did not escalate in severity or duration.

By comparison, the data from 2025 provides compelling evidence of the impact achieved within just one year of TNSFFCC's operation. As of May 2025, the total number of forest fire detections in Tamil Nadu stood at 2023 a significant decline from 2024. Among these, only 112 incidents were classified as Large Forest Fires by FSI. This sharp reduction in both overall fire alerts and large-scale fire events is directly attributed to the streamlined functioning and improved coordination between the TNSFFCC and the DFFCCs. Quick field-level mobilization and real-time decision-making supported by technological tools and clearly

defined workflows have transformed fire response capabilities. The containment of fires before escalation and the reduction in large-scale incidents underscore a major achievement in Tamil Nadu's forest fire management within just one year of institutional strengthening.

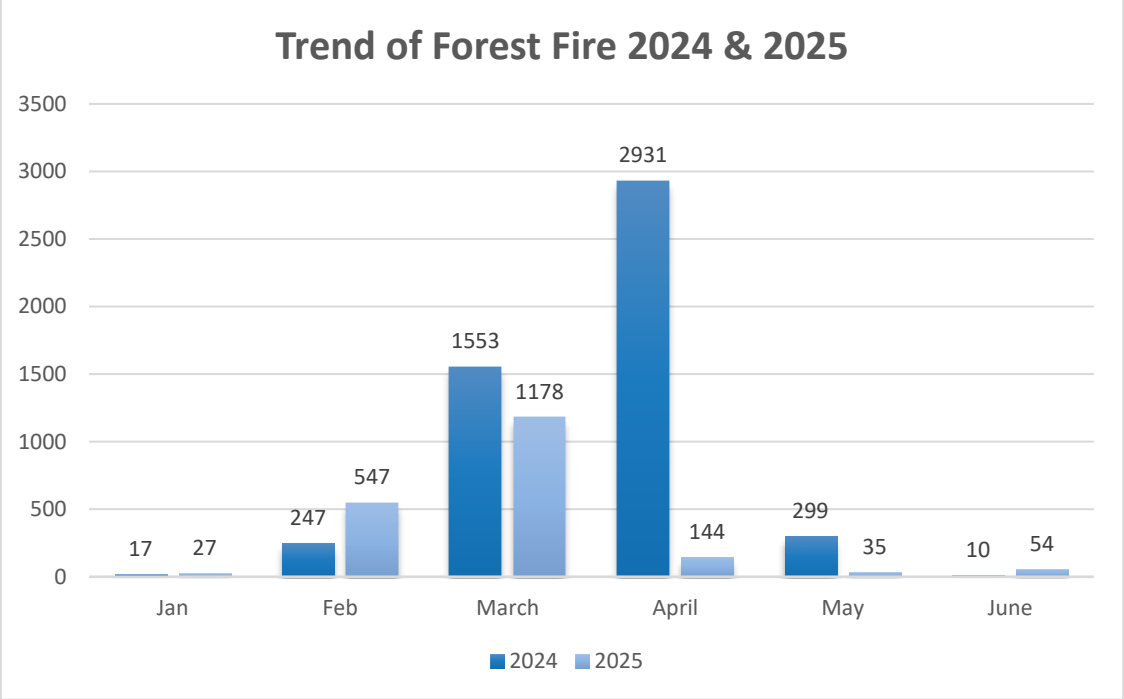


Figure 62: 2024 VS 2025

Fire Season	No of FSI Fire Alerts for Tamil Nadu	Total No of FSI Fire Alerts (all states)	Percentage of Fire alerts from FSI for TN to the total fire alerts reported in all states
Nov 2019 to June 2020	1555	146950	1.06
Nov 2020 to June 2021	1422	398774	0.36
Nov 2021 to June 2022	1206	253008	0.48
Nov 2022 to June 2023	2342	206403	1.13
Nov 2023 to June 2024	4084	202580	2.01
Nov 2024 to June 2025	2023	192396	1.05

Table 13: No of Alerts received in FSI for Tamil Nadu

Enhanced Operational Responsiveness

A cornerstone of TNSFFCC's impact has been the dramatic reduction in response time to forest fire alerts, which has been achieved through the integration of advanced technologies and systemic process reforms. Prior to the establishment of the centre, fire alerts would take considerable time to be validated and actioned upon due to fragmented

communication channels and manual data handling. Post-establishment, the TNSFFCC instituted a real-time alert dissemination mechanism, primarily through the Tamil Nadu Forest Fire Management Information System (TNFFMIS), which synchronizes satellite-based alerts with mobile and web-based platforms accessible to field officers. From the below table, it was clearly observed the reduction in response time due to the full operational capabilities of TNSFFCC.

The TNFFMIS system processes alerts received from MODIS and SNPP-VIIRS satellite sensors and ensures that registered users, including field-level forest staff and divisional officers, receive fire detection alerts on their mobile devices and dashboards almost immediately. Along with these, ArcGIS platform was also utilized for better monitoring and visualization of ground-level information. As a result, field teams are now able to respond to incidents faster, initiate suppression measures more effectively, and document their interventions in real-time. These systemic improvements have collectively ensured that the average time between alert receipt and on-site response has been shortened to less than an hour in most cases.

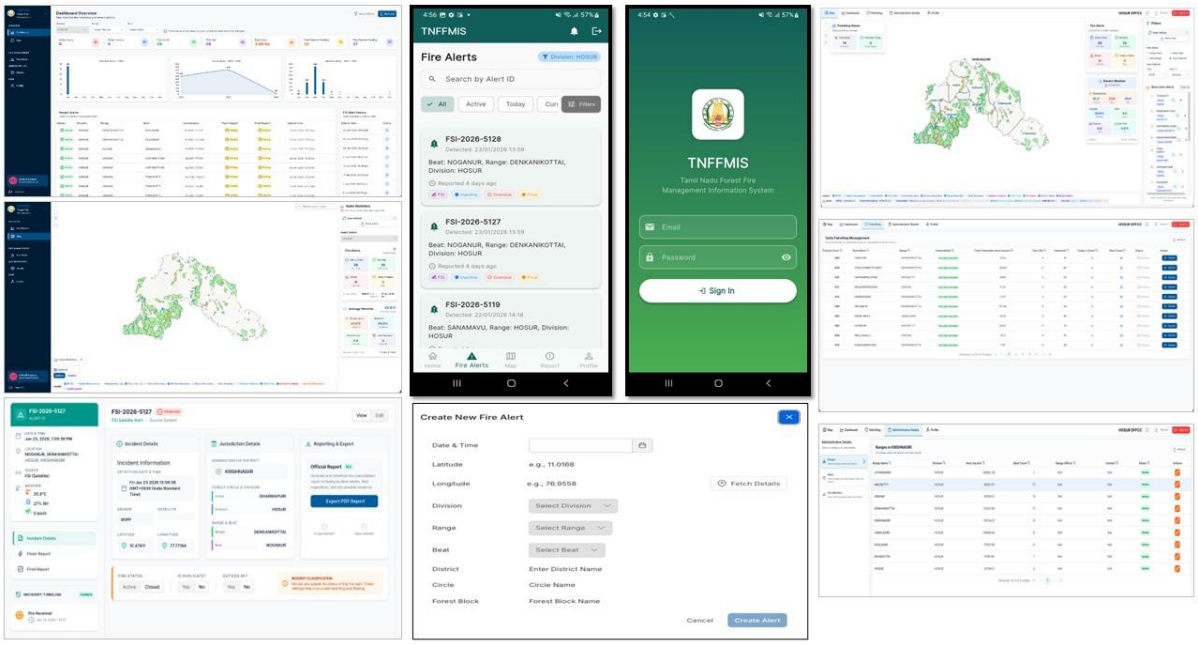


Figure 63: Tamil Nadu Forest Fire Management Information System

Fire Incident Tracking and Report Submission

The comprehensive fire incident tracking framework introduced by TNSFFCC has standardized the process of documentation and response monitoring across all forest divisions. The Tamil Nadu Forest Fire Management Information System (TNFFMIS) now serves as the single-point repository for all fire-related data, facilitating both transparency and accountability in forest fire management. Upon receiving an alert, field officers are required to submit a Flash Report through the TNFFMIS mobile application, documenting initial observations including GPS coordinates, fire size, suspected cause, and immediate suppression activities. Once the fire is doused, a Final Report is submitted, which contains detailed information on the area affected, photographic and video evidence, suppression techniques used, and the resources mobilized.

This two-tier reporting mechanism not only facilitates a chronological understanding of each fire incident but also populates division-wise dashboards that display metrics such as number of fires, area burnt, response time, and pending reports. By systematizing the reporting process, the TNSFFCC has enabled faster reviews, better resource planning, and data-driven evaluations of each division's preparedness and response efficiency. Moreover, the dashboard interface has empowered senior administrators to monitor active fires and ensure follow-up actions are timely and effective.

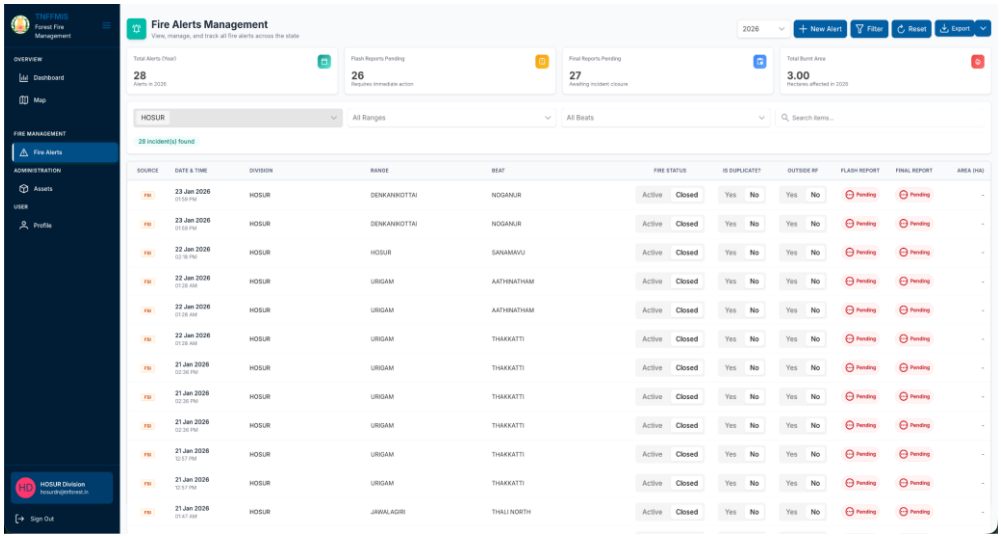


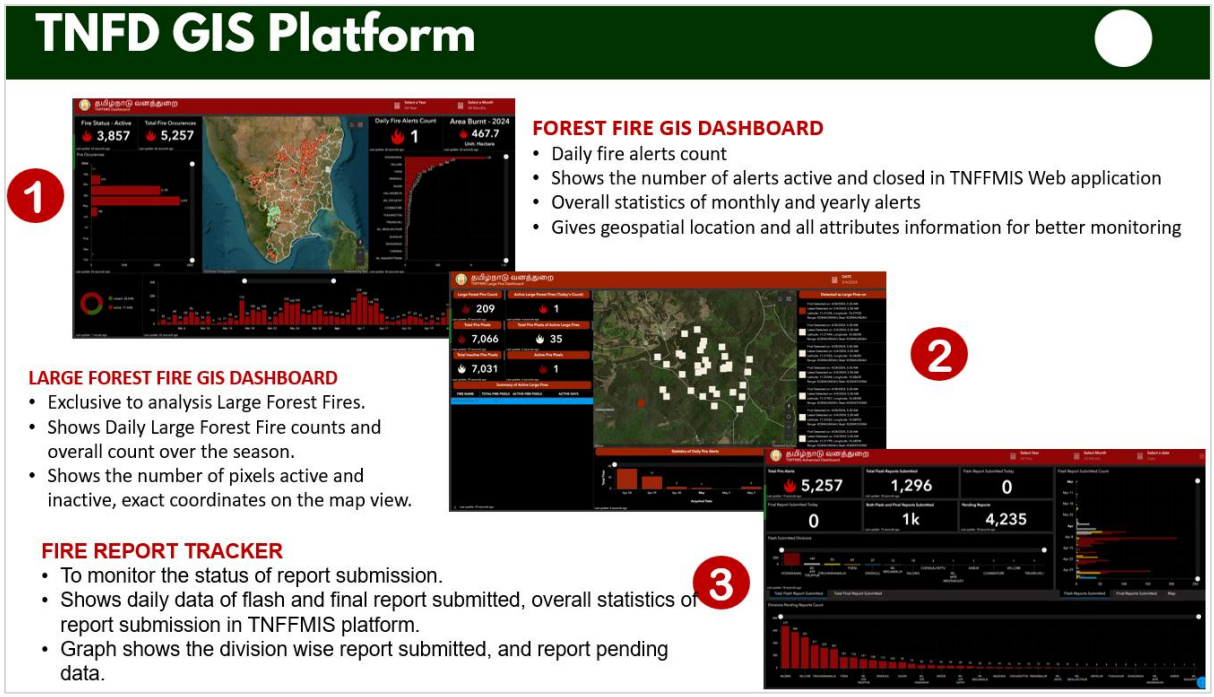
Figure 64: Reporting Mechanism of TNFFMIS

Technological Tools and Resource Mobilisation

One of the defining features of the TNSFFCC initiative has been the integration of technology and field-level resource optimization in forest fire management. Recognizing the limitations of traditional methods, the centre has deployed a range of modern tools including satellite-based fire detection systems, GIS-based vulnerability mapping, thermal drones, and wireless communication kits. These technologies have been instrumental in pre-fire planning, real-time surveillance, and post-fire assessment.

The use of drone technology, particularly thermal drones, has gained traction in high-risk divisions such as Kodaikanal, Coimbatore, Salem, and Namakkal, where dense forest cover and terrain complexity make ground surveillance challenging. These drones facilitate the detection of hidden hotspots and fire lines, enabling fire crews to act proactively. Simultaneously, the GIS team at TNSFFCC has conducted a multi-variable analysis encompassing topography, fuel load, and human proximity to identify the most fire-prone beats and ranges, thereby enabling focused interventions.

In terms of equipment, Tamil Nadu Forest Department has procured and deployed an extensive inventory of fire-fighting gear under modernization schemes. This includes leaf blowers, power saws, water misters, rucksacks, fireproof clothing, GPS devices, and safety kits. Furthermore, 5,452.71 km of fire lines were constructed in 2024 alone, which function as physical barriers to prevent the lateral spread of fires. These investments have collectively enhanced the resilience and responsiveness of the state's fire-fighting apparatus.



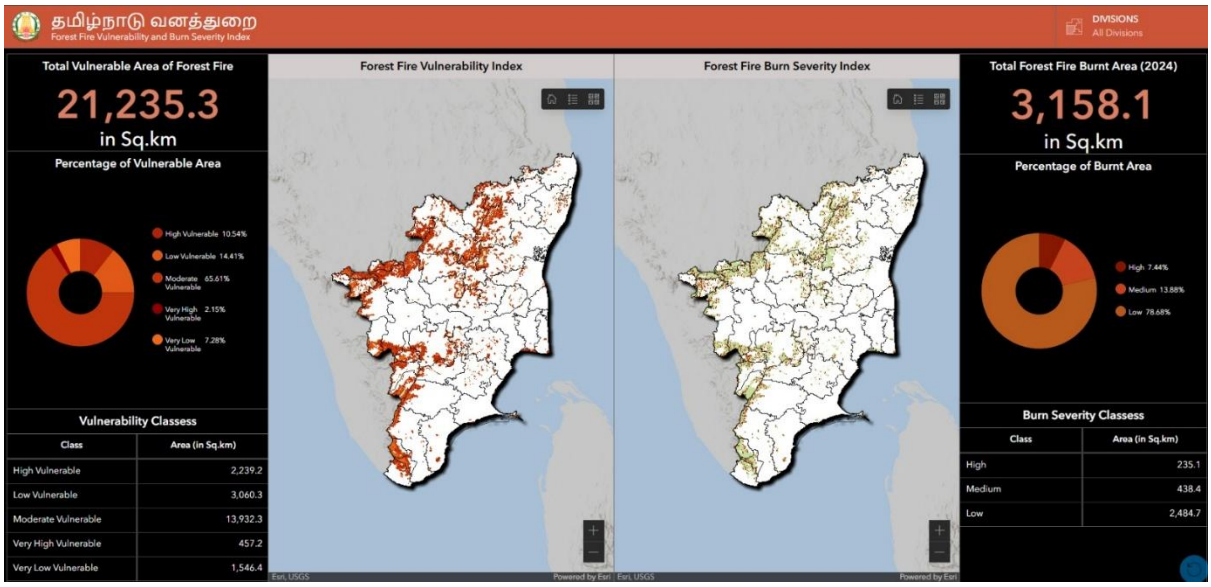


Figure 65: TNFDs GIS Platform for Spatial Inferences

In addition to these resources, a dedicated survey form was developed for systematic fire line data collection, and a comprehensive dashboard was created to support visualization, monitoring, and decision-making. This dashboard integrates fire detection points with nearby fire line data in a unified map view, enabling field staff to quickly identify the closest fire lines in relation to active fire locations. This streamlined interface significantly enhances

ground-level dousing operations by improving situational awareness and response coordination.

Visits to TNSFFCC and Knowledge Sharing

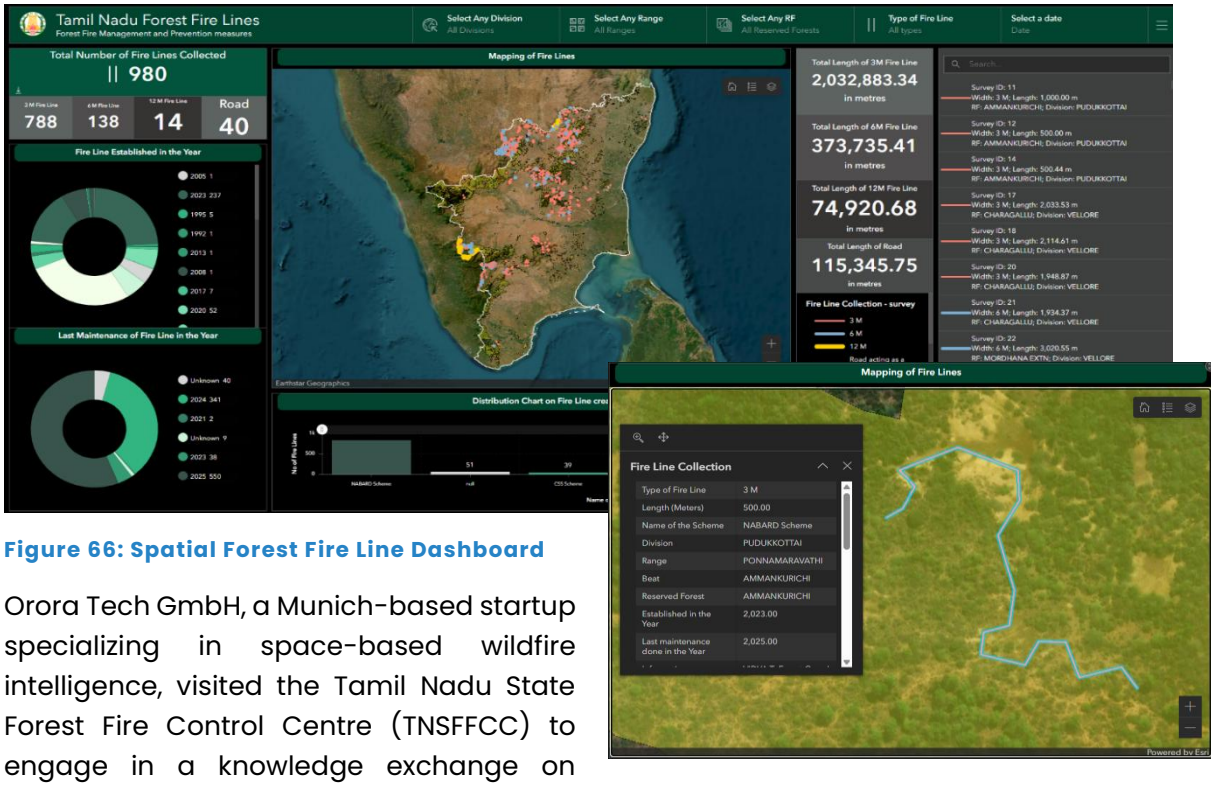


Figure 66: Spatial Forest Fire Line Dashboard

Orora Tech GmbH, a Munich-based startup specializing in space-based wildfire intelligence, visited the Tamil Nadu State Forest Fire Control Centre (TNSFFCC) to engage in a knowledge exchange on advanced wildfire management solutions. The Orora Tech team explored the operational frameworks and technological tools employed by TNSFFCC, sharing insights into their



Figure 67: Orora Tech Team, German

proprietary wildfire detection and monitoring platform. Their solution leverages data from over 25 satellites and integrates AI-driven analytics to provide near-real-time detection of wildfires, even in remote areas. Key features include early detection of fires as small as 4×4 meters, real-time monitoring, fire spread prediction, and post-fire damage assessment. The platform's capabilities align with TNSFFCC's objectives of enhancing situational awareness and response times in forest fire management. This collaborative interaction

underscored the potential for integrating advanced satellite-based technologies into Tamil Nadu's forest fire control strategies, fostering a synergistic approach to wildfire mitigation and ecosystem preservation.

Further, a team from the Kerala Digital University visited the TNSFFCC in April 2025 to gain first-hand insight into Tamil Nadu's forest fire management ecosystem. During their visit, the team explored the operational infrastructure of the centre and studied the Tamil Nadu Forest Fire Management Information System (TNFFMIS), ArcGIS-based dashboards, and real-time monitoring systems. The visit culminated in a comprehensive knowledge-sharing session with the GIS and fire response teams at TNSFFCC. This interaction proved highly insightful, fostering mutual understanding and highlighting opportunities for adopting similar models in other states, particularly those with ecologically sensitive forest zones.



Figure 68: Kerala Forest Department

The TNSFFCC has emerged as a hub for inter-institutional collaboration and capacity building through various study tours, workshops, and consultations. Notably, in April 2025, a delegation from the Tamil Nadu Forest Department visited the National Remote Sensing Centre (NRSC) in Hyderabad to explore advanced satellite-based detection systems, assess data validation protocols, and initiate technical collaborations. During this visit, scientists from NRSC demonstrated enhanced fire alert mechanisms that could deliver actionable data within 30 to 60 minutes and offered integration support for embedding these services within TNFFMIS.



Figure 69: National Remote Sensing Centre, Forestry and Ecology Team

Presentations were exchanged between the two agencies, with Tamil Nadu showcasing its dashboard-based approach and NRSC providing insights into AI/ML applications for fire spread modelling. The discussions also highlighted the importance of incorporating wind dynamics and terrain features in vulnerability assessments. These cross-learning opportunities have played a critical role in continuously evolving the operational standards of TNSFFCC and positioning Tamil Nadu as a model state for forest fire management.

Workshops, Achievements and Institutional Strengthening

Tamil Nadu has actively participated in several regional and national workshops aimed at enhancing the operational and technical capacities of the Tamil Nadu State Forest Fire Control Centre (TNSFFCC). These workshops have provided valuable exposure to advanced tools and methodologies in forest fire management, including real-time data integration, GIS-based fire risk assessment, and drone-assisted surveillance. Officers from various levels, including divisional forest officers, assistant conservators, and GIS specialists, have engaged in sessions focused on modern firefighting equipment, mobile-based reporting systems, and community-based fire mitigation strategies. These participations have significantly contributed to the upskilling of personnel and the strengthening of institutional frameworks within TNSFFCC.

1. **National Workshop on Forest Fire and Its Challenges – New Delhi (24.10.2024)**
   The TNSFFCC participated in the National Consultative Workshop on Forest Fire and Its Challenges, jointly organized by the Ministry of Environment, Forest and Climate Change (MoEFCC) and the National Disaster Management Authority (NDMA). Representing Tamil Nadu, the TNSFFCC delivered a comprehensive presentation on the state's integrated forest fire response strategy. The session highlighted Tamil Nadu's emphasis on Disaster Risk Reduction (DRR) through advanced GIS tools, interactive dashboards, and a multi-tiered Forest Fire Control Centre network. The delegation also showcased community-driven models like the "Friends of Forest" initiative, underlining the importance of local engagement in wildfire mitigation.



2. **National Workshop on Redesigning Forest Firefighting Tools and Equipment – IIFM Bhopal (21-22 November 2024)**

At the National Workshop on Redesigning Forest Firefighting Tools and Equipment held in collaboration with IIFM Bhopal and NDMA, TNSFFCC emphasized the need for innovations in

fire response technology. Topics discussed included water-efficient fire suppression systems, sustainable fire retardants like suppression balls, custom all-terrain vehicles (ATVs), and the expansion of UAV capabilities. The TNSFFCC also advocated for AI-driven assessments and resource mapping as essential components of future-ready fire management systems. These discussions reinforced Tamil Nadu's commitment to bridging technological gaps through research, development, and public-private partnerships.



3. **Regional Workshop on Forest Fire Prevention and Management – Thiruvananthapuram (29-30 January 2025)**

   At the Regional Workshop held in Thiruvananthapuram by MoEF&CC and IIFM Bhopal, TNSFFCC presented a data-rich analysis of Tamil Nadu's forest fire landscape. The presentation covered sensitivity mapping, fuel load estimation, diurnal and seasonal patterns, and human-forest interface risks. The deployment of a fully digital, paperless MIS portal and mobile application was also showcased, illustrating the shift towards real-time, on-ground data capture and incident reporting. The role of artificial intelligence in early warning systems and post-fire assessment was discussed, reinforcing Tamil Nadu's position at the forefront of adaptive, tech-driven forest fire management.



4. **Workshop on Forest Fire prevention and Management – Naya Raipur (20.12.2024)**
   At the Regional Workshop held in Raipur by Chattisgarh Forest Department, TNSFFCC presented a detailed presentation on best practices in Forest Fire Management in Tamil Nadu.
5. **Achievements**

   On the occasion of the International Day for Biological Diversity, the Tamil Nadu State Forest Fire Control Centre (TNSFFCC) was honoured with a prestigious award by the Hon'ble Forest Minister for its exemplary contribution to forest fire management in the state. The recognition specifically acknowledged the establishment of a state-of-the-art Forest Fire Control Centre in Chennai and the development of the Tamil Nadu Forest Fire Management Information System (TNFFMIS). This comprehensive system utilizes advanced GIS-based analytics at the forest beat level, encompassing fire sensitivity mapping, terrain and human risk modelling, forest-type-specific fuel risk assessments,

and real-time data visualization tools for strategic interventions. A landmark achievement under this initiative has been the operationalization of 34 District Forest Fire Control Centres across Tamil Nadu, significantly enhancing response efficiency and field coordination. The recognition underscores the state's leadership in deploying scientific tools and institutional frameworks for proactive forest fire prevention and management.

6. Institutional Strengthening



The centre has also advocated for the establishment of divisional fire control centres in high-risk regions such as Kodaikanal, Hassanur, and Udhagai, arguing that such units would decentralize operations and provide faster response capabilities. These proposals have been backed by fire detection data from FSI, which consistently flagged these areas as vulnerable. The emphasis on proactive planning, backed by scientific data and field-level feedback, has allowed the TNSFFCC to design and implement targeted strategies that are both scalable and sustainable. Several trainings were also conducted for the field level staffs.

Future Scope

Looking ahead, the Tamil Nadu Forest Department is keen to strengthen the operational capacity of TNSFFCC through a series of targeted initiatives. These include establishing new divisional fire control centres in highly sensitive areas, expanding drone coverage, and integrating artificial intelligence tools to predict fire spread dynamics in varying terrains. Moreover, there is a recognized need to develop wind parameter models and automate resource allocation based on real-time fire alerts. Community incentive programs to encourage early fire reporting and the establishment of fire lines before the start of the fire season have also been proposed.



Tech to play major role in detecting, fighting fires in Nilgiris forests

B. RAVICHANDRAN | DC
OOTY, FEB. 28

Starting from the second half of February till April, it is certainly a period of stress for the jungles as the dry weather not only makes the forests become brittle, posing a dried-up look, but also makes the jungles become more susceptible to forest fires.

In the forest-rich Nilgiris, wherein the frost during the winter months between December and mid-February always would take the juice out of the leaves, rendering the flora to be churned and making them brittle due to natural cryopedological reactions, the threat of forest fire looms large post-winter.

So, the Tamil Nadu forest department has geared up for forest fire prevention and has management plans and measures to prevent, tackle wildfires.

Supriya Sahu, additional chief secretary, departments of environment, climate change and forests, told Deccan Chronicle that under the Nalsani scheme, a TN State Forest Fire Control Centre (TNSFFCC) has been established. This centre, equipped with the necessary GIS technology is capable of continuously monitoring forest fires across the state.

About 34 district forest fire control centres across the state have been established to act as local units in collating data on fire occurrences, updating fire data and coordinating activities under the guidance of TNSFFCC.

The 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, she elaborated.

On forest fire prevention in the Nilgiris and the initiatives taken in this regard, Supriya Sahu said forest fires pose a significant environmental threat, leading to habitat destruction, loss of biodiversity and increased carbon emission. The risk of such incidents is heightened by dry conditions, human activities and climate change. Effective fire prevention measures, including controlled burns, firebreaks and continuous monitoring, are essential to mitigate these risks, she said.

Water availability plays a critical role in fire management. Ensuring a sustainable water supply through rainwater harvesting, check-dams and artificial waterholes can significantly enhance fire-fighting capabilities. To enhance the resilience of the Nilgiris forest division against forest fires, a comprehensive disaster management plan is being implemented, incorporating early warning systems, rapid response teams and sustainable water management strategies, she added.

On the action plan for forest fire prevention and control, she stated that precautionary measures implemented annually include creation of fire line (fire line is all about virtually clearing the twigs and bushes at the particular breadth and length across the ridges by "controlburn" that would prevent fires from spreading from one sector to another, in case of occurrence of forest fires), deployment of fire watchers across vulnerable areas to enhance early detection and response and fire awareness campaigns.

Fire dousing pickup vehicle - a custom-built fire dousing vehicle equipped with a water tanker and pump system - is currently under development. Forest fire vulnerability maps have been prepared based on data from the past nine years to enhance the effective management and mitigation of forest fires. All relevant stakeholder departments have been instructed to closely monitor waste disposal and any potential fire hazards near forest areas.

Technological intervention includes implementation of the Forest Survey of India (FSI) fire alert system, which employs geospatial technology to detect fire points via satellite to alert relevant forest officials. This apart, construction of fire watch towers in fire-prone forest areas to facilitate early detection and rapid response by fire-fighting teams and establishment of village-level forest fire protection groups are being done.

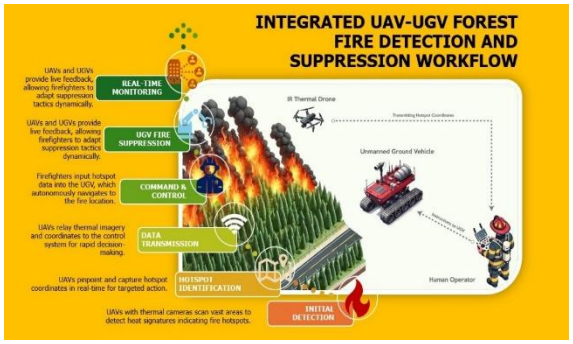
The implementation of these measures aims to mitigate the risks and impact of forest fires, ensuring the protection of forest ecosystems, wildlife and local communities, says Supriya Sahu.

Drawing of fire-line is underway in the jungles in Nilgiris. –DC

A tiger in a drying jungle in the Nilgiris. –DC

Furthermore, a comprehensive feedback loop involving daily status reporting of LFFs, post-fire regeneration tracking, and ground-truth validation will be institutionalized to improve adaptive management.

In addition, the Forest Department should prioritize the implementation of an Integrated UAV-UGV (Unmanned Aerial Vehicle and Unmanned Ground Vehicle) initiative to further advance fire management capabilities. This integrated approach proposes the deployment of UAVs for high-resolution thermal imaging, aerial surveillance, and hotspot detection in rugged or inaccessible forest terrains. Complementing this, UGVs can be equipped for ground-level operations such as carrying fire retardants, transporting equipment, or assisting with mop-up operations in hazardous zones where human entry may be unsafe. The synergy between aerial and terrestrial autonomous systems will provide a more comprehensive fire response, enabling better data collection, reducing response times, and enhancing the safety of field personnel. Pilot trials in vulnerable divisions are recommended before scaling across the state. These forward-looking measures are intended to transition Tamil Nadu's forest fire response from a reactive to a predictive and preventive paradigm.



In addition to these efforts, a comprehensive proposal was submitted to both the National Disaster Management Authority (NDMA) and the State Disaster Management Authority (SDMA) outlining strategies for enhancing forest fire management across Tamil Nadu. The proposal addresses various aspects of capacity building, technology integration, and infrastructure development.

Conclusion

The establishment and operationalization of the Tamil Nadu State Forest Fire Control Centre (TNSFFCC) have fundamentally reshaped the way forest fires are managed in the state. From rapid alert dissemination and reduced response times to advanced geospatial analytics and robust community engagement, the impact of TNSFFCC has been both transformative and measurable. While the environmental conditions contributing to forest fires have become more severe, the state has responded with agility, innovation, and strategic foresight. With continued investments in technology, infrastructure, and human capital, TNSFFCC is well-positioned to emerge as a national exemplar in sustainable and scientific forest fire management.


9

CHAPTER 9: TNSFFCC'S STANDARD FORMAT FOR RESOURCE PLANNING

The Tamil Nadu State Forest Fire Control Centre (TNSFFCC) follows a systematic, data-driven approach for distributing resources and efforts to manage and control forest fires across divisions. The distribution relies on four key factors, each expressed as a percentage and combined using a weighted approach to prioritize areas most in need.

1. Importance of Vulnerability as the Primary Factor

Forest fire vulnerability is considered the primary determinant, assigned the greatest weight (40%) in the distribution process. This reflects its critical role in identifying areas most susceptible to forest fires due to ecological and environmental conditions. Prioritizing based on vulnerability focuses attention and effort on locations with the highest risk of severe fire impact.

Alongside vulnerability, the three other factors employed are:

i. *Fuel risk for 2026*
ii. *Number of sensitive ranges per division*
iii. *Forest Survey of India (FSI) alerts data from 2022 to 2025*

Each factor's output is represented as a percentage derived from spatial and statistical analyses.

2. Derivation of Vulnerability Percentage

Vulnerability was analysed through a weighted summation of nine spatial datasets in ArcGIS such as,

i. *Forest cover*
ii. *Historical fire points (2015-2025)*
iii. *Settlements*
iv. *Roads*
v. *Slope*
vi. *Aspect*
vii. *Elevation*
viii. *Stream proximity*
ix. *Land surface temperature*

These combined metrics produce a composite vulnerability score. ArcGIS classified the vulnerability into five categories: very high, high, moderate, low, and very low. The focus is exclusively on **high** and **very high** vulnerability zones.

The area covered by these two categories within each division was extracted from GIS attributes. The vulnerability percentage per division was calculated as the ratio of this area to the total combined high and very high vulnerability area in all divisions:

Vulnerability % = [(Area of High + Very High Vulnerability in the division)/ (Total Area of High + Very High Vulnerability in all divisions)] X 100

No of Years	Weightage
4	1.0
3	0.8
2	0.5
1	0.2

3. Fuel Risk Mapping and Percentage Calculation

Fuel risk evaluation uses forest type data since different vegetation types exhibit varying flammability characteristics. For instance, dry deciduous forests have high flammability.

Each of the 39 forest type classes was assigned a fuel risk rank from 1 to 5. This information generated a fuel risk map in ArcGIS.

Only **high** and **very high**-risk classes are considered, paralleling the vulnerability approach. The leftover fuel load area is estimated by subtracting the currently burnt area from the total high and very high-risk area to reflect remaining fire potential.

The fuel risk percentage for each division was computed as:

Fuel Risk % = [(Left over Area of High + Very High Fuel Risk in the division)/ (Total Area of High + Very High Fuel Risk in all divisions)] X 100

4. Identification and Calculation of Sensitive Ranges Using Min-Max Normalization

Sensitive ranges were identified based on fire occurrences using FSI alerts data from 2022 to 2025. The process involved:

S *= Total fire incidents recorded in each range over 4 consecutive years.*

L *= Number of years fire was recorded in that range.*

Smin *was fixed at 1, representing the minimal fire occurrence value, like in AHP or Likert scale.*

Smax *is the maximum S value found among all ranges.*

W *is the weightage for each consecutive year*

S' *is the Normalized Score*

FIS *is Fire Intensity Score*

Normalized Score S′ was calculated using Min-Max normalization formula:

$$S' = (S - S_{min})/ (S_{max} - S_{min})$$

The Fire Intensity Score (FIS) for each range was computed and classified using the below given table, by multiplying S′ with the Weightage assigned to the number of fire years W.

Class	Fire Intensity Score
High	Greater than or equal to 0.8
Moderate	0.5 to 0.8
Low	Less than 0.5

$$FIS = W \times S'$$

Two conditions were applied to select sensitive ranges:

> ***Condition 1***: *Ranges with fire occurrences in all 4 consecutive years (weight 1.0).*
>
> ***Condition 2***: *Ranges with fire occurrences in 3 consecutive years, included only if fire intensity was classified as high or moderate.*

The count of sensitive ranges per division was derived from this selection. The sensitive range percentage was then calculated as,

$$\text{Sensitive Range \%} = [(\text{No of Sensitive Ranges in division}) / (\text{Total Ranges in the divisions})] \times 100$$

For example, Tiruvannamalai has 9 sensitive ranges out of 11, approximately 81%.

5. Calculation of FSI Alerts Percentage

The percentage contribution of alerts for each division was calculated by taking the total number of alerts received in that division from 2022 to 2025 and dividing it by the overall number of alerts received across all divisions in Tamil Nadu during the same period; and expressed in a percentage, indicating each division's share of the total fire alert incidents in the state and providing a clear comparative measure of fire activity intensity across divisions.

$$\text{FSI Alerts \%} = [(\text{No of Alerts in division}) / (\text{Total No of Alerts in Tamil Nadu})] \times 100$$

6. Final Distribution Using Weighted Ratio

The four percentage factors are combined using this weighted formula:

Factors	Weightage in %
Forest Fire Vulnerability	40
Fuel Risk	20
No of Sensitive Ranges	20
FSI Alerts from 2022 - 2025	20

Table 14: Weighted Ratio to obtain combined score

The formula: $\text{Combined Score \%} = 0.40 \times V + 0.20 \times F + 0.20 \times S + 0.20 \times A$

Where V, F, S, A are the percentages from vulnerability, fuel risk, sensitive ranges, and FSI alerts respectively.

The calculated percentages were categorized into four groups based on the maximum value observed, with specified ranges such as 1 to 6, 6 to 12, 12 to 18, and 18 to 24; resources were then allocated according to these categories, with the highest allocation assigned to divisions falling within the top range of 18 to 24, reflecting their greater relative priority.

7. Justification of Weighting

i. Vulnerability receives the largest weighting because it is the key indicator of fire susceptibility and expected impact.

ii. Fuel risk and the number of sensitive ranges reflect operational risk factors and historical fire persistence.

iii. FSI alerts represent real-time monitoring data, ensuring recent trends are included.

iv. The 40:20:20:20 ratio balances ecological risk with fire behaviour data and monitoring results, enabling effective prioritization.




10

CHAPTER 10: FOREST FIRE PREDICTION MODEL-2026

Tamil Nadu State Forest fire control centre executing the Forest Fire Prevent and Management activities for the year of 2026. GIS (Geographical Information System) plays a central role in forest fire prediction by integrating, analysing, and visualizing spatial data related to fire occurrence. GIS provides a platform to compile multiple fire influencing factors such as vegetation type, fuel load, topography, meteorological variables, and human activities into a unified spatial framework. These datasets are organized as thematic layers and analysed using spatial modelling techniques to identify areas with fire risk.

GIS and Remote Sensing based Forest Fire Prediction Analysis

GIS based forest fire prediction relies on a set of spatial parameters that influence ignition probability, fire spread, and intensity. This fire prediction layers are derived from Topographic, Biological, Meteorological, and Anthropogenic parameters. Each parameter is prepared as a raster layer and standardized before integration.

1. Topographic Parameters

Topography strongly controls fire behaviour by influencing fuel dryness and flame spread.

- **Elevation (m) -** Higher elevations generally exhibit lower temperatures and higher moisture, reducing fire probability compared to low lying regions.
- **Slope (degrees or %) -** Fire spreads more rapidly upslope because heat rises and preheats vegetation ahead of the flame front.
- **Aspect (degrees)** - South- and southwest-facing slopes (in the Northern Hemisphere) receive higher solar radiation, leading to drier fuels.

2. Biological Parameters

- **Forest cover** - Forest cover was classified into Open Forest, Moist deciduous forest, Water, Non-Forest, Scrub and Very high dense forest to apply the characteristics of each class while weighting.
- **Normalized Difference Vegetation Index (NDVI)** NDVI is used to estimate vegetation health and fuel moisture. Sentinel 2A 10m spatial resolution satellite data (January -2025) derived using the below algorithm.

$$NDVI=(NIR+RED)(NIR-RED)$$

Low NDVI values indicate stressed or dry vegetation, which increases fire risk.

3. Meteorological Parameters

Meteorological parameters such as,

- **Annual Mean Rainfall (mm)**
- **Annual Mean Relative Humidity (%)**
- **Annual Mean Temperature (°C)**
- **Annual Mean Wind Speed (km/h)**

Were acquired from Indian Meteorological Department for the period of 2022-2025

4. Anthropogenic Parameters

- **Distance to Roads Density** – Road density was generated by buffering 20 m on both sides of the roads which are near to forest fringes with regular noticeable human activities.
- **Distance to Settlement Density -** Fires frequently originate near villages due to agricultural burning, fuelwood collection, and negligence. Therefore, a 1 km buffer was generated around Reserved Forest areas, and a settlement density was derived based on the proximity of the nearest settlements within this buffer.

Methodology

The forest fire prediction process follows a structured geospatial workflow integrating satellite data and spatial analysis techniques.

Step 1: Data Collection

- Satellite imagery (Sentinel 2A)
- Digital Elevation Model (DEM-30m)
- Meteorological Data (Temperature, Rainfall, Humidity and Windspeed- IMD)
- Historical fire occurrence points (FSI)
- Road and Settlement vector data (TNeGIS)

Step 2: Data Preprocessing

- Image resampling and projection
- Cloud masking
- DEM sink filling and smoothing

Step 3: Parameter Extraction

- Slope and Aspect from DEM
- NDVI from satellite imagery
- LST from thermal bands
- Roads and Settlement density

Step 4: Standardization of Parameters

All thematic layers are reclassified to a common scale (e.g., 1–5 or 1–9), where higher values represent higher fire risk.

Step 5: Weight Assignment (AHP Method)

Weights are assigned based on statistical importance.

$$Fire\ Risk\ Index = \sum_{i=1}^{n} W_i \times X_i$$

Where:

- W_i= Weight of parameter
- X_i= Standardized score of parameters *i*

Step 6: Weighted Overlay Analysis

An overlay technique was used by integrating all weighted layers to generate a Forest Fire Prediction for the year 2026

Step 7: Fire Risk Zonation

The final index is classified into categories based on the output values such as,

- High Risk
- Medium Risk
- Low Risk
- Very Low Risk

Step 8: Validation

Model accuracy is evaluated using,

- Historical fire locations
- Forest Fire Alerts (FSI) January- 2026
- Forest Fire Vulnerability
- Forest Fire Sensitivity

Inferences

Based on the weighted overlay analysis, the study area was classified into four forest fire risk categories High, Medium, Low, and Very low, with division wise statistics summarized in the tables below. A total of 46 divisions fall under the high-risk category, covering an area of 5,144.7 Sq.km. The top 20 high risk divisions include Dharmapuri, Tiruvannamalai, Hosur, Dindigul, Vellore, WL ATR Tiruppur, Erode, Tiruppattur, WL STR Sathy, Salem, Coimbatore, WL Srivilliputhur, Nilgiris, WL MTR Masinagudi, Kodaikanal, Kanyakumari, WL ATR Pollachi, Attur, Viluppuram and Theni.

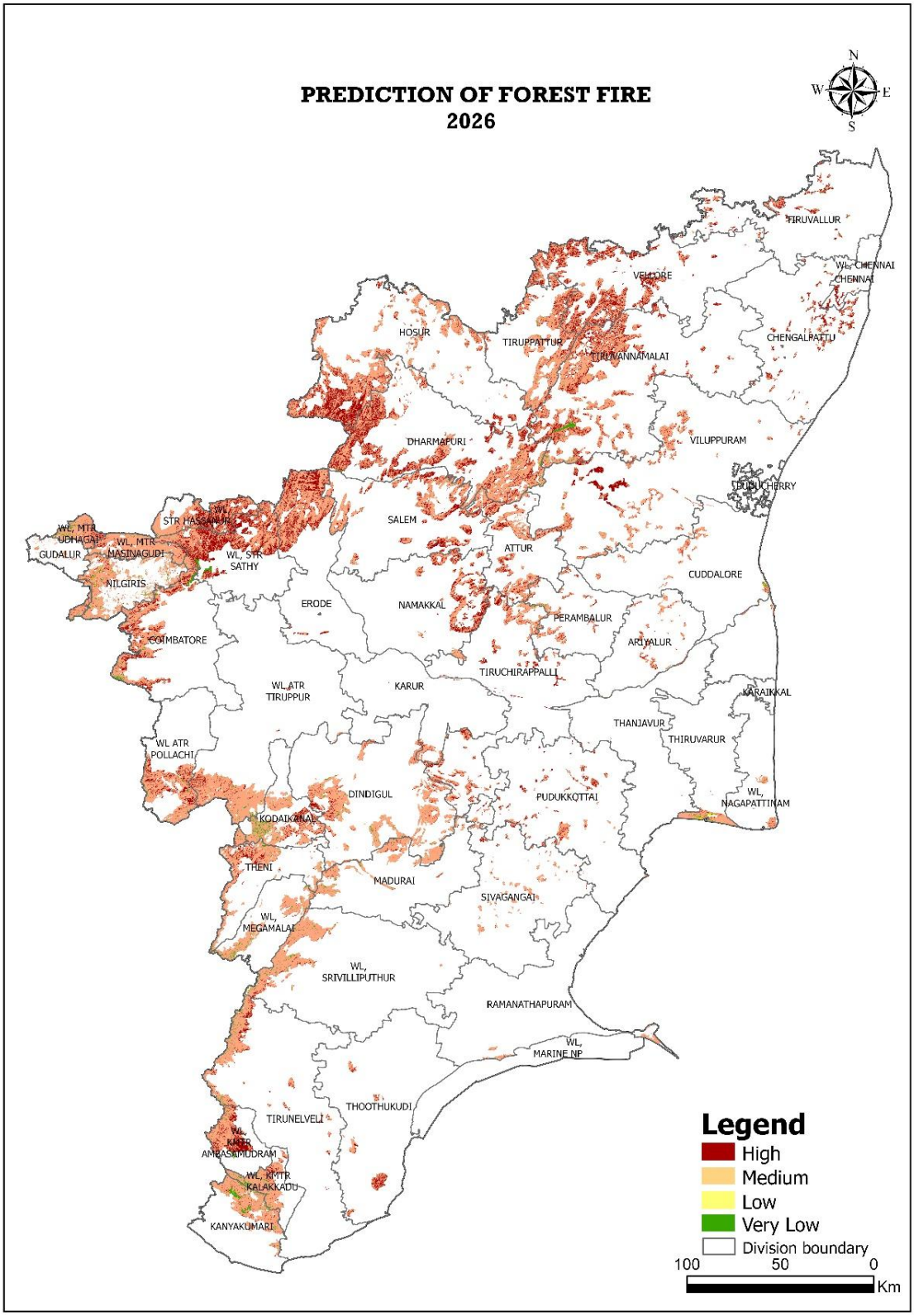


Figure 70: Forest Fire Prediction Map - 2026



ANNEXURE

Administrative Boundaries Sensitive to Forest Fire (2015-2025)

Based on 2015 – 2025 FSI Forest Fire Alerts

Table: 1.1 Ranking of Circles based on Sensitivity to Forest fire

S.NO	CIRCLE
1	VELLORE
2	DHARMAPURI
3	DINDIGUL
4	ATR
5	SMTR
6	KMTR
7	SALEM
8	STR
9	CHENNAI
10	MTR
11	VILUPPURAM
12	TRICHY

Table: 1.2 Ranking of Divisions based on Sensitivity to Forest fire

S.NO	DIVISION
1	HOSUR

2	KODAIKANAL
3	VELLORE
4	THENI
5	NILGIRIS
6	TIRUPPATTUR
7	KANYAKUMARI
8	TIRUVANNAMALAI
9	WL ATR TIRUPPUR
10	DHARMAPURI
11	TIRUVALLUR
12	DINDIGUL
13	SALEM
14	WL, MTR DIVISION
15	TIRUNELVELI
16	WL, STR HASSANUR
17	COIMBATORE
18	WL ATR POLLACHI
19	WL, MEGAMALAI
20	KALLAKURICHI
21	WL, STR SATHY
22	ERODE
23	WL, SRIVILLIPUTHUR
24	NAMAKKAL
25	WL, KMTR DIVISION
26	MADURAI
27	ATTUR
28	CHENGALPATTU
29	VILUPPURAM
30	GUDALUR
31	TIRUCHIRAPPALLI
32	PUDUKKOTTAI
33	PERAMBALUR
34	SIVAGANGAI

35	CUDDALORE
36	ARIYALUR
37	THOOTHUKUDI
38	KARUR
39	THANJAVUR
40	WL, KMTR KALAKKADU
41	WL, MARINE NP
42	CHENNAI
43	RAMANATHAPURAM
44	WL, MTR MASINAGUDI
45	WL, NAGAPATTINAM
46	THIRUVARUR
47	WL, MTR UDHAGAI

Table: 1.3 Ranking of Ranges based on Sensitivity to Forest fire

S.NO	RANGE
1	DENKANIKOTTAI
2	PERUMPALLAM
3	PALANI
4	UDUMALAIPETTAI
5	GUDIYATHAM
6	JAWALAGIRI
7	ODUGATHUR
8	ARCOT
9	URIGAM
10	ANCHETTY
11	AZHAGIAPANDIPURAM
12	BODI
13	VELLORE
14	PALLIPATTU
15	TIRUPPATTUR
16	AMBUR
17	KODAIKANAL
18	POOMPARAI

19	SHERVAROY SOUTH
20	VELIMALAI
21	SINGARAPETTAI
22	KORAKUNDAH
23	MANNAVANUR
24	UTHAMAPALAYAM
25	ALANGAYAM
26	THENI
27	KULASEKARAM
28	VALPARAI
29	AMARAVATHI
30	HARUR
31	KOTTAPATTY
32	THIRUTTANI
33	DEVATHANAPATTY
34	SIRUMALAI
35	POLUR
36	MUKURTHY
37	UDHAGAI NORTH
38	HASSANUR
39	CUMBUM
40	HOSUR
41	MASINAGUDI
42	KALIYAL
43	CHENGAM
44	NAMAKKAL
45	SANKARANKOIL
46	SEGUR
47	KANNIVADY
48	GUDALUR(T)
49	PUDUPALAYAM
50	ODDANCHATRAM
51	BOLAMPATTY

52	ARANI
53	MEGAMALAI
54	KADAYANALLUR
55	KRISHNAGIRI
56	TALAVADI
57	KATTABETTU
58	JAMNAMARATHUR
59	BATHALAGUNDU
60	SANTHAVASAL
61	MELPET
62	SATHYAMANGALAM
63	SINGARA
64	ANDHIYUR
65	VARUSANADU
66	AMIRTHI
67	KUNDAH
68	TIRUVANNAMALAI
69	PYKARA
70	THEPPAKADU
71	CHINNAMANUR
72	GOVERNOR SHOLA
73	UDHAGAI SOUTH
74	BARGUR
75	HOGENAKKAL
76	PALAKKODU
77	KALLAKURICHI
78	BOOTHAPANDY
79	RAJAPALAYAM
80	DANISHPET
81	ULUNDURPETTAI
82	COIMBATORE
83	BHAVANISAGAR
84	GOMUKHI

85	NADANUR
86	VELLIMALAI
87	NILGIRIS EASTERN SLOPE
88	PERANAMPATTU
89	SHERVAROY NORTH
90	RAYAKOTTAI
91	SAPTUR
92	KARAMADAI
93	USILAMPATTY
94	UPPER KODAYAR
95	PARSONS VALLEY
96	TIRUPATTUR(S)
97	VANDARAVU
98	MUNDANTHURAI
99	NADUVATTAM
100	CHENNAMPATTY
101	WATRAP
102	YERCAUD
103	SHOLAVANDAN
104	SATHANUR
105	SRIVILLIPUTTUR
106	KALRAYAN
107	MADURAI
108	BITHERKADU
109	PERAMBALUR
110	THANIPADI
111	TIRUCHIRAPPALLI
112	GANDAMANUR
113	SIRUMUGAI
114	COURTALLAM
115	COONOOR
116	KOTHAGIRI
117	PUDUKKOTTAI

118	TALAMALAI
119	SIVAGIRI
120	DHARMAPURI
121	THEERTHAMALAI
122	POLLACHI
123	VRIDDHACHALAM
124	MUDUMALAI
125	T N PALAYAM
126	ATTUR
127	GUDALUR
128	VALAPADI
129	CHERAPATTU
130	KADAYAM
131	PENNAGARAM
132	TAMBARAM
133	VATTALAKUNDU
134	ARIYALUR
135	GUDIYATTAM
136	SOOLAGIRI
137	SRIPERUMPUDUR
138	THURAIYUR
139	PAPANASAM
140	TIRUNELVELI
141	CHENGALPATTU
142	INNADU
143	METTUR
144	GERMALAM
145	NATHAM
146	KANNIVADI
147	KALAKKADU
148	KOLLIMALAI
149	RASIPURAM
150	MADURANTHAGAM

151	MORAPPUR
152	THIRUPORUR
153	CHERAMBADY
154	PALAPATTU
155	TIRUMAYAM
156	BERIJAM
157	METTUPALAYAM
158	VEPPANTHATTAI
159	GUMMUDIPOONDI
160	ALAGARKOIL
161	KARGUDI
162	KEERANUR
163	CHENJI
164	KARUR
165	MANAPPARAI
166	TINDIVANAM
167	PERIYANAICKENPALAYAM
168	RED HILLS
169	THAMAMPATTY
170	ULANDY
171	CUDDALORE
172	MULLUKURICHI
173	ANDIPATTY
174	ARANTANGI
175	ERODE
176	KOVILPATTI
177	KUMBAKONAM
178	VILUPPURAM
179	POOMBARAI
180	THANJAVUR
181	TIRUCHENDUR
182	UTHANGARAI
183	AYYALUR

184	KEELAKARAI
185	PANDALUR
186	PERIYAKULAM
187	RAMANATHAPURAM
188	SIRKALI
189	THIRUVALLUR
190	THOOTHUKUDI
191	DEVADANAPPATTI
192	GANGAVALLI
193	MADUKKARAI
194	MANDAPAM
195	MANNARGUDI
196	PITCHAVARAM
197	SIVAGANGAI
198	THAMMAMPATTI
199	THIRUKURUNGUDI
200	THUMBAL
201	TIRUPPATTUR(S)

Table: 1.4 Top 500 Beats Sensitive to forest fires

S.NO	BEAT
1	PARICOMBAI WEST
2	GUDIYUR
3	PERUMPALLAM
4	PUNGANUR NORTH
5	AVALANCHE(WL)
6	PANNAIKADU
7	MADDUR
8	UPPER BHAVANI
9	KOMBU WEST
10	ASAMBU
11	PUNGANUR SOUTH
12	RANGAMPETTAI
13	AGARAM

14	GULLATTI EAST
15	VADAKAVUNJI
16	AZHAGIAPANDIPURAM
17	AYYUR
18	MELPALLAM
19	POOMPARAI WEST
20	THADIKARANKONAM SOUTH
21	JAWALAGIRI
22	THIRUMOORTHIMALAI
23	THULUVABETTA EAST
24	PERUMALMALAI(K)
25	PARICOMBAI EAST
26	KALAYAMPUTHUR
27	PALAMADI
28	KESTHUR
29	ULIBANDA
30	THOLUVABETTA EAST
31	BETTAMUGILALAM
32	MACHUR
33	BALASAMUDRAM EAST
34	SITHAYANKOTTAI
35	KAVALAPATTY
36	GEDDESAL
37	KEMPAGARAI
38	GALIGATTAM
39	KALIYAL
40	PANAI WEST
41	NAICKENERI(VLR)
42	THAKKATTI
43	NATRAMPALAYAM
44	VELLAKUTTAI
45	AMMUR
46	KOKKANAMALAI

47	AKKAMALAI
48	BELLATTY
49	MADAKADAPPA
50	NOGANUR
51	PUDUR
52	THOLUVABETTA WEST
53	KURUMBAPATTY
54	SINGARAPETTAI EAST
55	KEELANAVAYAL
56	PECHIPARAI
57	SURULACODE
58	CHELLAMTHURUTHI
59	KOMBAI
60	PULLUR EAST
61	SWAMIMALAI(VLR)
62	ARUNGULAM EAST
63	GLENMORGAN
64	GULLATTI WEST
65	THEVARAM SOUTH
66	MANNAVANUR NORTH
67	TAMBIRANKANAL
68	ASANAMPETTAI
69	KARADIBETTA
70	SATHGUR
71	SIROOR SOUTH
72	KODAGARAI(HOS)
73	MANJAMPATTI SOUTH
74	THAISHOLAI
75	THALI NORTH
76	PALLANGI EAST
77	MAHIMANDALAM
78	MALLAHALLI
79	MARANDAHALLI NORTH

80	SHOLUR
81	GUNDUR EAST
82	CHEYYAR
83	PALLANGI WEST
84	KONDAPALLI
85	PERAMBUKANAL
86	ARANGALTHURGAM
87	KUPPANATHAM
88	NOCHIKUTTAI
89	BALASAMUDRAM WEST
90	KANIYAMBADI
91	KODAI ROAD
92	PEDDARAMAPURAM
93	KODAYAR
94	KOTTAIYARU
95	KOTTASATHANA PALLI
96	PITCHANGARAI
97	POOSIMALAIKUPPAM
98	KUDIRAYAR EAST
99	MORDHANA
100	NAICKANUR SOUTH
101	VELIMALAI NORTH
102	VELLAKKALTHERI
103	THALI SOUTH
104	THANDIGUDI
105	BIKKAPATHI
106	JOLARPETTAI
107	KOKKATHORAI
108	KULASEKARAM NORTH
109	NADUCOMBAI
110	MAMBAKKAM
111	MARANDAHALLI SOUTH
112	GRASS HILLS

113	KURANGANI SOUTH
114	NOCHILI
115	SIROOR NORTH
116	KOZHIMUND(K)
117	SEGUR SOUTH
118	MORGANBETTA
119	PALLIKONDA
120	PANAMADANGI
121	DEVATHANAPATTY
122	DODDAGATTY
123	BOMMARAJAPURAM NORTH
124	KONASAMUDRAM
125	MOONGILPALLAM
126	VANNATHIPARAI
127	PONNAPALLAI NORTH
128	THOTTALAM NORTH
129	CHINNAMALAI
130	SANTANAVENUGOPALAPURAM
131	SIRUMALAI I
132	VARATTAR
133	VEPPANAPALLI
134	BERGANI
135	KALLAPARAI
136	KONDAPPANAYAKKANPALAYAM
137	ERIYUR
138	ERUKKAMPATTU(VLR)
139	SANDYNALLA
140	CHELLUPULI
141	MURUGAMALAI WEST (K)
142	AYAKUDI
143	EASALTHITTU EAST
144	JONDRAMPALLI
145	KALAMALAI(KMTR)

146	NEITHALAPURAM NORTH
147	URIGAM
148	KAMANUR (P)
149	KARNATAGIRI
150	KOTTAPATTY SOUTH
151	PARAVAMALAI
152	PATCHALUR
153	TANAKAMALAI
154	ULAKKARUTTIAR
155	BATHALAGUNDU
156	MUTHUKOMBAI
157	PAVUNJIPATTU
158	SINGARAPETTAI WEST
159	ANDIPATTY WEST
160	ARASAMPETTAI
161	PATHIRAPALLI
162	UTHAMAPALAYAM
163	VASUDEVANALLUR
164	WODDAPATTY(H)
165	MANGALADEVI
166	THEKKAMPATTY
167	ARUNGULAM WEST
168	BILIKUNDULU
169	NADUKUPPAM
170	PERANDAPALLI
171	THATTAN COMBAI
172	ANAIKARAIPATTY
173	ERASAKKANAYAKKANUR
174	KATHIRIPATTY
175	KAZHUMALAI
176	VISHAMANGALAM
177	DHANAKONDAPALLI
178	KADAYANALLUR

179	KOOKAL
180	KOTTAIMALAI(VLR)
181	ADUKKAM
182	ANCHETTY
183	BADAKUPPAM
184	DAMARAI EAST
185	GOVERNOR SHOLA
186	KAVUTHI
187	KOMBAIPATTY
188	PERIAMALAI SOUTH
189	PONMANAI
190	THAGARAKUPPAM
191	ELUTHUR
192	MAVADAPU
193	SOKKADI
194	PARSONS VALLEY
195	THEVARAM NORTH
196	VELIMALAI SOUTH
197	ANAKATTI SOUTH
198	ANANDAVADI
199	BERNAPALLI
200	KORAKUNDAH
201	KURUMALAI
202	MALATTAR
203	MARAMALAI
204	MEGAMALAI SOUTH
205	NORTHAMALAI
206	PANAI EAST
207	POOMPARAI EAST
208	DENKANIKOTTAI
209	ERIYUR NORTH
210	GLENMORGAN(S)
211	KULASEKARAM SOUTH

212	MANCHI
213	OOTHAMPARAI
214	PADARMALAI
215	PARVATHAMALAI NORTH
216	THIRUTTANI
217	ERIYUR SOUTH
218	KANNIVADY
219	MAHARAJAKADAI
220	PANNAIKARADU NORTH
221	PODUMALAI
222	PUDUR(HOS)
223	SELUR
224	THEERTHAM
225	ANAIBETHAHALLA
226	ANDIAPPANUR
227	BEJJALATTI
228	KONGADAI
229	KUNJANUR
230	POONDI NORTH
231	PUNIMANGADU
232	RASINGAPURAM
233	SAPTUR NO 9
234	VANNATHIPARAI EAST
235	BALAMORE
236	BOKKAPURAM
237	CHARAGALLU
238	GUTTIRAYAN
239	NADUVATTAM
240	OOTHU
241	PANANGATTERI
242	PARVATHAMALAI SOUTH
243	PONNAPALLAI SOUTH
244	SANTHAVASAL

245	VANIYAR EAST
246	VARUSANADU
247	ATHIYOOTHU
248	GUNDUR WEST
249	KURANGUTHOPPU
250	NARASAPURAM
251	PERIYATHUKOMBAI
252	SANDUMALAI WEST
253	VELANCOMBAI
254	VENNIAR WEST
255	AGAMALAI WEST
256	BANGITAPAL
257	CUMBUM
258	MELPET SOUTH
259	MITTALAM SOUTH
260	VENNIAR EAST
261	ARASARADI NORTH
262	CHELLAKOILMETTU
263	ELANTHAIKULAM
264	JALDARAI
265	KODANADU
266	KULIPATTI
267	KUNDUKOTTAI
268	MACHAMPATTU NORTH
269	THALAYANAI SOUTH
270	USIMALAI
271	VELLAKKAL SOUTH
272	ALIALAMANGALAM NORTH
273	ALLERI NORTH
274	EBBANADU
275	KOTTURMALAI
276	PALANKOTTAI
277	PAMBAR EAST

278	THONGUMALAI NORTH
279	AMIRTHI
280	BELPATTI
281	EAGALOOTHU
282	GUDIGAM
283	KOZHIMUND
284	NANTHIPARAI
285	SANAMAVU
286	THERKKUMALAI WEST
287	ULIBANDA NORTH
288	ADAIYUR
289	BINAKANAHALLI SOUTH
290	ERAIYURMALAI
291	GUNRANI
292	MARUTHAMPARAI
293	MEGAMALAI NORTH
294	PAMBARPURAM
295	PYKARA
296	VIRIYANKOIL
297	KALLAMPALAYAM
298	MINJIGAN BOLI
299	PAKKAM
300	PERIAMALAI NORTH
301	THALAKARAI
302	THALAYANAI NORTH
303	UBBARANI
304	VARAM
305	IMBERALLAH
306	KALLAPADI
307	PINNANTHURAI
308	PUDUVALAVU
309	CHIKKARASAMPALAYAM
310	KALARAPATTI

311	KAMBALAI
312	KARIYAMUND
313	KARMANGUDI
314	KARUBELLA
315	KATTUPUTHUR
316	KILUR
317	KURANGANI NORTH
318	MANJAVADI SOUTH
319	MITTALAM NORTH
320	MULAKKADU SOUTH
321	RANJANKDUI
322	SIRUMALAI II
323	SOLAGANAI
324	GEJALATTI
325	MELARASAMPETTAI
326	PALLIPATTY NORTH
327	PEERKADAVU
328	SOOLAGIRI
329	SURIYAKADAI
330	THADAGAMALAI
331	AMBURUVI
332	ANAIMADU
333	BANDISHOLA
334	KOOTHAMUDI NORTH
335	NEITHALAPURAM SOUTH
336	PERUNGULATHUR
337	PIRAVADIAR
338	PULIYUR EAST
339	SITTILINGI NORTH
340	SOTHUPARAI
341	THOTTALAM SOUTH
342	VARANJARAM
343	VAYALPATTY

344	VIRISETTIPALLE
345	ATTUR GHAT
346	AYYARPADI
347	BARGUR(TVM)
348	BILIKKAL
349	GERMALAM WEST
350	NAYAKKANERI
351	NEDIYAM
352	OORGOUNDANUR
353	PADANTHURAI
354	PALAYAM
355	PUDUPATTU
356	SIRUMALAI SOUTH
357	SYNAGUNDA
358	THANDA
359	THENPALANI
360	THUMMAKUNDU SOUTH
361	VANDARAVU
362	VANNATHIPARAI WEST
363	VELLAKKAL NORTH
364	YERIMEDU
365	CHICKKALLI
366	CHITTERI
367	DEVIAR(VNR)
368	KARIYANAPALLI
369	KESARKULI
370	MANAR
371	NALLUR
372	PILLUR
373	SITTILINGI WEST
374	UTHAPPANAICKANUR
375	VIRALIPATTY
376	AGAMALAI EAST

377	EASALTHITTU WEST
378	JARUGUMALAI SOUTH
379	KALLUPALLI
380	KODAGARAI
381	MALLAPURAM
382	PARIGAM SOUTH
383	POONGULAM
384	THADAGAM SOUTH
385	THUMMAKUNDU NORTH
386	TIRTHAGIRI
387	UTCHIMALAI KUPPAM
388	ARASANATHAM
389	CHINNAKADU
390	GUNDAKKAL
391	KAKKARAI
392	KAPPUTHU
393	KUDIMADUVU
394	KUTTAIYUR II
395	MANALUR
396	MASINAGUDI
397	MAVANALLAH
398	MUDIMUND
399	PANAGUDI
400	POONDI SOUTH
401	SIVAGIRI
402	SURALUR
403	UDEDURGAM WEST
404	ULIBANDA SOUTH
405	WATRAP NO 2
406	AGASTHIYARPURAM
407	ALLERI SOUTH
408	ATHUVAMBADI
409	ERUKKAMPATTU

410	KELUR
411	KILKOTHAGIRI
412	KOVILTHERI
413	METTUR(DGL)
414	MURUGAMALAI EAST (K)
415	NADANUR
416	PARAMANANDAL
417	PERALI
418	PULAVACHIAR
419	SOOLAPURAM
420	TIRUMAYAM
421	UDANGAL
422	VELLIYANKADU EAST
423	VEPPAMPATTI EXTENSION
424	ERUMAIPATTY
425	HASSANUR
426	KARUPPASAMY KOIL
427	KUDIRAYAR WEST
428	KURUVADI
429	NANJANAD
430	ODUGATHUR
431	PADAVEDU
432	PAGADUPATTU
433	PALAVADI
434	PAMBAR WEST
435	THADIKARANKONAM NORTH
436	ALIALAMANGALEM SOUTH
437	ANAIKARAI
438	APPUR
439	CUMBUM METTU
440	EKKATTUR
441	ERUMAKKADAI
442	GUNDAR NORTH

443	KADAHATTI
444	KADAYAM
445	KANNAMADAI SOUTH
446	KARIKUTTANUR
447	KARMARPET
448	KOTTADU
449	MANJAMPATTI NORTH
450	MATHALAMPARAI
451	MAVADI
452	MELUMALAI
453	MULAKKADU WEST
454	MURUKKAMBADY
455	OOTTAMALAI
456	PONNUR
457	PULIYANJOLAI
458	RAVANDAVADI
459	SENDAMANGALAM
460	SINGARA
461	SITTILINGI
462	SURULIPATTY SOUTH (M)
463	THUKKARAMUND
464	THUMBAL
465	VADAKARAI
466	VALAVANTHINADU
467	VALLIMALAI
468	WATRAP NO 4
469	AMMAPALAYAM SOUTH
470	AMMUR NORTH
471	BEJJALATTI(E)
472	BOTHAMALAI SOUTH
473	CHINNAOVILAPURAM
474	ERIYUR(DPI)
475	GUNDANSHOLAI

476	KANAVAIPATTY (D)
477	KANAVAIPUDUR
478	KANJERI
479	KATHIRIKAI ODAI
480	KODAMADI
481	KOMUTTERI SOUTH
482	KUNJAPPANAI(CBE)
483	LINGAMALAI
484	MANJANOOTHU SOUTH
485	MARUTHAMALAI
486	MAVILIPATTY
487	MULLANKADU
488	NAICKENERI
489	PALAMARATHUR SOUTH
490	PALLALAKUPPAM
491	RAJAMPARAI
492	SANTHANAKAVU
493	SEEMANUTHU
494	SURULIPATTY NORTH
495	THATHANUR
496	THOMBUREDDY
497	TIGINARAI
498	VANDALUR
499	WODDAPATTY
500	AMMANKOIL

Table: 1.5 Top 500 RF & RL Sensitive to Forest Fires

S.NO	RESERVE FORESTS AND RESERVE LANDS
1	ANAIMALAI RESERVED FORESTS
2	VIRAPULI RESERVED FORESTS
3	AMPTHILLDOWN RESERVED FORESTS
4	BODI NORTH HILL RESERVED LANDS
5	KUNDAH RESERVED FORESTS
6	AYAGUDI RESERVED LANDS

7	P V VALLEY RESERVED FORESTS
8	WENLOCK DOWN RESERVED FORESTS
9	AIYUR RESERVED FORESTS
10	GUTTIYALATTUR RESERVED FORESTS
11	THOLUVABETTA RESERVED FORESTS
12	PUNGANUR RESERVED FORESTS
13	ASAMBU RESERVED FORESTS
14	MEGAMALAI RESERVED LANDS
15	TALAMALAI RESERVED FORESTS
16	KOLATTI RESERVED FORESTS
17	INNER JAVADI RESERVED FORESTS
18	PERUMALMALAI (DGL) RESERVED FORESTS
19	SIRUMALAI RESERVED LANDS
20	KALAMALAI RESERVED FORESTS
21	SEGUR RESERVED FORESTS
22	KUDIRAIYAR RESERVED FORESTS
23	MORDHANA RESERVED FORESTS
24	MOYAR RESERVED FORESTS
25	KURUMBAPATTY RESERVED FORESTS
26	VASUDEVANALLUR RESERVED FORESTS
27	KOMBAI RESERVED FORESTS
28	KUKKAL RESERVED FORESTS
29	ARASAMPATTU RESERVED FORESTS
30	KANNIVADI BLOCK I RESERVED LANDS
31	VANNATHIPARAI RESERVED FORESTS
32	KESTHUR RESERVED FORESTS
33	PANAI RESERVED FORESTS
34	KARUTHAMALAI RESERVED FORESTS
35	NATRAPALAYAM RESERVED FORESTS
36	NORTH BARGUR RESERVED FORESTS
37	JAWALGIRI RESERVED FORESTS
38	MUDUMALAI & KUMBARAKOLLI RESERVED FORESTS
39	MORDHANA EXTN RESERVED FORESTS

40	KEMPAKARAI RESERVED FORESTS
41	THENMALAI RESERVED FORESTS
42	AMBUR RESERVED FORESTS
43	ULIBANDA RESERVED FORESTS
44	SINGARAPETTAI EXTN RESERVED FORESTS
45	MADDUR RESERVED LANDS
46	MANJAMPATTI RESERVED FORESTS
47	SANANKUPPAM RESERVED FORESTS
48	AMARAVATHI RESERVED FORESTS
49	SAMERI RESERVED FORESTS
50	GALIGATTAM RESERVED FORESTS
51	PALAMATHY RESERVED FORESTS
52	MAMBAKKAM(V) RESERVED FORESTS
53	NAICKANERI RESERVED FORESTS
54	KARAVALLI COMBAI RESERVED FORESTS
55	MOOLAIYAR RESERVED FORESTS
56	THAGGATTY RESERVED FORESTS
57	VIRAPPANUR RESERVED FORESTS
58	AMMOOR RESERVED FORESTS
59	VELIMALAI RESERVED FORESTS
60	BOLAMPATTI II RESERVED FORESTS
61	THEVARAM RESERVED FORESTS
62	PAPANASAM RESERVED FORESTS
63	PH SOUTHERN SLOPE RESERVED FORESTS
64	THALLY RESERVED FORESTS
65	SAPTUR RESERVED FORESTS
66	KAPPUTHU RESERVED FORESTS
67	KOTTAGUDI RESERVED LANDS
68	OLIYANUTHU RESERVED FORESTS
69	BODI WEST HILLS RESERVED FORESTS
70	CHARAGALLU RESERVED FORESTS
71	KARAPATTU RESERVED FORESTS
72	PUTHUR RESERVED FORESTS

73	NEKKANAMALAI RESERVED FORESTS
74	MAHIMANDALAM RESERVED FORESTS
75	BILIGUNDULU RESERVED FORESTS
76	NOGANUR RESERVED FORESTS
77	ALANGAYAM RESERVED FORESTS
78	MALLAHALLI RESERVED FORESTS
79	KOTTAPATTY EXTN RESERVED FORESTS
80	NOCHIKUTTAI EXTN RESERVED FORESTS
81	GUTTIRAYAN RESERVED FORESTS
82	MARANDAHALLI EXTN RESERVED FORESTS
83	AMBUR DURG RESERVED FORESTS
84	KESTHUR EXTN RESERVED FORESTS
85	SOUTH BARGUR RESERVED FORESTS
86	WODDAPATTY RESERVED FORESTS
87	MALAYALAM RESERVED FORESTS
88	NEDIUM RESERVED FORESTS
89	PATRAKAD RESERVED FORESTS
90	MURUGAMALAI RESERVED FORESTS
91	ADUKKAM RESERVED FORESTS
92	AIYUR EXTN I RESERVED FORESTS
93	MANGALAM RESERVED FORESTS
94	UBBARANI RESERVED FORESTS
95	PARVATHAMALAI RESERVED FORESTS
96	MARANDAHALLI RESERVED FORESTS
97	PANAMADANGI RESERVED FORESTS
98	ANCHETTY RESERVED FORESTS
99	THELLAI RESERVED FORESTS
100	BILLIKKAL RESERVED FORESTS
101	KARNATAGIRI RESERVED FORESTS
102	KAVUTHIMALAI RESERVED FORESTS
103	AGAMALAI RESERVED FORESTS
104	ANDIPATTY RESERVED FORESTS
105	ERASAKKANAYAKKANUR RESERVED FORESTS

106	MACHAKKAL RESERVED FORESTS
107	NILGIRI EASTERN SLOPES RESERVED FORESTS
108	AMMAPALAYAM RESERVED FORESTS
109	KOTTAPATTY RESERVED FORESTS
110	PERIYAMALAI (TVM) RESERVED FORESTS
111	SANAMAVU RESERVED FORESTS
112	SETHUR RESERVED FORESTS
113	KANIYAMBADI RESERVED FORESTS
114	SRIVILLIPUTHUR RESERVED FORESTS
115	MARUTHANATHI RESERVED FORESTS
116	KALAMALAI (KMTR) RESERVED FORESTS
117	PARAVAMALAI RESERVED FORESTS
118	SAMIKANAL RESERVED FORESTS
119	URIGAM RESERVED FORESTS
120	MULAKKADU RESERVED FORESTS
121	PALLIKONDA RESERVED FORESTS
122	MORAPPUR RESERVED FORESTS
123	NOCHIKUTTAI RESERVED FORESTS
124	PANNAIKARADU RESERVED FORESTS
125	ANDIAPPANUR RESERVED FORESTS
126	BIKKAPATHIMUND RESERVED FORESTS
127	KADAYANALLUR RESERVED FORESTS
128	ALIALAMANGALAM RESERVED FORESTS
129	MAHARAJAKADAI RESERVED FORESTS
130	NEDUNGUNAM RESERVED FORESTS
131	NOCHILI RESERVED FORESTS
132	THALLY EXTN RESERVED FORESTS
133	PEDDARAMAPURAM RESERVED LANDS
134	TIGER SHOLA RESERVED FORESTS
135	PALLIPATTI RESERVED FORESTS
136	SURANGANAR RESERVED FORESTS
137	KADAVUMALAI RESERVED FORESTS
138	PONNERI RESERVED FORESTS

139	S U VANAM RESERVED FORESTS
140	VELLAKKALTHERI RESERVED FORESTS
141	KENGODU NORTH RESERVED FORESTS
142	MANCHI RESERVED FORESTS
143	SEGUR BL II RESERVED FORESTS
144	SIVAGIRI RESERVED FORESTS
145	THOLUVABETTA EXTN RESERVED FORESTS
146	KANNIVADI RESERVED LANDS
147	MADDUR EXTN RESERVED LANDS
148	PERUMAL MALAI SHOLA RESERVED FORESTS
149	SITILINGI RESERVED FORESTS
150	VEPPANAPALLI BIT I RESERVED FORESTS
151	ANANDAVADI RESERVED FORESTS
152	KALLAR (DGL) RESERVED FORESTS
153	PARADHARAMI RESERVED FORESTS
154	ARANKANAL RESERVED FORESTS
155	NADUVATTAM RESERVED FORESTS
156	PUNIMANGADU RESERVED LANDS
157	THUMBERI RESERVED FORESTS
158	WAGUTHUMALAI RESERVED FORESTS
159	ANAIKATTY SOUTH RESERVED FORESTS
160	PAVUNJIPATTU RESERVED FORESTS
161	SANTHAVASAL RESERVED FORESTS
162	THAISHOLA RESERVED FORESTS
163	VELLORE FORT HILL RESERVED FORESTS
164	COURTALLAM RESERVED FORESTS
165	VELLAKKAL RESERVED FORESTS
166	BOLAMPATTI III RESERVED FORESTS
167	DODDAPPANAICKANUR NORTH RESERVED FORESTS
168	MALLIYAMBADI RESERVED LANDS
169	PAMBAR RESERVED FORESTS
170	SENGALVARAYAR RESERVED FORESTS
171	TAMARAIKADU RESERVED FORESTS

172	THEVARAM ADDN RESERVED FORESTS
173	CHITTERI EXTN RESERVED FORESTS
174	MADHANANCHERI RESERVED FORESTS
175	POONGULAM RESERVED FORESTS
176	AIYUR EXTN RESERVED FORESTS
177	PALLALAKUPPAM RESERVED FORESTS
178	AIYUR EXTN III RESERVED FORESTS
179	BADANAVADI RESERVED FORESTS
180	SELUR RESERVED FORESTS
181	JARUGUMALAI RESERVED FORESTS
182	MANJAVADI GHAT RESERVED FORESTS
183	MYLARVADA RESERVED LANDS
184	UDEDURGAM RESERVED FORESTS
185	ERAIYURMALAI RESERVED FORESTS
186	GOPINARI RESERVED FORESTS
187	KARUNGAL RESERVED FORESTS
188	KUNJANOOR RESERVED FORESTS
189	MADHAKADAPPA RESERVED FORESTS
190	MEEKERU BETTU RESERVED FORESTS
191	PULLUR EAST RESERVED FORESTS
192	VANIYAR RESERVED FORESTS
193	BEERGANI RESERVED FORESTS
194	CHITTERI RESERVED FORESTS
195	HIGHWAVYS RESERVED LANDS
196	KOOTHAMBAKKAM RESERVED FORESTS
197	PERUNGULATHUR SWAMIMALAI RESERVED FORESTS
198	SOKKADI RESERVED FORESTS
199	SYNAGUNDA RESERVED FORESTS
200	AMBURUVI RESERVED FORESTS
201	KANNAMADAI RESERVED FORESTS
202	KESARAGULI RESERVED FORESTS
203	KOKKATHORAI RESERVED FORESTS
204	KONASAMUDRAM RESERVED FORESTS

205	N S AGRAHARAM RESERVED FORESTS
206	PARAMBIKKARADU RESERVED LANDS
207	SIRUMALAI RESERVED FORESTS
208	SURULIPATTI RESERVED FORESTS
209	TAADAGAMALAI RESERVED FORESTS
210	AGARAMCHERI RESERVED FORESTS
211	AMBUR FUEL RESERVED FORESTS
212	ATTUR GHAT RESERVED FORESTS
213	DENKANIKOTTA RESERVED FORESTS
214	JAKANARI SLOPE RESERVED FORESTS
215	KARANDAMALAI RESERVED FORESTS
216	PARAMANANDAL RESERVED FORESTS
217	RAVANDAVADI RESERVED FORESTS
218	VENGANUR RESERVED FORESTS
219	ACHANPUDUR GRAZING BLOCK1 RESERVED FORESTS
220	BOLAMPATTI I RESERVED FORESTS
221	GUNDAR VALLEY EXTN RESERVED FORESTS
222	KALNADU RESERVED FORESTS
223	PILLUR SLOPE RESERVED FORESTS
224	SITILINGI EXTN RESERVED FORESTS
225	VALLIPATTU RESERVED FORESTS
226	VEERACHETTIPALLI RESERVED FORESTS
227	VIRALIPATTI RESERVED FORESTS
228	AVARALLAH RESERVED FORESTS
229	JOLARPET RESERVED FORESTS
230	KALLAPADI RESERVED FORESTS
231	MAHENDRAGIRI RESERVED FORESTS
232	MALLAPURAM GHAT RESERVED FORESTS
233	MANGALAM (PMB) RESERVED FORESTS
234	NALLAPATTU RESERVED FORESTS
235	NEDUKADUHALLA RESERVED FORESTS
236	NILGIRI PEAK RESERVED FORESTS
237	PALUR RESERVED FORESTS

238	PONNAIYAR RESERVED FORESTS
239	THAMBIRAN KANAL RESERVED FORESTS
240	THERKUMALAI WEST RESERVED FORESTS
241	AIYUR EXTN II RESERVED FORESTS
242	BOOTHAKARADU RESERVED FORESTS
243	CHINNAKADU RESERVED FORESTS
244	EBANADU ADDN RESERVED FORESTS
245	KALLATTY SLOPE & ADDN RESERVED FORESTS
246	KEELANAVAYAL RESERVED FORESTS
247	KUDIMADUVU RESERVED FORESTS
248	OUTCHERLONY RESERVED FORESTS
249	SANTANAVENUGOPALAPURAM EXTN I RESERVED FORESTS
250	SANTANAVENUGOPALAPURAM RESERVED FORESTS
251	SETTIPALLI RESERVED FORESTS
252	TIRTHAGIRI RESERVED FORESTS
253	KAILASAGIRI RESERVED FORESTS
254	KALAKKADU RESERVED FORESTS
255	KUMBALAM II RESERVED FORESTS
256	NAICKANERI EXTN RESERVED FORESTS
257	PALAMARATHUR RESERVED FORESTS
258	SYNAGUNDA EXTN RESERVED FORESTS
259	THADAGAM RESERVED FORESTS
260	VALASAMALAI RESERVED FORESTS
261	DENAD RESERVED FORESTS
262	ELUMALAI RESERVED FORESTS
263	KUMBALAM I RESERVED FORESTS
264	MAHAKALIKAPURAM RESERVED LANDS
265	MOOLAKADU RESERVED LANDS
266	NEEDLE ROCK ADDN II RESERVED FOREST
267	PUTHUR ESTATE RESERVED FORESTS
268	SATHIYAVADI RESERVED FORESTS
269	UTCHIMALAI RESERVED FORESTS
270	VARAM RESERVED LANDS

271	VENKATARAJAKUPPAM RESERVED FORESTS
272	VEPPANAPALLI EXTN RESERVED FORESTS
273	BOKKAPURAM RESERVED FORESTS
274	CHINNARADODDI RESERVED FORESTS
275	JANGALAPALLI RESERVED FORESTS
276	KALARAPATTI RESERVED FORESTS
277	PARIGAM RESERVED FORESTS
278	PEDDANAGAPUDI RESERVED FORESTS
279	PULIANSHOLAI RESERVED FORESTS
280	SARUVUMALAIKARADU I RESERVED FORESTS
281	SINGARAPETTAI RESERVED FORESTS
282	THEERTHAMALAI RESERVED FORESTS
283	THOMBAKKAL RESERVED FORESTS
284	VALLIMALAI RESERVED FORESTS
285	VEPPAMPATTI EXTN RESERVED FORESTS
286	ABANADU RESERVED FORESTS
287	ALAMELUMANGAPURAM RESERVED FORESTS
288	ALWARMALAI RESERVED FORESTS
289	EZUTHUR RESERVED LANDS
290	GULLU RESERVED FORESTS
291	KANAVAIPUDUR RESERVED FORESTS
292	KANJERI RESERVED FORESTS
293	KARUNGALTHONI MEDU RESERVED FORESTS
294	KIDAR RESERVED LANDS
295	MANKARADU RESERVED FORESTS
296	MELUR SLOPE RESERVED FORESTS
297	PAIVALASA RESERVED LANDS
298	PALLALAKUPPAM EXTN RESERVED FORESTS
299	THUMBAL RESERVED FORESTS
300	APPUKKAL RESERVED FORESTS
301	APPUR RESERVED FORESTS
302	GANDAMANUR EAST RESERVED FORESTS
303	GUNDALAPALLI RESERVED FORESTS

304	JAMBUTHU RESERVED FORESTS
305	KOTHAKOTTAI RESERVED FORESTS
306	KOVILADI RESERVED FORESTS
307	KUKKAL VALLEY RESERVED FORESTS
308	KUNNAM RESERVED FORESTS
309	NELLIMALAI (VLR) RESERVED FORESTS
310	SPRING FIELD RESERVED FORESTS
311	THIRUVARANKULAM RESERVED LANDS
312	VELLAKUTTAI RESERVED FORESTS
313	VENUGOPALAPURAM RESERVED FORESTS
314	VETTIANTHOLUVAM RESERVED FORESTS
315	ATTIYUR RESERVED FORESTS
316	BARABETTA RESERVED FORESTS
317	KANANKADU RESERVED FORESTS
318	KANNIVADI BLOCK II RESERVED FORESTS
319	KANNIVADI BLOCK III BIT II RESERVED FORESTS
320	MAMBAKKAM EXTN(V) RESERVED FORESTS
321	MELAGUDALUR RESERVED FORESTS
322	NELLITHURAI RESERVED FORESTS
323	POTTIYAM RESERVED LANDS
324	PUDUPATTY RESERVED FORESTS
325	PULIYARAI RESERVED FORESTS
326	RENGASAMY PEAK RESERVED FORESTS
327	SENGIRAI RESERVED FORESTS
328	TEAK GUNDU KARADU RESERVED FORESTS
329	VEDIYANKADU WEST II RESERVED FOREST
330	VENGUNAM RESERVED FORESTS
331	ACHANPUDUR GRAZING BLOCK2 RESERVED FORESTS
332	ALAGAR HILLS RESERVED FORESTS
333	ANAIKATTY SOUTH EXTN RESERVED FORESTS
334	ATHIMUGAM II RESERVED FORESTS
335	BRACKEN SHOLA RESERVED FORESTS
336	KELUR RESERVED FORESTS

337	KUTTADI RESERVED FORESTS
338	MELKUNDHA RESERVED FORESTS
339	NEDUKADUHALLA ADDN RESERVED FORESTS
340	NERALAKOTTA RESERVED FORESTS
341	PALAMALAI (SLM) RESERVED FORESTS
342	PEDDUR BIT I RESERVED FORESTS
343	PEDDUR BIT II RESERVED FORESTS
344	PERUMBUR RESERVED LANDS
345	SOLAIMATHI RESERVED FORESTS
346	THUMBAL EXTN RESERVED FORESTS
347	UPPUR RESERVED LANDS
348	VADAKARAI KILPADAGAI RESERVED FORESTS
349	VANDALUR RESERVED FORESTS
350	VELAMUNDY RESERVED FORESTS
351	VIRAMACHAMPATTY RESERVED FORESTS
352	AGARAM RESERVED LANDS
353	ANAIMADUVU RESERVED LANDS
354	ATHIMUGAM I RESERVED FORESTS
355	BERIGAI RESERVED FORESTS
356	BLACK BRIDGE RESERVED FORESTS
357	CHINNASAMUDRAM RESERVED FORESTS
358	COONOOR PEAK RESERVED FORESTS
359	GOLLAPALLY RESERVED FORESTS
360	JADAYAGOUNDAN SLOPES RESERVED FORESTS
361	JALLUTHU RESERVED FORESTS
362	KORAMANGALAM BIT I RESERVED LANDS
363	MADURAPAKKAM RESERVED FORESTS
364	MAVILIPATTY RESERVED FORESTS
365	MUDHANAI RESERVED FORESTS
366	NANJANAD RESERVED FORESTS
367	PARADHARAMI EXTN RESERVED FORESTS
368	POTHATTURPET RESERVED FORESTS
369	PUDUPPER RESERVED FORESTS

370	SINNATHU SHOLA ADDN RESERVED FORESTS
371	T EDAIYAR RESERVED FORESTS
372	TAGARAI RESERVED FORESTS
373	THUNAKADAVU RESERVED FORESTS
374	VEDIYANKADU EXTN 3 RESERVED LANDS
375	VEERAMANGALAM RESERVED FORESTS
376	CHINNATIRUPATHY RESERVED LANDS
377	GUNDAKKAL RESERVED FORESTS
378	KAMBATTI BL RESERVED FORESTS
379	KANIYANKADU RESERVED FORESTS
380	KARIMBEDU RESERVED FORESTS
381	KOOTHA NACHIYAR RESERVED FORESTS
382	KOTTAMALAI RESERVED FORESTS
383	KUTTAR RESERVED FORESTS
384	MALLUR RESERVED FORESTS
385	MANJIKONDAPALLI RESERVED FORESTS
386	MEDANADU ADDN I RESERVED FORESTS
387	MEDANADU RESERVED FORESTS
388	MELMURUVAM RESERVED LANDS
389	MIDETHEPALLI RESERVED FORESTS
390	MUDIDEVARMUND RESERVED FORESTS
391	MUKURTHI PEAK RESERVED FORESTS
392	MUTTAKADU RESERVED FORESTS
393	NAGALUTHU RESERVED FORESTS
394	NANGUR RESERVED FORESTS
395	NARASINGAPURAM RESERVED FORESTS
396	NATHAMUR BIT II RESERVED FORESTS
397	NEEDLE ROCK ADDN I RESERVED FORESTS
398	NOOLAHALLI & REDDIHALLI RESERVED FORESTS
399	NORTHERN HAY RESERVED FORESTS
400	PERAIYUR RESERVED FORESTS
401	PUDUKOTTAI KASPA EAST RESERVED LANDS
402	PULLUR RESERVED FORESTS

403	SENJAI EAST RESERVED FORESTS
404	SEVUR RESERVED FORESTS
405	THADAGAM BLOCK IV RESERVED FORESTS
406	THERKUMALAI EAST RESERVED FORESTS
407	THEVAR MALAI RESERVED FORESTS
408	THOMBAKKAL EXTN RESERVED FORESTS
409	THORADIPATTU RESERVED LANDS
410	VEDIYANKADU WEST I RESERVED FORESTS
411	VELLIMALAI RESERVED LANDS
412	YERIMALAI RESERVED FORESTS
413	AMMANKOIL ADDN II RESERVED FORESTS
414	ARAMPOONDI RESERVED LANDS
415	ARUNA RESERVED FORESTS
416	ATTIPAKKAM RESERVED FORESTS
417	BOMMINAICKENPALAYAM RESERVED FOREST
418	BROOKELANDS RESERVED FORESTS
419	C K THERKUNADU X RESERVED FORESTS
420	CHITTAL RESERVED FORESTS
421	CHITTALI RESERVED FORESTS
422	CHOKKAMPATTI RESERVED FORESTS
423	DENKANIKOTTA EXTN RESERVED FORESTS
424	GUDALUR(KPM) RESERVED FORESTS
425	INNADU RESERVED LANDS
426	KADATHUR(HOSUR) RESERVED FORESTS
427	KALMALAI RESERVED FORESTS
428	KARIYANAPALLI I RESERVED FORESTS
429	KARUVELAMBADI RESERVED LANDS
430	KATTURANI EAST RESERVED FORESTS
431	KUMBALAM III RESERVED LANDS
432	KURUMALAI RESERVED FORESTS
433	MANIYARPALAYAM RESERVED LANDS
434	MANNUR (KPM) RESERVED FORESTS
435	MEDANADU ADDN II RESERVED FORESTS

436	MODUR PEDUKUTTAI RESERVED FORESTS
437	MOZHIPATTU RESERVED LANDS
438	MUTHUR RESERVED FORESTS
439	NAGALUR (ERD) RESERVED FORESTS
440	NARALAPALLI EXTN RESERVED FORESTS
441	NARALAPALLI RESERVED FORESTS
442	NARIGANAPURAM RESERVED FORESTS
443	NATHAMUR BIT I RESERVED FORESTS
444	NATTAMPALLI RESERVED FORESTS
445	NEDUGALLU & EXTN RESERVED FORESTS
446	NERPUGAI PATTI RESERVED FORESTS
447	NOCHILI EXTN RESERVED FORESTS
448	P UDAYARENDAL RESERVED FORESTS
449	PACHAIPALAMALAI RESERVED FORESTS
450	PADIKKAMVAYAL KUNNU 1,2,3 RESERVED LANDS
451	PALAVAKKAM RESERVED FORESTS
452	PANDUR RESERVED FORESTS
453	PERIAKADAMBUR RESERVED FORESTS
454	PILAPADI RESERVED FORESTS
455	POOMALAI RESERVED FORESTS
456	PULIANSHOLAI EXTN RESERVED FORESTS
457	PUTTAI RESERVED FORESTS
458	RAMASAMUDRAM RESERVED FORESTS
459	RAVATHANALLUR RESERVED FORESTS
460	SANTHAVASAL EXTN RESERVED FORESTS
461	SANYASIMALAI RESERVED FORESTS
462	SELUR EXTN RESERVED FORESTS
463	SENGATTUR RESERVED FORESTS
464	SIRUMALAI NORTHEAST SLOPE RESERVED FORESTS
465	SIRUVATTUKADU RESERVED FORESTS
466	THIRUVENNAINALLUR RESERVED LANDS
467	VADAPATTI RESERVED FORESTS
468	VALLUVAMBAKKAM RESERVED FORESTS

469	VEERARAGHAVAPURAM RESERVED FORESTS
470	AMMANKOIL FOREST BL I RESERVED FORESTS
471	ANAGIRI SHOLA RESERVED FORESTS
472	ARAMANAIKURICHI RESERVED FORESTS
473	ARASADI ARIVETTI RESERVED FORESTS
474	ARASANKAD RESERVED FORESTS
475	ATHANGUDI RESERVED FORESTS
476	BADUR RESERVED FORESTS
477	BERGANI I RESERVED FORESTS
478	C K VADAKKUNADU 1 RESERVED FORESTS
479	CHERAMBADI RESERVED FORESTS
480	CURZON VALLEY II RESERVED FORESTS
481	DEVARNADU I RESERVED FORESTS
482	DEVARNADU II RESERVED FORESTS
483	DODDAPPANAICKANUR SOUTH RESERVED FORESTS
484	GANGAIKONDAN RESERVED FORESTS
485	GOVINDAPURAM RESERVED FORESTS
486	GUDAKKAL RESERVED FORESTS
487	HULLEPALAYAM RESERVED FORESTS
488	KAGGUCHI EXTN I & IV RESERVED FORESTS
489	KAMBATTI RESERVED FORESTS
490	KAMMASAMUDRAM RESERVED FORESTS
491	KANJAMALAI RESERVED FORESTS
492	KANNIVADI BLOCK III BIT I RESERVED FORESTS
493	KARTHIKEYAPURAM BIT I RESERVED FORESTS
494	KARTHIKEYAPURAM BIT II RESERVED FORESTS
495	KATTUMAILUR EXTN RESERVED FORESTS
496	KATTUR RESERVED FORESTS
497	KATTURANI CENTRAL RESERVED FORESTS
498	KAVARAMALAI RESERVED FORESTS
499	KAYAR RESERVED FORESTS
500	KEELAIYUR RESERVED FORESTS

Table: 1.6 Percentage of Forest Area affected in 2025

S.NO	DIVISION	AREA IN SQ.KM	% OF AREA AFFECTED
1	HOSUR	78.624145	38.943
2	VELLORE	40.223823	19.923
3	WL ATR TIRUPPUR	14.39172	7.128
4	THENI	10.455336	5.179
5	WL ATR POLLACHI	8.812552	4.365
6	TIRUPPATTUR	6.909859	3.422
7	KODAIKANAL	6.307412	3.124
8	WL, SRIVILLIPUTHUR	4.284566	2.122
9	NAMAKKAL	3.605901	1.786
10	NILGIRIS	3.412184	1.690
11	KANYAKUMARI	3.355728	1.662
12	TIRUVALLUR	2.855048	1.414
13	SALEM	2.719018	1.347
14	DHARMAPURI	2.503975	1.240
15	DINDIGUL	1.69707	0.841
16	SIVAGANGAI	1.374	0.681
17	PUDUKKOTTAI	1.259401	0.624
18	COIMBATORE	1.205388	0.597
19	TIRUVANNAMALAI	1.148188	0.569
20	TIRUNELVELI	1.009469	0.500
21	WL, MEGAMALAI	0.858683	0.425
22	WL, MTR MASINAGUDI	0.792999	0.393
23	WL, STR SATHY	0.679206	0.336
24	GUDALUR	0.651404	0.323
25	VILUPPURAM	0.589749	0.292
26	WL, MTR UDHAGAI	0.547381	0.271
27	MADURAI	0.525706	0.260
28	ERODE	0.49821	0.247
29	WL, STR HASSANUR	0.291338	0.144
30	WL, KMTR KALAKKADU	0.282281	0.140
31	WL, KMTR AMBASAMUDRAM	0.016544	0.008
32	CHENGALPATTU	0.007887	0.004
33	ATTUR	0.00146	0.001
TOTAL		**201.897631**	**100**

