

CHAPTER III

Adoption of advanced technologies to curb illegal mining

Summary

- Mining Surveillance System for the minor minerals has not yet been implemented (December 2022) even after a lapse of five years.
- Plotting of 202 quarry leases using the Google Earth Pro software revealed that in eight cases, there were pits which were created due to excavation in the areas beyond the approved co-ordinates/ boundaries of the quarry leases and in 40 cases, plantation around the lease areas was not carried out as per the conditions of EC and Quarry Plans. Further, in Kawardha district, pits were observed at 15 sites in the areas other than the sanctioned leases.
- With the help of drone survey, conducted through technical consultant, Audit detected illegal quarrying of limestone outside the approved boundary (Dhansuli, Nardaha and Akoldih-Khapri), illegal quarrying of *murrum* at unauthorised site in Nava Raipur and illegal quarrying of sand beyond the sanctioned lease area in Kumhari spanning over 85,544.65 square meter in Raipur district. The volume of illegal extraction of minerals was estimated at 2,83,061.94 cubic meter.

3.1 Introduction to advanced technologies

State Mineral Policy (as amended in 2013) envisaged use of high resolution satellite data to detect illegal excavation. Mining activities can be monitored using modern technologies, as adopted for major minerals. This may include development of Mining Surveillance System (MSS), use of Geographic Information System (GIS) and drone survey to identify illegal mining activities in the State. The status of implementation of MSS in respect of minor minerals in the State and the results of audit analysis of selected quarry leases using GIS and drone survey have been discussed in the following paragraphs.

3.1.1 Non-implementation of Mining Surveillance System for minor mineral leases

Government of India (GoI), Ministry of Mines launched (October 2016) MSS, a satellite-based monitoring system for curbing illegal mining activity in the country. This system aims to establish a regime of responsive mineral administration by curbing instances of illegal mining activities for major mineral leases through automatic remote sensing detection technology which can provide triggers¹ for any mining like activity in the vicinity of the existing mining areas. After successful implementation of MSS for major mineral leases, it was decided to implement the MSS for minor mineral leases as well.

¹ Incidences of illegal mining within 500 meter zone of mining leases captured in the MSS.

Accordingly, for implementation of MSS for minor mineral leases in the state of Chhattisgarh, GoI, Ministry of Mines, provided training to the State nodal officers of MSS on Geo-referencing and digitization. The officials of Directorate of Geology and Mining, GoCG (DGM) and State Remote Sensing Agency i.e. Chhattisgarh Council of Science and Technology (CGCOST) attended (July 2017) training. Later, Department of Geology and Mining, GoCG engaged (November 2017) CGCOST for implementation of MSS for 120² mines at a total cost of ₹ 24.73 lakh.

Audit observed that implementation of MSS required survey and recording of geo-coordinates of mine/ quarry boundary pillars through Differential Global Positioning System (DGPS), digitization and geo-referencing of cadastral maps of minor minerals leases based on ground control points, superimposition of geo-coordinates on satellite imagery, etc. However, the department had not developed the DGPS surveyed ground control points in the proximity of the mines/ quarries for correct Geo-referencing. Audit could not verify the progress and quality of work carried out by CGCOST, as the records regarding the progress of work assigned to CGCOST for implementation of MSS initially for 120 mines, were not provided to Audit despite repeated requests³.

With reference to non-development of DGPS surveyed ground control points and non-standardization of GPS, the Government stated (April 2022) that recruitment of qualified surveyors/ draftsmen would be required in each district. With reference to delay in implementation of MSS, Government stated (April 2022) that the CGCOST after obtaining the satellite data from the ISRO, carried out the geo-referencing and digitization work and generated triggers. The triggers were sent to the respective District offices for verification. However, it was observed during verification that the location of the mines boundaries as shown in the *khasra* map did not match with the coordinates and the shifting was seen at the site. This technical error was causing difficulties in the verification process.

The fact remains that the Mining Surveillance System for minor minerals is yet to be implemented successfully in the State.

Recommendation:

6. ***The Department should implement Mining Surveillance System for minor minerals at the earliest.***

3.1.2 Findings on the basis of application of Geographic Information System (GIS)

Audit obtained co-ordinates of the quarry leases from the selected nine DMOs and plotted co-ordinates of 202 quarry leases on the Google Earth Pro software.

After plotting these co-ordinates, Audit observed the following:

² Of 31 new minor mineral and granite.

³ Principal Accountant General's letter to the Department dated 24 August 2021.

- In 40 cases under seven districts, no plantation was observed around the lease area, which was violation of conditions of EC and Quarry Plans.
- In eight cases under four districts, pits were observed in the areas adjacent to quarry leases beyond the approved co-ordinates.
- In Kawardha District, pits were observed at 15 sites in the areas other than the sanctioned leases.

The summarised position of observations is given in **Table-3.1** below:

Table-3.1: Details of irregularities found after plotting of coordinates

| Name of DMO | Total no. of leases allotted | Number of cases scrutinised | Audit observations | |
|----------------|------------------------------|-----------------------------|---|---------------|
| | | | Pits observed outside approved co-ordinates | No plantation |
| Durg | 148 | 25 | 00 | 13 |
| Mungeli | 31 | 07 | 01 | 01 |
| Kawardha | 24 | 23 | 00 | 05 |
| Raipur | 214 | 67 | 05 | 02 |
| Balodabazar | 97 | 12 | 00 | 08 |
| Bilaspur | 123 | 23 | 01 | 00 |
| Janjgir-Champa | 193 | 22 | 00 | 08 |
| Kanker | 16 | 08 | 01 | 00 |
| Ambikapur | 109 | 15 | 00 | 03 |
| Total | 955 | 202 | 08 | 40 |

Thus, the lessees were not complying with the terms and conditions with regard to plantation of trees envisaged in EC and were carrying out quarrying operations outside the boundaries of co-ordinates approved in the Quarry Plan, but the Department has failed to enforce compliance of the norms envisaged in EC and Quarry Plans, as discussed in the ensuing paragraphs:

3.1.2 (i) Non-adherence to quarry plan norms (plantations not carried out)

As per the conditions stipulated in the EC/ Mining Plans, the leaseholders are required to undertake plantations in the barrier zone. Plantation work was not carried out as per norms given in EC and Mining Plans in 40 cases. Out of these, 33 leases were granted before 2015 and eight leases were granted after 2015.

Joint physical verification of 10 out of above mentioned 40 cases revealed that in seven cases, no plantation was carried out, while in other three cases, the plantation was carried out partially.

In the instant case, it can be seen that plantation work was not carried out as per EC and Mining Plan. The Department could not ensure compliance of the conditions of EC and Mining Plans even in the case of leases which were granted after 2015.



Figure-3.1 (a): Satellite image of mine at Village Ranijaraud, Balodabazar 1.172 Ha, where no plantation work was carried out. (Photo dated: May 2021), Source: Google Earth Pro



Figure-3.1 (b): Image of the above mine (figure 3.1 (a)) taken during joint physical verification (Photo dated: September 2022)

3.1.2 (ii) Pits beyond the approved co-ordinates

Out of the 202 quarry leases for which the Audit plotted the co-ordinates given in the respective approved plans, it was observed that in eight cases under four districts, pits were observed in the areas adjacent to the quarry leases beyond the approved co-ordinates.

In the instant case, it can be seen that the pit created due to the mining activity by the lessee was extended beyond the co-ordinates given in the approved Quarry Plan (as shown in **Figure- 3.2 (a), (b) & (c)**). During the joint physical verification of the quarry lease, the pit was found to be extended beyond the approved coordinates covering adjacent areas.



Figure-3.2 (a): Satellite image showing pit outside the approved co-ordinates (*khasra no. 1960, area- 0.971 hectare, village-Nardaha, Tahsil- Arang, District- Raipur, lease period- 25.09.2002 to 24.09.2032*) Photo dated: April 2021, Source: *Google Earth Pro*

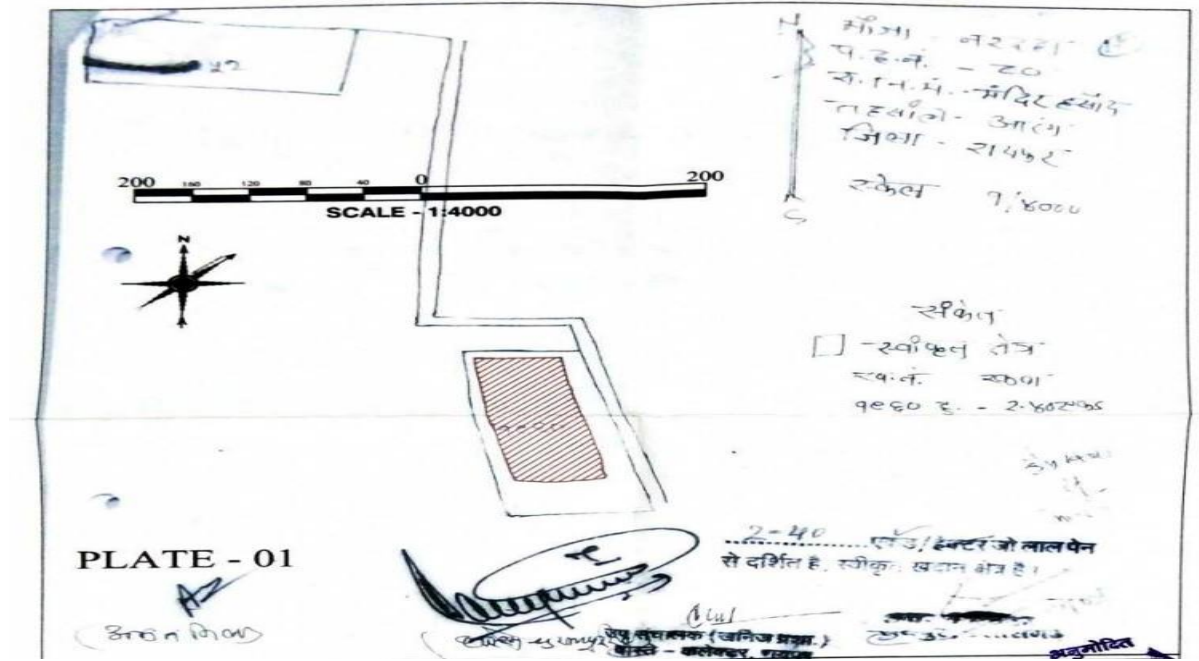


Figure-3.2 (b): Khasra map of Figure-3.2 (a)



Figure-3.2 (c): Image of the above mine (Figure-3.2 (a)) taken during joint physical verification (Photo dated: September 2022)

3.1.2 (iii) Mining activities in areas other than sanctioned leases

To verify the genuineness of co-ordinates and examine whether unauthorised mining activities were being carried out beyond the approved coordinates, Audit requisitioned co-ordinates of all the sanctioned leases in one of the selected districts i.e. Kawardha district. DMO, Kawardha furnished the coordinates of 28 leases (including major mineral leases). Audit plotted all the co-ordinates of these sanctioned leases through satellite imagery on “Google Earth Pro”. After plotting these co-ordinates, Audit identified 15 sites in the district, where pits were observed in the areas other than the sanctioned leases (as shown

in **Figure- 3.3 (a) & (b)**). This indicates sign of unauthorised mining activities outside the sanctioned lease areas.

Non-detection of illegal mining areas by the department would lead to increase in illegal mining activities and loss of revenue to the State Government.

Legends:

- Yellow – sanctioned leases
- Red - unauthorised pits

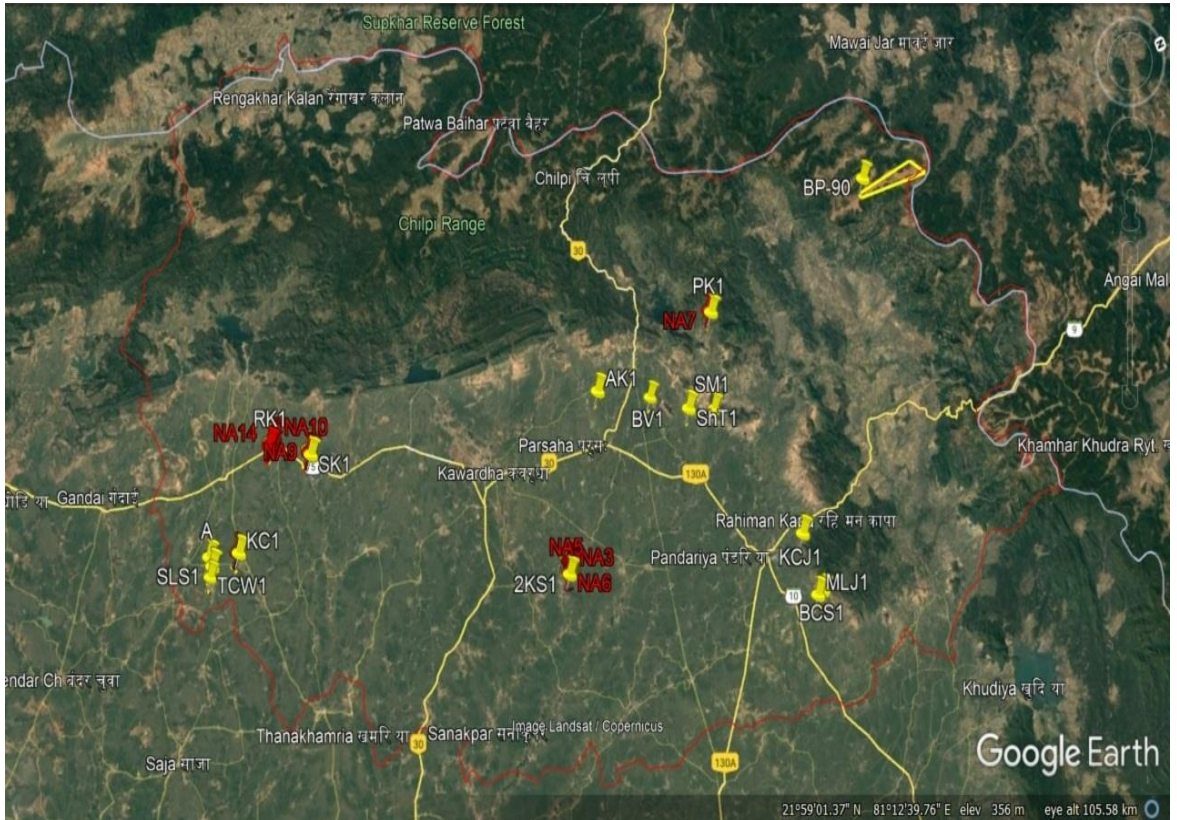


Figure-3.3 (a): Satellite image of sanctioned and unauthorised pits (Photo dated: May 2020), *Source: Google Earth Pro*



Figure-3.3 (b): Satellite image of sanctioned and unauthorised pits (Photo dated: May 2020), *Source: Google Earth Pro*

The Government stated (January 2023) that in case of minor minerals, leases were sanctioned after demarcation on the basis of *patwari* map. From the year 2015, it was made mandatory to work according to the Mining Plan in case of minor minerals also. After which, if irregularities were found in matching the co-ordinates shown in the approved mining plan, it is sent to the district offices for spot investigation and action. The mining plans were approved only after proper verification in this regard.

The reply is not acceptable as Audit observed in eight cases that pits, created due to excavation activities, were found beyond the approved co-ordinates, which was violation of Mining Plan. Further, the Government did not furnish reply with regard to no plantation work in the barrier zones of the leases and mining activities in areas other than sanctioned leases observed in Kawardha district.

3.1.3 Audit analysis of quarry leases using Drone Survey

On the basis of Google Earth Pro analysis of 202 quarry leases and joint physical verification of 40 quarry leases, Audit selected seven quarries/ sites⁴ for mapping and volume calculation of illegal mining sites using drone survey. The National Institute of Technology (NIT), Raipur (technical consultant) was engaged as technical consultant for this purpose. Audit accompanied the technical consultant along with departmental officials during the drone survey. The technical consultant conducted the drone survey on the basis

⁴ One illegal *murrum* excavation site at Nava Raipur, noticed during joint physical verification, one sand mine and five limestone quarries of Raipur district.

of co-ordinates mentioned in the approved quarry plans. The technical consultant's report confirmed significant illegal excavation in three out of five limestone quarries and in the sand mine. Further, the total area and volume of illegally excavated *murrum* were also calculated using Drone Survey.

3.1.3 (i) *Illegal mining of murrum*

Quarry Permit for extraction, removal and transportation of *murrum* required for the works of any department or undertaking of the Central Government/ State Government/ private work, is granted for a period of two years under Rule 58, and the permission for removal/ transportation of *murrum* through deepening or widening *Panchayat* ponds/ tanks, well, water reservoir or any other digging work, is granted under rule 59(1) of CMM Rules.

During the joint physical verification of mines along with the officials/ staff of DMOs (between October 2020 and August 2021), Audit observed extraction and dumping of huge quantity of *murrum* near Reco village, Nava Raipur and Mura-Tilda area (DMO, Raipur) without obtaining valid permits (**Figure- 3.4 (a) & (b)**).



Figure-3.4 (a): Unauthorised *murrum* excavation near village Reco, Nava Raipur (date of image: October 2020).



Figure-3.4 (b): Unauthorised *murrum* excavation near village Reco, Nava Raipur (date of image: October 2020).

Audit conducted drone survey of the illegal *murrum* excavation site at Nava Raipur with the help of the technical consultant. As per the reply of DMO, Raipur it was noticed that, during the period 2015-16 to 2020-21 only three quarry permits for quarrying of *murrum* were sanctioned⁵, for use in the road construction work (NH 200), for a period of two years (06.12.2016 to 05.12.2018). The sanctioned areas of the quarry permits were situated in village- Naktikhapri, Tahsil – Tilda (District – Raipur). The technical consultant's report revealed that total area of illegal excavation was 38,867.2 square meter (shown as 1, 2 and 3 in the **Figure-3.5**) wherein approximately 99,528.78 cum of *murrum* was excavated without obtaining valid quarry permit. This resulted in loss of revenue to the tune of ₹ 49.76 lakh⁶ to the Government, being the value of applicable royalty.

⁵ M/s Punj Lloyd, Raipur

⁶ Royalty = ₹ 50 x 99528.78 cum = ₹ 49,76,439

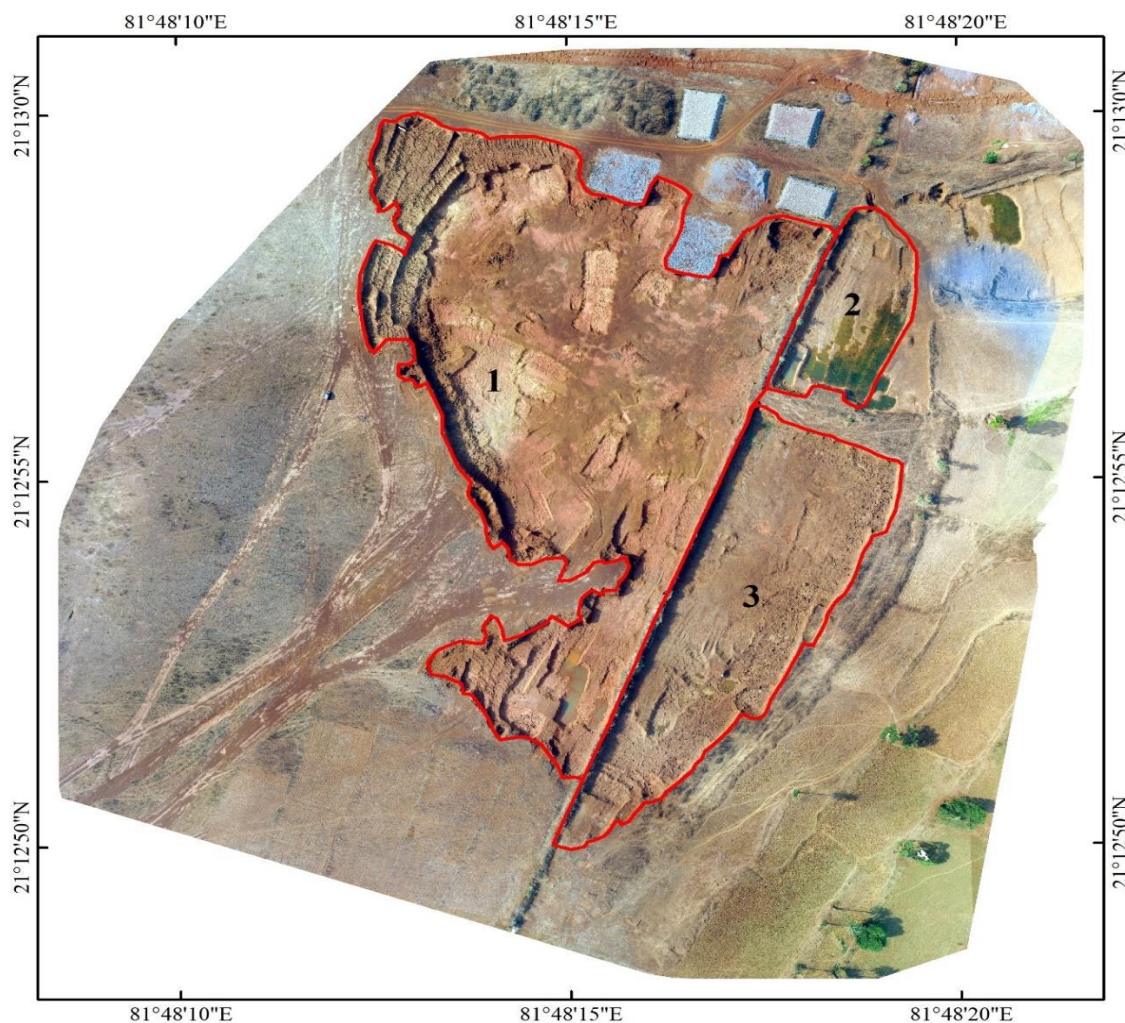


Figure- 3.5: Drone image of illegal *murrum* excavation (shown as 1, 2 and 3 in the Fig. above) at RECO Village, Nava Raipur (date of image: May 2022)

3.1.3 (ii) *Illegal mining of sand*

During the joint physical verification of mines along with the officials/ staff of DMOs, audit noticed extraction, transportation and dumping of sand in Raipur, Bilaspur, Balodabazar, Janjgir-Champa and Mungeli districts at locations outside the sanctioned/permitted leased out areas.

Audit conducted drone survey of sand mine at Kumhari under the jurisdiction of DMO, Raipur. As per information provided by the Department, only one sand lease was sanctioned by the DMO at Kumhari during 2019-21 after the commencement of Chhattisgarh Minor Mineral Ordinary Sand (Quarrying and Trade) Rules, 2019. Drone Survey was conducted using the approved coordinates of the sanctioned sand lease in the mining plan. As per report of the technical consultant, illegal excavation was carried out in a huge area beyond the sanctioned lease area. Out of that, an area of 5,759.45 square meter was captured through drone camera for volume calculation which showed that approximately 2,958.04 cum of sand was illegally excavated as shown in the

Figure- 3.6 and 3.7. This resulted in loss of revenue to the tune of ₹ 1.48 lakh⁷ to the Government, being the value of applicable royalty.

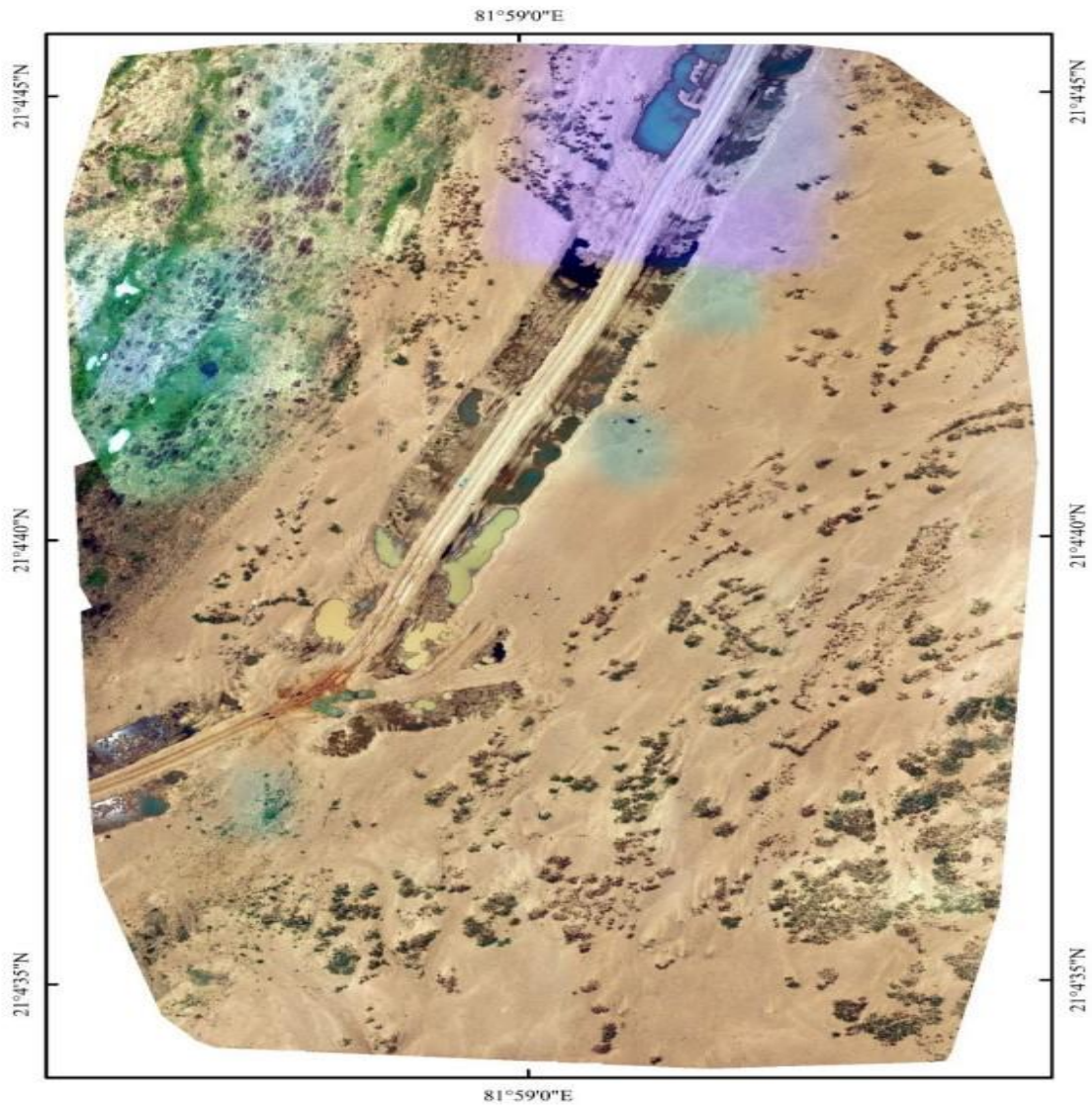


Figure- 3.6: Drone image showing illegal excavation of sand beyond the allotted lease area (Kumhari, khasra no. 1882, date of image: May 2022)

⁷ Royalty = ₹ 50 x 2958.04 cum = ₹ 1,47,902.



| Pin | Kumhari 1 | Kumhari 2 | Kumhari 3 | Kumhari 4 |
|-----------|---------------|---------------|---------------|---------------|
| Latitude | 21°04'43.99"N | 21°04'42.84"N | 21°04'38.11"N | 21°04'38.96"N |
| Longitude | 81°58'44.26"E | 81°58'53.62"E | 81°58'52.59"E | 81°58'43.31"E |

Figure- 3.7: Image showing approved lease area of sand mine and illegal excavation outside the lease area at Kumhari, Raipur, khasra no. 1882, area- 4 hectare, period of lease- 30.12.2019 to 29.12.2021.

3.1.3 (iii) *Quarrying operations beyond the approved co-ordinates of limestone quarry leases*

Audit conducted drone survey of five limestone quarry lease sites under the jurisdiction of DMO, Raipur.

The technical consultant's report for the limestone quarry leases at Dhansuli, Nardaha and Akoldih-Khapri, Tahsil- Arang, District- Raipur revealed the following:

- In the case of quarry lease at Dhansuli, the lessee was allotted quarry lease at *khasra* No. 818, 870 and 871 (new 913, 926, 927) in 1.19 hectares⁸, (red boundary in the middle, mentioned as Legal Excavation in **Fig 3.8**). However, it was observed that illegal excavation of approximately 57,750.27 cum of limestone from an area of 15,831 square meters (1.583 Ha) beyond the approved co-ordinates (marked in yellow colours) was carried out, resulting in loss of revenue amounting to ₹ 68.96 lakh⁹ to the Government, being the value of applicable royalty.

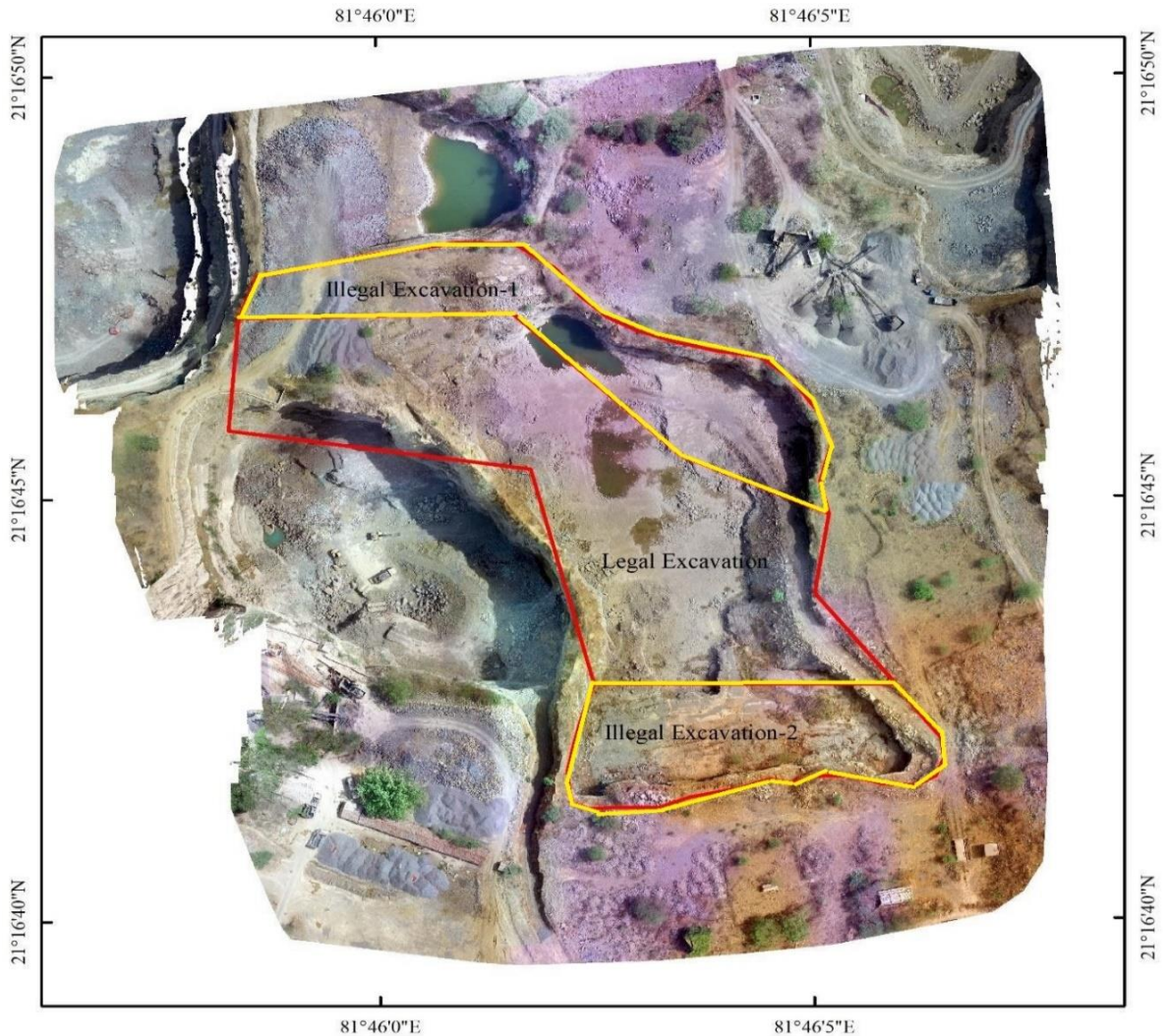


Figure- 3.8: Drone image showing quarry lease boundary and illegal excavation beyond the lease area (village- Dhansuli, Tahsil- Arang, date of image: May 2022)

- In the case of quarry lease at Nardaha, the lessee was allotted quarry lease at *khasra* No. 1997 (part), in 1.214 hectares¹⁰, out of which approximately 0.37 hectare was unexplored¹¹. However, it was observed that illegal excavation

⁸ Quarrying- 0.748, dumping- 0.265, statutory boundary- 0.040, and plantation- 0.059.

⁹ 0.67 cum = 1 Tonne; 57,750.27 cum = 86,194 Tonne; Royalty = ₹80 x 86,194 Tonne = ₹68,95,520.

¹⁰ Quarrying- 0.821, and dumping- 0.393.

¹¹ Calculated using Google Earth Pro on the basis of report furnished by NIT.

(marked in black colour) of approximately 76,076.14 cum of limestone from an area of 13,892 square meters (1.389 Ha) beyond the approved co-ordinates was carried out as shown in the **Figure- 3.9**, resulting in loss of revenue amounting to ₹ 90.84 lakh¹² to the Government, being the value of applicable royalty.

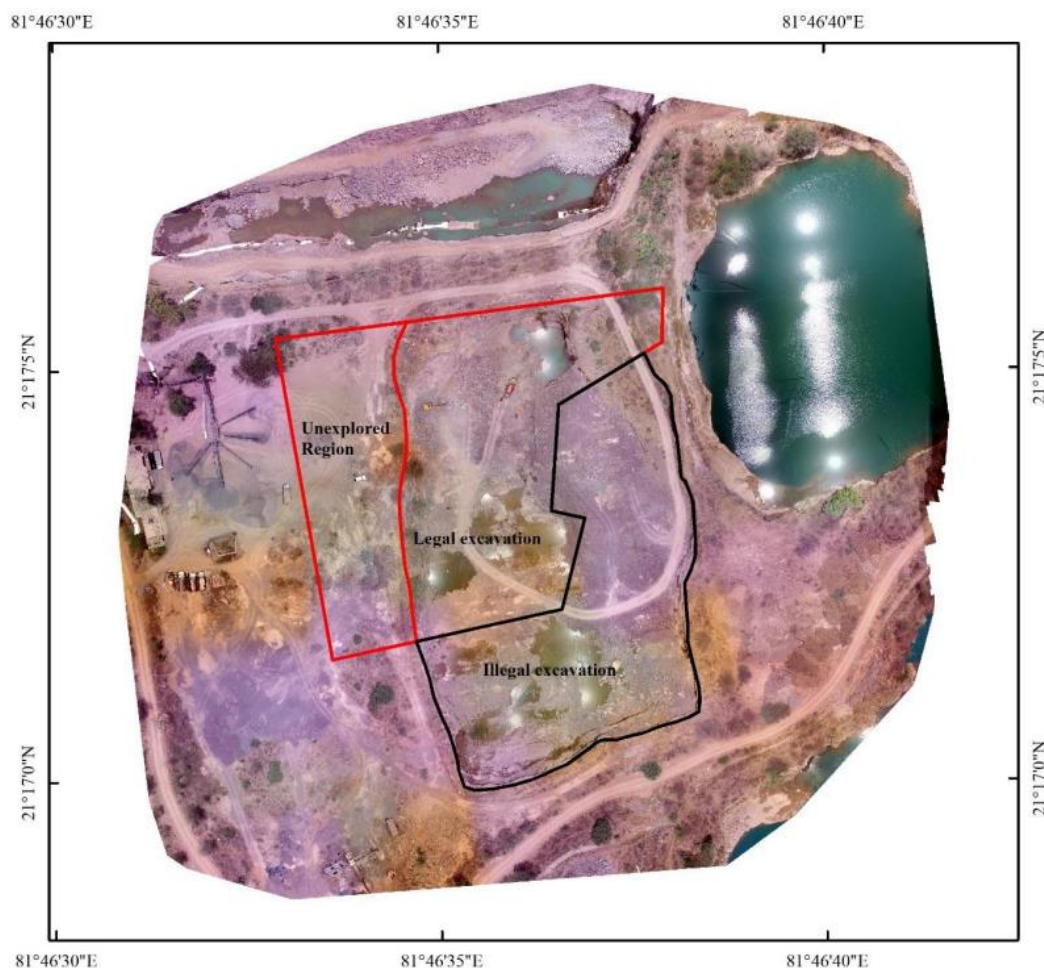


Figure- 3.9: Drone image showing quarry lease boundary and illegal excavation beyond the lease area (Nardaha, Tahsil- Arang, District- Raipur, date of image: May 2022)

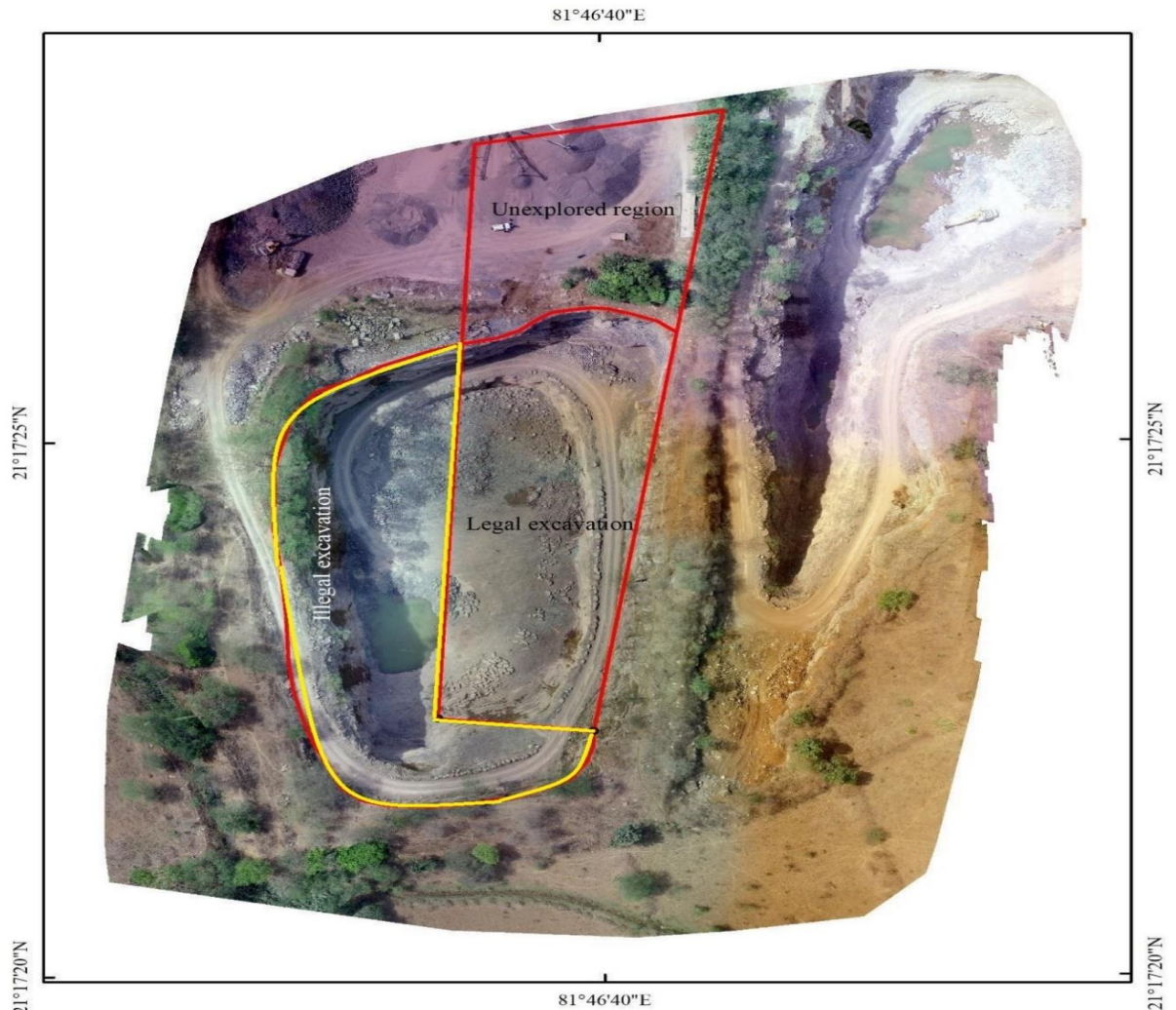
- In the case of quarry lease at Akoldih-Khapri, Tehsil- Arang, the lessee was allotted quarry lease at *khasra* No. 553/ 1 (part) in 1.052 hectares¹³, out of which approximately 0.5 hectare was unexplored¹⁴. However, illegal excavation (marked in yellow colour) of

¹² 0.67 cum = 1 Tonne; 76076.14 cum = 1,13,546 Tonne; Royalty = ₹ 80 x 1,13,546 Tonne= ₹ 90,83,680.

¹³ Quarrying- 0.407, dumping- 0.135, temporary dumping- 0.207, crushing plant- 0.100, storage- 0.05, infrastructure- 0.028, and unused area- 0.125.

¹⁴ Calculated using Google Earth Pro on the basis of report furnished by NIT.

approximately 46,748.71 cum of limestone from an area of 11,195 square meters (1.120 Ha) beyond the approved co-ordinates was observed, as shown in the **Figure- 3.10**, resulting in loss of revenue amounting to ₹ 55.82 lakh¹⁵ to the Government, being the value of applicable royalty.



Coordinates of lease boundary:

| Point No. | 1 | 2 | 3 | 4 |
|-----------|---------------|---------------|---------------|---------------|
| Latitude | 21°17'29.24"N | 21°17'29.38"N | 21°17'22.33"N | 21°17'22.45"N |
| Longitude | 81°46'39.11"E | 81°46'41.13"E | 81°46'39.89"E | 81°46'38.72"E |

Figure- 3.10: Drone image showing quarry lease boundary and illegal excavation beyond the lease area (Akoldih-Khapri, Tahsil- Arang, date of image: May 2022)

The reply of the Government is awaited (December 2022).

Recommendation:

- The Department should examine the feasibility and use of GIS/ Drone Survey to detect illegal mining activities till the implementation of Mining Surveillance System.*

¹⁵ 0.67 cum = 1 Tonne; 46748.71 cum = 69,774 Tonne; Royalty = ₹ 80 x 69,774 Tonne = ₹ 55,81,920.