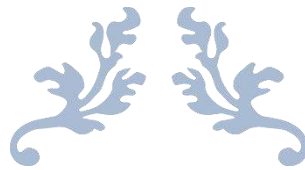# Standard Operating Procedure Document

# COAL MINE SURVEILLANCE AND MANAGEMENT SYSTEM (CMSMS)
# &
# MOBILE APP KHANAN PRAHARI

*Developed by*

**Bhaskaracharya National Institute for Space Applications and Geo-Informatics (BISAG-N)**
**&**
**Central Mine Planning & Design Institute Ltd.
(CMPDI)**

# CONTENTS

## 1.0 BACKGROUND

The illegal mining of coal has been a major issue in India for many years, causing significant damage to the environment and leading to a loss of lives as well as revenue to the government. Illegal coal mining has been reported in several coal mining states across the country. In order to curb illegal coal mining activities and keeping in view e-governance initiative of GoI, Ministry of Coal (**MoC**), requested Bhaskaracharya Institute for Space Applications and Geo-Informatics (**BISAG**), Gandhinagar, to develop a *Surveillance System* in association with **CMPDI** for Coal sector wherein illegal coal mining incidents could be identified so that suitable action may be taken to prevent and curb illegal coal mining activities.

A presentation was made to Secretary (Coal), MoC, GoI in this regard wherein it was advised that the system may be called Coal Mine Surveillance & Management System (CMSMS) and it was also directed that additional important information related to coal blocks and other activities should also be incorporated in the system so that it can be used as a decision support system.

## 2.0 WHAT IS ILLEGAL COAL MINING?

In general terms, Illegal coal mining is the mining of coal without the permission of the government or without following the regulations and laws set by the government. Illegal coal mining can be further categorized as:

- Any coal mining activity carried out by the allottee which extends beyond the mining lease boundary, the part of activity being carried outside the allotted boundary is an illegal coal mining operation.

- Also, any coal mining activity like rat hole mining,





pilferage etc. carried out by any unauthorized person(s) or entity anywhere in the coalfield region can also be called an illegal coal mining activity.

## 3.0 ABOUT CMSMS (Coal Mines Surveillance and Management System)



**Fig 1:** CMSMS Landing Page (**https://cmsms.ncog.gov.in/CMSS/login/**)

The *Coal Mine Surveillance & Management System* (**CMSMS**) is a web-based GIS application that was launched by Ministry of Coal, GoI in July 2018 along with associated mobile app named *Khanan Prahari*. This system was developed by Bhaskaracharya National Institute for Space Applications and Geo-informatics (BISAG-N), Gandhinagar and Central Mine Planning and Design Institute (CMPDI), Ranchi, Subsidiary of Coal India Limited. The objective of CMSMS is detection of illegal/ unauthorized mining sites, report, monitor and take suitable action based on complaints received from Khanan Prahari App.

**The above mentioned CMSMS portal has been recently been revamped under the directive of Ministry of Coal (MoC) to make it more informative with new interface and additional features.**

The CMSMS uses the basic platform of Ministry of Electronics & Information Technology (**MeitY**) and National Center of Geo-Informatics (**NCoG**). BISAG, Gandhinagar has developed number of e-governance websites on Web-GIS platform for various government organizations. All such systems are ported on the NCoG portal. The National Centre of Geo-informatics (NCoG) is a Geographic Information System (GIS) based decision support system platform under the National e-Governance Division (NeGD) of the Ministry of Electronics and Information Technology (MeitY), GoI. It is a single source GIS platform for sharing, collaboration, location-based analytics, and decision support systems catering to central and state ministries/departments/agencies across India. The Coal Mine Surveillance &

Management System is also ported on the same portal and can be accessed by the web address https://cmsms.ncog.gov.in/CMSS/login/

## 4.0 SALIENT FEATURES OF CMSMS

The salient features of this CMSMS system are as follows:

- The CMSMS incorporates map of India provided by MeitY on which information up to village level boundaries are available.
- Geo-referenced Coalfield boundary, Block boundary, Mine Lease boundary and CMSP Block boundary are also available as separate layers in the system at the Coal Map section available in the Home Page. These layers can be found in Vector Layer under Layers Tab.
- The CMSMS has provision of coverage of coalfield area with a buffer zone of 100 m.
- CMSMS system for generating information on illegal mining based on Information/ complaints provided by Mobile App 'Khanan Prahari' through public participation.
- The complaints generated through above mentioned system are registered at the CMSMS portal with a specific ID and is automatically sent to Nodal Officer of the concerned area (CIL/ Non-CIL) through Email and SMS.
- The Monthly Report of the CMSMS will be sent to all Nodal Officers (CIL/Non CIL) including CVO's in case of Subsidiaries.
- A complainant can track his/her complaint status through **Track your Complaint ID** through input of Complaint ID.
- As per the case, the Nodal Officers in CIL subsidiaries/ State Governments have to verify these complaints on ground and take action, if the complaints are found true.
- The status of verification of the complaints and the Action Taken in this regard has to be put in Action Taken section in *Coal Map* Section after successful nodal login of concerned area.
- Any illegal coal mining activity carried out beyond the lease boundary will be reported to the Director of Mines & Geology of respective States or their representatives for further remedial actions.
- CMSMS also provides access to **Other Information** on Reports on "Land Reclamation Monitoring based on Satellite Data" being carried for CIL mines. This report provides information on the progressive changes due to various reclamation activities carried out in coal mines.
- CMSMS will have three types/ levels of access for its various users:
  - **Citizen Access:** Has viewing access to all information available on CMSMS Portal.
  - **Nodal Officers:** View & access to enter action taken information against reported cases.
  - **Administrator:** CMPDI has right to edit/ modify/ delete/ update relevant information.
- In Coal Map tab provided on the Dashboard takes to GIS Map visualizer. In this section, one can select layers of interest and overlay it on digital boundary maps or on satellite images to see the

reported incident. The location of illegal mining site reported through mobile app will be shown by Flag Marks.

▪ A very comprehensive set of Frequently Asked Questions (FAQs) is available both in Hindi and English in the FAQ Section on the CMSMS dashboard so that anyone can understand the terminology and features of the CMSMS.

▪ The associated mobile app of CMSMS portal is called 'Khanan Prahari'. This app is a tool for reporting any illegal coal mining incident by any individual from the site where the actual event is taking place. The mobile app is available for both Android and IOS platforms on respective App Stores.

## 4.1 CMSMS Home Page

After logging in as Citizen Access or by using the credentials provided by CMPDI for Nodal Officers, the following page appears (Fig 2). The page has five options- 'Dashboard', 'Summary Report', 'FAQ', 'Other Information', and 'Track your Complaint ID'.



**Fig 2:** CMSMS Home Page after Citizen Access /Nodal Login.

## 4.1.1 Dashboard

The first page shows default Pie chart status of generated complaint in different categories and segments of CIL and Non CIL area. It shows the status of complaints generated through Khanan Prahari mobile app. This page has the facility to sort the complaints in different levels. On clicking on pie chart of CIL and Non CIL pie zone, complaints further distributed in Subsidiary level in CIL and State in Non CIL. This can be sorted date wise, either CIL related complaints or non-CIL complaints. The cumulative status is shown as default at top. It also shows how many of the incidents that has been reported are found to be True/ False and how many are

yet to be verified in detailed database table in bottom level when last level of subsidiary/State has been selected further. (Fig 3)
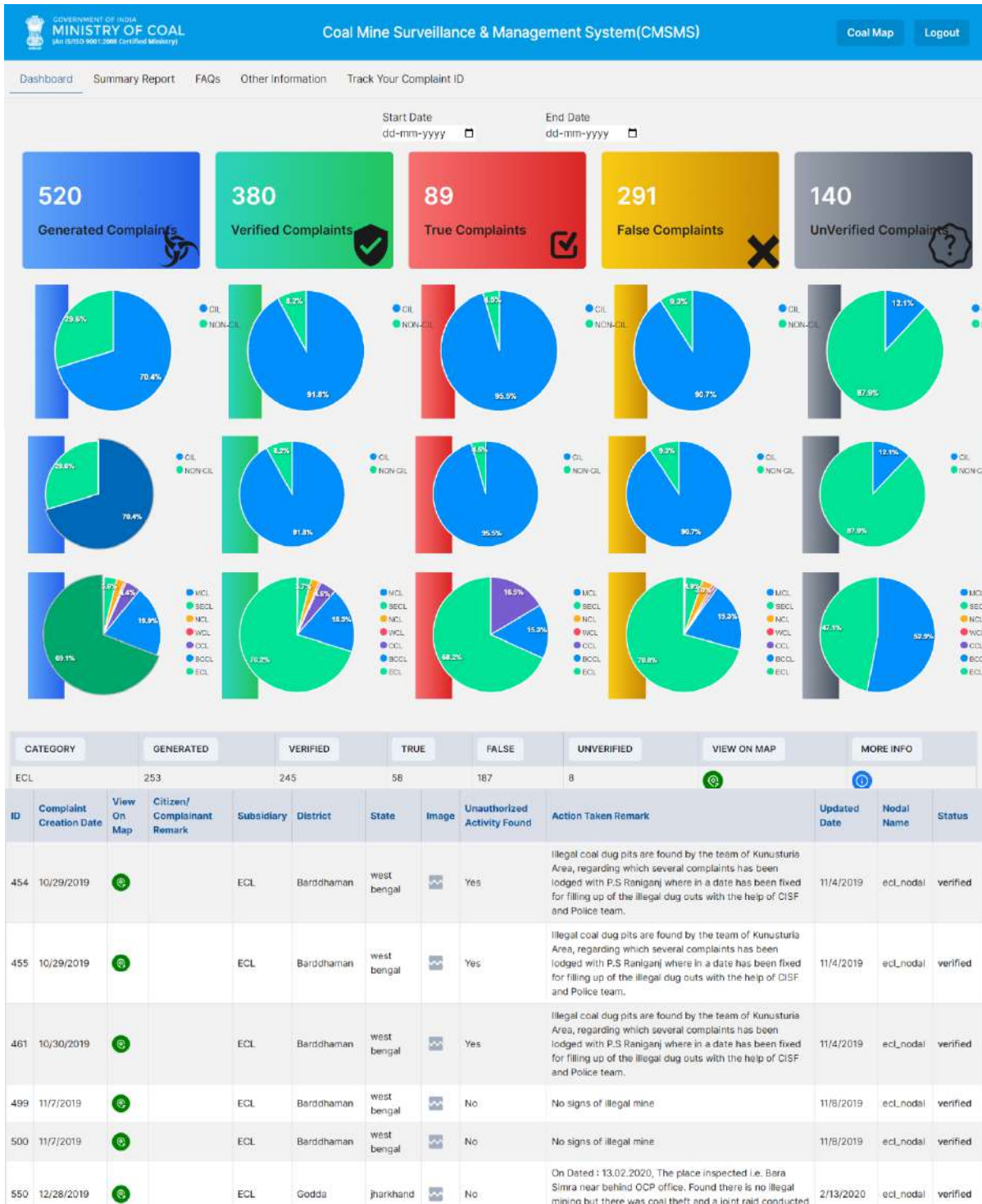


**Fig 3:** Showing Detailed Dashboard activity

### 4.1.2 Summary Report



**Fig 4:** Summary Report Tab Shows Tabular Status of Complaints

The Summary Report Tab on the Home Page takes the user to Complain Status Dashboard wherein the detailed information of the complaints registered on the CMSMS portal are available. This page has facility for sorting the registered complaints available on this page. Sorting can be done for All/ CIL/ Non CIL complaints in Date wise

and State wise manner also. Further, location and action taken status of the sorted complaints can also be seen by clicking the View on Map or More Info buttons available on the page.

These reports can also be downloaded in PDF format by clicking the Export button present on the page

### 4.1.3 Frequently Asked Questions (Faqs)



The CMSMS Web Portal Home Page also contains a FAQ Tab. Users may select 'FAQ' tab to view the Frequently Asked Questions in this section related to CMSMS and Khanan Prahari Mobile App. FAQ in both English and Hindi are available under this tab

### 4.1.4 Other Information (Land Reclamation)

The user may select '**Other Information'** tab to view the reports on Satellite Data based monitoring of Land Reclamation activities undertaken in CIL mines. Access to this page is through the CMSMS Home Page. (Fig 5)

The purposed of carrying out the land restoration / reclamation monitoring is to assess the area under backfilling, plantation, social forestry, active mining area, water bodies, distribution of wasteland, agricultural land and forest in the leasehold area of the projects. This will help in assessing the

progressive status of mined land reclamation and to take up remedial measures, if any, required for environmental protection. Land Reclamation reports are available under two categories:

- Projects with annual production of more than 5 million cubic meter (Coal + OB) and
- Projects with annual production of less than 5 million cubic meter (Coal + OB).

The user may select any particular year and view the detailed Land Reclamation report of that year.



**Fig 5:** Land Reclamation Page of CMSMS

## 4.1.5 Track Your Complaint ID

This tab is newly designed at portal similar to Khanan Prahari mobile app at which user can track his/her complaint status by entering complaint id. If the complaint Id is valid, the search result will display the database row of that complaint and similarly the status of complaint will show that complaint is either verified or not verified. This tab will ease the general citizen to know the status of reported complaint if complaint id is known earlier.
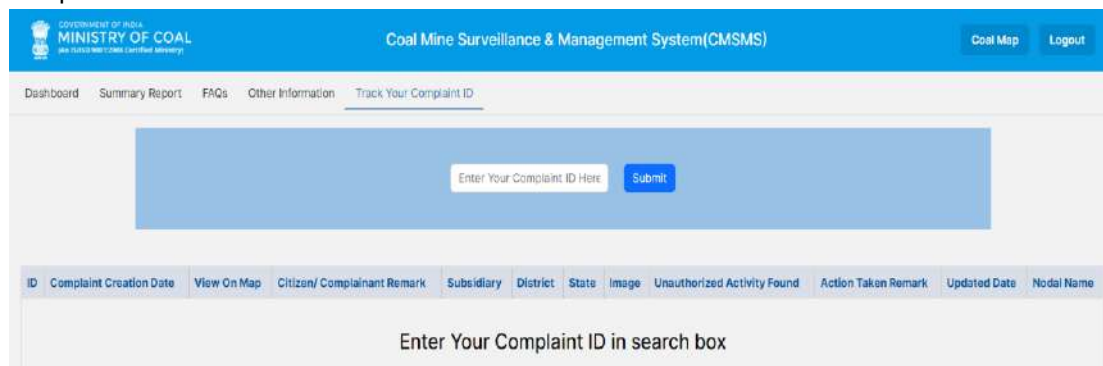


**Fig 6:** Status of Complaints through search option by Complaint ID

Status of complaints can be seen by entering complaint ID in this tab section. User can input his/her compliant ID and get the information of complaint status in bottom.

## 4.2    COAL MAP

The 'Coal Map' Tab on the CMSMS Home Page (Refer Fig 7) takes the user to India Map page where the user/ visitor can view various layers like Base Map Layers, Vector Layers, Raster Layers, Satellite Images of Coalfields etc. 'Base Map' provides various boundaries like state boundary, district boundary, taluka and village boundary. River, Rail, and Road are also provided under the base map category. Satellite Map of India is available under 'Raster Layers tab'.

Under Vector Layers option, Coalfield boundary, Lease boundary and Coal Block boundary are provided. Satellite images of various coalfields are provided separately also under 'Raster Layers'. Selecting Khanan Prahari Data under Mobile App Data Tab will show the flagging of places from where cases of illegal coal mining incidents have been reported. The details are described below for each layer segment.

### 4.2.1   India Map

The default GIS layers will display at this page of COAL MAP menu selection. At a glance the entire India Map will displayed at default showing all state boundaries. The left bottom corner will show scale and legend of the map which is dynamic in nature on zoom by scrolling the map. The legend of different layers will Pop up when layers will visible on click. Top left corner has a menu for analytical tools, which can be expanded on clicking on it. The right top corner has a panel for different GIS layers set. The top is search menu where input keywords for layers can be entered for any specific layers or data. Next in line is High Resolution image tab where API based satellite maps of Google, Bing aerial and FCC image of 60 CM resolution of PAN India is available for display. 3rd tab is for different layers like Vector layers, Satellite images, Raster layers and complaint location are integrated which are provided by CMPDI. Next to 4th tab is basemap for Road, Rail and River for Pan India level.
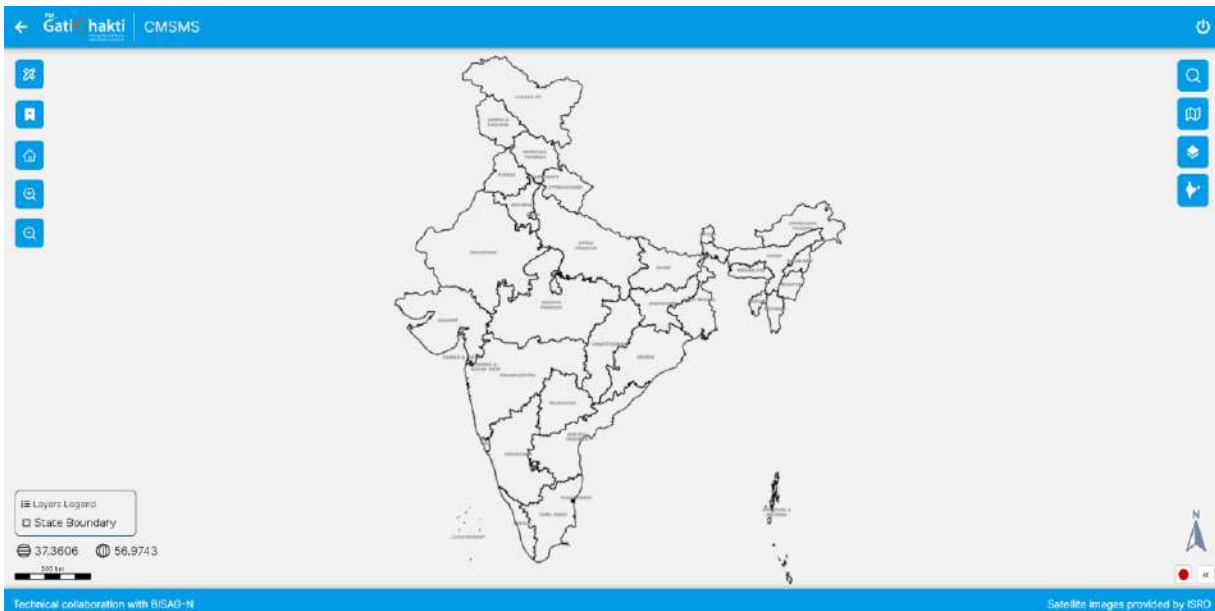
**Fig 7:** INDIA MAP (GIS Visualizer)
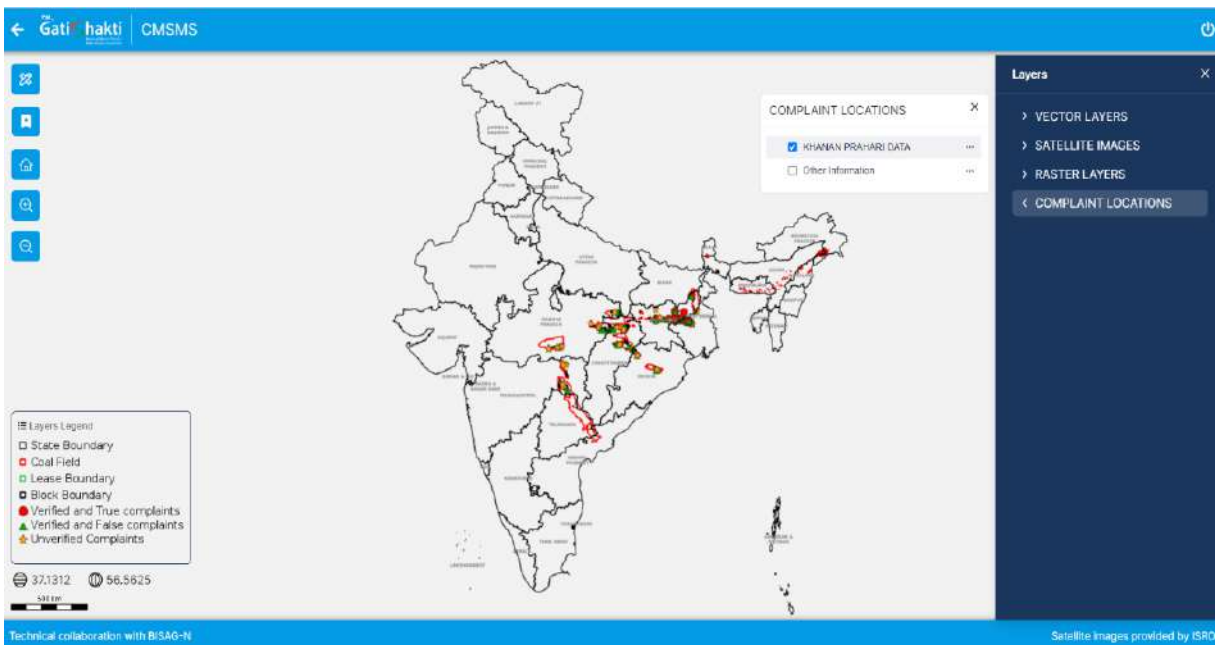
### 4.2.2 GIS Layers



**Fig 8:** GIS layers Tab

At right corner of the India Map page different categories of GIS layers are incorporated to showcase GIS layers at portal. These are Vectors layers, raster layers, Satellite images and Complaint locations of the reported locations. (Fig 8)

| S.N. | Layer Tab | Layer Information | Details/Source |
|------|-----------|------------------|----------------|
| 1. | Search panel | Input keyword search tab | Search tab |
| 2. | Vector layers | Blocks, Lease, Coalfield of Coal | Supplied by CMPDI |
| 3. | High Resolution Image | Google, High resolution images | API based layers |
| 4. | Satellite Images | LISS 4 images ( year 2021) | |
| 5.. | Raster Layers | Coalfield FCC images (Old) | Supplied by CMPDI |
| 6. | Complaint locations | Khanan Prahari data | Khanan Prahari app data |
| 7. | Base MAPS | Administrative (District to Village) | As a Basemap |
| | | Base layers (Road , rail ,River) | As a Basemap |

### 4.2.3 Analysis Tools

Apart from the above, various tools for Navigation, Search, Add Geometry, Print Drag & Drop Kml etc., are also available in left side of the *GIS Map Visualiser Page.* On the Top of the page, through Administrative Tools under Layer Manager one can have access as per LOGIN credentials to Action Taken Reports of all the complaints registered at the CMSMS portal.
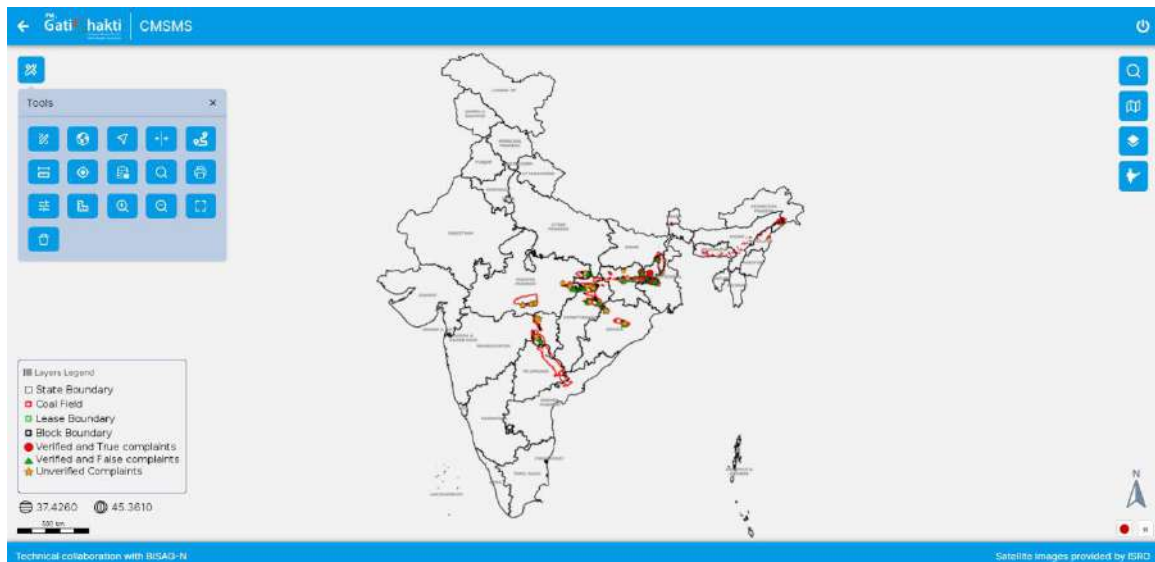


**Fig 9:** Analysis Tools

The different analysis tools are functional for selecting any area of interest and related information.

### 4.2.4 ActionTaken (for Nodal officers)
This corner is developed for only authorized Nodal officers and citizen cannot access this section.

**Fig 10:** Action Taken menu

The nodal officers can see their concerned are generated complaints and based on location value the complaint will verify at ground. If complaint found true in nature a details report will be submitted by concerned nodal officer in Action Taken Report.



**Fig 11:** Shows Action taken remarks

# STANDARD OPERATING PROCEDURES (SOPS)

## 5.0 CMSMS DATA FLOW DIAGRAM:

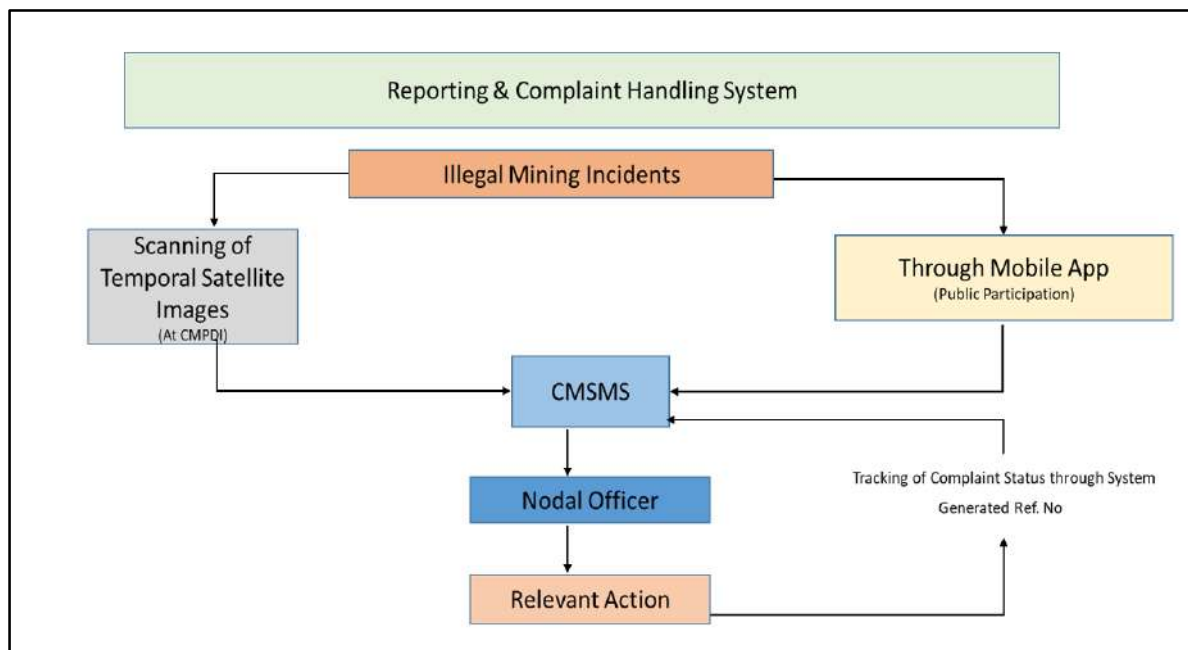The flowchart diagram showing the reporting and complaint handling system of CMSMS is shown below (Refer Fig 5)



**Fig 12: CMSMS Data Flow Diagram**

## 6.0 GUIDELINES FOR USING CMSMS

To access the CMSMS web portal, visit https://cmsms.ncog.gov.in/CMSS/login/. The user is directed to the login page of the CMSMS portal as indicated (Fig 6).

There are provisions for three levels of users on the CMSMS Portal:

1. **Citizen Access**: Any citizen may access information available on this portal through Citizen Access. No username or password is required. Citizen Access has only viewing rights and cannot modify any data.
2. **Nodal officers Access:** Nodal Officer of each subsidiary/ State Government can log in using their credentials provided by CMPDI. They can view the Khanan Prahari / CMSMS reported incidents and verify the same in the field and give feedback on the reported incident in Action Taken Report under *Administrative Tools* on *GIS Map Visualiser Page.*

3. **Administrator**: Administrator can use his credentials to log in and edit/ delete/ modify/ add layers like Block Boundary, Lease Boundary etc.
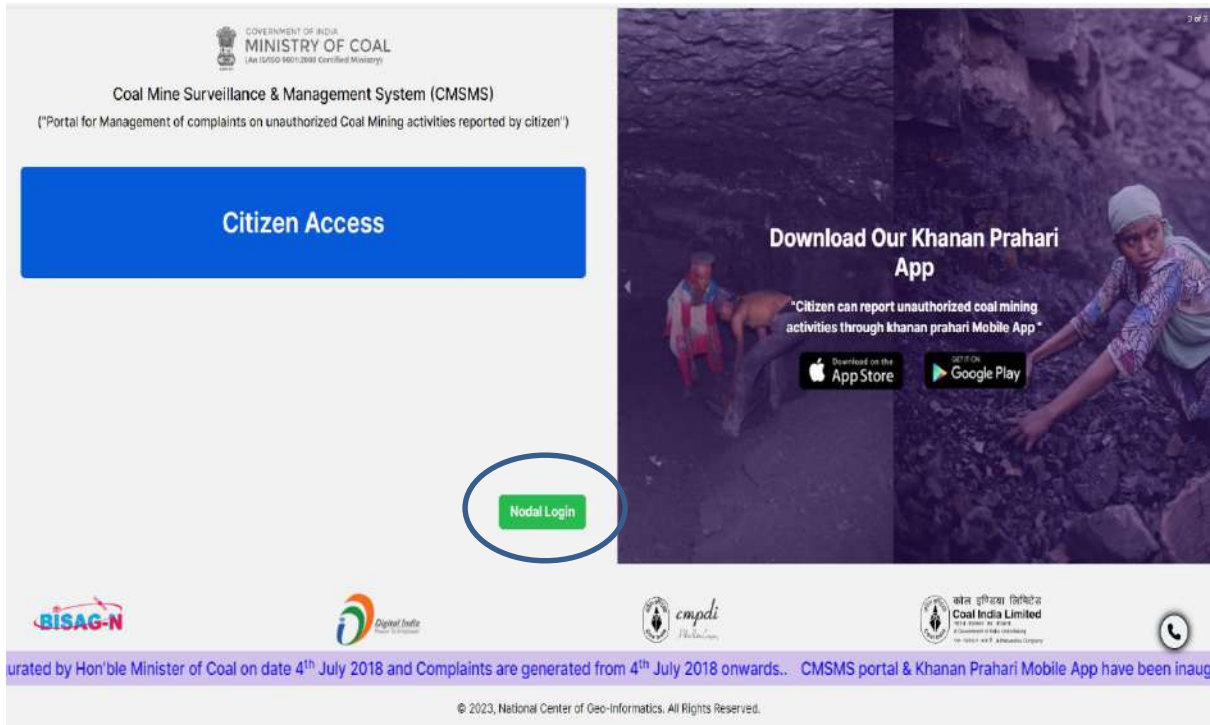


**Fig 13: The Nodal login page displayed in CMSMS**

**Viewing the Application**

1. Log in as citizen access or using credentials (for Nodal).
2. Click on the Coal Map option. It displays the map of India on the screen.
3. Various type of information can be seen on the COAL MAP section. To view different layers on coal map page, click on the 'Layers' tab available on top right (Fig 14). It displays Panel for 4 subgroups namely: Search layers, High Resolution Images, layers and Base maps
4. Under the 'Layers' Tab, there are several options like Vector layers, Satellite Images, Raster layers and complaint locations are integrated. The user may select any of these options to visualize them on the map. A Legend is also displayed describing what each symbol represents in the map (shown in Fig 14).
5. The 'Action Taken' tab displays the Action Taken Report and other details with respect to report generated whenever an incident is reported/detected (Fig 16).
6. To view the District, Taluka or Village of any State of India, click on 'Base Map' tab provided on top right and select the relevant option. As shown in Fig 14, state and district options are selected.

The user then needs to zoom in to that particular state to visualize districts, villages etc. (Fig 15). A legend is also displayed alongside.

7. By clicking on the Base map layers Road, rail, river layers can visualize at pan India level.
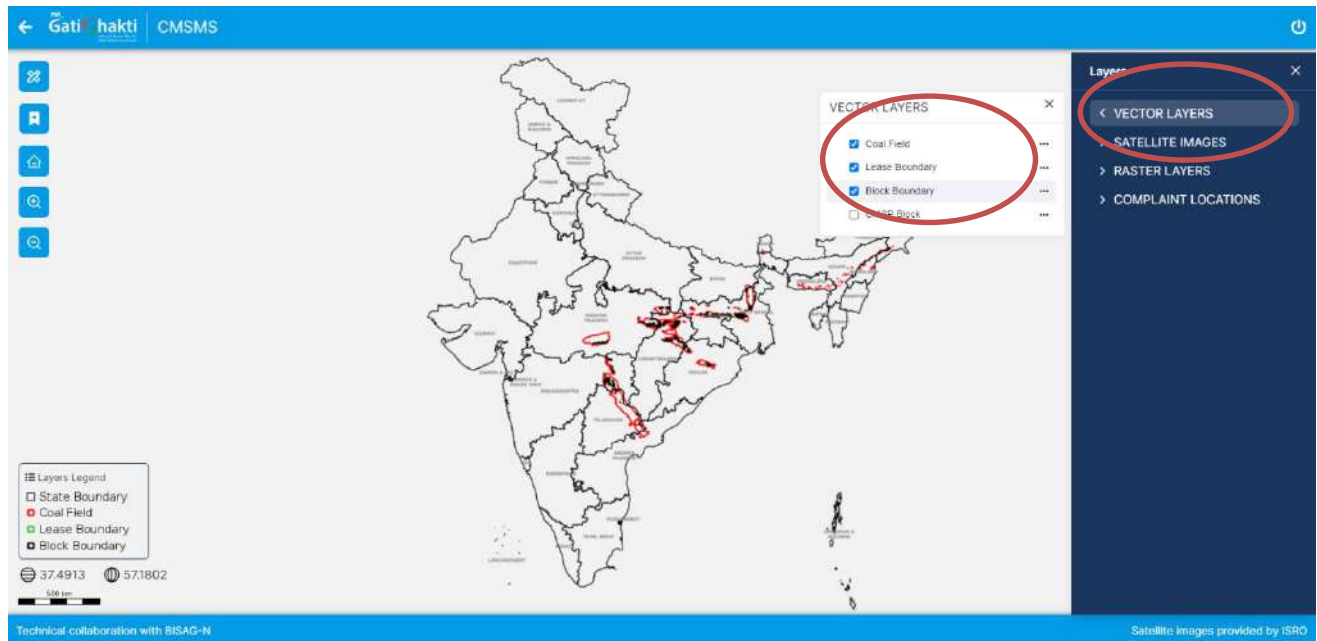8. Under High Resolution Images, there are three options: Aerial, google and High res image. (Fig 19).



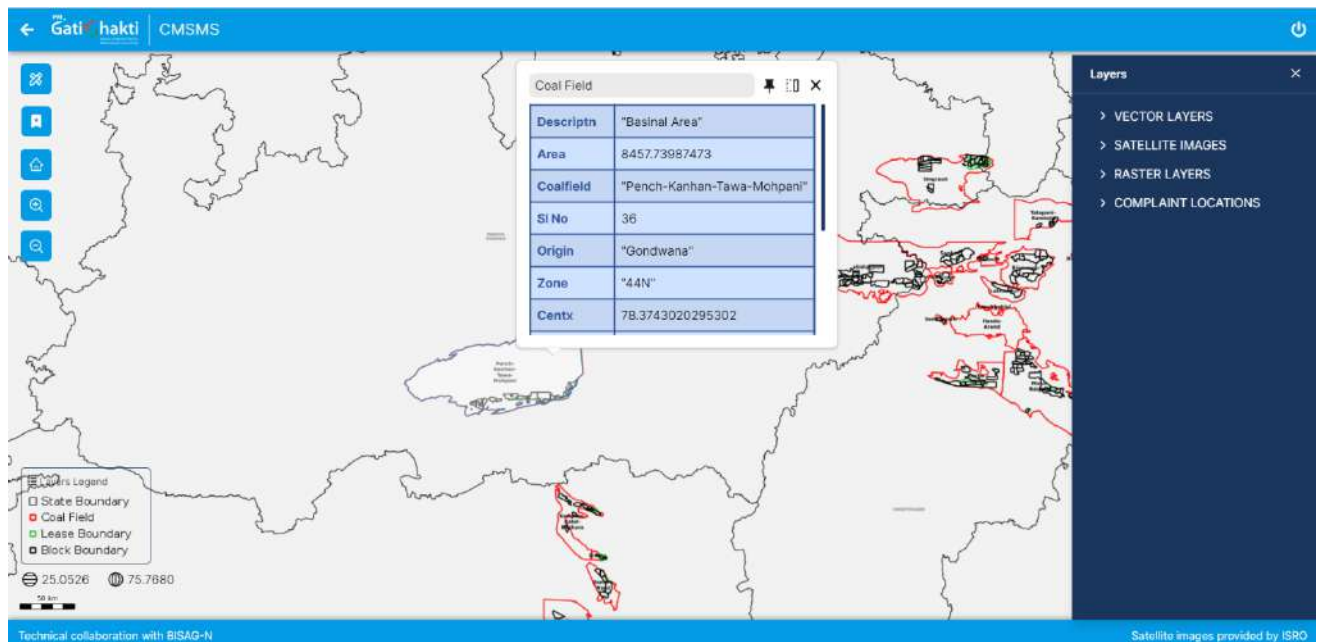**Fig 14:** Displaying Coalfield Boundaries on GIS Map Visualizer



**Fig 15:** GIS Map Visualizer showing the selected features along with the attributes
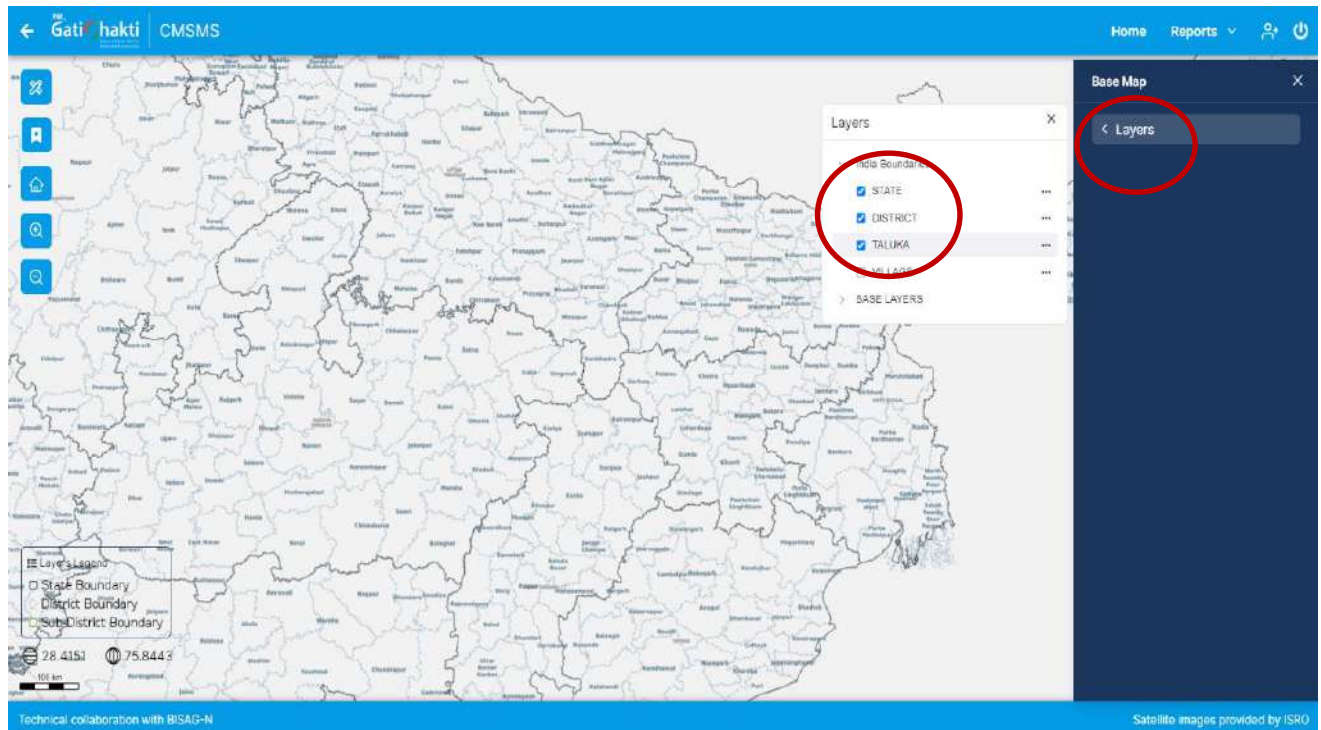
**Fig 16:** The 'Action Taken Report' page of CMSMS



**Fig 17:** GIS Map Visualizer showing the District and State options under Base Map
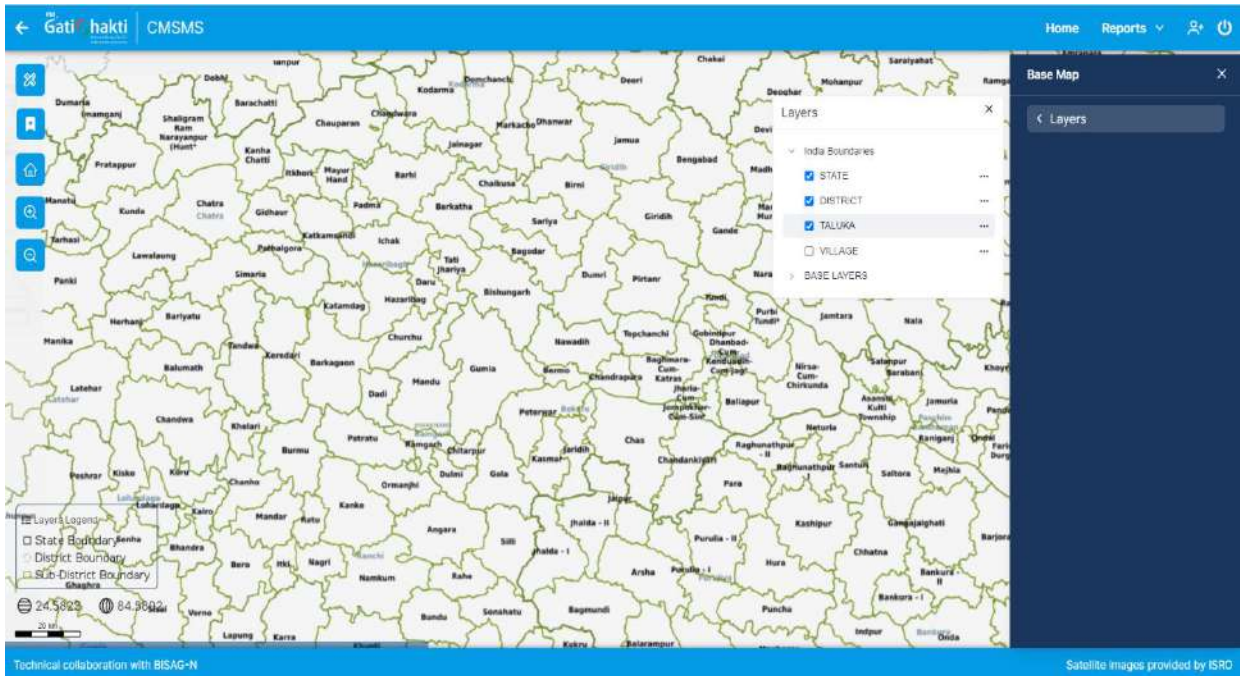
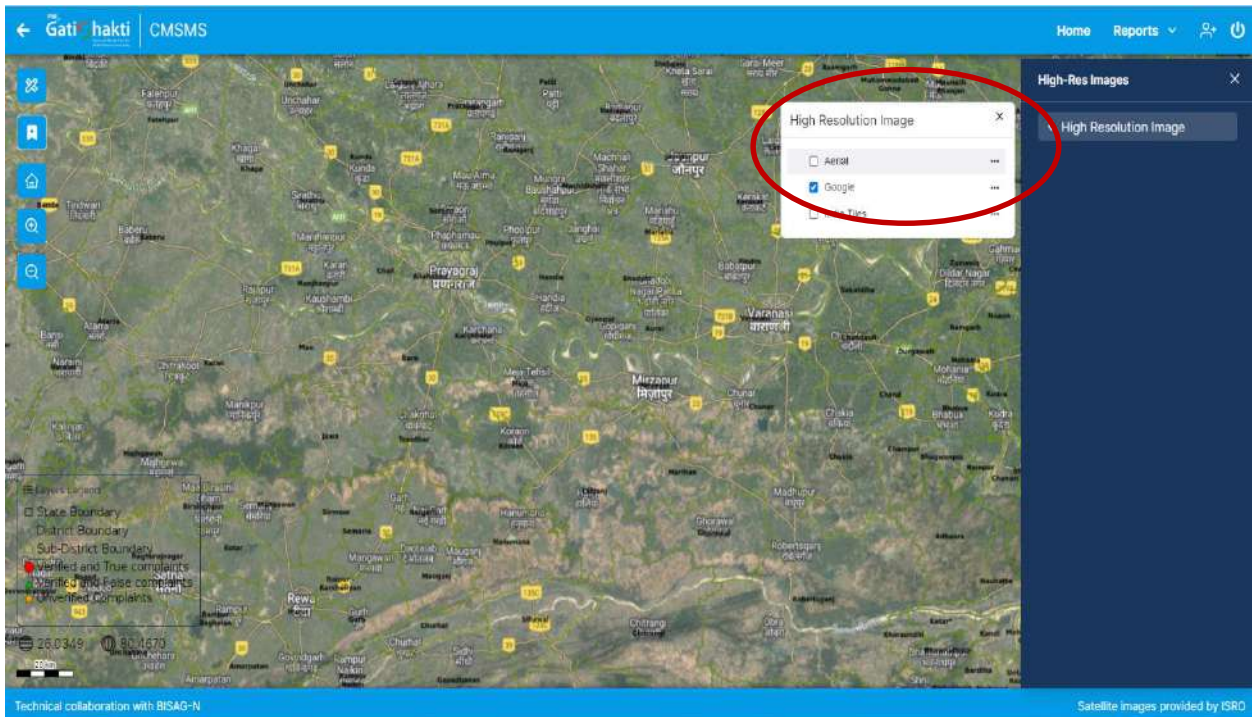**Fig 18:** Image showing the District and State Boundaries of a region



**Fig 19:** Satellite image along with the place names

**Role of Nodal officers.**

- Nodal Officers have been nominated by competent authority of respective subsidiary companies of CIL to view, verify and take suitable actions on the illegal coal mining reports generated within CIL command area.
- For the areas outside CIL, Director of Mines & Geology of respective States or their representatives have been nominated to function as Nodal Officers for taking suitable action against reported incidents.
- CMPDI will communicate 'User ID' and 'Password' to Nodal Officers for accessing the CMSMS website.

## 7.0 PROCEDURES TO BE FOLLOWED BY NODAL OFFICER

| | Activity | Action | Response Time |
|---|---|---|---|
| **A)** <br><br><br><br><br><br><br><br> **B)** | Updation, deletion and GIS data layers' upgradation will have administered by CMPDI <br><br> Reporting of illegal coal mining by general public through Mobile App (**Khanan Prahari**) | **a) Viewing of report** <br> The Nodal Officer will receive information about illegal mining in their control area through email and SMS. <br><br> On receipt of information, the Nodal Officer will login into the System <br> - By entering User Name and Password allotted to them and Captcha shown on the screen. <br> After login <br> - Click 'Coal Map' Tab in dashboard <br> - Click on 'Reports' Tab <br> - Search/Select Complain ID No. <br> - Press "View on Satellite Map" to view complain location. | One Day |
| **C)** | Once Nodal will login through its credentials the complaints generated in their area will only displayed for verification. | **b) Verification**: <br> The Nodal Officer will verify the report by verification in the field (Ground Truthing). | One Week |
| | | **c) Action:** <br> After ground truthing the Nodal Officer will have to update the information into "Action Taken Report" of CMSMS. | One Week |
| | | **d) Action Taken details to be entered into the System –** <br> - Nodal Officer will confirm about veracity of the report of illegal mining by selecting on Yes / No. **Yes,** will imply that the activity reported is found to be that of 'illegal coal mining'. | One Day |

| | | - **No** means "No Illegal Coal Mining activity was found.<br>- Nodal Officer can also put his additional remarks | |
|---|---|---|---|

# 8.0 HOW TO DETECT AND REPORT ILLEGAL MINING

Report or triggers can be generated in CMSMS

Through geo-tagged photograph and information uploaded through mobile app (**Khanan Prahari**) which is available for both Android and IOS platform by any person/ citizen.

# 9.0 "खनन प्रहरी" - THE MOBILE APP: OPERATIONAL PROCEDURES



It is a Mobile App of Ministry of Coal for Reporting Illegal Coal Mining. It is a tool for reporting any illegal coal mining incident through geotagged photographs as well as textual information by any individual from the place of incidence.
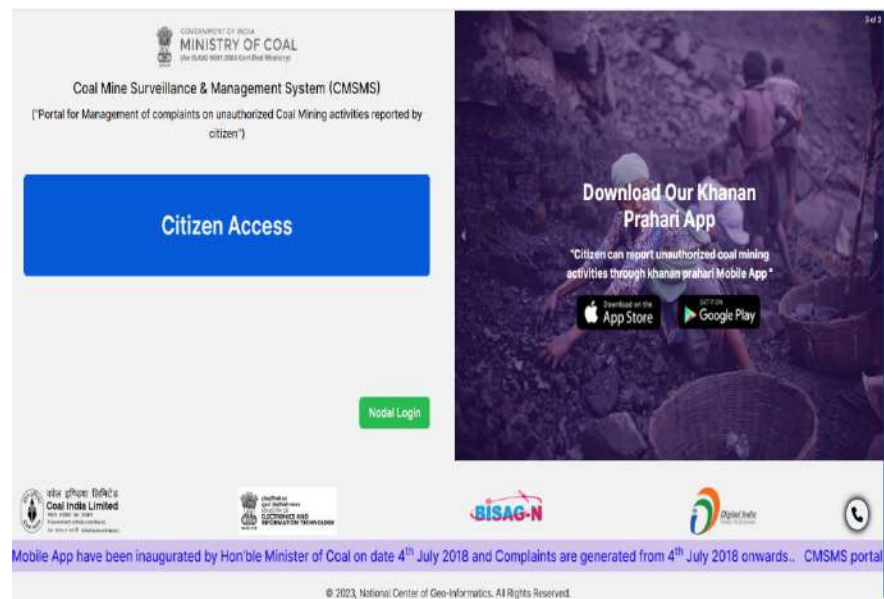


**Fig 20:** Khanan Prahari Mobile app

The download link **of Khanan Prahari mobile app** is available at CMSMS Portal at right side. The app is developed with technical support of BISAG at both the platform i.e. Android and Apple IOS. (Playstore and Appstore).
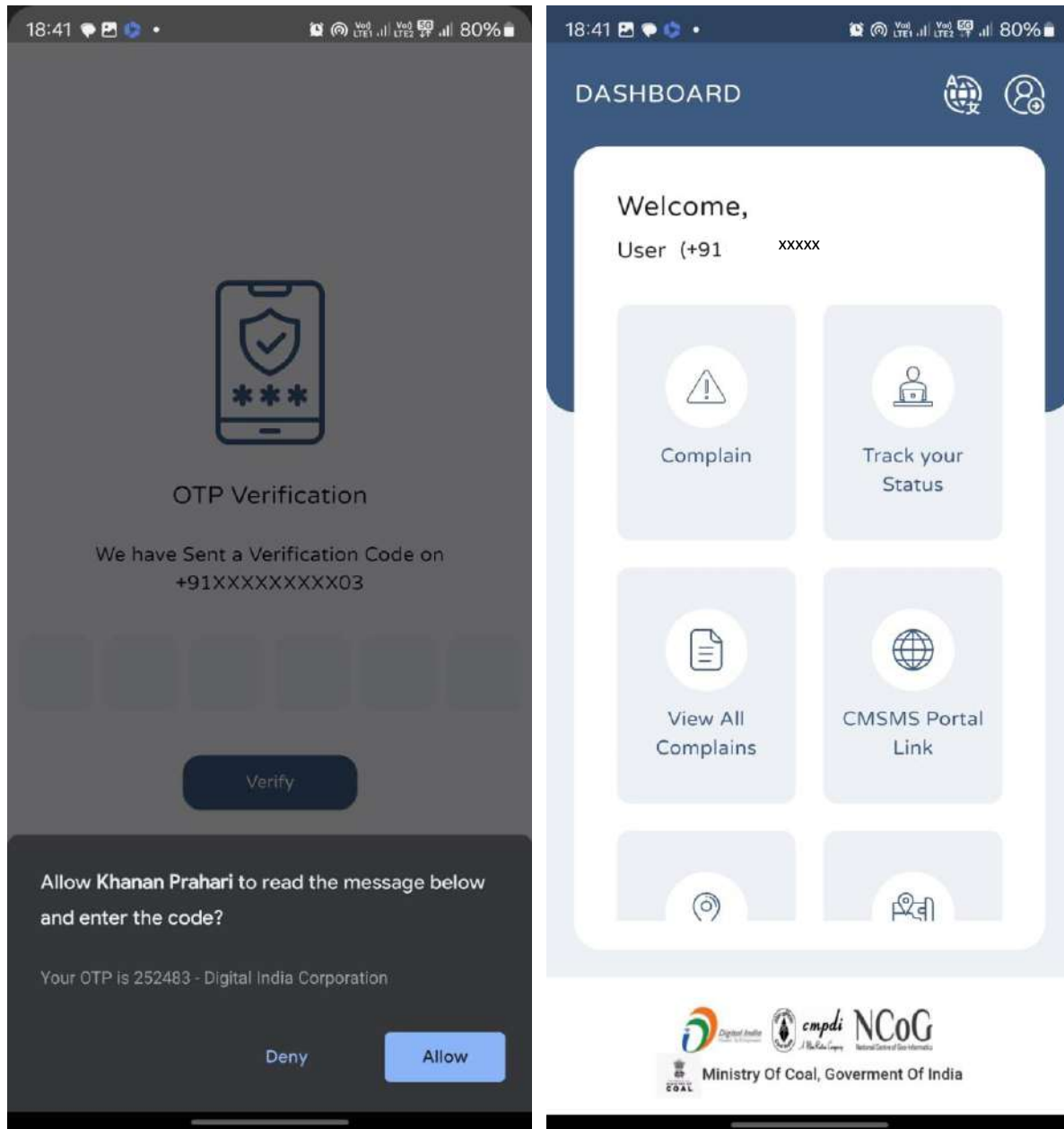
**Fig 21:** Login Page and Dashboard Page after login at Khanan Prahari Mobile app

After successful login verified by OTP based Security, any person willing to report any incident of illegal mining, may do so using the first option 'Complain' at the top of the home page of the app (Fig 21). User can switch to HINDI/English language facility by choosing by language icon at top right corner before Profile area.

**Fig 22:** The Complain Lodging Page of Khanan Prahari

1. The c**omplaint** page opens the new section of input form (Fig 22). Enter the mobile no. and the complaint details in the Remarks row. Take a picture of the incident site through camera of the Mobile App. GPS enabled devices will instantly record the latitude - longitude of the location.

2. Press the 'Submit' button. The complaint will be submitted to the system for verification. A complaint number will be generated for future reference.

3. History of previous complaint can be seen in **View all complaints** menu.
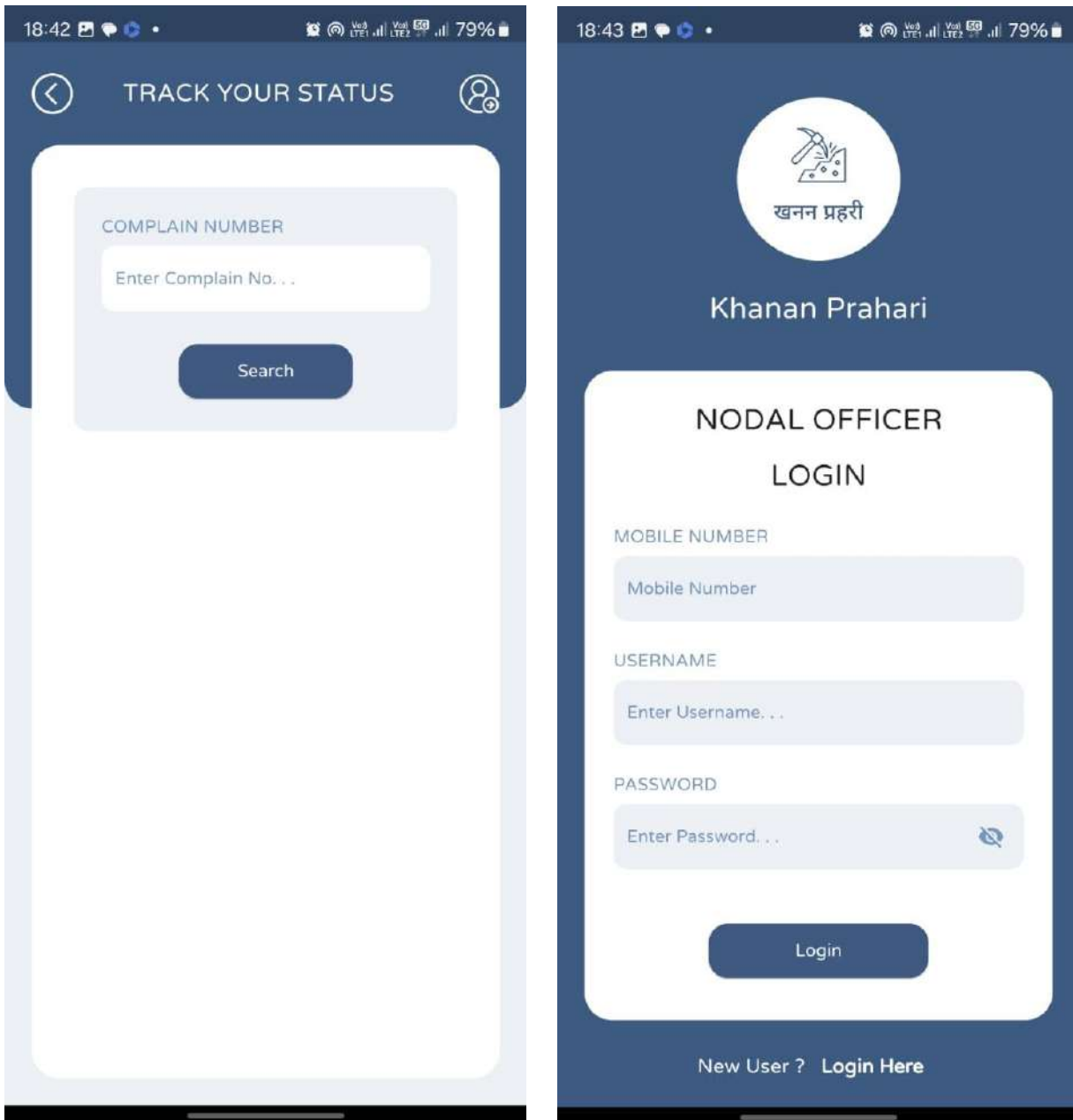
**Fig 23: Complain Tracking Page of Khanan Prahari**

4. The complaint number is unique for each complaint, and can be seen in the system for tracking of the status.

5. To know the current status of the complaint, click on 'Track Your Status' option on the home page of the app (marked as 2 in Fig 18). The tracking page is displayed (Fig. 20). Enter the complaint number and submit it. The current status of the complaint will be displayed.

6. The designated nodal officer can also login through Khanan Prahari mobile app and verify the complaints with action taken remark and action taken pics.
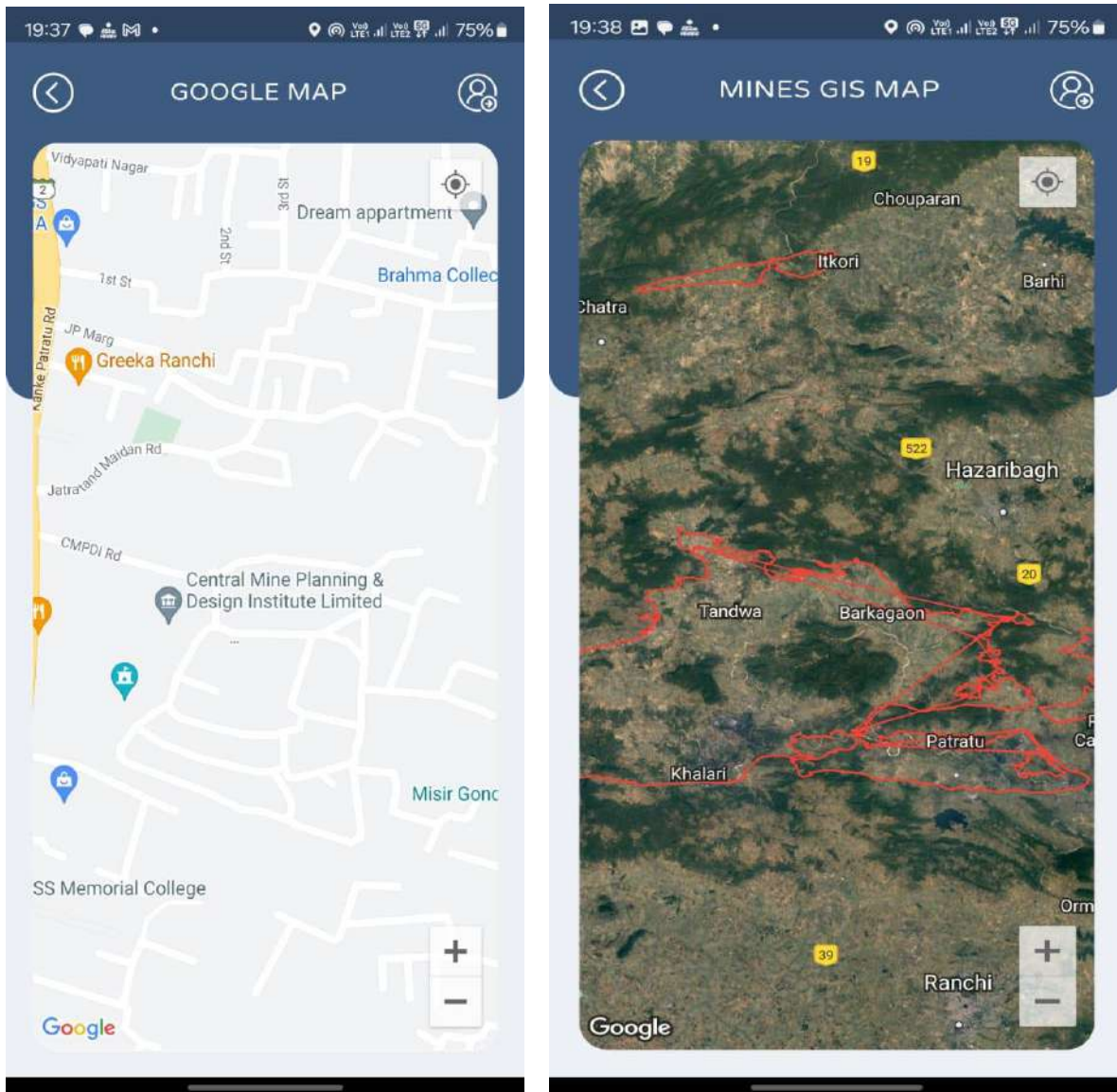
**Fig 24: Google Map and Mine Map in Khanan Prahari mobile app**

Two Map options are provided in the home page: 'Mines Map' and 'Google Map'. 'Mines Map' displays the Satellite imagery along with names of places and roads and, 'Google Map' shows the map provided by Google. GPS enabled devices will also show the current location of the device (mobile).(Fig 24)

FAQ' option provides more information regarding the commonly asked questions about the various terminologies located at Khanan Prahari Mobile app.

## 10.0 EXPECTED BENEFITS OF CMSMS

- CMSMS can prove to be an effective tool for identification, reporting and taking remedial actions on illegal coal mining incidents.
- It is expected to contribute to reducing illegal coal mining incidents and improve the utilization of coal in a better way.
- It will improve the safety and living conditions of the public in the coalfield area.

# *THE END*