



# DELINEATING DIRECTLY MINING-AFFECTED AREAS

Writers: **Srestha Banerjee and Chinmayi Shalya**

Technical support: **Aditya Sharma**

Data research support: **Siva Karthik Valaparla, Prashanth Chinnappanavar and Rajeev Ranjan**

Editor: **Archana Shankar**

Production: **Rakesh Shrivastava and Gundhar Das**



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**Centre for Science and Environment**

41, Tughlakabad Institutional Area

New Delhi 110 062

Phones: 91-11-40616000

Fax: 91-11-29955879

E-mail: [cse@cseindia.org](mailto:cse@cseindia.org)

Website: [www.cseindia.org](http://www.cseindia.org)

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# 1. INTRODUCTION

District Mineral Foundation (DMF) was instituted under the Mines and Minerals (Development and Regulation) Amendment Act 2015, with the specific objective to ‘work for the interest and benefit of persons and areas affected by mining-related operations’. The funds accrued to DMF Trusts in various mining districts should be used for uplifting socioeconomic and human development conditions of mining-affected people and areas. Therefore identification of the affected people and appropriate delineation of the affected areas is a prerequisite for planning DMF fund use, making investments targeted, and minimizing the scope of ad hoc spending.

Recognizing the fact that DMF funds must be used in an ‘organized and structured manner’, the Pradhan Mantri Khanij Kshetra Kalyan Yojana (PMKKKY), which provides guidelines on various aspects of functioning of DMFs, has defined who the mining-affected people are, and how can mining-affected areas be identified and delineated.<sup>1</sup> Further, as all areas in a mining region are not equally affected by mining and related operations, ‘directly mining-affected areas’ and ‘indirectly mining-affected areas’ have been clearly distinguished. The intended purpose is to prioritize DMF fund use in directly affected areas.

However, in the fifth year of its implementation, most states and districts have not identified directly and indirectly affected mining areas with precision as required by the law. This is contributing to ad hoc spending by DMF Trusts in various districts by shifting the focus from areas and issues where the urgency is maximum.

This policy paper considers a geospatial mapping exercise to understand what can be an appropriate approach for delineating directly affected mining areas. This can guide state governments and the DMF administration in the mining districts to efficiently plan DMF fund use and optimize the potential of investments.

## 2. WHAT ARE DIRECTLY AND INDIRECTLY MINING-AFFECTED AREAS?

The PMKKKY guidelines outline what should be considered a directly mining-affected area and what should be an indirectly mining-affected area. They have also been incorporated in the DMF Rules of all mining states.

Directly affected areas include:

- a. Where direct mining-related operations such as excavation, mining, blasting, beneficiation and waste disposal (overburdened dumps, tailing ponds, transport corridors etc.) are happening or are located;
- b. Villages and gram panchayats within which mines are situated and are operational. Such mining areas may extend to neighbouring villages, blocks, districts or even states;<sup>2</sup>
- c. An area within such radius from a mine or cluster of mines as may be specified by the state government, irrespective of whether this falls within the district concerned or adjacent district;
- d. Villages in which families displaced by mines have been resettled/rehabilitated by the project authorities;
- e. Villages that significantly depend on the mining areas for meeting their economic needs and have usufruct and traditional rights over the project areas—for instance, for grazing, collection of minor forest produce etc.

Indirectly affected areas include those where the local population is adversely affected on account of economic, social and environmental consequences due to mining-related operations. These impacts include deterioration of water, soil and air quality, reduction in stream flows and depletion of groundwater, congestion and pollution due to mining operations, transportation of minerals, increased burden on existing infrastructure and resources.

From the above definitions it is clear that to delineate mining-affected areas, districts need to consider multiple factors and a well-defined approach.

### 3. CURRENT STATUS OF DELINEATION OF AFFECTED AREAS

Varied approaches have been considered over the past years by different state governments and mining districts to identify mining-affected areas. As a basic approach, villages or municipalities where mines are located and/or mining-related activities are happening (criteria 'a' and 'b' of directly affected areas as mentioned in Chapter 2) have been identified as directly affected.

However, directly affected areas do not include only these two. As the PMKKKY guidelines specify, other adjoining areas must also be considered as directly affected, such as 'villages that significantly depend on the mining areas for meeting their economic needs' and 'have usufruct and traditional rights over the project areas, for instance, for grazing, collection of minor forest produce etc.'. At the same time, 'displaced' people who have been resettled in the region are also directly affected. But identification of these can get challenging.

To outline these areas in a structured manner, the PMKKKY guidelines thus mention that the DMFs should consider delineating areas within a specific 'radius' from mines or a cluster of mines as directly affected. State governments can provide the necessary guidance on what can be considered an appropriate radius.

A few states and districts have considered or begun to consider such a radius-based approach to delineate directly affected areas. For example:

- The Government of Odisha has specified in the State DMF Rules that areas within a 10 kilometre (km) radius from a mine or cluster of mines shall be considered as directly affected. This is irrespective of whether this area falls within the district where the mine is located or any other adjacent district.<sup>3</sup>
- The Government of Telangana also recently amended their DMF Rules and specified areas within a 10 km radius as directly affected areas.<sup>4</sup>
- The Government of Maharashtra on the other hand specifies areas within a 20 km radius as directly affected in the State Rules.<sup>5</sup>

What is evident from the above is that the radii specified by the state governments are substantially large ones. Arguably, a primary reason for this is that if large radii are not considered, DMF funds will be limited to only a fraction of the population and most of the money will not be used.

However, certain outstanding concerns remain with such reasoning for delineating directly affected areas. These include:

- What does it mean to consider a substantially large radius, such as 10 km, around each mine or cluster of mines in a district as compared to the total district population?
- How does such radii fare with respect to per capita DMF fund availability? Is it substantial or does it stretch the funds too thin?
- Is a single radius justified for all districts, especially considering variations in population distribution and varied proportions of DMF funds that districts receive?

## 4. DELINEATING DIRECTLY MINING-AFFECTED AREAS WITHIN SPECIFIC RADII

To address the aforementioned questions and to understand how directly mining-affected areas can be delineated, a geospatial mapping exercise has been done for nine mining districts in three states—Odisha, Jharkhand and Chhattisgarh. These states are also the topmost in terms of DMF accrual. The districts chosen include Keonjhar, Angul and Jharsuguda in Odisha; Ramgarh, Chatra and West Singhbhum in Jharkhand; and Korba, Dantewada and Raigarh in Chhattisgarh.

### 4.1 Selection of mapping areas

The nine mining districts have been chosen as representative areas to capture various types of minerals mined, scale of mining and mining methods, geography of the mineral-bearing areas, population density, socioeconomic distribution of communities in the area, and the amount of DMF funds the districts are receiving (see *Table 1: Districts selected for mapping*).

**TABLE 1: DISTRICTS SELECTED FOR MAPPING**

State	District	Estimated annual DMF accrual (in Rs crore)	Cumulative DMF accrual (in Rs crore as in July 2019)	Key mineral mined in the district	Type of mining	No. of mines mapped	Average population density of mining-affected blocks*
Jharkhand	Ramgarh	250	567.8	Coal	Open cast	19	708
	Chatra	110	568.8	Coal	Open cast	5	244
	West Singhbhum	300	665	Iron ore	Open cast	11	271
Chhattisgarh	Korba	400	997	Coal	Open cast and underground	10	183
	Raigarh	70	183	Coal	Open cast	8	234
	Dantewada	100	385	Iron ore	Open cast	7	136
Odisha	Keonjhar	800	3,269	Iron ore	Open cast	22	265
	Angul	250	1,121	Coal	Open cast and underground	10	458
	Jharsuguda	150	619	Coal	Open cast	14	598



## 4.2 Mapping

To map the areas that are potentially affected by mining activities, a database of the operational mines in each of the districts was prepared.<sup>6</sup> This included a total of 106 mines.

The prospective directly mining-affected areas around each of the 106 mines were mapped considering three radii—at 3, 5 and 10 km—to study the population distribution as well as ascertain per capita DMF fund availability. The geospatial analysis used the ArcGIS platform and involved the following steps:

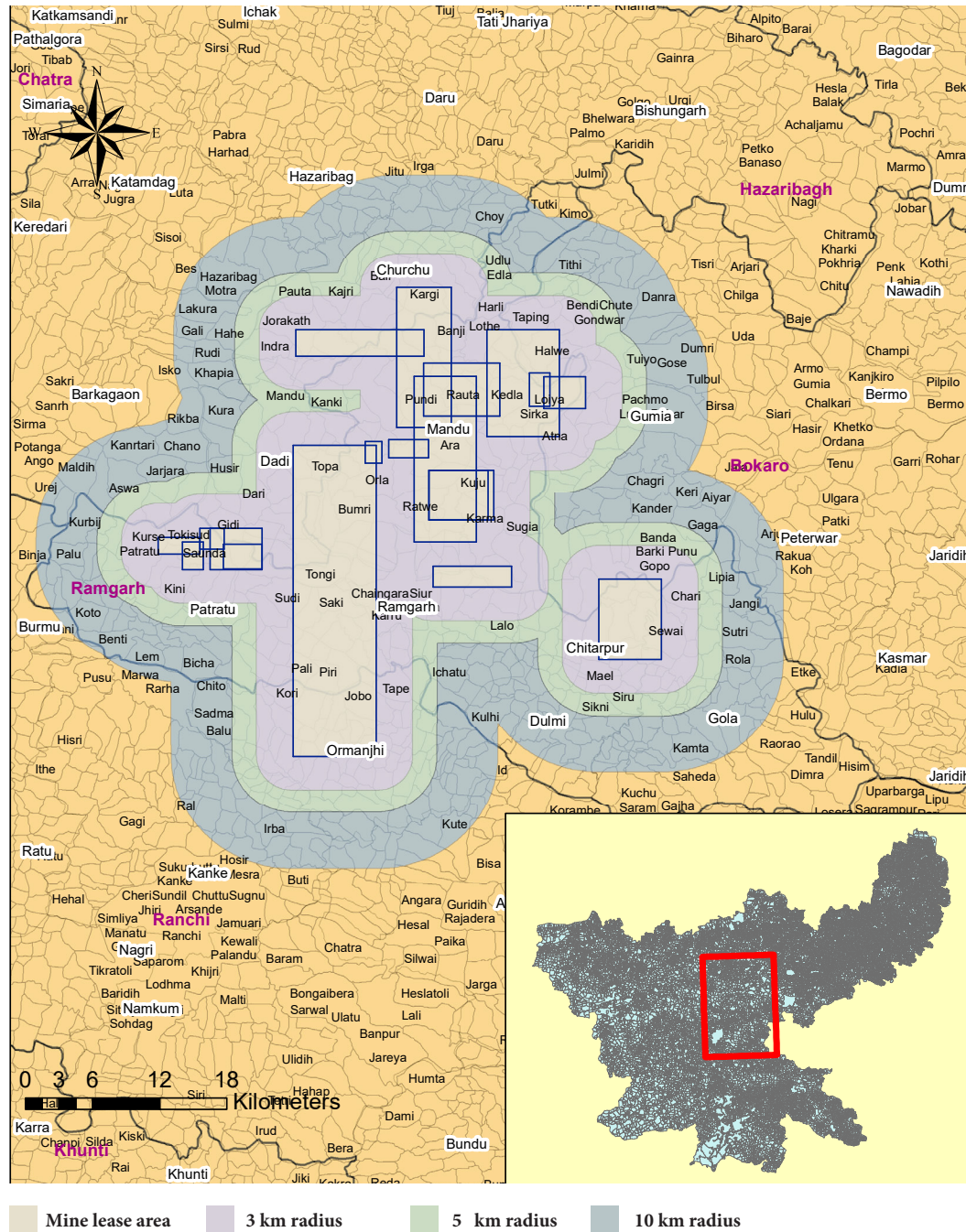
- i. Shape files with boundaries of different administrative units—district, sub-district and villages/ municipalities—were used as base maps to plot the mines in respective districts.<sup>7</sup>
- ii. Using the ‘buffer’ tool (of proximity analysis toolbox of ArcGIS), 3, 5 and 10 km buffer polygons were created around each of the mine lease areas or mine clusters and maps were generated.
- iii. The ‘select by location method’ and the ‘intersect option’ were then used to extract the villages (and municipalities) that intersected the relevant buffer layers.
- iv. The villages (and municipalities) as mapped within each radii were then exported from ArcGIS as an excel file with complete attributes, such as population, number of households etc.

The data as extracted was used for analysis of population falling within specific radii of the mining districts and estimating the per capita DMF fund availability.<sup>8</sup> (See *pages 10–18 for maps of nine districts depicting mining-affected areas in three radii—3, 5 and 10 km.*)

## JHARKHAND

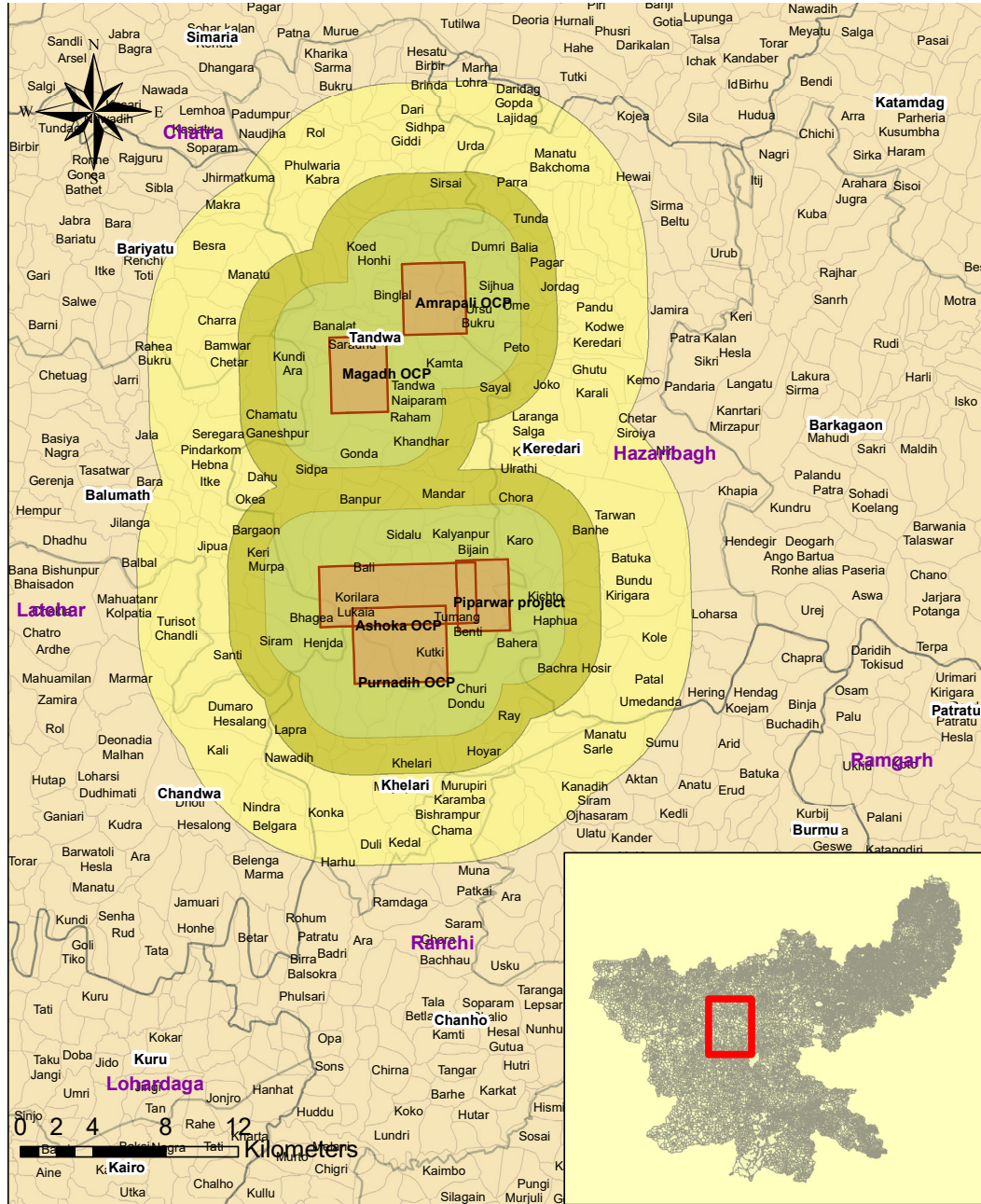
### RAMGARH

A radius of 3 km from each major mineral mine in Ramgarh district considered a directly affected area will cover nearly 74 per cent of the district's population. The per capita DMF fund available for these people is Rs 2,700 per year.



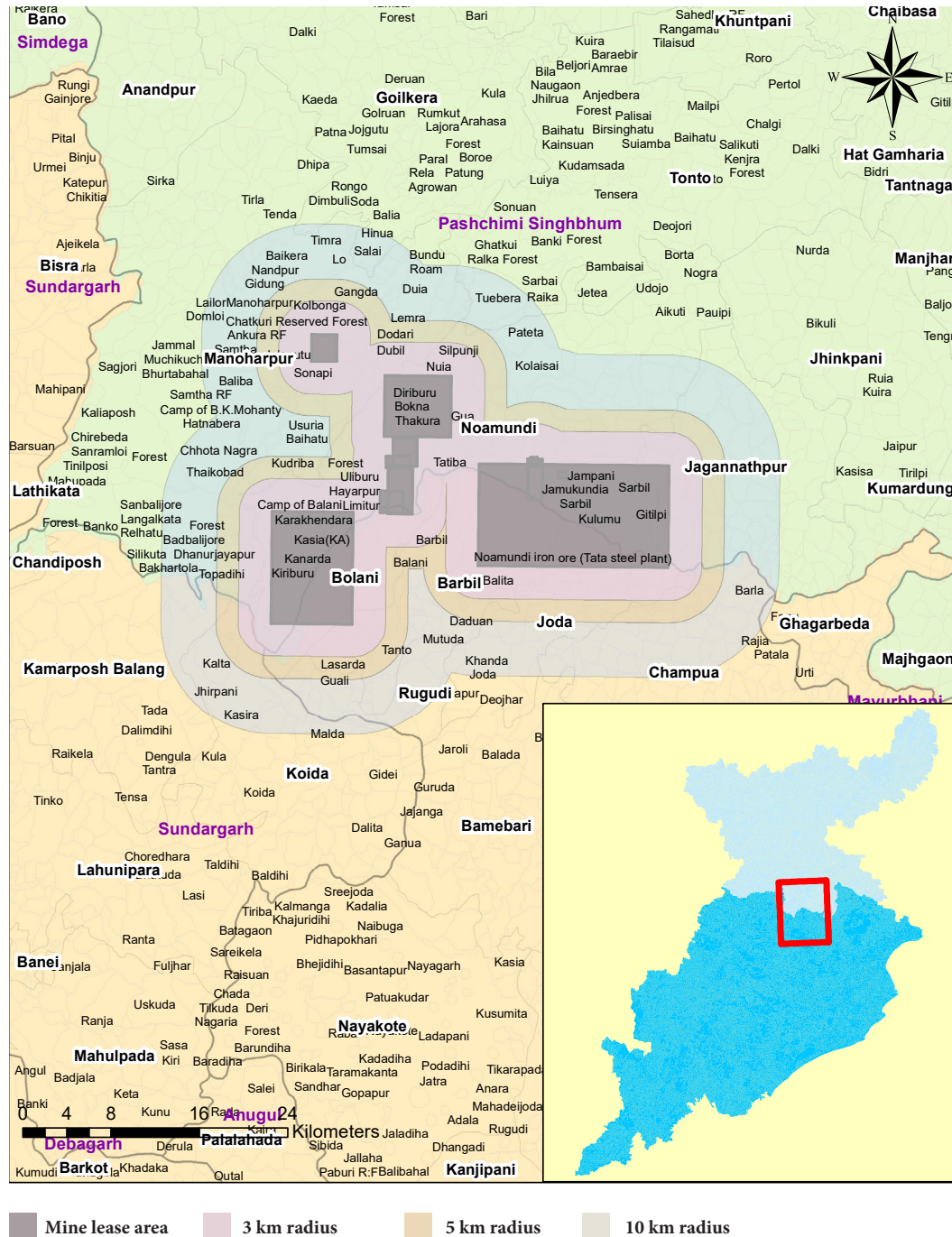
### CHATRA

The high proportion of rural population in mining areas in Chatra district—nearly 90 per cent on average—and their dispersed habitation pattern makes a radius of 5 km from major mineral mines appropriate to be considered as directly affected. The per capita DMF fund available within a 10 km radius is estimated to be about Rs 11,000 per year.



### WEST SINGHBHUM

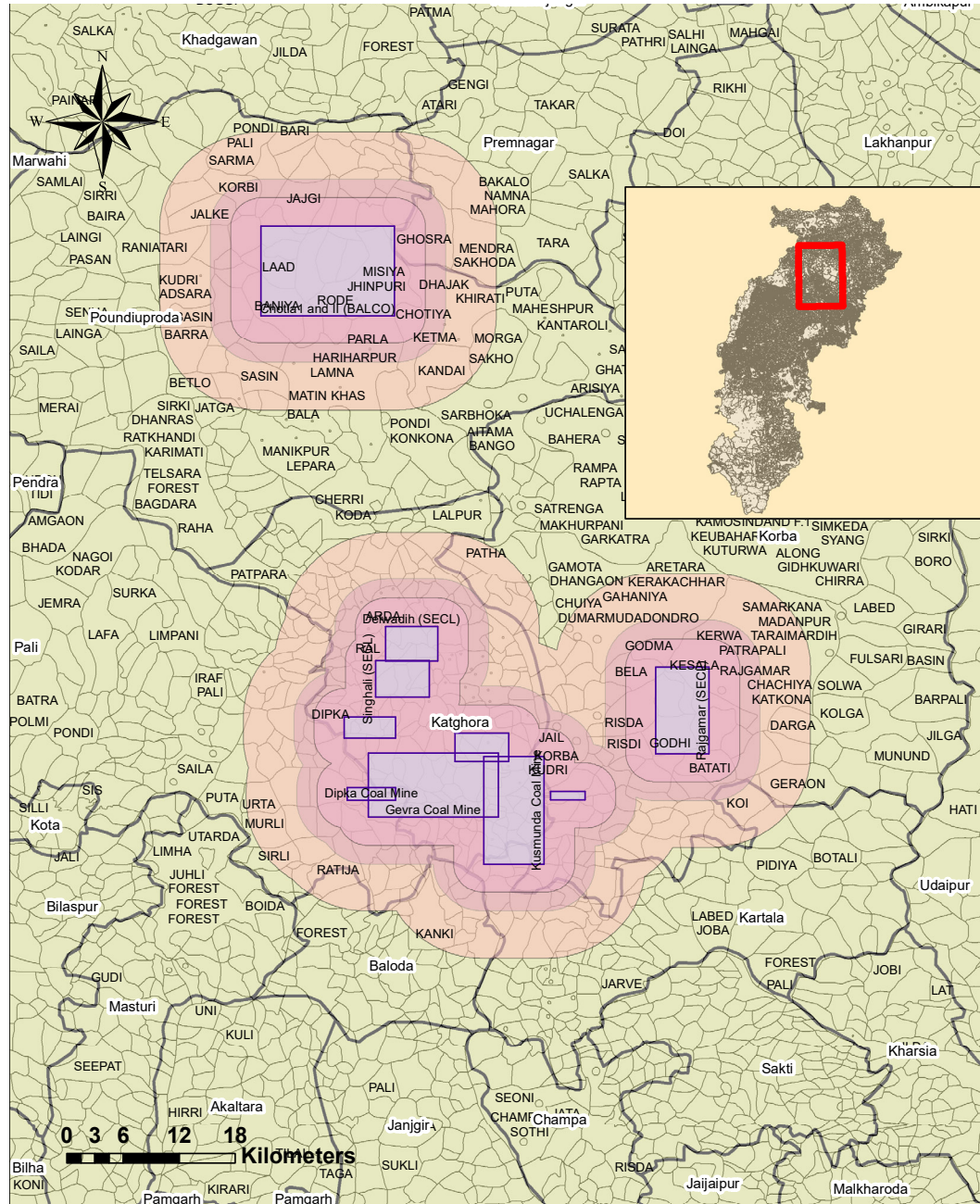
The main mining areas of West Singhbhum district are characterized by forested and hilly terrains. Given the predominantly dispersed tribal settlements in these areas, a radius of 5 km from each major mineral mine will cover nearly about 8–9 per cent of the district's population, with a per capita fund availability of nearly Rs 24,000 per year.



## CHHATTISGARH

### KORBA

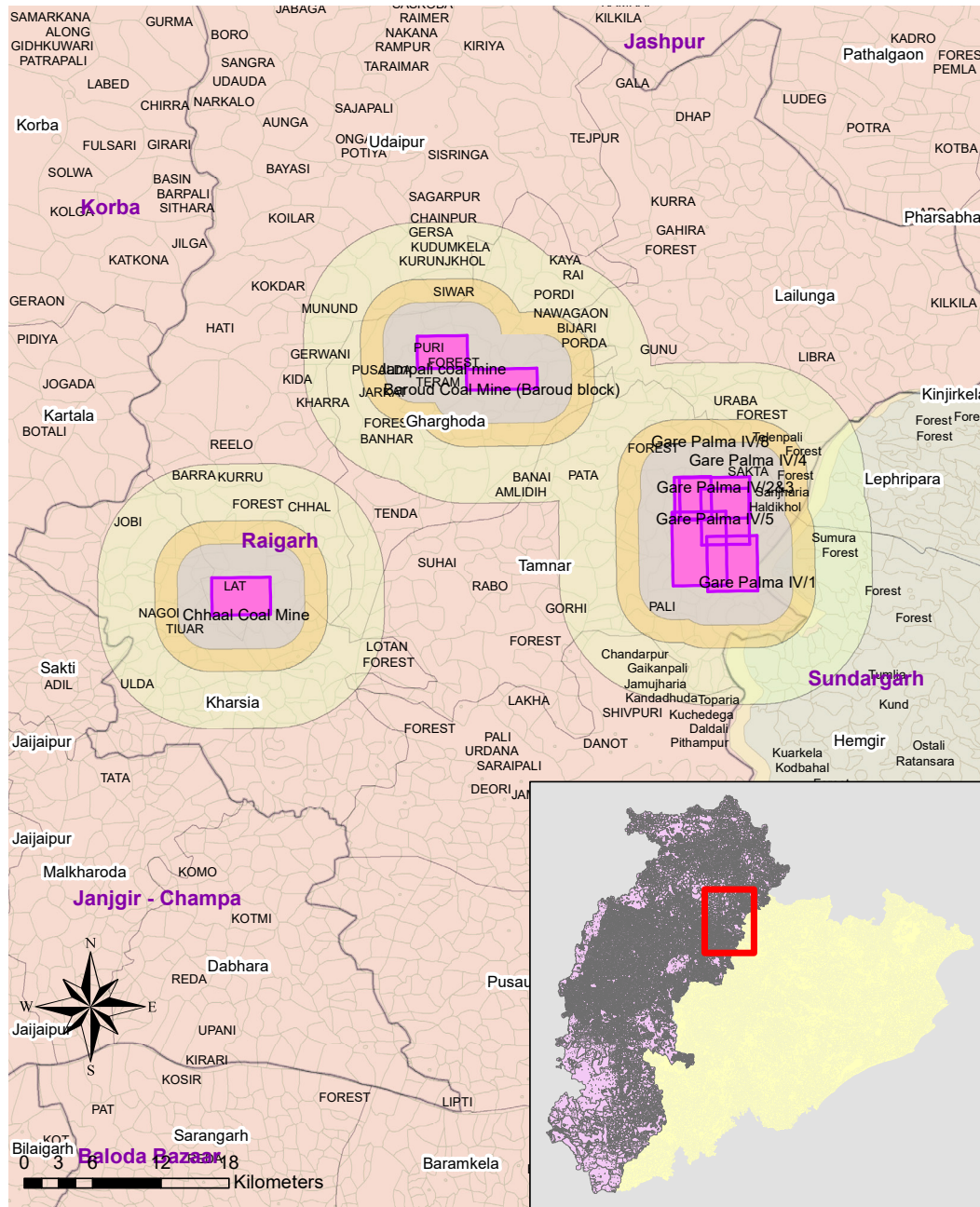
A heavily industrial district, Korba has high population densities in and around the mining areas. About 75 per cent of the district's population comes within directly affected areas if a radius of 10 km from a mine or cluster of mines is considered. Even a radius of 3 km covers about 38 per cent of the district's population.



Mine lease area
  3 km radius
  5 km radius
  10 km radius

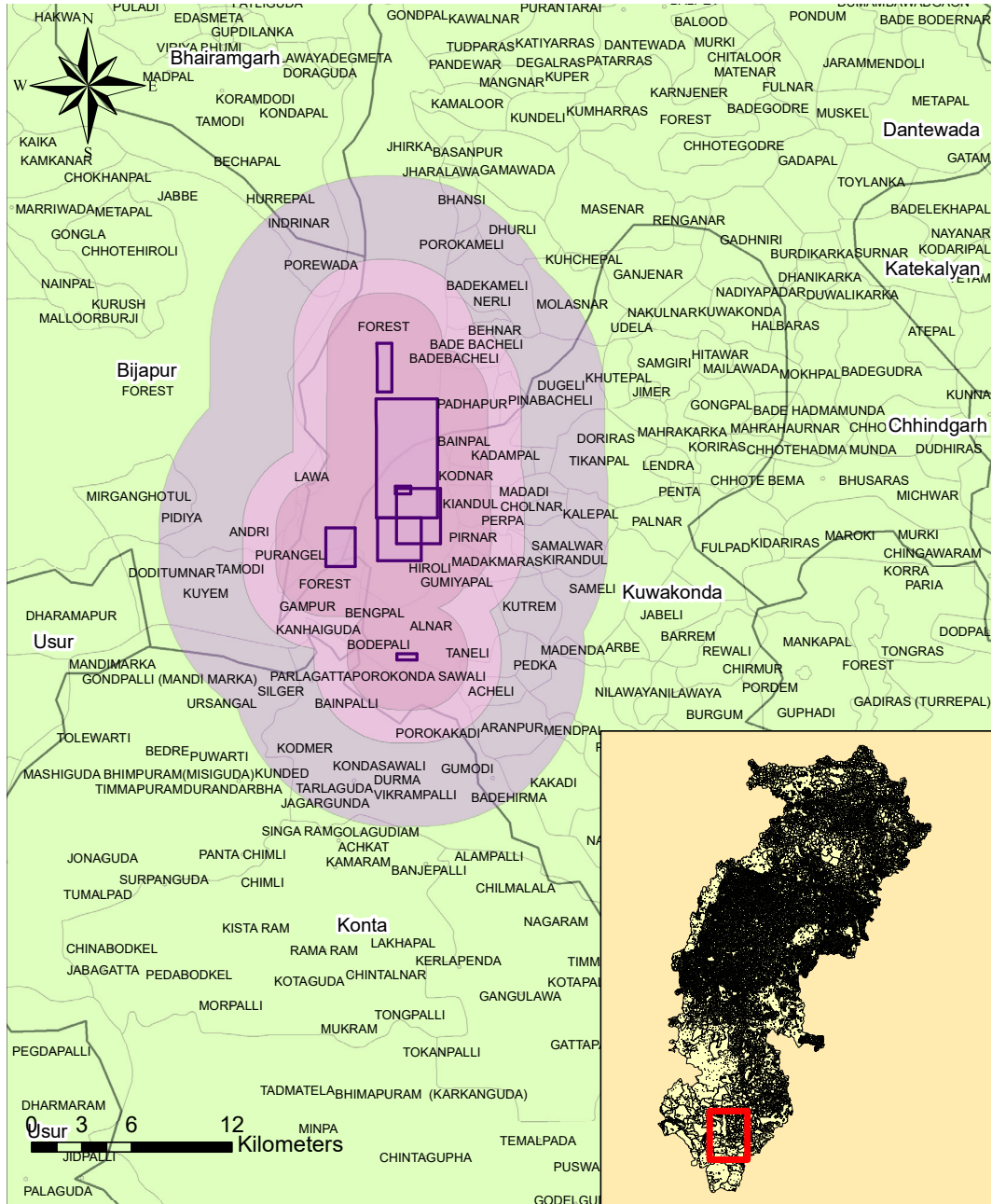
### RAIGARH

Given the limited DMF fund estimated annually in Raigarh district, considering a radius of 10 km from a mine or cluster of mines as directly affected makes the per capita DMF fund available for communities within such areas extremely limited, about Rs 2,400 per year.



### DANTEWADA

In tribal-dominated Dantewada district, the mining areas are characterized by forested and hilly terrains. Given the low population density in these areas, a radius of 5 km from each major mineral mine covers about 21 per cent of the districts' population, with a per capita DMF fund availability per year of Rs 16,500.

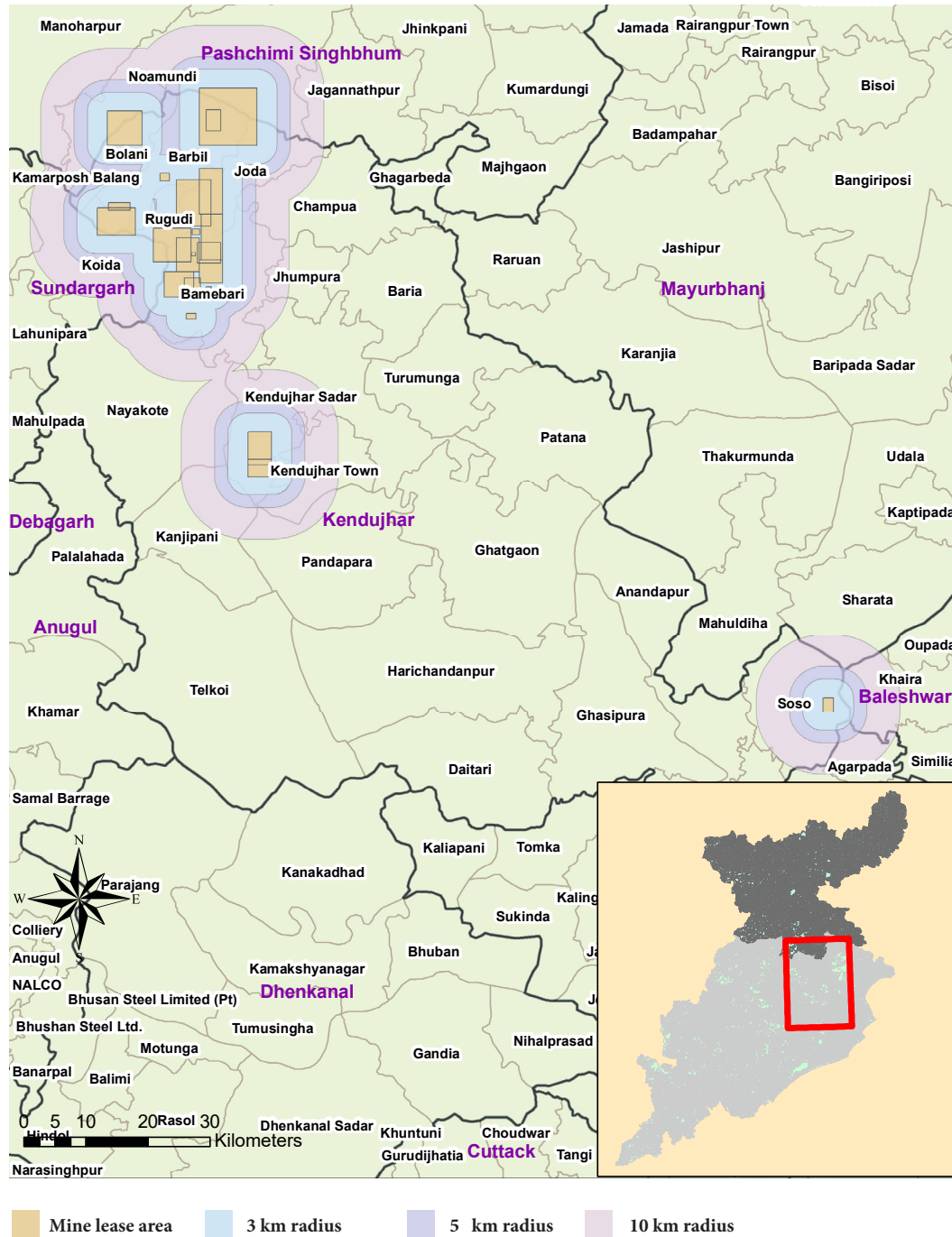


Mine lease area    
  3 km radius    
  5 km radius    
  10 km radius

## ODISHA

### KEONJHAR

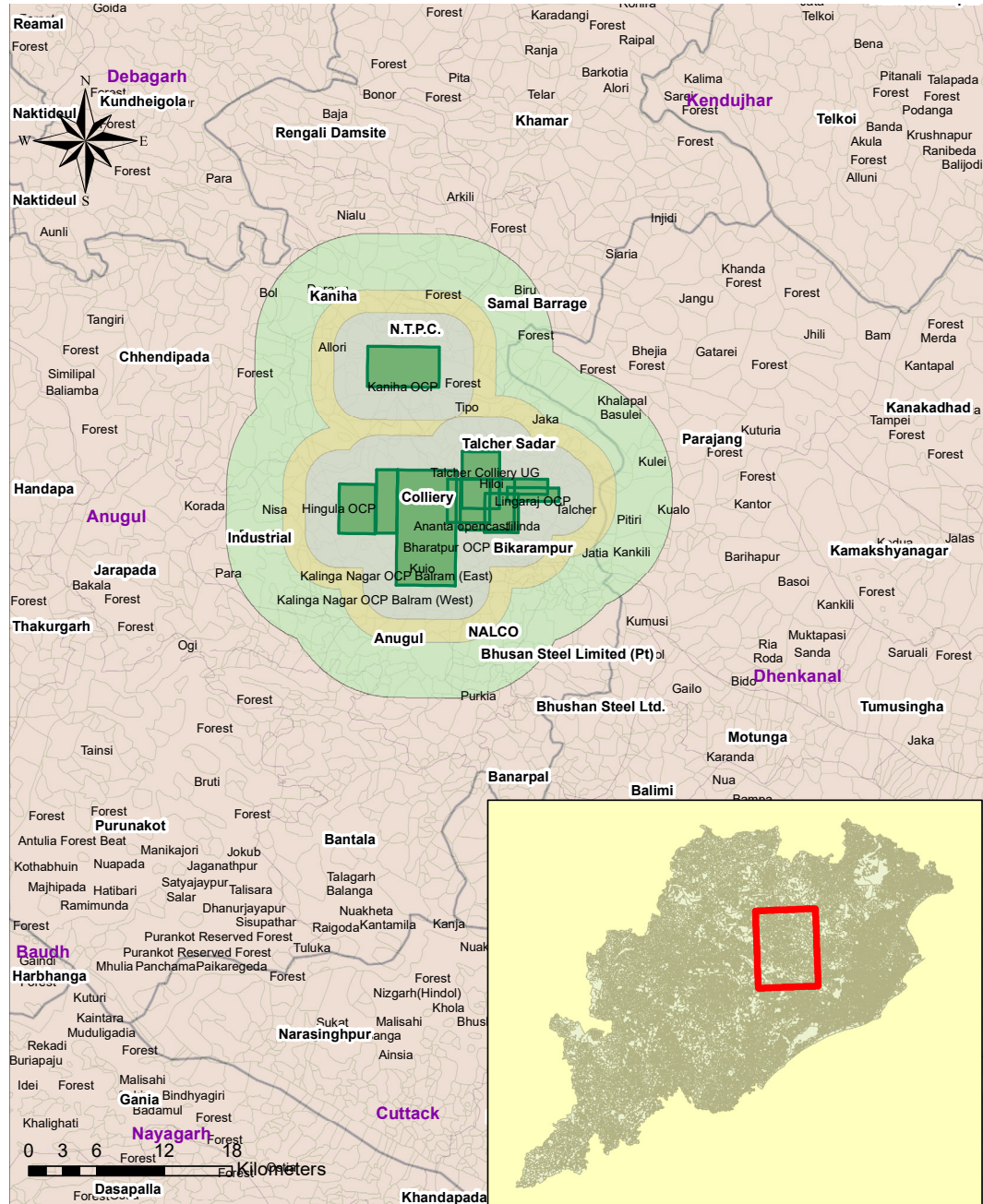
Keonjhar district has considered a radius of 10 km from a mine or cluster of mines as directly affected. Given the large number of major mineral mines in the district and their location, this radius includes villages of adjoining districts such as Sundargarh, Bhadrak, Balasore (Baleshwar) and West Singhbhum but the list of directly affected villages in Keonjhar does not include villages of these districts.





## ANGUL

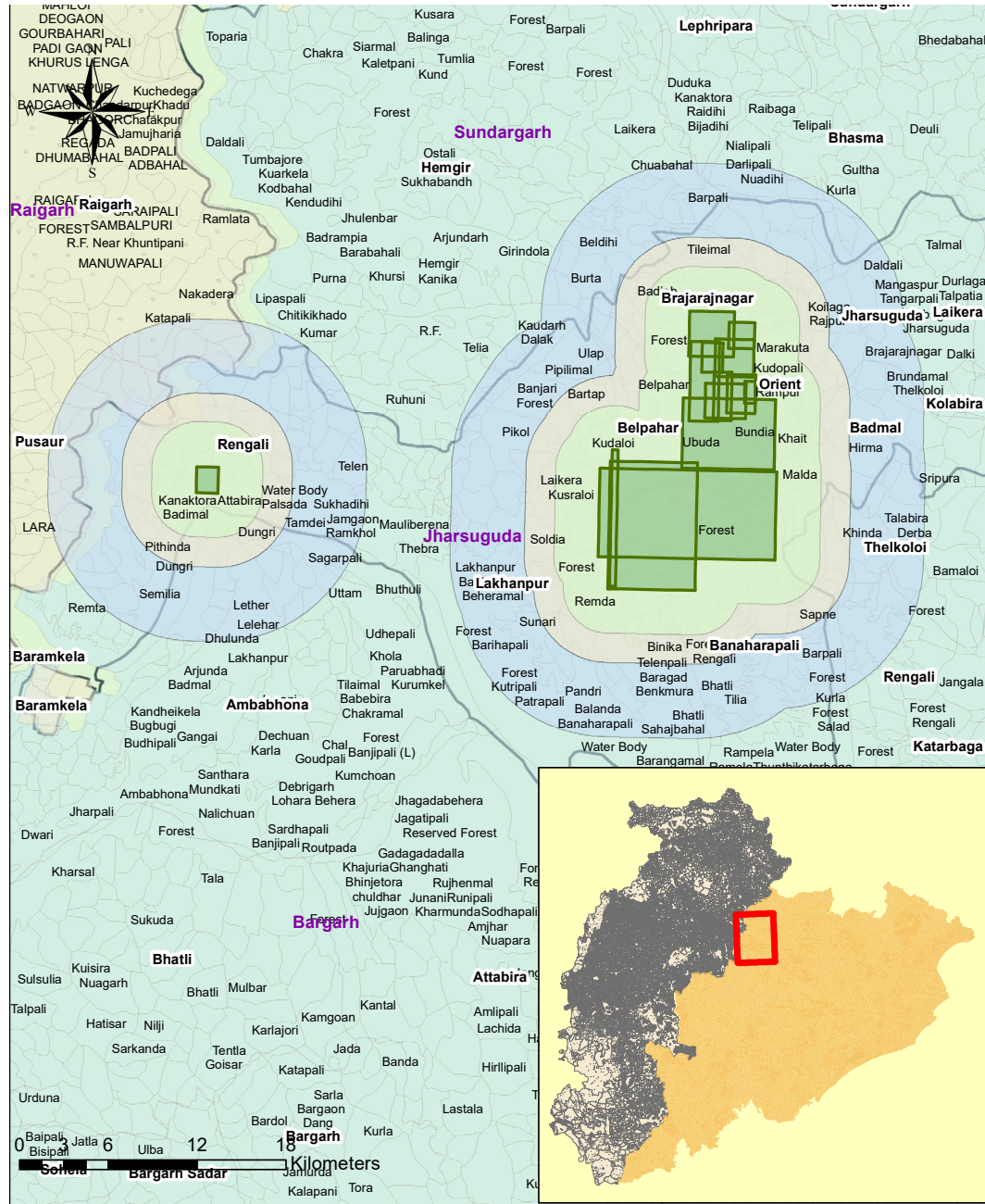
Given the population density of Angul district and the mining areas, considering a radius of 10 km from a mine or cluster of mines as directly affected covers about 43 per cent of the district's population. This effectively makes the DMF fund a general development fund for the district.



- Mine lease area
- 3 km radius
- 5 km radius
- 10 km radius

### JHARSUGUDA

In Jharsuguda, a small district with high population density, considering a radius of 10 km from a mine or cluster of mines as directly affected covers more than 73 per cent of the district's population. It also covers villages of neighbouring districts such as of Sundargarh, Sambalpur and even of Chhattisgarh's Raigarh district, creating administrative challenges.



Mine lease area
  3 km radius
  5 km radius
  10 km radius

## 5. INFERENCES AND CONCLUSION

The mapping exercise of the nine representative mining districts clearly suggests the following (see Table 2: Proportion of district's population covered and per capita fund availability considering various radii from the mines).

- In districts where mining areas are characterized by flat terrain and high population density, a 10 km radius covers nearly three-fourth of the district's population in most cases. This is particularly discernible for coal-mining districts such as Korba, Ramgarh and Jharsuguda.
- The proportion of a district's population falling within a 10 km radius is typically low if the district's mining areas are characterized by hilly terrain and forested areas and thus have a low population density. These areas also have high tribal populations living in small hamlets. This is particularly discernible for iron ore mining districts such as Keonjhar, West Singhbhum and Dantewada.
- Consideration of a 10 km radius also makes the per capita DMF fund availability negligible in districts such as Korba, Raigarh, Ramgarh, Angul and Jharsuguda. On an average, DMF fund available per person per year is between Rs 2,700 to Rs 4,500.
- On the other hand, if a 3 km radius is considered as directly affected in the aforementioned coal districts, the per capita fund availability almost doubles.
- What is clear from the trend of per capita fund availability of all districts is that DMF fund alone is not substantial as compared to the need of these areas. For instance, in West Singhbhum, a per capita availability of Rs 14,850 per year is grossly suboptimal considering the poor income levels of people, child development indicators, health burden and healthcare access, education etc.<sup>9</sup> The situation is similar in most other districts as well.
- There are also potential administrative challenges with a 10 km radius. In districts where mines are located closer to the district boundaries and/or the district has a smaller geographical area, a significant proportion of directly affected areas will go into adjoining districts. The question is which DMF Trust would then account for these people who fall

**TABLE 2: PROPORTION OF DISTRICT'S POPULATION COVERED AND PER CAPITA FUND AVAILABILITY CONSIDERING VARIOUS RADII FROM THE MINES**

District	10 km radius		5 km radius		3 km radius	
	Population covered (%)	Per capita DMF fund available per year* (Rs)	Population covered (%)	Per capita DMF fund available (Rs)	Population covered (%)	Per capita DMF fund available (Rs)
Keonjhar	29.6	14,900	19	23,300	16.5	26,900
Angul	42.7	4,600	32	6,100	21	9,300
Jharsuguda	72.3	3,500	45.7	5,600	37.8	6,849
Ramgarh	97	2,700	83	3,175	74	3,551
Chatra	11.8	8,900	9.6	11,000	9	12,300
West Singhbhum	13.4	14,850	8.3	24,000	6.7	29,500
Korba	75	4,400	62.4	5,300	56.2	5,900
Raigarh	19	2,400	10	4,900	6.5	7,200
Dantewada	28	12,500	21.2	16,500	11.5	30,500

\*Per capita fund availability calculated on the basis of annual estimated fund accrual

within the boundary of another district, but arguably are affected by mines located in another district.

For example, in Keonjhar, about 28 per cent of the population of directly affected areas falls in Sundargarh, Bhadrak, Balasore (Baleshwar) and West Singhbhum districts. However, a review of the directly affected village list of Keonjhar district shows that none of the villages that fall within these other districts have been considered directly affected. The same has also been observed for Angul and Jharsuguda districts.

It can be concluded with certainty from the mapping exercise that consideration of a flat 10 km (or more) radius from a mine or cluster of mines to delineate directly affected areas is not an appropriate approach. For effectively delineating mining-affected areas, the following should be considered:

- The approach ideally should be district-specific, taking into account the following factors:
  - Type and scale of mining operations;
  - Population density in the mining areas and demographic distribution;
  - Geographical and geological parameters; and
  - Baseline pollution data, particularly air, water and soil pollution.
- In all cases, a radius no more than 5 km from a mine or cluster of mines is justified considering the per capita DMF fund availability. In fact, even for a 3 km radius the DMF fund available per person per year is suboptimal. This makes a clear case for convergence of DMF funds with other financial resources available for the district. However, such convergence must happen only after analysis of resource gaps and developing a need-based DMF plan.
- In cases where directly affected areas fall within other district or state boundaries, the issue of DMF fund distribution must be resolved to benefit the affected communities.
- Districts should prepare geo-referenced maps of mining-affected areas considering all these factors. The state Space Application Centre or agencies with equivalent expertise can be consulted for such purpose.
- Considering that the mining areas are dynamic in nature (mines open and close over years), the affected areas maps must be reviewed every five years and updated as necessary.



## REFERENCES

1. The Ministry of Mines, Government of India, through an order dated 16 September 2015, directed all mining states to integrate the PMKKKY in the respective state DMF Rules.
2. Later some states also included municipal wards in the scope of mining-affected areas as in some districts mines are located in such areas.
3. Odisha District Mineral Foundation Rules 2015, as amended in 2016, available from <https://mines.gov.in/writereaddata/UploadFile/Odisha%20DMF%20Rules.pdf>, accessed on June 2019
4. Telangana District Mineral Foundation (Trust) Amendment Rules 2018, available from [https://mines.telangana.gov.in/MinesAndGeology/Documents/2018INDS\\_MS38.PDF](https://mines.telangana.gov.in/MinesAndGeology/Documents/2018INDS_MS38.PDF), accessed on June 2019
5. Maharashtra District Mineral Foundation (Trust) Rules, 2016, available from <https://mines.gov.in/writereaddata/UploadFile/Maharashtra%20DMF%20rules.pdf>, accessed on 15 June 2019.
6. The list of operational mines has been obtained from the respective state and district mining departments and coordinates of the mine lease areas has been considered as per environmental clearance letters of the mines, the Environmental Impact Assessment (EIA) reports and any additional data as shared by the mines departments.
7. District and sub-district layers procured from ESRI, Michael Bauer Research GmbH, Ministry of Statistics and Programme Implementation; Village layer from Socioeconomic Data and Application Center (SEDAC) hosted by Center for International Earth Science Network (CIESIN) at Columbia University.
8. For population enumeration, Census 2011 has been used as the base data.
9. Centre for Science and Environment, 2018, *Indicative Plan: District Mineral Foundation*, West Singhbhum, Jharkhand, as available from <https://www.cseindia.org/district-indicative-plan-west-singhbhum-jharkhand-8522>





**Centre for Science and Environment**

41, Tughlakabad Institutional Area, New Delhi 110 062, India

Ph: +91-11-40616000 Fax: +91-11-29955879

E-mail: [rajan@cseindia.org](mailto:rajan@cseindia.org) Website: [www.cseindia.org](http://www.cseindia.org)