

## **1. INTRODUCTION**

Sporadic forest fire incidences were reported in Goa in first fortnight of March 2023, which were attended swiftly by Forest Department, under able leadership and guidance of Hon'ble Forest Minister [HFM] and Chief Secretary, in coordination with all concerned including Fire and Emergency Services, District Disaster Management Authority, Police Department, Village Panchayats, Local Community and Armed Forces. All fires were controlled successfully in shortest feasible time period. To ascertain the cause of fire, facts and circumstances to take corrective measures an inquiry was ordered by PCCF. Accordingly, consequent to receipt of information from all DCF's a report on recent fires in State is furnished hereunder.

## **2. Background:**

**2.1** As per studies forests fires are not uncommon. It has been a natural part of ecosystem since origin of forest. Fires, at times, are very useful and essential for good natural forest development and regeneration. Throughout historic time forest fires have been ignited and burned naturally through the forest. These low intensity fires in past kept the forest floor free from the natural annual build-up of the litter including dead grass, senescent leaves & twigs, thick brush, and dead trees. As a result, fire has significantly contributed in shaping the vegetation patterns and wildlife distributions in the forests.

**2.2** "Fire is a good servant but a bad master" the saying is true for forest fire too. Controlled forest fires have been very useful and essential for

healthy forest growth. But uncontrolled forest fire may adversely affect and destroy forest vegetation. Fire causes many direct or indirect effects on the forest ecosystem. They may be beneficial but at most of the times these effects are deteriorating. The damage to a forest by fire depends mainly on size of the fire. The main adverse impact of the uncontrollable forest fire includes damage to growing stock of forests, loss of vegetation, increase in soil erosion, degrade soil quality, retrogrades forest regeneration, affects wildlife habitat including microbe's etc.

**2.3** The Forest Survey of India, Ministry of Environment Forest & Climate Change, Government of India [FSI] in its India State of Forest Report, 2021, has kept Ninety Nine percent [99 %] of the forests of Goa under less fire prone category, while only one percent [1.0 %] of the forest is kept under moderately fire prone category which are spread across both districts. Due to naturally rich dense forests and comparatively high rainfall in State, forest fire in the state is restricted between March to May.

**2.4** The incidences of fire in Goa as per past experiences can be attributed to environmental factors which is further aggravated by several anthropogenic reasons most common being cultural operations practised by local populace in managing their farm lands (including cashew plantations) which trigger fire in adjoining forest areas.

### **3. BASICS OF FOREST FIRE**

**3.1** Out of three essential components of fire triangle, two components i.e., fuel and oxygen are naturally available in forest. It is the third component i.e., heat that really initiates fire in the forest. Heat may be supplied by either natural or artificial reasons. Depending upon the source of the heat,

the causes for forest fire may be classified as natural or artificial. While lightening, volcanic explosion, friction of rolling stone etc. are the natural causes for forest fire; the anthropogenic causes may be subdivided into two categories i.e., deliberate causes and unintentional or accidental causes.

### **3.2 Causes of forest fire**

**3.2.1 Natural Fire:** Some forest fires start from natural causes like lightning, rolling stones, friction of dry bamboos and stems of trees. Moreover, high atmospheric temperatures and dryness (low humidity) offer favourable circumstance for a fire to commence.

**3.2.2 Anthropogenic fire:** When a source of fire like naked flame, cigarette smoking, electric spark or any man-made causes of ignitions come into contact with inflammable materials within forest, it causes forest fires. Such fires may be intentional or accidental. People living in the vicinity of forests often intentionally ignite fires for inducing growth of grass or clear forest floors for collecting Non-Timber Forest Products (NTFPs). Such fires many times become uncontrollable. In India, however over 95 % of fire incidences are of manmade in origin.

### **3.3 Types of forest fire**

**3.3.1 Ground fire:** A true ground fire is not easily predictable as it spreads within, rather than top of organic matter. It consumes organic matter like duff or peat present beneath the surface litter of the forest floor. It has unique characteristic of having a smouldering edge with no flame and little smoke. Ground fires are most hard to tackle.

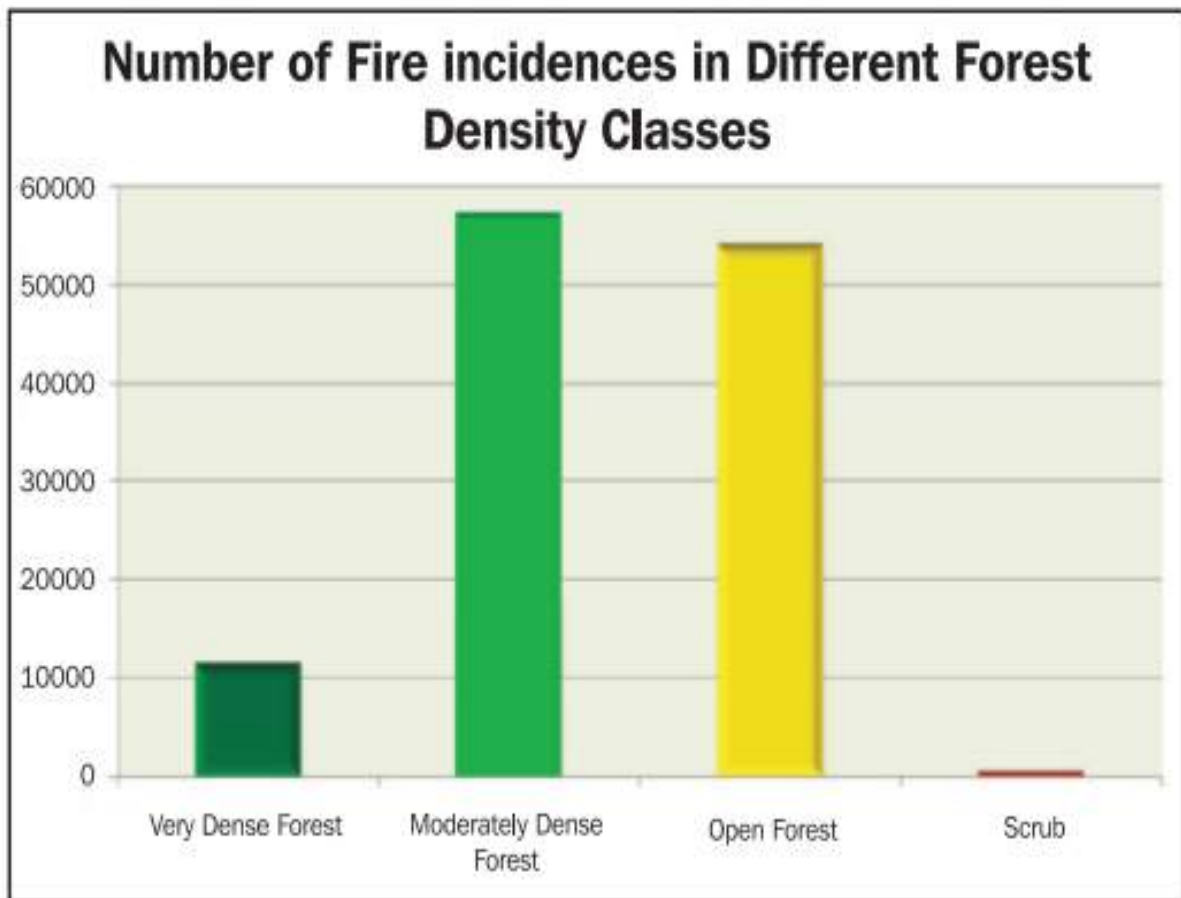
**3.3.2 Surface fire:** Surface fire is a fast-moving fire and burn loose and dried leaf litter, herbaceous vegetation, shrubs, small trees, and saplings

that are at or near the surface of the ground, mostly by flaming combustion. The expansion of the surface fire is dictated by the load of Surface and Aerial fuel an area harbour. This type of forest fires is most common in India.

**3.3.3 Crown Fire:** Crown fire advances from top to top of trees or shrubs without any close link with surface fire. It is the fastest way of spreading fire and most destructive for trees as well as wildlife. It is rarely observed in India.

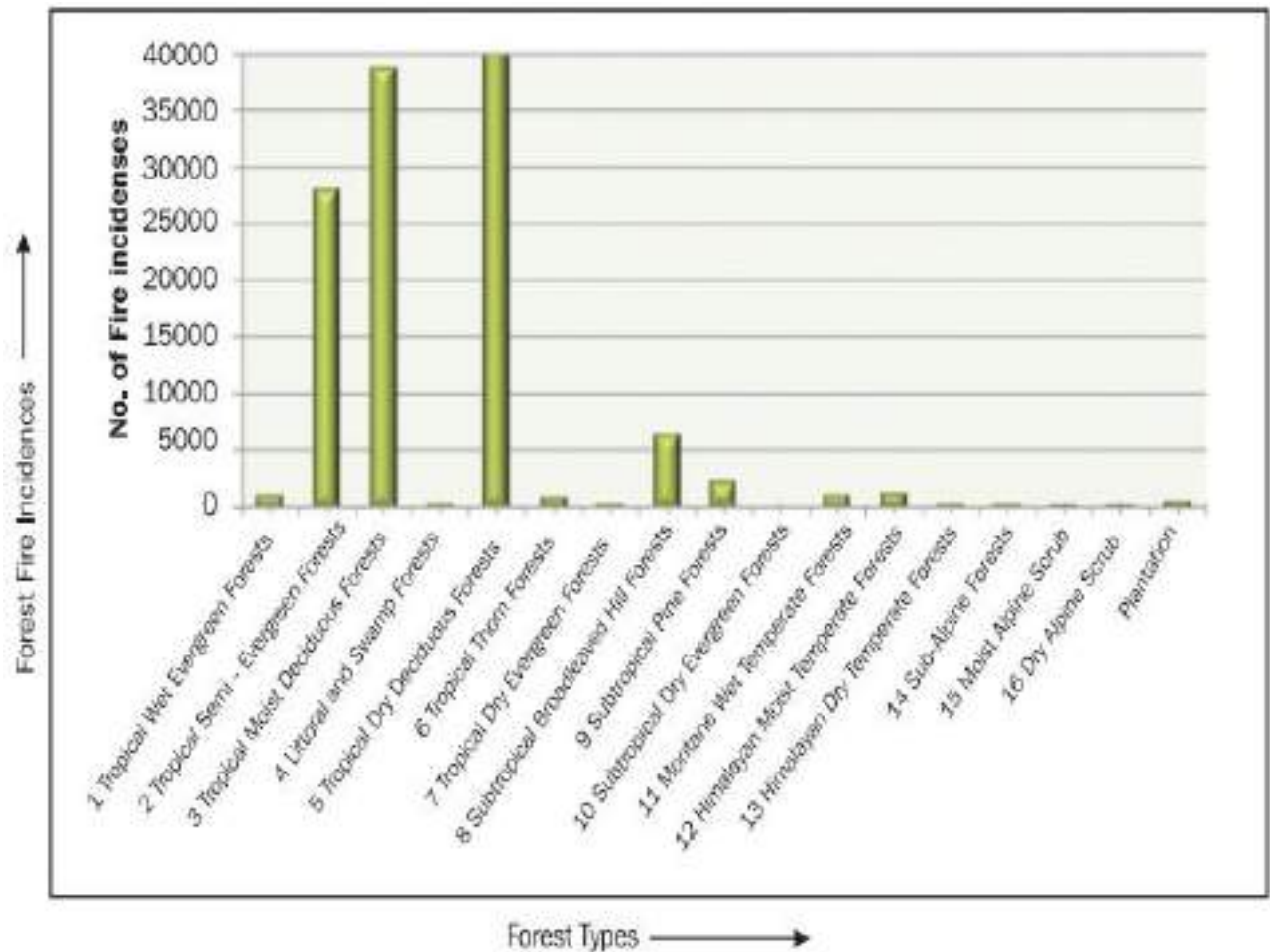
#### **4. HISTORICAL PERSPECTIVE OF FOREST FIRES IN THE COUNTRY**

**4.1** The country has been experiencing forest fire in different parts mostly during February to June every year. Forest fires are reported in almost all States and Union Territories except for few. The country has 16 forest types in four density classes. Based on forest fire incidences in the country, Forest Survey of India (FSI), Dehradun carried out a nationwide study and released a report regarding “*Vulnerability of India’s Forest to Fire*” in 2017 reporting that the most forest fire incidences are seen in Moderately Dense Forest (MDF) category compared to Open Forest (OF) category and Very Dense Forest (VDF) categories.



**Fig. 1:** Fire incidences vis-à-vis density class for the forest fire (Source: FSI)

**4.2** Further, Tropical Dry Deciduous Forest, Moist Deciduous Forest and Semi Evergreen forests of the country are most affected forest types compared to other type of Forest in the country by forest fire every year. The tropical deciduous and semi evergreen forest are most vulnerable types as it has highest amount of combustible dry biomass and majority of this type of forests of the country are dominated by human activity making the forest vulnerable to forest fire.



**Fig.2:** Forest fire incidences vis-à-vis forest types in India (source: FSI)

**4.3** Study concluded that, Climate and soil factors play a crucial role in deciding the assemblage of vegetation for a particular location and has profound impact on the varied topography and climatic zones to develop the different forest types. During summers of India, most of the forests here become extremely vulnerable to fires, owing to high temperature, long dry season coupled with dry biomass availability in the forest floors.

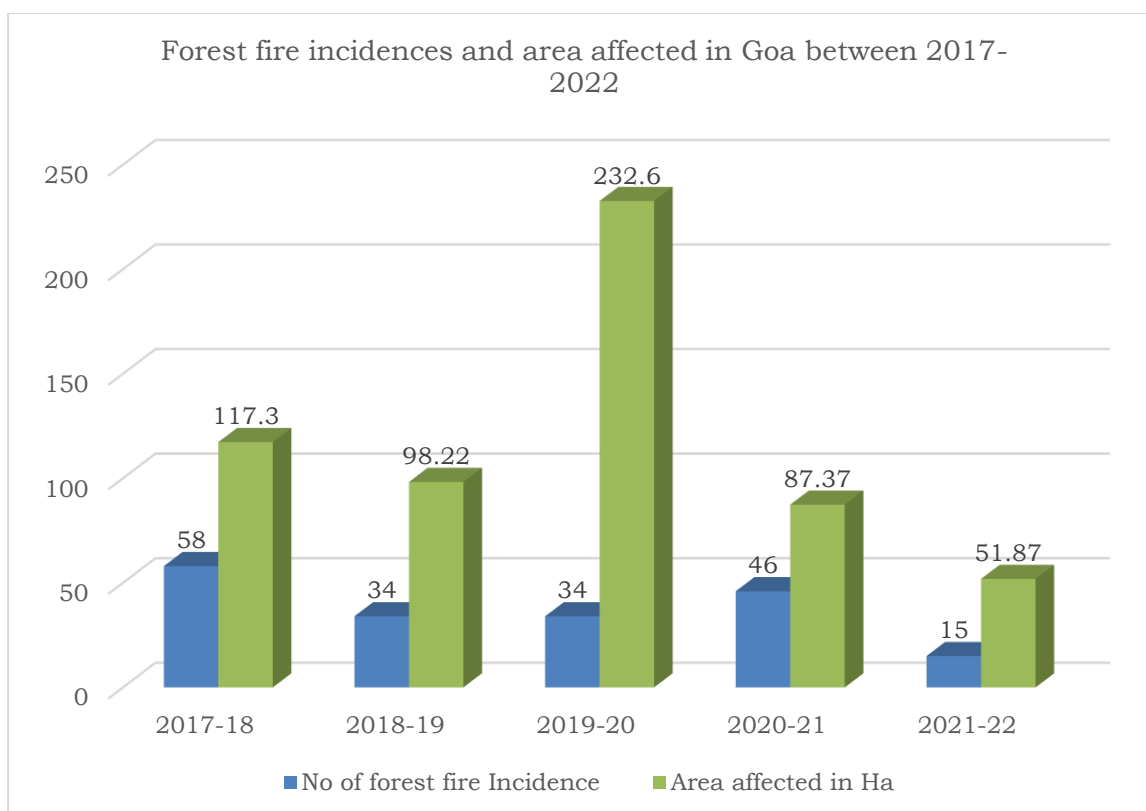
**4.4** The peninsular India and Central India has highest percentage under deciduous and semi evergreen forest type, these regions also experience long dry spell along with most of the rural population of the country depended on the forest and its resources, which make this type of forest more vulnerable to forest fires.

## 5. FOREST FIRE REPORTED IN GOA IN THE PAST FIVE YEARS

**5.1** Forest fire in Goa is an annual phenomenon mostly during March to May. The deciduous forests to semi evergreen forests present in both the district are impacted by the forest fire every year, however, on a minor scale. Number of Fire incidence reported during the last five years and area affected is tabulated as under,

**Table.1:** *Incidences of forest fires in past 5 years & Affected Area (in ha)*

<b>Year</b>	<b>No of forest fire Incidence</b>	<b>Area affected in Ha</b>
2017-18	58	117.3
2018-19	34	98.22
2019-20	34	232.6
2020-21	46	87.37
2021-22	15	51.87
<b>Total</b>	<b>187</b>	<b>587.48</b>



**Fig.3:** Forest Area affected due to forest fires in the past five years in Goa.

**5.2** During last five years, since 2017, a total of 187 forest fire affecting 587.48 ha area were reported. It is observed that, anthropogenic factors like burning grass lands for pastoral and agricultural purpose, burning of dry leaf litter in cashew plantations in order to facilitate ease of collection of cashew fruits from plantation floor are the primary causes for forest fire in the state of Goa. The matter of prime concern is that most of the cashew orchards are either contiguous to Forest or Forest rights settlement pockets inside forest areas, so the spread of fire to the forest is consequential and inevitable in such situation. As seen from fire data of past five years no significant pattern or rising trend in forest fire incidences is observed.

## **6. PREPAREDNESS OF THE STATE IN COMBATING FOREST FIRE**

**6.1** Forests Department has taken multipronged approach for management of forests fires in State to prevent and control forest fire at policy level, Inter-ministerial (GOI) level, Inter department level and at the level of the local communities. A State Action Plan on Forest Fire is in place which defines roles and responsibility of each authority within the Department and among the various departments during forest fire situation (**Annexure B**). After careful assessment of fire risk based on the FSI reports / alerts and past experience, a comprehensive forest fire prevention and management plan is prepared every year which *inter alia* includes following forest fire prevention measures:

**6.2 Engagement of fire watchers:** For monitoring and containment of forest fire during fire season, fire watchers are engaged between December to May across state, local youth are deployed for this purpose by imparting basic training along with other staff, they are placed at strategic places to monitor incidence of fire and to inform forest frontline line of respective area on real time basis, so as to control / douse fire in shortest feasible time.

**6.3 Creation of fire line:** Fire lines are created across risky / identified areas by making a buffer by removing dry combustible material in a width of minimum 2 mtrs across forest floor to break continuity of fire creeping on forest floor.



**Pic 1:** *One of the Fireline created inside forest as pre fire season activity acting as a buffer and prevents fire from spreading to the contiguous forest patch.*

**6.4 Control burning:** Dry biomass on forest floor is medium for forest fire spread, so as to prevent fire, control burning activities are taken up at identified places in forest, along either side of roads and linear ways by gathering and burning dry leaf litters and dry biomass, it is one of most effective ways to reduce fuel load in a controlled environment.



**Pic:2** *Control burning being carried out in forest as a fire prevention measure.*



**Pic.3** Typical Surface/Creeping Fire in Goa Forest



**Pic 4** Fire line being created in forest to check the spread of fire



**Pic.5** *Reducing fuel load on forest floor by manual intervention*



**Pic.6** *Ember management- staff putting off embers on dead tree, if unattended triggers reoccurrence of fire in the forest.*

**6.5 Infrastructure:** As stated above, considering fire risk involved, assessment of firefighting equipment is carried out and required number of such equipment and tools are included in annual plan. All the field divisions are equipped with firefighting tools and machinery like mechanised air blowers, mist blowers, rakes and firefighting aprons and other field infrastructures like protection camps, watch towers. Specially designed three water tankers, mounted on a Bolero Vehicle, which are well suited for undulating forest terrain were provided to divisions last year. These three water tankers were very helpful in dousing the recent fires.

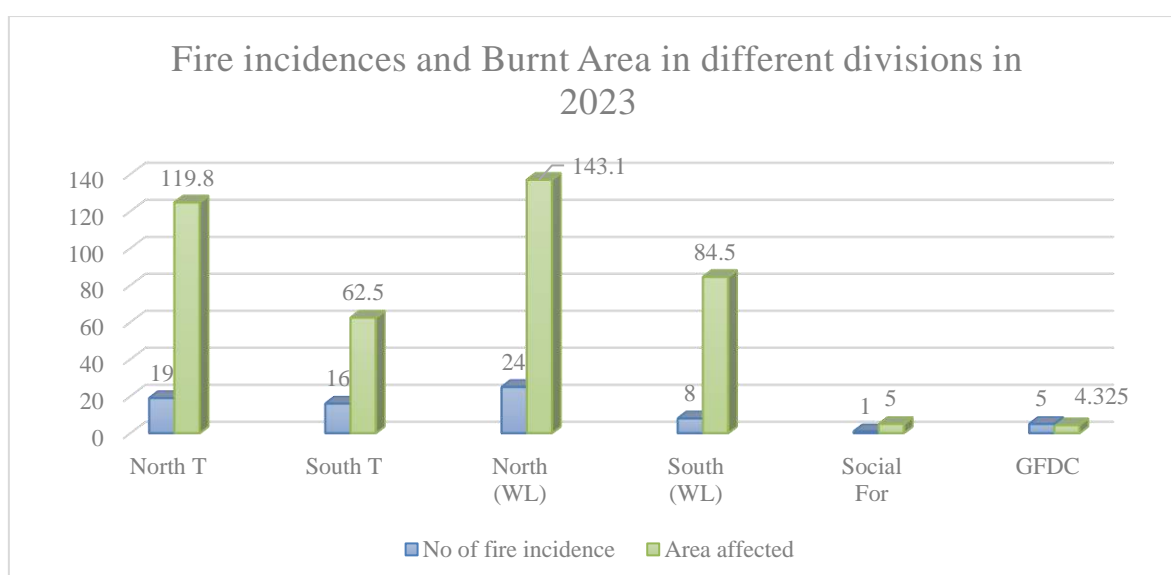
**6.6 Trainings and awareness programmes:** All the frontline staff and villagers across sensitive areas are trained periodically to combat forest fire. Further, awareness workshop and programmes are conducted for stakeholders to sensitize about preventive measures to control fire including cause and ill effects of forest fire.

## 7. FOREST FIRE INCIDENCES REPORTED IN GOA IN 2023

**7.1** Sporadic fires were reported and detected all across the state including forests, private areas, *Communidade* lands, plantations, revenue lands, etc. especially since 05<sup>th</sup> March, 2023.

**Table. 2** Forest fire incidence reported by divisions between 4<sup>th</sup> March to 15<sup>th</sup> March 2023

SN	Division	No of fire incidences	Area affected in Ha
1	North Goa Forest	19	119.8
2	South Goa Forest	16	62.5
3	North (WL & ET)	25	143.013
4	South (WL & ET)	8	84.5
5	Social Forestry	1	5.0
6	GFDC	5	4.325
<b>Total</b>		<b>74</b>	<b>418.138</b>



**Fig:4.** Number of fire incidence &Area affected in different division 4<sup>th</sup> to 15<sup>th</sup> March 2023

**Table: 3** *Table indicating fire incidences reported per day from 4<sup>th</sup> -15<sup>th</sup> March*

<b>SN</b>	<b>Date of occurrence</b>	<b>No of fire incidences</b>
1	5 <sup>th</sup> March	5
2	6 <sup>th</sup> March	2
3	7 <sup>th</sup> March	11
4	8 <sup>th</sup> March	20
5	9 <sup>th</sup> March	10
6	10 <sup>th</sup> March	9
7	11 <sup>th</sup> March	7
8	12 <sup>th</sup> March	6
9	13 <sup>th</sup> March	4
10	14 <sup>th</sup> March	0
11	15 <sup>th</sup> March	0
<b>Total</b>		<b>74</b>

**Table. 4** *Category of land affected by forest fire in March 2023*

<b>Category of land</b>	<b>Number</b>	<b>Burnt Area in ha approx.</b>
Private land/Revenue land	12	29.7
Comunidade area	1	5.00
Private Forests	3	35
Government Forests (including Protected Areas, GFDC leased out areas)	59	348.438
<b>Total</b>	<b>74</b>	<b>418.138 ha</b>

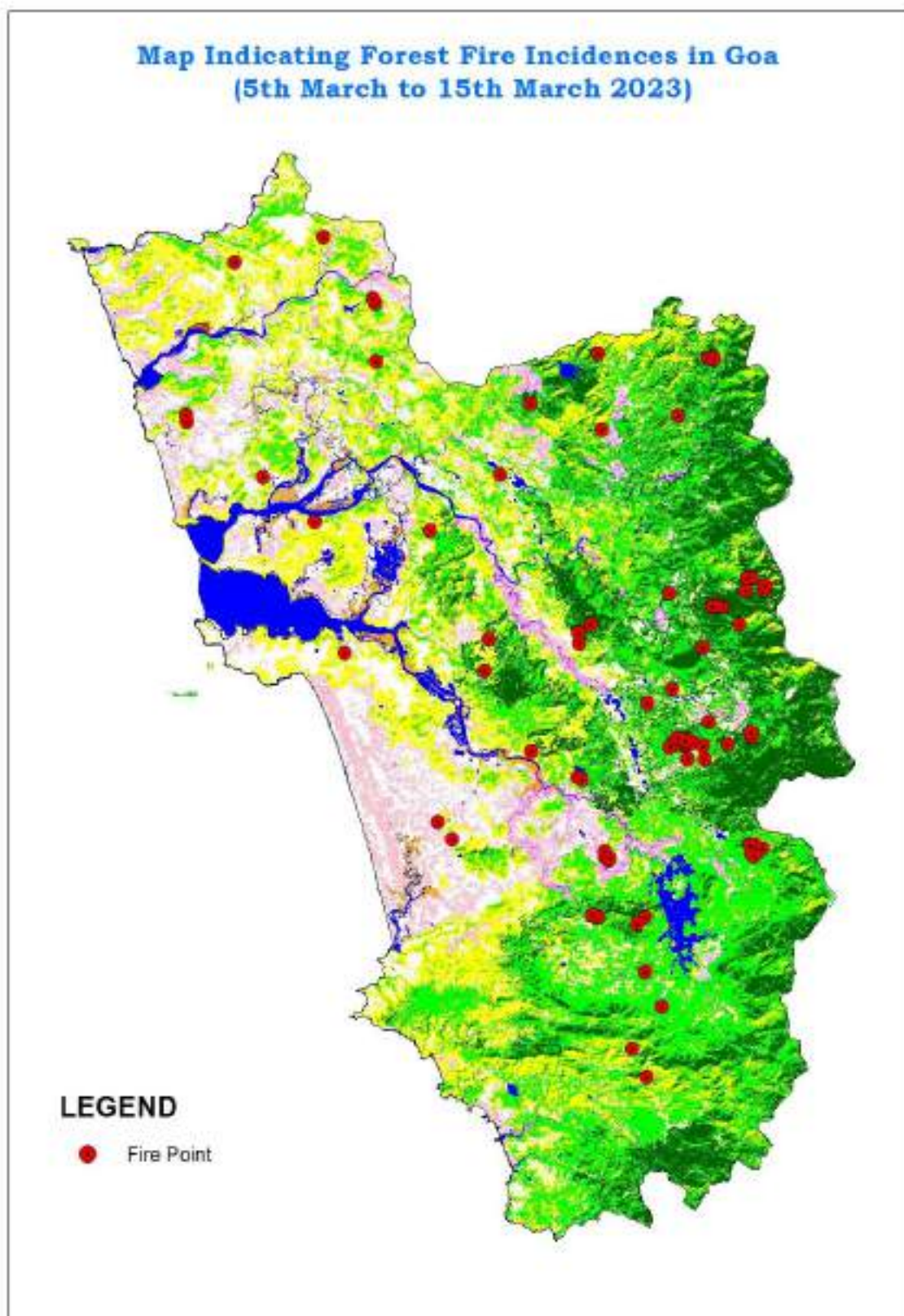
**Table 5.** *Fire incidences and Area affected by fire in Government Forest Area*

<b>SN</b>	<b>Government Forest</b>	<b>Number of fire incidences</b>	<b>Area Affected [Ha]</b>
1	RF/PRF	22	116.51
2	Protected Area	32	227.603
3	GFDC leased area	5	4.325
<b>Total</b>		<b>59</b>	<b>348.138</b>

**Table: 6** *Fire incidences and Area affected in Protected Area's in Goa*

<b>Division</b>	<b>Protected Area</b>	<b>Fire incidences</b>	<b>Area affected [Ha]</b>
DCF WL&ET, North	i. Bhagwan	7	74.59
	Mahaveer WLS & NP ii. Madei WLS	17	68.513
	<b>Total in North Goa District</b>	<b>24</b>	<b>143.103</b>
DCF WL&ET, South	Netravali Wildlife Sanctuary	8	84.5
	<b>Total in South Goa District</b>	<b>8</b>	<b>84.5</b>
<b>Total</b>		<b>32</b>	<b>227.603</b>

The observation of 74 fire includes all locations received through fire alert system of FSI during the period. All the fire locations received through FSI fire alert system were attended on real time basis, during the ground truthing by the forest frontline staff it was observed that some of the fire alerts were repetitive and some were false. One of the reasons for such false alerts may be spread of smoke in large area. Department worked closely with FSI to seek valuable advice to control fire.



**Fig.5** Map indicating forest fire incidences reported in Goa in 2023

**7.2** The Department, in close co-ordination and in tandem with the district authorities, Indian Navy / Air Force, including other line departments like Directorate of Fire and Emergency Services, Police, Village Panchayats, Local Community addressed local occurrences of fires on topmost priority, while mobilising available men and material to ensure that fire spots are contained and loss to life and property, including natural resources is kept at bare minimum. Most of the fires reported were doused on same day or the intensity of fire was significantly reduced. During the period two large fire patches were reported by Forest Survey of India, one patch was reported on 8/3/2023 at Sirvoi, Quepem, South Territorial Division and one at Surla-II beat of Bhagwan Mahaveer Wildlife Sanctuary, Mollem on 11/3/2023, on verification of patch it is observed that there were multiple fire points in a small span of 1 km so it has been shown as large fire.

**7.3** Close monitoring was carried out at the level of the Chief Secretary, Hon'ble Forest Minister and Hon'ble Chief Minister by holding regular meetings and by undertaking field visits as well as aerial surveys. The PCCF and CWLW remained in field during the period to assess the situation, preparedness of field units and to monitor and supervise the work on ground. The entire Forest Department was on High Alert during the period.

## **8. Chronology of Events**

### **1<sup>st</sup> to 4<sup>th</sup> March 2023**

**8.1** Minor Fire were reported in Palolem in South Goa, fire was set to clear paddy field in private area which reached to adjacent Govt forest area, it was brought under control within few hours by the South Goa Forest Division Team. A minor fire was also reported in GFDC Cashew Plantation area which originated from nearby private cashew area, it was also brought under control by GFDC and South Goa Forest Division Team on same day.

### **5<sup>th</sup> March 2023**

**8.2** Forest fire was reported at several locations in Madei Wildlife Sanctuary in Charaundem, Chorla Ghat, Pali, Satrem area. Acting immediately Forest department in coordination with Collector North, Fire Department and all concerned including local people attended forest fire on top priority. A total of 15 teams comprising of around 150 forest frontline staff, fire trekkers and labourers were deployed to control fire in Madei area.

**8.3** Department started receiving information about fire at various locations in State therefore to ascertain ground situation and extent of fire affected area without loss of time Department immediately contacted Goa Naval Base [IN] and requested Flag Officer Goa Area (FOGA), Goa for an aerial survey. Responding promptly IN, within few hours of request, deployed a Dornier Aircraft to ascertain ground situation and extent of fire areas including active fire locations. Based on aerial survey IN in late afternoon informed that a total of eight fires were active in the state and provided GPS coordinates of active fires.

**8.4** Based on inputs received from IN, Forest Department acted swiftly at all identified locations in coordination with all concerned and by late evening and controlled the fire largely at almost all locations. However, due to availability of plenty of fuel in forest in form of dried leaves/ grasses and wind flow reoccurrence of fire was being reported at most of the locations.

**8.5** Meanwhile, Indian Navy assured for full support and informed that they are working on feasibility of dousing forest fire in hill tops and inaccessible areas by using Helicopters.

**8.6** Later in the evening HFM, PCCF and CWLW & Collector (North) visited fire affected areas in Chorla Ghat and Valpoi area to ascertain impact of Forest fire. HFM directed Forest Department to closely monitor the situation, deploy additional manpower in Madei and other fire affected sites, involve community and take necessary action in coordination with District Administration and all concerned authorities to check the further spread of fire and to control it all the earliest feasible.



**Pic. 7** *Hon'ble Forest Minister, Goa reviewing forest fire preparedness in the state.*

## **6<sup>th</sup> March 2023**

**8.7** Forest Fire, though minor, in Madei Wildlife Sanctuary was spread in relatively large area in comparison to other places. However, with combined efforts fire was under control. Some of the affected areas were on hill tops. The main challenge was such active fire spots in inaccessible areas where it was not possible for manpower to reach due to difficult terrain. Such small active fires were potential threats and source of fire for adjoining / down the hill forest areas. High winds made the situation further worse and challenging.

**8.8** Additional manpower was deployed in Madei area, directions were issued to DCF Social Forestry, Soil Conservation and DCF North Goa Forest Divisions to deploy their respective division staff in Madei to control fire at the earliest.

**8.9** To control the fires in inaccessible / hill top area Department requested Indian Navy to facilitate and deploy helicopters fitted with Helibucket to supplement the efforts of ground team to douse fire in such areas. The Collector North Goa was requested to deploy a team of officials to ascertain ground situation so that forest fire could be controlled especially by involving Disaster Management official's / firefighting equipment and assets.

## **7<sup>th</sup> March 2023**

**8.10** On request of Forest Department, Government of Goa, the Indian Navy deployed Helicopters fitted with Helibucket [Helicopter bucket or Helibucket is a specialized bucket suspended on a cable carried by a helicopter to deliver water for aerial firefighting] to douse the fire at some identified locations where reoccurrence of fire was reported (**Anx - C1**).

**8.11** Later in the evening surface fire incidents are reported in Cashew Plantation at Keri and Morlem. Staff of Forest Department doused the fire in coordination with all concerned including local people.

**8.12** Overall situation of Forest fire in Madei Sanctuary was under control. A meeting was called by HCM and HFM on 7<sup>th</sup> evening to assess the situation.

**8.13** Considering spread of fire across State, for intensive monitoring and Supervision purpose, entire State was divided in sectors and a DCF / ACF level officers was made in charge of each sector with direction to assist respective Forest Division divisions to closely monitor the forest fire incidences, assessment and deployment for manpower for patrolling and to attend active fire swiftly in coordination with all concerned (**Anx C2**).

**8.14** To control the fire in Morlem dedicated joint teams comprising of officials of Forest Department, Fire, District Administration and local community were formed

#### **8<sup>th</sup> March 2023**

**8.15** Early morning joint team rushed to control fire in Morlem area and with their tireless efforts fire was doused by afternoon. The role and contribution of community in Morlem was very significant and praiseworthy.

**8.16** As discussed during the meeting a communication requesting Aerial assistance was sent to Ministry of Defence for dousing the fire especially in the inaccessible areas and to extend all the support to combat forest fire (**Anx C3- C4**).

**8.16** In the morning HFM carried out an aerial survey, accompanied by FOGA and DCF Working Plan, to ascertain situation on ground and extent of fire across State.

**8.17** As many fire alerts were being received from FSI to ensure real time dissemination of information one control room was immediately set up in PCCF Office at Van Bhawan. 24X7 monitoring was established wherein a team of executives with necessary technical competence in handling large datasets and GIS was deployed to assess the FSI alerts, share GPS coordinates with ground team, assess the area and type of forests under fires and to delineate extent of spread of fires across demographic space within State (**Anx C5**).

**8.18** Directions were given to field formations on various counts like liaison with District disaster machinery, stepping up enforcement in co-ordination with Police, increasing protection strategies, enhancing public awareness, community mobilisation, etc. Entry in Protected and Forest area was strictly regulated to check any unauthorised entry in forest area. Department made several correspondences with the line departments and authorities for faster mobilization of resources, as well as garnering wider public participation in management. Letter were sent out to the District Collectors (District DMA) of both the districts to generate public awareness, while activating their Disaster Management machinery, following which public advisories were issued by the District Collectors (**Anx C6-8**).

**8.19** The Superintendent of Police North & South Goa Districts were implored to assist in management of fires by enforcing relevant laws in close co-ordination with Forest and Revenue officials. To ensure that no person is

engaged in any omission or commission of any act that could lead to aggravation of the situation and to sensitize public to abstain from any form of act that could be detrimental and lead to thwarting the efforts being taken by Government.

**8.20** For a greater outreach, the Director (Information & Publicity) too was approached to disseminate the Public Advisories issued by the District Authorities in vernacular languages, apart from Hindi and English.

**8.21** The extensive liaison with all the District Administration and other line Departments ensured that all authorities were in the know-how of occurrences and all available resources could be pressed into immediate coordinated action to contain spread of forest fires. This way, it was ensured that almost no forest fires extended for more than a day and almost all were largely controlled within a few hours of detection (**Anx C9**).

**8.22** PCCF ordered an enquiry to ascertain the cause and reason for forest fire incidences in the state and directed respective jurisdictional DCFs to conduct the enquiry (**Anx C10**).

**8.23** Director (Agriculture) was requested to create sensitization among the farmers to undertake slash and burn under supervision to avoid untoward incidences of spread of fire into forest area (**Anx C11**).

**8.24** HFM took up the matter with higher authorities in MoD / PMO for early deployment of aerial assets. Further, Department also closely followed with concerned officials in Ministry of Defence, Indian Air Force and Indian Navy so as to ensure immediate deployment of aerial assets.

**8.25** To update people of Goa and all concerned about status of fire in Goa HFM issued status update thrice a day through social media platforms.

As per 9 PM report 5 fires were active and a total of 22 fires were doused during the day. 793 manpower was deployed to control the fire.

### **9<sup>th</sup> March 2023**

**8.26** One IAF helicopter fitted with Heli bucket was deployed to control the fire in inaccessible areas.

**8.27** In response to request of the Forest Department orders were issued by North and South Goa Collectors for community participation in forest fire fighting and public awareness (**Anx C12**).

**8.28** All active forest fires were attended in close coordination with all concerned including aerial team of MoD.

**8.29** Later in afternoon to assess the fire situation on ground and extent of fire CS, PCCF and CWLW carried out an aerial survey of affected areas including Shigao in Mollem , Satrem & Derodem in Madei and Dharbandora, alongwith IN and IAF officials. During the survey it was observed that smoke was spread in large area, isolated minor fires were seen on hill tops, Minor fires and smoke were also seen in Karnataka area bordering Goa.

**8.30** An indicative list of Dos and don'ts for public to assist Forest Department in preventing forest fire kindling and combating forest fire was issued to all the forest divisions for circulation and implementation (**Anx C13**).

**8.31** As per 10 PM report five fires were active and three fires were doused during the day.

### **10<sup>th</sup> March 2023**

**8.32** Ground team with the aerial support of IAF worked tirelessly to control fire at all locations.

**8.33** Dedicated Forest fire control room including helpline number of the Department **(1926)** was publicised to be used for receiving calls on forest fire from the public at large. HFM wrote a letter to Hon'ble Defence Minister of India with request to facilitate for two dedicated IAF helicopters to control the fire **(Anx C14)**.

**8.34** An updated status report was sent to SDMA for information and appropriate action.

**8.35** As per 10 PM report 7 fires were active and nine fires were doused during the day.

### **11<sup>th</sup> March 2023**

**8.36** Ground team continued to work and with aerial support of IAF fire in most of the area were under control

**8.37** As a matter of abundant caution, necessary steps were taken to keep the field formation on high alert. All necessary directions pertaining to liaison with District Authorities, regular intensive patrolling particularly in vulnerable areas like the periphery of forests bordering habitation, public awareness and strictly enforcing the provisions of Wildlife (Protection) Act, 1972 and the Indian Forest Act, 1927, etc. were reiterated **(Anx C15)**.

**8.38** Director Information and Publicity was requested to continuously disseminate information to general public through available medium on advisory issued by various authorities w.r.t forest fire **(Anx C16)**.

**8.39** As per 10 PM report 07 fires were active and 16 fires were doused during the day.

## **12<sup>th</sup> March**

**8.40** At all active fire locations ground team worked in close coordination with aerial team. With the combined effort fire was under control at almost all spots. Simultaneously, adequate manpower was deployed, round the clock, at doused fire spots to check reoccurrence.

**8.41** As per 10 PM report total active fires were 8 and two fires were doused during the day

## **13<sup>th</sup> March 2023**

**8.42** Ground and Aerial team continued their joint efforts to attend and control fire which was mostly doused by this time at all locations except in some inaccessible / hill top areas.

**8.43** As desired by NDMA a status report on forest fire in Goa was sent to them for kind information and appropriate action at their end.

**8.44** As incidences of fire were reported near Goa-Karnataka border, immediately the matter was taken up with PCCF- cum- HOFF, Karnataka with request to set up an Inter-State Coordination team for real time monitoring of fires in respective jurisdiction and exchange of information to control the fires at the earliest feasible. A Nodal officer was appointed and the phone numbers of the field functionaries were shared between the two states to have a concerted co-ordination in case of forest fires along the Goa-Karnataka border. The state of Karnataka too immediately responded by appointing a nodal officer at their end and conveying the same to Goa. Such Real time exchange of information between Nodal Officers of two states significantly supplemented each other's effort to control fires (**Anx C17**).

**8.45** Further, concerned DCFs (North-WL and South WL) were instructed to be on high alert, deploy fire-watchers at strategic locations, carry out intensive patrols along the Goa-Karnataka border and use drones for survey and effective management (**Anx C18**).

**8.46** As per 10 PM report 03 fires were active and 10 fires were doused during the day.

#### **14th March,2023**

**8.47** NDMA reviewed the fire situation in Goa. HFM, CS, PCCF, DGP, IG [P], Collectors North and South Goa, Director Fire Services attended the meeting. CWLW made a presentation and briefed NDMA about status of fire while informing that as on date all the active fires in State have been doused. NDMA while appreciating the efforts of State in controlling the fires suggested to have a comprehensive Forest Fire Management Plan

**8.48** As per 10 PM report active fires were NIL. All spots having potential to recur like Derodem, Surla, Mhadei were closely supervised and monitored.

#### **15<sup>th</sup> March 2023**

**8.49** After successful containment of all forest fire in the state by 14<sup>th</sup> March 2023, the aerial support extended by the Indian Air force and Indian Navy was disengaged from forest fire combating work. As per 10 PM report Active fires were NIL. All spots having potential to recur like Derodem, Surla, Mhadei etc. were closely monitored. Increase in humidity and sparse showers in Cotigao and Netravali brought some respite. However adequate manpower was deployed for monitoring and vigil (**Anx C19**).

**8.50** All the correspondences made with different authorities between 5<sup>th</sup> March and 15<sup>th</sup> March are enclosed as **Annexure II**.

## INTERDEPARTMENTAL COORDINATION IN MANAGING FOREST FIRE



**Pic 8** *Indian Navy helicopter assisting Forest department by aerial water dropping for dousing forest fire.*



**Fig. 9** *Use of Heli Bucket in aerial dousing of forest fire in one the sites*



**Pic. 10** Staff of Goa Fire & Emergency Service, assisting in dousing forest fire



**Pic. 11** Staff of Goa Fire and Emergency services assisting in containing fire at private and revenue area



**Pic.12** *Volunteers join hands with forest department for forest fire control*



**Pic.13** *Villager community participates with forest department for combating forest fire.*

## 9. Findings of Divisions:

The enquiry reports submitted by Forest Divisions included fire incidences, causes, affected area assessment, field coordination, deployment of manpower, habitation in the vicinity of fire incidences, FRC claims, Human involvement accidental / deliberate and otherwise, Offence cases booked etc. Out of total 74 fire incidences reported between 5<sup>th</sup> to 15<sup>th</sup> March, 59 sites in Government Forest, 12 Private/ Revenue land, 3 in Private Forest areas and 1 in Comunidade land affecting 418.138 ha. Further 34 offence cases have been registered by Forest / Police authorities under various laws against 2 known and rest unknown persons.

### 9.1 Findings of North Territorial Division:

A total of 19 fire incidences were reported in North Goa Forest division, during the period including 9 incidences in Government Forest, 9 incidences in private area and 2 incidences in Private Forest area, (\*fire at Bethora village has occurred in both Private Forest as well government forest) as detailed below;

**Table.7** Findings of DCF (North) for all the forest fire affected areas in his jurisdiction.

SN	Fire Site & Status of land	Affect ed Area [Ha]	GPS Coordinates	Cause of fire	Distance from human habitation	FRC Claim	Remarks
1	Morlem Sy.no. 56/0 Keri Range	26.30	N 15° 35'28.75" E 74° 03'53.00"	Human interference is doubted and	Approx 1.5km from human habitation	No FRC claim	Complaint Filed at Valpoi Police Station FIR No. 19/2023

	(Reserve Forest: 4.30 ha & Private Forest: 22 Ha)			inquiry is in progress.			dated 08/03/23 . Forest Offence booked under ROC No. 20/RFO/Keri/2022-23 on 13.03.23
2	Gawas wada Sy No. 56/0 Keri Range (Reserve Forest)	03	N15°35' 23.808 E 074° 4'0.936"	Human interference is doubted and inquiry is in progress.	Approx 1.5km from human habitation	No FRC claim	Forest Offence booked under ROC No. 20/RFO/Keri/2022-23 Dated:- 13.03.23
3	Sy. No. 603 of Shiroda village (Reserve Forest)	07	N 15° 34" 32.83 E 74° 04" 35.61	The fire happened due to excessive heating on the hill-side and enhanced wind velocity prevailed during the day.	Human habitation- 2.5 Km Plantation – 1.5 km CA plantation	No FRC claim	Though the fire appears to be natural, a Forest Offence Case has been drawn vide FOR No.8 dated 08/03/23

4	Gurkhem , Dharbandora, Sy. No. 207 Collem Range  (Govt. Forest)	14	N 15° 24' 15.08 E 74° 06' 48.73	The fire happened due to excessive heating on the hill-side and enhanced wind velocity prevailed during the day.	1 Km	No FRC claim	Though the fire appears to be natural, Forest Offence Case drawn vide FOR No.9 dtd 09/03/23
5	Chandel Sy.No. 19  (Reserve Forest)	1.8	N 15043' 42.21' E 73°53' 26.26"	Due to excessive heating on the hill-side and enhanced wind velocity.	1 Km	No FRC claim	Though the fire appears to be natural, a Forest Offence Case drawn dated 09/03/23
6	Sy. No. 122 of Bethora village (Reserve Forest)	06	N 15° 22 22.0 E 74° 0 37. 7	Human interference is doubted and inquiry is in progress.	1 Km	No FRC claim	Though the fire appears to be natural, Forest Offence Case drawn vide FOR No.9 dated 10/03/23
7	Suktolim Collem sy. No. 21/2	03	N 15° 21' 45.89 E 74°11' 04.45	Human interference/ negligence is	1 Km.		No case has been registered as no evidence

	(Unclassified forest)			doubted. Detailed inquiry in progress		No FRC claim	was seen on ground to say it is human induced.
8	Sy. No. 9 of Pilliem village/okambi  (Govt. Forest)	19	N 15 40 87 .02 E 74 10 85 .32	Due to excessive heating on the hill-side and enhanced wind velocity.	1 Km	No FRC claim	Though the fire appears to be natural, Forest Offence Case drawn dated 10/03/2023
9	Aglote, Collem Sy. No. 13  (Govt. Forest)	19	N15° 25' 36.54 E74°10'20.92	Human interference/negligence is doubted. Detailed inquiry in progress	0.6 Km	No FRC claim	Though the fire appears to be natural, a Forest Offence Case drawn dated 10/03/2023
10	Sy. No. 194 of Bethora village  (Private forest)	05	N 15° 22' 22.03 E 74° 02' 37.71	Human interference is doubted and inquiry is in progress.	01 Km	No FRC claim	An Offence Case was drawn at Ponda Range vide FOR No.9 dated 08/03/2023

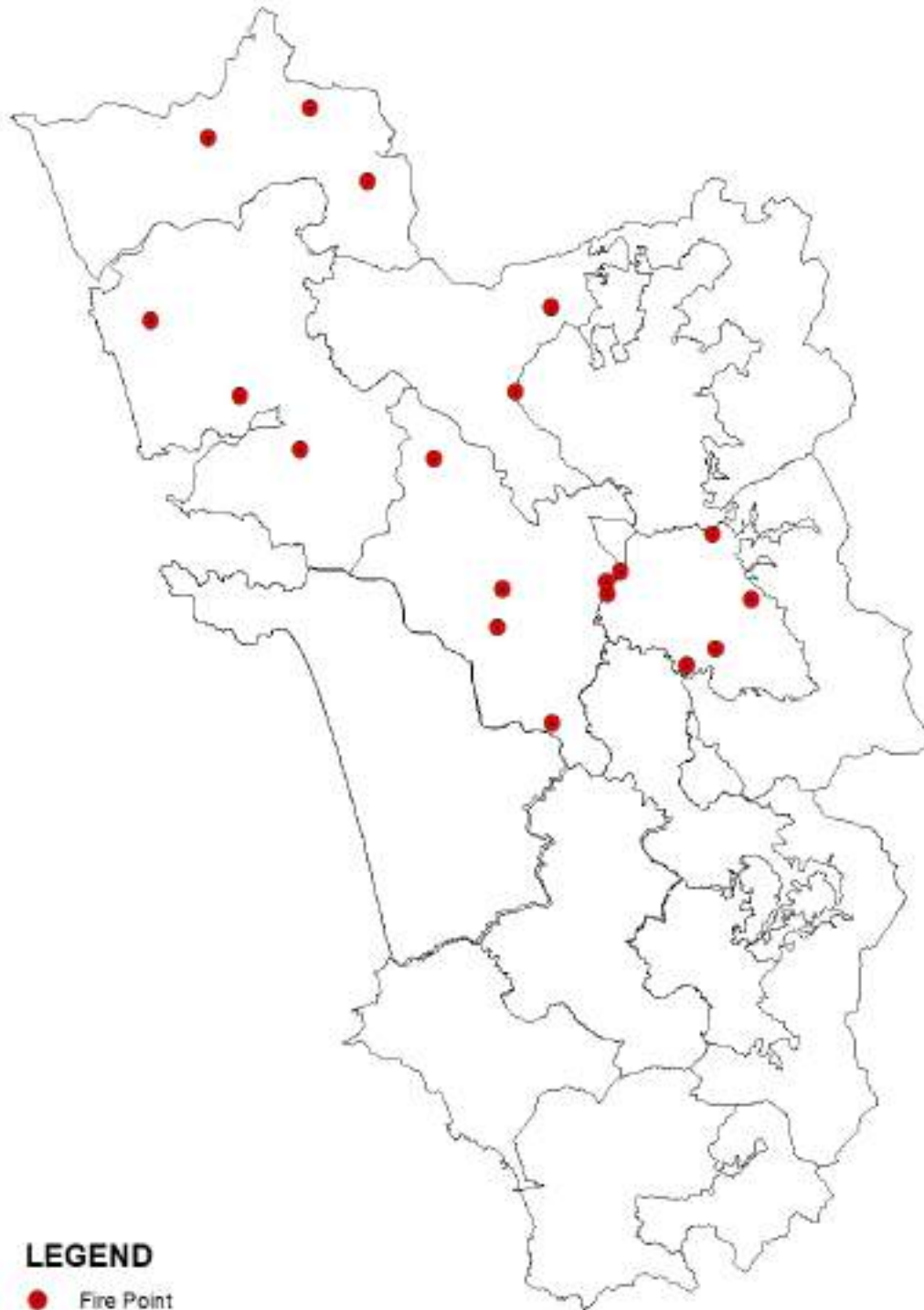
11	Chimbel, Tiswadi- Goa. Sy.no.16 /1  (Private property)	02	N15°29'42.65 E73°53' 1.40"	Human interference is doubted and inquiry is in progress.	Adjoining to human habitation	No FRC claim	Forest offence booked vide ROC No.94/PJ M/2022- 23, Dated: 08/03/23
12	Bottar, sacorda, Collem Sy. No. 13 (private area)	01	N15° 23' 24.64 E 74°10' 0.68	Human interference/negligence is doubted. Detailed inquiry in progress	1 km	No FRC claim	No case has been registered as no evidence was seen on ground to say it is human induced.
13	Bhoma village, Ponda Taluka (Private area)	0.5	N 15° 47' 92.23 E 73° 96' 06.01	Due to excessive heating on the hill- side and enhanced wind velocity.	1 Km	No FRC claim	No case has been registered as no evidence was seen on ground to say it is human induced.
14	Satpal Sacorda, Collem sy. No. 25  (Revenue land)	02	N15°23' 24.64 E 74°12'33.99	Human interference/negligence is doubted.	200 mtrs.	No FRC claim	No case has been registered as no evidence was seen on ground to say it is human induced.

15	Salvador-do-Mundo, (Porvorim ) Sy.no. 116/11  (Private property)	0.2	N 15° 31" 56.61 E 73° 50" 25.01	Deliberately done by owner of the property.	Adjoining to human habitation	No FRC claim	File complaint at 08/03/2023 Porvorim Police Station. (Forest offence booked vide ROC No.91/PJM/2022-23, dtd 08/03/23)
16	Tivrem, Priol Beat, Ponda Range (private area)	05	N 15°49' 80.40" E 73°96' 82.33"	Due to excessive heating on the hill-side and enhanced wind velocity.	1 Km	No FRC claim	No case has been registered as no evidence was seen on ground to say it is human induced.
17	Sonshi village, Keri range (Private Mine area)	01	N15 48 75.89 E 74 11 59.93	Human interference/negligence is doubted.	0.5 Km	No FRC claim	No case has been registered as no evidence was seen on ground to say it is human induced.
18	Vadaval Sy.No. 105/1 (Pvt.Area)	02	N 15° 67 52 11 E 73. 93 43 42	Due to excessive heating of rocks and dry leaf litter layer	Approx. 500 mtrs from human habitation	No FRC claim	No case has been registered as no evidence was seen on ground to say it is human induced.

19	Malpem village  Sy. No: 130,131, 132	02	N 15 42 38 E 73 49 10	Human negligence	Approx 100 mtrs from human habitation	No FRC Claim	No case has been registered
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Detailed enquiry report of division is enclosed as annexure as ***Annexure A 1.***

**Map Indicating Forest Fire Incidences in North Territorial Area  
(5th March to 15th March 2023)**



**Fig.6** Map showing fire incidences in North territorial area in 2023

## 9.2 Findings of South Territorial Division:

Total sixteen fire incidences had been reported in the jurisdiction of South Goa division between 5<sup>th</sup> March to 15<sup>th</sup> March, affecting 40.5 ha in 12 government forests sites, 14 ha in 3 private areas and 8 ha in one private forest as detailed below,

**Table.8** Findings of DCF(South) for all the forest fire affected areas in his jurisdiction.

S N o	Fire Site & Status of land	Affe cted Area [Ha]	GPS Coordinates	Cause of fire	Distance from human habitation	FRC Claim	Remarks
1	Chauder Cortalim (Private area)	4	N15° 23'13.95" E 73° 54'32.37"	Dry ground litter and dry and hot temperature . No feasible natural cause of fire detected. The suspected anthropoge nic origin of fire was informed to district administrati on for needful action.	0.6 Kms (approx)	No FRC claim	As it was private area no case has been registered by the division, district administration has been asked to take legal action.
	Curdi Range	4.5	E 15° 07' 8.66" N 74° 09'36.31"	Unknown	2 Km Distance		As the cause could not be

2	Sy. No. 2 of Curpem				from human habitation/ No Plantation near fire site.	No FRC claim	ascertained at field regarding human influence in kindling the fire, no case has been registered.
3	Sanguem Range Sy. No 21 Cortali	5	N15°13'11.544 E 74° 7'56.994	The incident area is replete with dry fallen leaves and dry bushes and branches. From preliminary investigation, it is seen that the fire started as ground fire due to natural causes. The site was inspected for any evidence for foul play and the inspection revealed no conclusive evidence to	No human habitation/ plantation nearby.	No FRC claim	As the cause of fore could not be ascertained at field regarding human influence in kindling the fire, no case has been registered.

				attribute the fire to anthropogenic causes			
4	Quepem Range S.No.18 9/1 of Rivona village of Sanguem Taluka	3	N 15° 13'12.78" E 74° 07'56.6"	Spread from adjoining private area	About 1.5 Km	No FRC claim	As the fire was spreading from private area an unknown case has been registered by the division, district administration has been asked to take legal action.
5	Quepem Range S.No.11 6 (P) of Malkarnem village Quepem Taluka		N 15°10'20.10" E 74° 5'53.10" N 15°10'26.13" E 74° 5'42.10"	Spread from adjoining private area	About 800 mt	No FRC claim	As the fire was spreading from private area an unknown case has been registered by the division, district administration has been asked to take legal action.
6	Quepem Range S.No. 21 of Nagvem village Quepem	8	N 15°10'08.00" E 74° 7'16.04" N 15°10'08.83"	Spread from adjoining Paddy fields	About 500 mt		As the fire was spreading from private area an unknown case has been registered by

	Taluka (Private forest )		E 74° 7'06.98"			No FRC claim	the division, district administration has been asked to take legal action.
7	Quepem Range S.No. 11 of Sulcorn a village, Quepem Taluka	6	N 15°12'58.79" E 74° 7'35.73" N 15°13'07.54" E 74° 7'37.28"	Spread from adjoining Paddy fields	About 500 mt	No FRC claim	As the fire was spreading from private area an unknown case has been registered by the division, district administration has been asked to take legal action.
8	Range:- Mobile Squad Sarzora Dramapur  (Private area)	4	N 15°06'45.03" E 74° 10'15.89" N 15°06'52.64" E 74° 10'04.60"	Dry ground litter and dry and hot temperature . No feasible natural cause of fire detected. The suspected anthropogenic origin of fire was informed to district administration for	0.7 Kms (approx)	No FRC claim	Offence case registered under GPTA

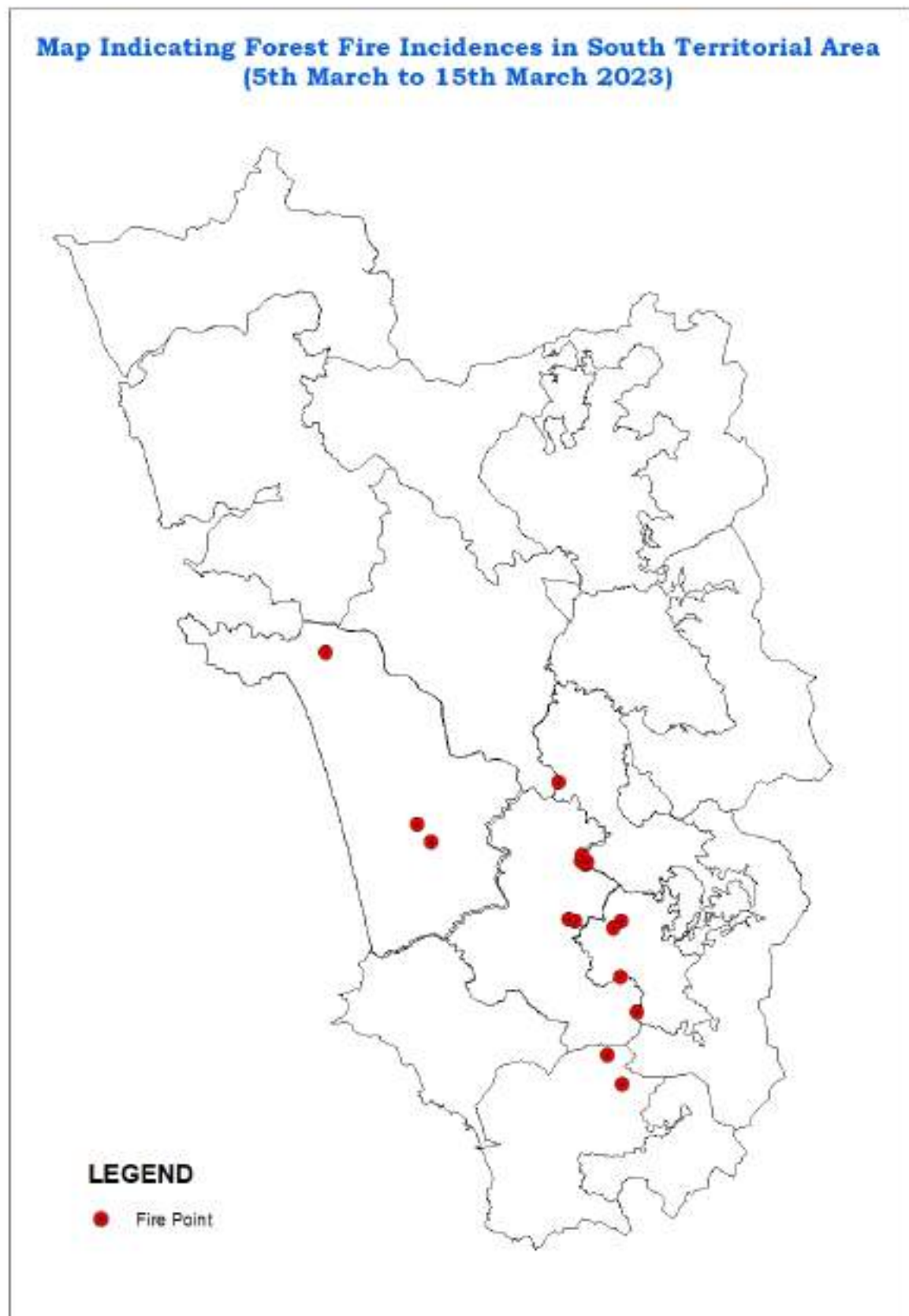
				needful action.			
9	Range:- Mobile Squad Dramapur (Private area)	6	E 15° 13'58.16" N 73° 59'56.28"	Dry ground litter and dry and hot temperature . No feasible natural cause of fire detected. The suspected anthropogenic origin of fire was informed to district administration for needful action.	0.7 Kms (approx)	No FRC claim	Offence case registered under GPTA
10	Curdi Range Sy. No. 12 of Colombar	1.5	N 15°10'12.96" E 74° 9' 17.01"	Unknown	4.5 Km Distance from human habitation /1.5 Km Plantation near fire site.	No FRC claim	As the cause of fire could not be ascertained at field regarding human influence in kindling the fire, no case has been registered.
	Canacona Range	5	N 15°02'08.994" E 74°09'38.256"	Unknown	1.5 km from	Yes	An unknown case had been registered,

11	Sy.No.1 27, Avali		N15° 02' 08.994" E-74° 09'33.93"		Avali village		investigation under way.
1 2	Canacon a Range Sy.No.1 27 Badsare , Kindalk atta	2	N-15°02'09.829" E-74°09'26.538" N-15°02'09.841" E-74°09'26.576" N-15°02'09.849" E-74°09'26.536" N-15°02'09.072" E-74°09'27.960"	Unknown	3 km from Kindalk atta village	No FRC claim	An unknown case had been registered, investigation under way.
1 3	Curdi Range Sy. No. 25 of Talsai	3	N 74° 9'37.53" E 15°10'11.32"	Unknown	1 Km Distance from human habitation /No. Plantation near fire site.	No FRC claim	As the cause of fire could not be ascertained at field regarding human influence in kindling the fire, no case has been registered.
14	Curdi Range Sy. No. 12 of Colomba	0.5	N74° 09'13.00" E15° 09' 6.00"	Unknown	3.5 Km Distance from human habitation /500 mtrs. Plantation near fire site.	No FRC claim	As the cause of fire could not be ascertained at field regarding human influence in kindling the fire, no case has been registered.

15	Curdi Range Sy. No. 25 of Talsai	1	E 15° 10' 02.00" N 74° 09' 36.00"	Unknown	1 Km Distance from human habitation /No. Plantation near fire site.	No FRC claim	As the cause of fire could not be ascertained at field regarding human influence in kindling the fire, no case has been registered.
16	Sanguem Range Sy. No 25 & 33 of Sanvordem beat of Sanguem range.	5	N 15° 14' 56.48" E 74° 05' 18.866"	The incident area is replete with dry fallen leaves and dry bushes and branches. From preliminary investigation, it is seen that the fire started as ground fire due to natural causes. The site was inspected for any evidence for foul play and the inspection	Distance 1 Km – Houses and 1 ½ km – Plantation in Sy.No 23 of Rumbrem Village	No FRC claim	An unknown case had been registered, investigation under way.

				revealed no conclusive evidence to attribute the fire to anthropoge nic causes			
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Detailed enquiry report of division is enclosed as ***Annexure A 2.***



**Fig. 7** Map showing fire incidence in South Territorial area in 2023.

### 9.3 Findings of North (WL & ET) Division:

A total of 24 fire incidence affecting 143.013 ha area has been reported by the North Wildlife and Ecotourism division at Madei Wildlife Sanctuary and Baghwan Mahaveer Wildlife Sanctuary, while 1 person has been booked under WPA/IPC, seven unknown cases has been registered under WPA/IPC.

**Table. 9** Findings of DCF (WL&ET-North) for all the forest fire affected areas in his jurisdiction.

S N	Fire Site & Status of land	Affect ed Area [Ha]	GPS Coordinates	Cause of fire	Distance from human habitati on	FRC Claim	Remarks
1	Chorla Ghat & Charavn em village hill, Ivrem Beat	3.81	15°37'56.15"N 74° 7'14.93"E  15°37'56.15"N 74° 7'14.93"E	Fire occurred from the road side of chorla ghat, many commuters uses said chorla ghat road passing through sanctuary fire may have been occurred due to left over cigarettes	Adjacent to Chorla Ghat Road	No FRC claim	Valpoi Police Station are investigating matter vide crime no. 19/2023 u/s 435, 436 of IPC & WPA, 1972 and RFO Madei is assisting same.
2	Dipaji Rane Ghad Satrem	7.97	15°37'12.70"N 074°13'24.10"E	Fire occurred at hill and has been spread in part of FRC claimed area.	Adjacent to FRC claim area	FRC Claims present	Valpoi Police Station investigating matter wide crime no. 19/2023 u/s 435, 436 of IPC & WPA, 1972 and RFO Madei is assisting Police Inspector.
3	Kayla Surla , Surla Beat	1.37	15°38'8.84"N 74°11'42.13"E	Fire travelled from river side through a dry valley; there is a village Parwad on the fringe along	Aerial distance of top site 50- 60mtr and down	FRC Claims present	An unknown Case has been registered under WPA, 1972.

				border and people do have FRC claim area (Cashew plantation).	site 530 mtr (Parwad Village)		
4	Parwad trail at Hill Satrem	3.60	15°38'04.50"N 074°13'03.70"N	Fire occurred at hill and has been spread top side.	aerial distance of 3 km (Parwad Village)	No FRC claim	Valpoi Police Station investigating matter wide crime no. 19/2023 u/s 435, 436 of IPC & WPA, 1972 and RFO Madei is assisting same.
5	Acacia Plantation on Derodem Beat	2.57	15°35'21.09"N 74°13'6.44"E	Old pathway from Derodem to Vaiguinium Village passes through Acacia plantation. It is apprehended that fire may be due to negligence of commuters.	Adjacent to old forest route (Derodem to Vaiguinium Village)	No FRC claim	Valpoi Police Station investigating matter wide crime no. 19/2023 u/s 435, 436 of IPC & WPA, 1972 and RFO Madei is assisting same.
6	Zamblikade Ivrem Beat	10.5	15°37'1.50"N 74° 7'17.79"E	Due to wind fire might have been spread from topside of burned Cashew plantation area.	Adjacent to Zamblikade Road site	No FRC claim	As it is road side incident, with no clue of intentional fire no case is registered
7	Dangarmol & Khadiyacho Dongar Derodem Beat (site I, II, III and IV)	9.84	15°36'17.40"N 074°14'07.20"N	Ritual evidences were noticed at site – I, the said celebration may have resulted in forest fire however, fire at Site II, III and IV occurred due to reoccurrence of fire higher elevation of the hill	FRC claim present for Cashew plantation at aerial distance of 150 mt.	No FRC claim	Valpoi Police Station investigating matter wide crime no. 19/2023 u/s 435, 436 of IPC & WPA, 1972 and RFO Madei is assisting same.

8	Bandirwada Caranzo I IV Beat	4.482	15°32'46.33"N 74°13'12.81"E	fire occurred in middle of forest, exact cause cannot be ascertained, however site is approximate 1km away from human settlement and people of fringe villages do visit Forest areas for basic needs, accidental fire might would have been happened.	Bandirwada village of Caranzol located at aerial distance of 140mt	No FRC claim	As the human habitation is more than a kilometre away, no intentional cause of fire could be ascertained so no case is registered.
9	Satali Site – Caranzo I-III Beat	9.68	15°31'38.61"N 74°12'33.89"E	Place is just adjacent of village road of Satali Human Settlement, fire may be due to negligence of commuters	Satali wada of Caranzol village located at aerial distance of 100 mt	No FRC claim	No evidence against perpetrators could be established and fire appears accidental, so no case is registered.
10	Zadani Site - I Nanoda Beat	2.746	15°33'19.12"N 74°14'6.13"E	Ritual; place located near zadani, fire may occurred due to negligence of visitor.	Adjacent to internal road to Zadani rituals place	No FRC claim	No evidence against perpetrators could be established and fire appears accidental, so no case is registered.
11	Zadani Site - II Nanoda Beat	1.215	15°33'9.59"N 74°14'35.03"E	Traditional ritual site (Old Shiva temple) located near zadani, fire may occur due to negligence of visitor.	At 10 mt aerial distance from internal Road going towards Pisthyachi Kon ritual place	No FRC claim	No evidence against perpetrators could be established and fire appears accidental, so no case is registered.
			15°37'50.02"N	Traditional Holi rituals undertaken			Valpoi Police Station investigating matter wide crime no.

12	Landslide area of Satrem Beat	2.65	74°12'32.17"E	by Villagers was observed at hill.	Aerial distance of 1.5 km (Satrem Village)	No FRC Claim	19/2023 u/s 435, 436 of IPC & WPA, 1972 and RFO Madei is assisting same.
13	Pendral Beat	2.12	15°32'51.83"N 74°13'39.02"E	Fire occurred at top middle of hill, exact reason cannot be ascertained.	Bandirwada village of Caranzol located at aerial distance of 880 mt	No FRC claim	As no cause could be established after preliminary investigation, No case is registered.
13	Krishnapur village of Karnataka state border Codval Beat	0.31	15°33'39.81"N 74°15'48.81"E	Forest road is used by villagers of adjoining state and fire may have occurred due to negligence of commuters.	At distance of 5 mts aerial distance from old forest route (Derodem to Viginium Village)	No FRC Claim	As the fire appears to be ignited due to negligence, no case is booked against anyone.
14	Mangeshi-kon Derodem Beat	0.95	15°36'36.25"N 74°13'15.97"E	At middle of hill exact reason cannot be ascertained.	Site located at distance 468 mt from road and cultivation area.	No FRC Claim	Valpoi Police Station investigating matter wide crime no. 19/2023 u/s 435, 436 of IPC & WPA, 1972 and RFO Madei is assisting same.
15	Coparde village hill, Pali Beat	3.34	15°34'19.65"N 74°7'21.95"E	Fire took place due to negligence of claimant Shri Eknath Sawant of FRC while roasting cashew nut.	Occurred in FRC claimed area	FRC Claims present	FIR registered vide no. 21/2023 u/s 435 IPC and Sec. 30 of Wild Life Protection Act, 1972 dated 12/03/2023.
16	Adjoining hill Parwad,	0.89	15°39'0.05"N 74°12'6.79"E	Fire travelled from Parwad side	Adjacent to border of Karnataka State, at aerial distance		As there are no deliberate human cause is established, so no case is registered.

	Surla Beat			state border of Karnataka State.	of 1.60 km (Parwad Village)	No FRC Claim	
17	Adjoining Kharkoro, Surla Beat	0.47	15°40'46.19"N 74°10'49.08"E	Villagers use pathway through <i>Acacia</i> plantation to commute into Cashew cultivation claimed under FRA and Site of fire occurrence is adjacent to pathway.	Surla village is located at aerial distance of 280 mt	No FRC claim	No deliberate cause of fire is ascertained, so no case is registered
18	Anmod Ghat, Mollem WLS Govt. Forest	10	N15°24'45.5 E074°14'44.2  N15°24'41.8 E074°14'51.7  N15°24'34.8 E074°14'31.8  N15°24'39.7 E074°14'24.5	Fire occurred along Highway NH4 stretch from Karnataka to Goa possibly due to heavy commutation vehicle traffic might be from alive cigarette burning or otherwise in the area due to winds it spread further.	Nearby Mollem village 08 Km.	No FRC claim	Few commuters were apprehended who were seen to smoke in the Protected area they were penalised for the act as per law. No specific case could be registered for deliberate cause of fire.
19	Surla-II Mollem Govt. Forest	04	N15°26'18.6 E074°14'55.1  N15°26'13.9 E074°14'55.9  N15°26'11.5 E074°14'49.6  N15°26'15.6 E074°14'45	Nearby private areas farmers annually clean their fields, orchards, cashew plantation etc. as a seasonal cultural activity by the practice of putting fire for clearing weeds, dry grasses and unwanted vegetation. There are few villages situated near the area of fire occurrence and while doing so the above-mentioned practice of putting fire, there may be chances of	Nearby Karemol village at the distance of 200 mtrs, Madhalwada at the distance 100 mtrs and Boriyali at the distance of 200 mtrs.	No FRC claim	Prima facie, no deliberate cause of fire could be ascertained, so no case has been booked.

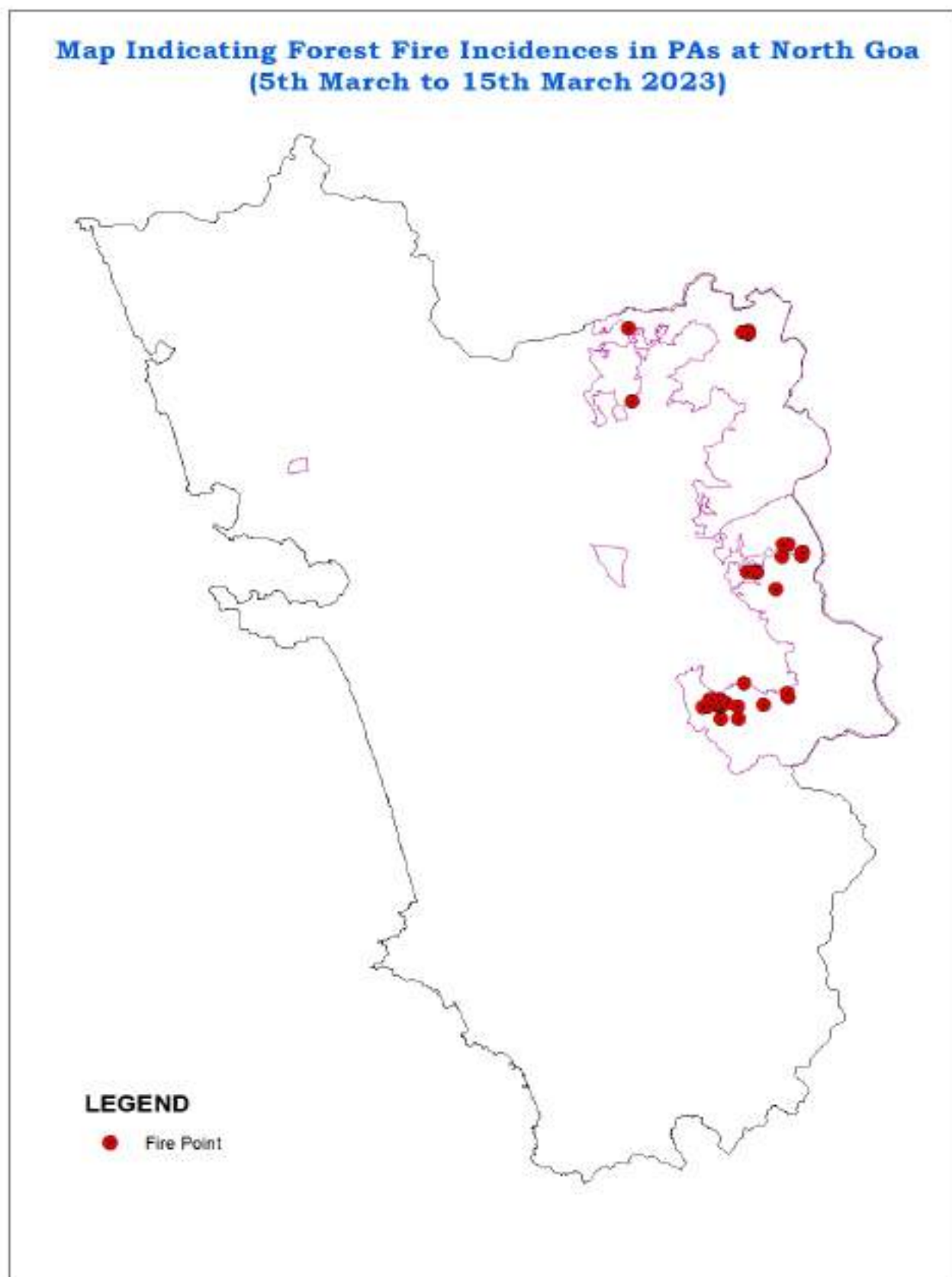
				spreading fire from nearby villages into the forests due to wind, as few areas falls within the limits of protected areas and some are at the fringe of forests.			
20	Surla-I Mollem Govt. Forest	05	<p>N15°26'52.1 E074°14'57.1</p> <p>N15°26'53.2 E074°26'53.2</p> <p>N15°26'44.9 E074°14'56.8</p> <p>N15°26'47.0 E074°15'06.</p>	Nearby private areas farmers annually clean their fields, orchards, cashew plantation etc. as a seasonal cultural activity by the practice of putting fire for clearing weeds, dry grasses and unwanted vegetation. There are few villages situated near the area of fire occurrence and while doing so the above-mentioned practice of putting fire, there may be chances of spreading fire from nearby villages into the forests due to wind, as few areas falls within the limits of protected areas and some are at the fringe of forests.	Nearby TambdiS urla village at the distance of 500 mtrs and Dhargem village at the distance of 500 mtrs.	06 Nos. of FRC Claims	An unknown Case has been registered under WPA, 1972.
	Shigao Beat	20	<p>N15°18'52 E074°12'06</p> <p>N15°18'58 E074°11'59</p>	Nearby private areas farmers annually clean their fields, orchards, cashew plantation etc. as a seasonal cultural activity by the	Nearby Pokarmol Village at the distance of 01 km, Viki kulan at	No FRC	No case registered.

21	Govt. Forest		<p>N15°19'5 E074°11'36</p> <p>N15°18'56 E074°11'37</p>	<p>practice of putting fire for clearing weeds, dry grasses and unwanted vegetation. There are few villages situated near the area of fire occurrence and while doing so the above-mentioned practice of putting fire, there may be chances of spreading fire from nearby villages into the forests due to wind, as few areas falls within the limits of protected areas and some are at the fringe of forests.</p>	<p>the distance of 1.50 km, kalay Village 2.30 km and Matojem Village at the distance of 2.50 km.</p>	claim exist	
22	Mauliguem Beat Mollem WLS Govt. Forest	02	<p>N15°16'03.599 E074°12'37.829</p> <p>N15°16'05.160 E074°12'37.829</p>	<p>Nearby private areas farmers annually clean their fields, orchards, cashew plantation etc. as a seasonal cultural activity by the practice of putting fire for clearing weeds, dry grasses and unwanted vegetation. There are few villages situated near the area of fire occurrence and while doing so the above-mentioned practice of putting fire, there may be chances of spreading fire from nearby villages into the forests due to wind, as few areas falls within the</p>	<p>Nearby Mauliguem village at the distance of 01 km.</p>	No FRC claim exist	No Case registered

				limits of protected areas and some are at the fringe of forests.			
23	Karemol Beat Mollem WLS Govt. Forest	30	N15°18'37.5 E074°13'05.5  N15°18'36.6 E074°13'10.6  N15°18'36.3 E074°13'15.3  N15°18'34.4 E074°13'25.9  N15°18'45.5 E074°13'32.6  N15°18'50.2 E074°13'27.3  N15°18'50.0 E074°13'15.1	Nearby private areas farmers annually clean their fields, orchids, cashew plantation etc. as a seasonal cultural activity by the practice of putting fire for clearing weeds, dry grasses and unwanted vegetation. There are few villages situated near the area of fire occurrence and while doing so the above-mentioned practice of putting fire, there may be chances of spreading fire from nearby villages into the forests due to wind, as few areas falls within the limits of protected areas and some are at the fringe of forests.	Nearby village karemol at the distance of 500 mtrs	No FRC Claim Exist	No case registered.
24	Maida of Collem-II Beat Mollem WLS	3.5	N15°19'01.2 E074°15'18.4  N15°19'03.4 E074°15'27.7  N15°18'55.8 E074°15'21.2  N15°18'56.9 E074°15'29.9	Nearby private areas farmers annually clean their fields, orchards, cashew plantation etc. as a seasonal cultural activity by the practice of putting fire for clearing weeds, dry grasses and unwanted vegetation. There are few villages situated near the area of fire	Nearby Sozamol village 02 Km.	No FRC claim exist	NO case registered.

				<p>occurrence and while doing so the above-mentioned practice of putting fire, there may be chances of spreading fire from nearby villages into the forests due to wind, as few areas falls within the limits of protected areas and some are at the fringe of forests.</p>			
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Detailed enquiry report of the division is enclosed as ***Annexure A 3***



**Fig. 8** Map showing fire points in Protected areas of North Goa in 2023.

#### 9.4 Findings of South (WL & ET) Division:

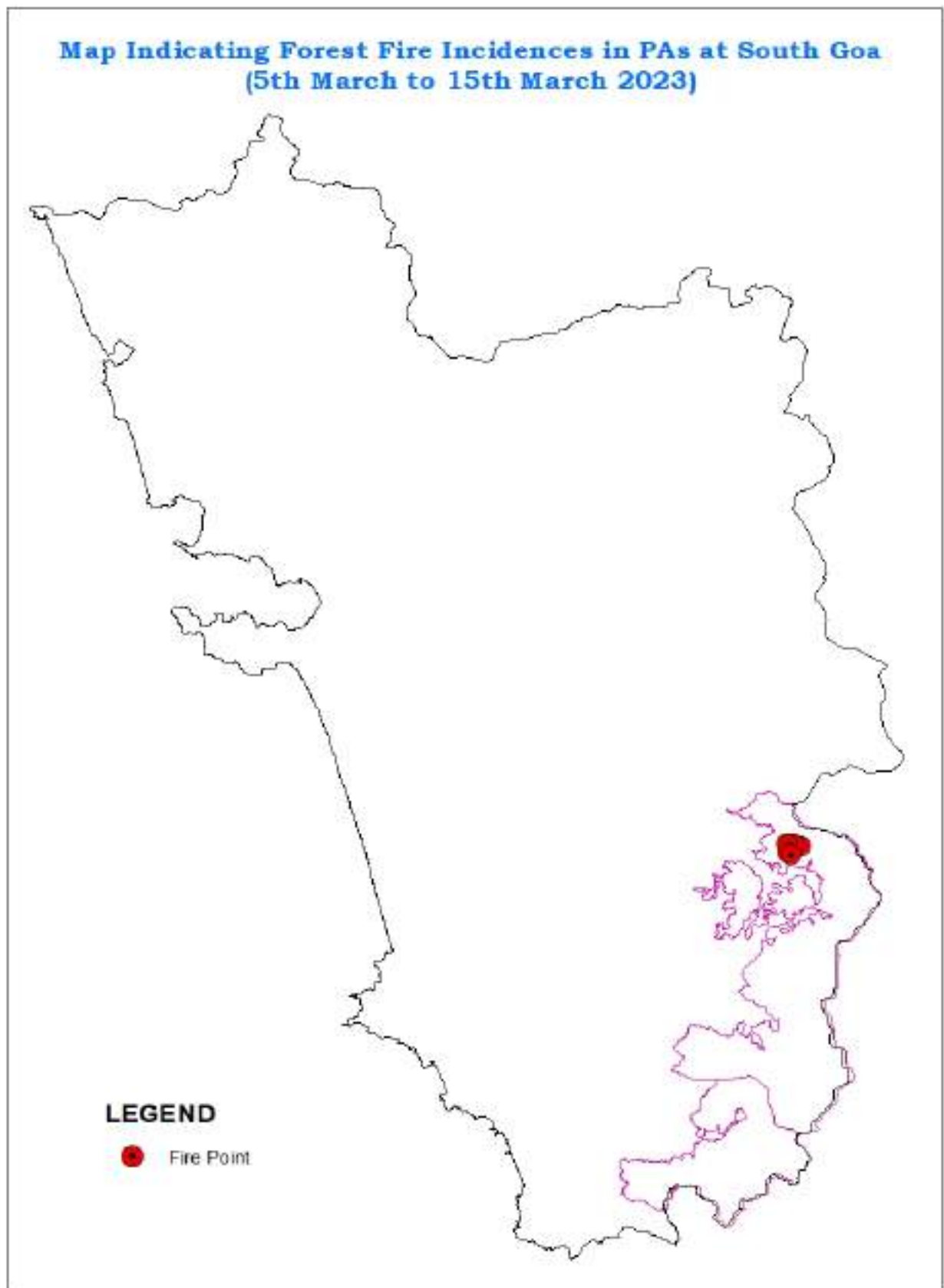
A total of eight forest fire incidence has been reported from the protected areas of south Wildlife & Eco tourism division, while seven unknown cases have been registered under WPA, investigation is under way.

SN	Fire Site & Status of land	Affected Area [Ha]	GPS Coordinates	Cause of fire	Distance from human habitation	FRC Claim	Remarks
1	Cumari	3	15° 09'45" N 74°16' 32" E	Appears to be man made		No FRC Claim exist	Forest offence under WLPA against unknown offender has been booked. Inquiry is in process.
2	Cumari	40	15° 10'57" N 74°15' 42" E		500 Meters	No individual claims but community claims exist.	Forest offence under WLPA against unknown offender has been booked. Inquiry is in process.
3	Maida	3	15° 09'48" N 74°14' 43" E		300 Meters	No FRC Claim exist	Forest offence under WLPA against unknown offender has been booked. Inquiry is in process.
4	Potrem	25	15°14'21" N 74°15' 35" E		2 Kms.	No FRC Claims exist	Forest offence under WLPA against unknown offender has been booked. Inquiry is in process.
5	Tudov	1.5	15°12'41" N 74°14' 14" E		1 Km.	No FRC Claims exist	Forest offence under WLPA against unknown offender has been booked.

							Inquiry is in process.
6	Netravali	4	15° 03'44" N 74°13' 06" E	Appears to be man made	500 Meters	No FRC Claims exist	Forest offence under WLPA against unknown offender has been booked. Inquiry is in process.
7	Patiem	4	15°15'23" N 74°14' 29" E		1 Km.	No FRC Claims exist	Forest offence under WLPA against unknown offender has been booked. Inquiry is in process.
8	Nadke	4	14° 58'39" N 74° 15' 6" E		500 Meters.	No FRC claims exist	Forest offence under WLPA against unknown offender has been booked. Inquiry is in process.

**Table.10** Findings of DCF (WL&ET), South for all the fire affected areas in his jurisdiction

Detailed enquiry report of the division is enclosed as **Annexure A 4**



**Fig. 9** Map showing fire points in Protected areas of South Goa in 2023.

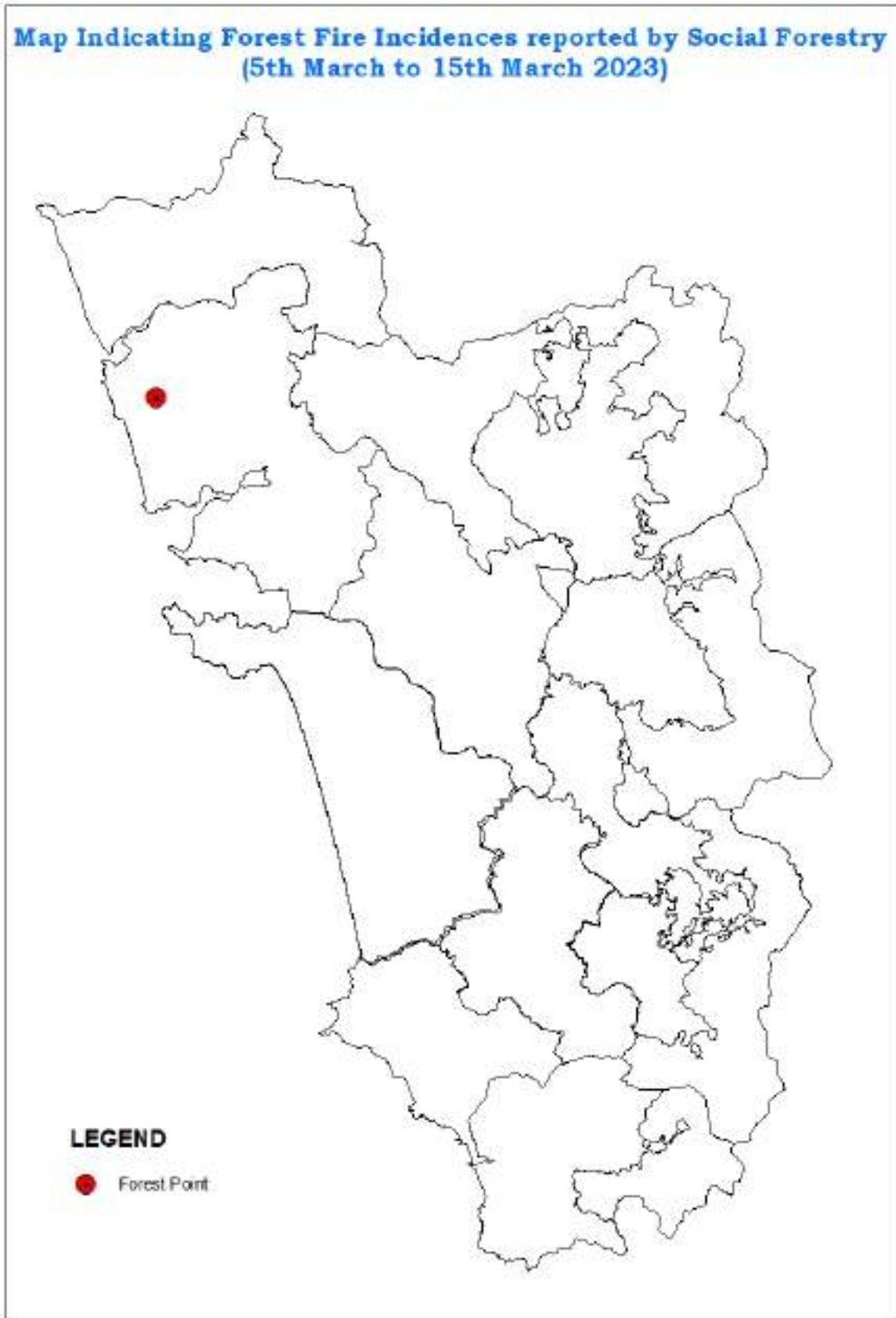
## 9.5 Findings of Social Forestry Division:

Only one fire incidence has been reported by Social Forestry, park and gardens division in Parra Comunidade land with an impacted area of 5 ha approximately,

**Table. 11** Findings of DCF (Social Forestry) for all the forest fire affected areas in his jurisdiction.

SN	Fire Site & Status of land	Affected Area [Ha]	GPS Coordinates	Cause of fire	Distance from human habitation	FRC Claim	Remarks
1	Parra at Parra Bardez-Goa (Comunidade Plantation)	5 ha	N 15.57863 E 73.776643 N 15.58351 E 73.775717 N 15.584429 E 73.775659 N 15.584985 E 73.773804	May be accidental	Here, the habitation is situated just on the border line of the plantation.	No FRC Claim	A written complaint has been filed with Mapusa police station on date 08/03/23

Detailed enquiry report of the division is enclosed as **Annexure A 5**



**Fig. 10** Map showing fire points in Comunidade area affected in 2023

## 9.6 Findings of GFDC:

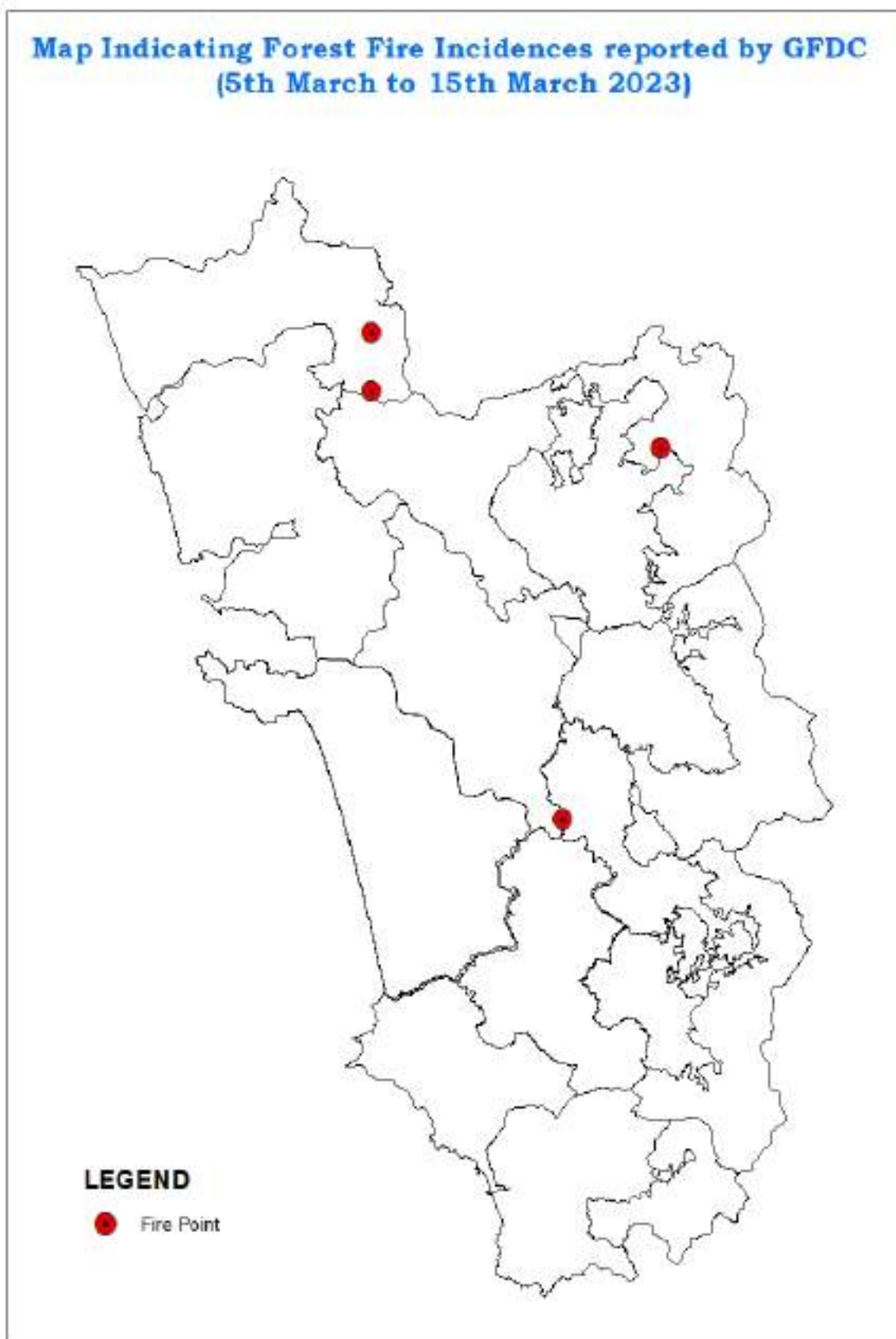
The Goa Forest Development Corporation (GFDC) is functioning on leased out area of forest department, where they have reported fire incidence at 5 locations with affected area of 4.325 ha.

**Table. 12** Findings of GFDC for all the forest fire affected areas in his jurisdiction.

S N	Fire Site &  Status of land	Affect ed Area [Ha]	GPS Coordinates	Cause of fire	Distance from human habitation	FRC Claim	Remarks
1	Maloli, item No.91  GFDC Morlem Range	0.005	N-15°35'1 E-74°11'16 N-15°34'52 E-74°11'6	Suspected to be intentional fire entered into GFDC cashew plantation area, The fire originated into the Mhadei Wildlife Sanctuary area and reached the cashew plantation under GFDC Morlem Range later on doused by the team of GFDC.	150 meter away from human habitation	06 FRC claims	As case has been registered by Wildlife division, no separate case is registered.
2	Sal, item No.55,5 6,57  GFDC Morlem Range	4.0	N- 15°683188 E- 74°923641	Roadside fire entered into GFDC Cashew plantation area through adjacent private cashew plantation. Fire was doused by team of GFDC.	Approx. 1 km away from human habitation	No FRC Claim	As no direct evidence for involvement of known human is found, no case is booked.
	Sal, item No.55,5 6,57	0.04	N15°683188 E 74°923641	Suspected to be unintentional/	Approx. 1 km away from	No FRC claim	As the fire was unidenti

<b>3</b>	GFDC Morlem Range			accidental fire. As doused fire got ignited, entered into cashew plantation area under GFDC Morlem Range	human habitation		onal re occurred fire which entered plantation, so no offence case booked
<b>4</b>	Nanoda, item No.53 GFDC Morlem Range	0.02	N15°37'43.3 E73°56'06.4	Suspected to be unintentional/accidental. GFDC staff doused fire. The fire originated from private cashew plantation and reached in to GFDC cashew plantation due to influence of heavy and strong wind.	Approx. 1 km away from human habitation	No FRC Claim	As it was suspected that the fire was unintentional which spread from adjacent plantation, no case was booked.
<b>5</b>	Pancha wadi Kaido, Pancha wadi village, Item No. 18 GFDC Ponda Range	0.3	N 15°17'01.75 E 74°06'12.35 N 15°16'54.71 E 74°06'17.91	Suspected to be unintentional / accidental. GFDC staff doused fire. The fire originated from Adjoining Reserve Forest of Sanguem range and reached in to GFDC cashew plantation due to influence of heavy and strong wind.	Approx 2km from human habitation	No FRC Claim	As it was suspected that the fire was unintentional which spread from adjacent plantation, no case was booked.

Detailed enquiry report of the division is enclosed as **Annexure A 6**.



**Fig 11.** Map showing fire points in GFDC area affected in 2023

## 10. ANALYSIS

Based on the enquiry report submitted by the Deputy Conservator of Forests of respective divisions, analysis of forest fire incidence with reference to various attributes is as under;

### 10.1 Rainfall pattern

The average rainfall of Goa is around 3500 mm, while during period [ 2017-2022 rainfall varied from 2700 mm to 4597 mm. In order to understand role of rainfall monthly and annual rainfall data was analysed with the fire occurrence and area affected during forest fire in the state in last five years,

**Table:13** *Table indicating average monthly rainfall data from 2018 to 2023, Source: (CCARI, Goa)*

Months	2018	2019	2020	2021	2022	2023
January	0	0	0	0.3	0	0
February	0	0	0	2	0	0
March	0	0	0	0	0.3	0
April	0	0	6	27	51.2	
May	0	0.4	0.4	422.6	99.6	
June	1100.6	752.2	1200.6	903.9	700.6	
July	898.6	1335.4	1331.3	1345.9	1098.3	
August	461.9	1266	1060	343.9	347.6	
September	36.7	681.8	729	481	276.8	
October	145.4	430.2	215	239.9	71.3	
November	10.4	4.6	0	166.4	0	
December	0	0	54.2	105.9	2.2	
Annual Rainfall in mm	2746.2	4470.6	4596.5	4038.8	2647.9	0

**10.1.1** The monthly rainfall data indicates 90 per cent of rainfall are received only during the monsoon season, generally January to May there are no or very few rains reported between 2017 to 2022 and in 2023 there is almost no rains from November 2022 to March,2023.

**Table: 14** Table indicating Annual rainfall vis-à-vis fire incidence and area affected by forest fire between 2017 to 2023.

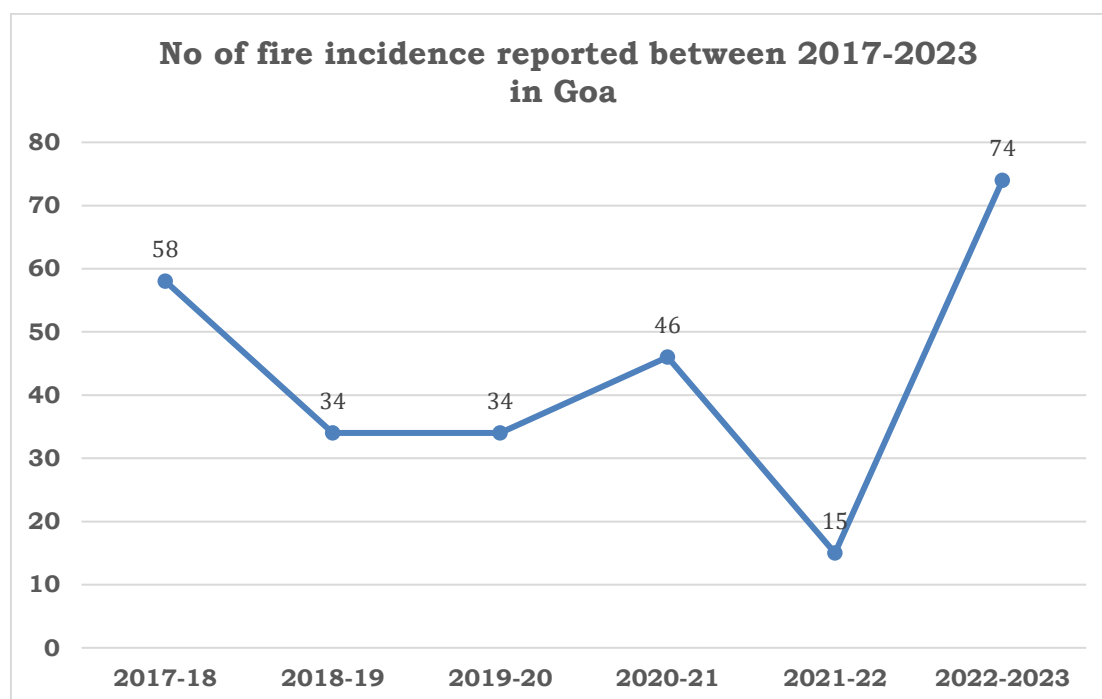
<b>Year</b>	<b>Rainfall In Mm</b>	<b>No of Forest Fire Incidence</b>	<b>Area Affected in Ha</b>
2017-18	2775.5	58	117.3
2018-19	2746.2	34	98.22
2019-20	4470.6	34	232.6
2020-21	4596.5	46	87.37
2021-22	4038.8	15	51.87
2022-23	2647.9	74	418.14

**10.1.2** No definitive trend of fire observed in state; however, during year 2021 and 2022 less fire incidences and less area was affected due to fire which may be due to high rainfall in the preceding years.

**10.1.3** On analysing forest fire occurrence and area affected corresponding to rainfall, it is observed that fire incidences and area affected are less when annual rainfall is above annual average of 3500 mm further in case rains are spread up to 8-9 months fire incidences and damage are further less. In year 2017, 2018 and 2022 annual rainfall is much less than normal and number of forest fire incidence and area affected is more in comparison to 2019, 2021 and 2022 with above normal rainfall and less fire incidences.

**10.1.4** On analysis of the current year's fire incidences, it is inferred that due to high rainfall in the past three years there had been a good growth of ground vegetation as well accumulation of large quantity of dry

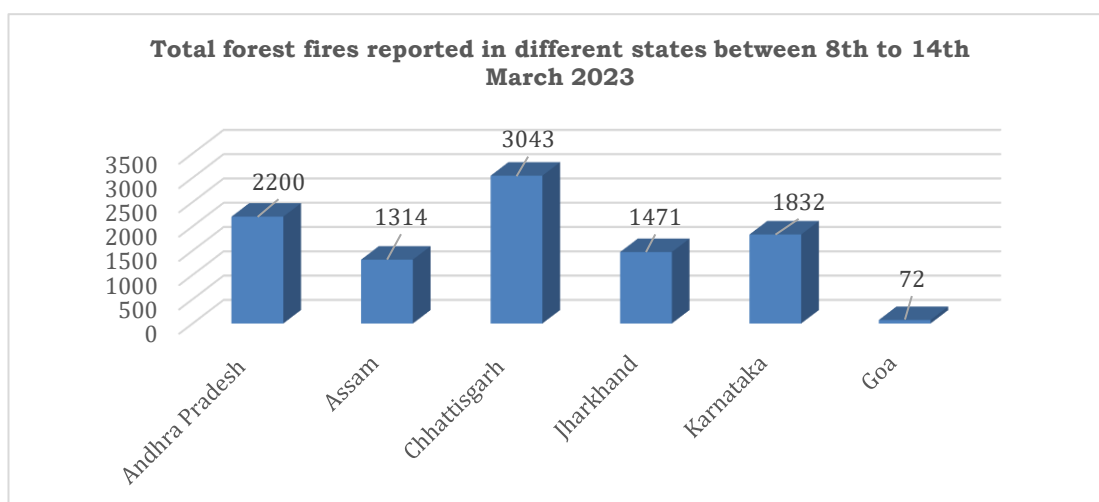
biomass. Prolonged dry spell since November, 2022 to March,2023 coupled with unprecedented high temperature, low humidity and high wind have made the environment conducive for fire in March. A total of 74 incidences were recorded in short period of 15 days compared to a total of 15 incidences reported during entire fire season of 2022.



**Fig.12** Graph indicating forest fires occurrence in the past and current year.

## 10.2 Trend of Forest Fire in Western Ghats Region / Country during period:

**10.2.1** As per Forest survey of India, MoEF&CC, GoI reports / data, during period, due to extreme weather conditions across country many fire incidences were reported mainly in Central Indian and peninsular States, worst affected being Chhattisgarh, followed by Andhra Pradesh, Karnataka, Jharkhand, Assam during the first fortnight, while Goa along with many other states have reported either few or no forest fire incidences during the first fortnight of March.

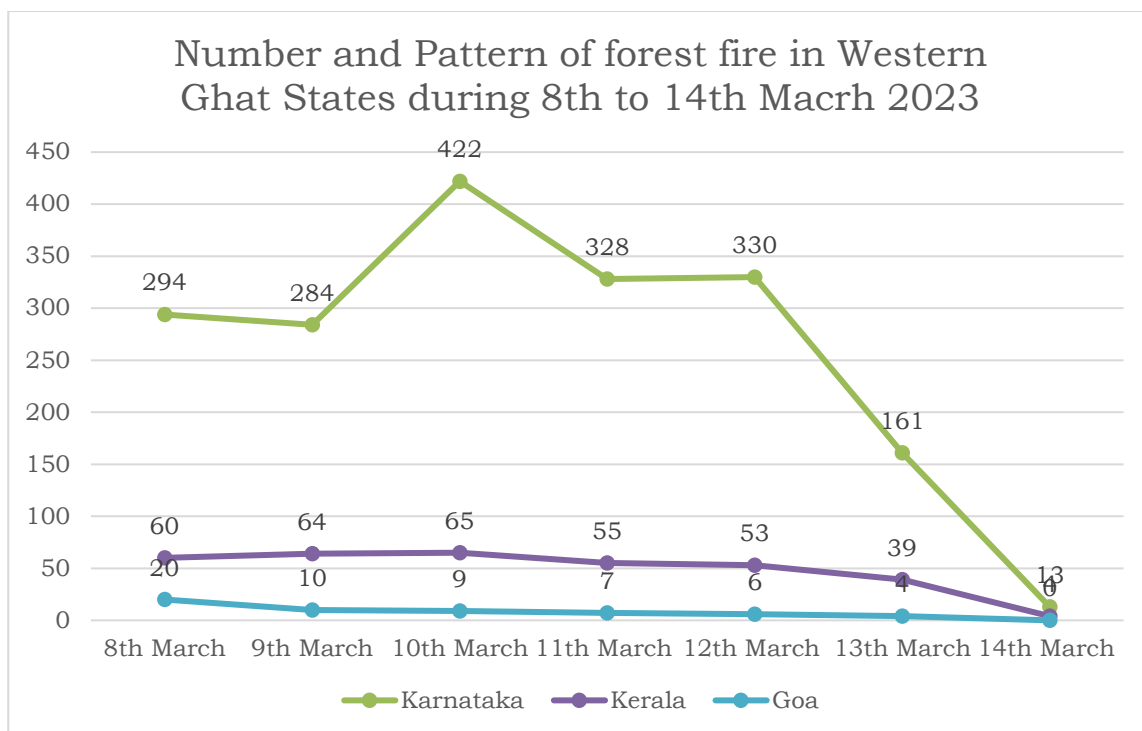


**Fig: 13** Forest fire reported in country during 1<sup>st</sup> fortnight of March 2023.  
Source: FSI

**10.2.2** Further, on analysis of forest fire at regional level for the same period as per the Forest Survey of India report, the neighbouring state Karnataka which has a similar forest type had also experienced similar surge in the forest fire incidences along with other Western Ghats's states suggesting sudden increase in forest fire not only restricted to Goa but it is a regional and national pattern.

**Table 15.** State wise number of real time Forest fire detected by FSI between 8<sup>th</sup> March to 14<sup>th</sup> March (Source: FSI)

State	8 <sup>th</sup> Mar	9 <sup>th</sup> Mar	10 <sup>th</sup> Mar	11 <sup>th</sup> Mar	12 <sup>th</sup> Mar	13 <sup>th</sup> Mar	14 <sup>th</sup> Mar
<b>Karnataka</b>	294	284	422	328	330	161	13
<b>Kerala</b>	60	64	65	55	53	39	4
<b>Goa</b>	20	10	9	7	6	4	0



**Fig.14** Pattern of forest fire reported in the Western ghat's states in March 2023.

**10.2.3** From the above-mentioned facts and graph it could be comprehended that during first fortnight of March weather was very extreme and conducive for fires and forest fire was reported in entire Western Ghats region including Goa except Maharashtra. As per Indian Meteorological Department, GoI report Maharashtra received isolated showers during 6<sup>th</sup> to 8<sup>th</sup> March which may be one of the reasons for less fires reported in Maharashtra during the period.

### 10.3 Affected Forest Type:

The fire incidence has been reported across the vegetation's of Goa, the most affected forest types are i) Moist deciduous and ii) Semi Evergreen Forest and iii) Dry Deciduous Forest (plantations), a trend that is also seen across Western Ghats area as per Forest survey of India's *Vulnerability of India's forest to fires*, 2017 report.

**10.3.1** Due to recent fire incidence in the state, approximately **418.138 ha** area has been reported as total Burnt Area, out of which **348.438 ha** is forest area, falling majorly under Moist deciduous and semi evergreen forests type.

#### **10.4 Anthropogenic Factors:**

Though some of the fire spots are reported to have happened near human habitation no loss of human life or property is reported. However, it is brought in all enquiry reports of DCF's that fire near human habitations could be manmade though more likely unintentional due to negligence and accidental cause.

**10.4.1** Further, out of 74 fire incidences reported 7 fire affected sites have FRC claims One in South Goa Forest division at Avali beat of Cancona range, four in Wildlife North Division one each at Satrem, Kayla, Surla, Coperdem- Palli Beta, whereas in Surla I- Mollem there are six claims. One community FRC claim at Cumari beat of Netravali WLS of DCF Wildlife South and there exist six claims at Maloli Village in GFDC area.

**10.4.2** An enquiry / investigation is under way by Forest and Police officials to ascertain cause of fire. However, at this stage all forest divisions have apprehended that cause of forest fire in forest area are pointing towards the man-made cause, though largely unintentional. Further the role / involvement and intention of Forest Right claimants under FRA in kindling the fire is also being enquired into.

## **10.5 Damage to Flora and Fauna:**

**10.5.1** On scrutiny and analysis of the report, it is found that forest fire happened in the state are *Surface/creeping fire* thus the dry leaf litters, dry poles/logs and trunks standing as well lying on the forest floor got burned in the incidences. The damage and losses to green vegetation are reportedly restricted to the ground vegetation's like herbs, shrubs and grasses only, no loss to any endangered flora or fauna were reported.

**10.5.2** Loss to human life, live stock and property has not been reported by the Divisions. However, at places damage to horticulture crop including cashew and Coconut have been reported outside forest area assessment of which is being carried out by the Agriculture Department. Further it is inferred from the report that as the forest fire in the state is surface/creeping fire, mammals and birds had a great chance to escape to safety compared to slow moving reptiles on ground, death of two snakes were reported. The wildlife habitat especially of Reptiles, Rodents, Birds [damage to Snag trees] and others was affected in burnt areas. Since nature of fire was Surface / Creeping fire a narrow strip was mostly reported affected. Requisite corrective measure will be taken to restore the damage to wildlife habitat.

## **11. CONCLUSION**

**11.1** A total of 74 fires were reported from 5<sup>th</sup> to 14<sup>th</sup> March, 2023. Out of which 12 was reported in Private land, 01 in Comunidade Land, 03 in Private Forest, and 59 in Government Forests including GFDC area. Approximately **418.138 ha** area has been reported as total affected by fire, out of which **348.438 ha** is Government Forest area

**11.2** The fire incidence has been reported across the State and most affected forest types are i) Moist Deciduous Forest ii) Semi Evergreen Forest and iii) Dry Deciduous Forest (plantations), similar trend observed in case of Western Ghats by the Forest survey of India in their report titled “*Vulnerability of India’s forest to fires, 2017*”.

**11.3** The fire during first fortnight of March, 2023 was largely due to unprecedented extreme weather conditions which triggered the fire occurrence in the state which are otherwise a regular annual phenomenon. The rain plays a major role in deciding fire occurrence and intensity of damage which is evident from the rainfall pattern and fire occurrence. As there was less rain in the previous year i.e., 2022, all the luxuriant ground vegetation which have grown in the past three years due to excess rain have converted into huge dry fuel / biomass, due to prolonged dry spell from November 2022 to March, 23, for the current year’s fire incidences,

**11.4** The socio-cultural practice of slash burning at Cashew plantations is considered to be one aspect of man-made fire, irresponsible and negligence of commuters using national highways, state highways ways and other interlinked roads within and adjacent to forest are more prone

to fire due to disposal of live cigarette stubs while travelling in forested road has also been seen as one factor causing forest fire.

**11.5** Festivity around the summer months is also been cited as one of the reasons for forest fire, as general public are seen to be using forest road and forested area during fire prone season, any unintentional fire might cause huge scale forest fire if environmental factors conducive for occurrence of fire is there, as seen in the recent fire incidences.

**11.6** The trend in the forest fires as observed in the past years indicate no steady pattern, but it is observed that rainfall patterns is linked to quantum of damage. This year, weather conditions like low rainfall in 2022, unprecedented high summer temperatures, low humidity and high winds favoured the forest fires to be more pronounced than yester years.

**11.7** The forest fire reported in first fortnight of March this year in Western Ghats dwelling state like Goa, Karnataka, Kerala has a similar pattern of fire incidences, there had been a sudden spike and subdued in the forest fire incidences pointing environmental factors manifesting the fire more than the human induced causes.

**11.8** On analysis of forest fire at regional level for the same period as per the Forest Survey of India report, neighbouring state Karnataka which has a similar forest type had also experienced similar spurt in the forest fire incidences along with other Western Ghats's states suggesting sudden increase in forest fire not only restricted to Goa but it is a regional and national pattern.

**11.9** Loss to human life, live stock and property has not been reported by the Divisions. However, damage to horticulture crops including cashew and coconut were reported mostly from areas outside forest.

**11.10** Further it is inferred from the report that as forest fire in the state was surface/ creeping fire, mammals and birds had a great chance to escape to safety compared to slow moving reptiles on ground. Death of two snakes were reported. The wildlife habitat especially of Reptiles, Rodents, Birds [damage to Snag trees] and others was affected in burnt areas. Since nature of fire was Surface / Creeping fire a narrow strip was mostly reported affected. Requisite corrective measure will be taken to restore the damage to wildlife habitat.

**11.11** The damage and losses to green vegetation are reportedly restricted to the ground vegetation's like herbs, shrubs and grasses only, no loss to any endangered flora or fauna were reported.

**11.12** An enquiry / investigation is under way by Forest and Police officials to ascertain cause of fire. A total of 34 cases has been registered under various laws against two known and rest unknown persons. At this stage all forest divisions have apprehended that cause of forest fire in forest area are pointing towards the man-made cause, though largely unintentional. The role / involvement and intention of Forest Right claimants under FRA in kindling the fire is also being enquired into.

**11.13** Out of 74 fire incidences reported 7 fire affected sites have FRC claims. Offence case based on site specific conditions have already been booked by forest and police authorities. Meanwhile, directions have also been issued to concerned DCF's that all affected area should be carefully

assessed, demarcated, restored and should be brought to the notice of concerned authorities while processing FRA claims in such areas. Communication has also been sent to Collector North & South Goa District who are chairman of District Level Committees under Forest Rights Act 2006 for appropriate action.

**11.14** The preparedness and dedication of the Joint Team could be adjudged from fact that except for 2 major fires, rest all were brought under control and doused within few hours' same day or the intensity of fire was reduced significantly. It was extremely challenging to manually control and douse the fire in inaccessible / steep hill top areas. For such areas the support of the Aerial Team of MoD was immense and supplemented the efforts of ground team to successfully control the fire in shortest feasible time.

**11.15** The support received from local Community was very good. To mention extraordinary support was received to control fire in Morlem, Surla and Sigao areas.

**11.16** The response time in which the mobilisation of helicopters and others resources required to respond to forest fire has been phenomenal in terms of inter-ministerial and interdepartmental coordination at state and national level, NDMA authority acknowledged the proactive steps taken by the department.

## **12 Lessons learnt:**

**12.1** The excellent co-operation received from various line Departments, including the district machineries, Fire Services, Local Community Defence Forces, who pitched in with their available resources within their ambit, helped to contain the forest fire in record time even in inaccessible terrain.

**12.2** Use of Fire blowers were found very effective in containing forest fire in remotest and toughest terrain.

**12.3** Even the semi evergreen forests of Goa are prone to forest fire if unfavourable environment prevails, like reported in other parts of the country.

**12.4** Ember management is very effective to control recurrence of fire in affected areas.

**12.5** It is very difficult to control fire in undulating forest area. Therefore, to control fire in remote and inaccessible forest areas especially designed fire tenders may be designed in consultation with fire Department and other experts.

**12.6** Firefighting dress with all safety gears on the lines of Fire Department Standard Operating Procedure should be made available to forest Front line staff, fire watches and all others who are engaged for fire control in forest areas.

**12.7** The slash burning in farm and agriculture land, which is seen as one of the main sources for fire in forest area, should be regulated. An SOP may be attempted by Agriculture Department in coordination with all concerned.

## **13. WAY FORWARD**

**13.1 Restoration and Rejuvenation of affected area:** In all fire affected areas, mostly ground vegetation is affected which may retrograde the forest regeneration. Therefore, instructions have been issued to concerned DCF's to take up Assisted Natural Regeneration (ANR) plantation in entire affected area within their respective jurisdiction this year to ensure early restoration of affected area. Plantations will be taken up considering Important Value Index (IVI index) of the existing forest which would help in creating a resilience to the forest. The plantation area will be fenced as per site requirement and will be closely monitored for better survival.

**13.2 Upgrading the Approach:** Considering the recent exceptional surge in fire incidences the existing policy and administrative interventions need to be revisited, revised, revamped, and updated to address the future challenges from the forest fire occurring in the state.

**13.3 Research on impact of forest fire:** As Western Ghats is one of the biodiversity hotspots as it hosts many rare flora and fauna, a detailed and intensive study is required to assess the biodiversity losses we are facing at ground level due to surface fire at site specific level to devise an appropriate intervention mechanism for protection and conservation.

**13.4 Dry biomass management in cashew orchards:** As the state of Goa is known for cashews, many thousand hectares of cashew orchard are located adjacent to forest or honeycombed between forest and pose a constant threat of fire during summer months, as the socio-cultural approach of orchard owners in dealing with leaf litters in orchards during fruiting season is seen detrimental as slash burning is neither beneficial

for environment nor favouring forest conservation. Therefore, state Agricultural Department will be requested to devise an appropriate practice / SOP for controlled burning in case of farmland with Agricultural and Horticultural crops including cashew & coconut in an environment and farmer friendly way on priority to check spread of fire through such practices.

### **13.5 Comprehensive Forest Fire Prevention and Management Plan:**

Department has already initiated action for revision of existing State Action Plan on Forest Fire in consultation with all stakeholders which would be a comprehensive Forest Fire Prevention and Management Plan. To seek assistance and support of NDMA in preparation of management plan a communication in this regard has already been sent to NDMA at Government and Department level.

### **13.6 Strengthening of Forest Frontline Staffs, Other stakeholder**

**including Community:** The Department will further intensify capacity building and training of forest frontline staff who will also be sent for training outside Goa in Central / State govt institutes. Emphasis will be given on joint training of all stakeholders. Special training and awareness camps will be organised for the local community. Further, in consultation with experts including Fire Department required firefighting equipment and tools in light of recent surge in fire incidences will be provided to all the Forest frontline staff.

### **13.7 Settlement of Forest Rights & Rehabilitation of people**

**outside Forest Area:** One of the main concerns is that the rights of people living in forests area is yet to be settled under Indian Forest Act 1927 and

Wildlife [Protection] Act 1972. Department will work and coordinate with all concerned for early settlement of rights expeditiously and subsequently attempts will be made to rehabilitate eligible bonafide beneficiaries outside forest area through a suitable compensation package. Voluntary rehabilitation will also be encouraged and promoted. This will ensure that forest area is free of any anthropogenic intervention and could be restored to natural habitat.

**14. Acknowledgement:** Department of Forest express sincere thanks and gratitude to all line Departments and community for outstanding support to control the fire. The expertise and professional acumen of officials of Fire and Emergency services was of immense help, at places, to douse fire in a short time without any loss of life and property. The prompt facilitation and support extended by collector and Superintendent of Police North and South Goa is priceworthy. The prompt aid and advice of flag officer commanding Goa area (FOGA) was very useful to combat fire successfully. The contribution of aerial support by Indian Air Force and Indian Navy helicopters, fitted by Heli buckets, in supplementing efforts of ground team to douse the fire in inaccessible area is commendable and laudable. Special mention and thanks to people of Goa who worked tirelessly and provided continued exemplary and outstanding support to check and control fire during period. This gesture of Local community is admirable. It was a collective team effort by which Forest Department in collaboration with all concerned successfully controlled all the fires within shortest feasible time.

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