

Human resource and skill requirements study for Indian mining sector (2019-2025)

Sampling plan for the Employer and Mining
Workers Survey

Skill Council for Mining Sector (SCMS)
May 2019



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Sampling Approach

1. Sampling approach for the employer survey

As discussed during the steering committee, we shall cover a sample of 152 employers as a part of the employer survey¹. The proposed sample has been equally divided across the organized and unorganized sectors, ensuring adequate representation of both.

Organized sector

The proposed sample of 77 employers from the organised sector includes employers categorized by mineral type, ancillary activities, contractors and industries involved in prospecting and exploration sub-sector. Based on secondary review, inputs from steering committee and mining sector experts, three activities, namely, Manufacturing of Equipment, Explosives contractors (including manufacturers) and Logistics and transportation have been identified as ancillary activities for the study. Additionally, we will cover 2 employers engaged in Prospecting and Exploration sub-sector and 20 contractors as a part of the organized sector sample.

The distribution of sample across categories is depicted in the table below:

S.No.	Employer Category	Target Sample
1.	Mineral type (Fuel- Coal & Lignite, Metal, Non Metal and Minor)	40
2.	Ancillary Activities	15
3.	Contractors and MDOs	20
4.	Prospecting and Exploration	2
	Total	77

Methodology adopted for arriving at the target sample:

1. Analysing population level data

As a first step, we developed a database of over 1000 employers involved in mining and other related activities basis secondary research and using EMIS² database. Further, companies were screened³, narrowing the list down to 88 employers. These employers were then bifurcated basis the type of mineral mining they were engaged in. As a next step, the population level data of 88 employers was divided into three categories, namely, large, medium and small based on revenue of the firm⁴. We adopted the following definition for categorization of firms based on revenue:

- Small: revenue of INR 0-75 crore
- Medium: revenue of INR 75- 250 crore
- Large: revenue of INR 250 crore and above

Further, at the population level, the share of large, medium and small employers for each mineral type was estimated. This has been shown in the table below:

¹ The sample size is large enough to provide statistically significant of key indicators at the sector level with 90% confidence interval and 7.5% of margin of error.

² <https://www.emis.com/>

³ Companies found to be inactive, no revenue available or working in areas of trade or finance were eliminated

⁴ This is validated through inputs from a mining sector expert

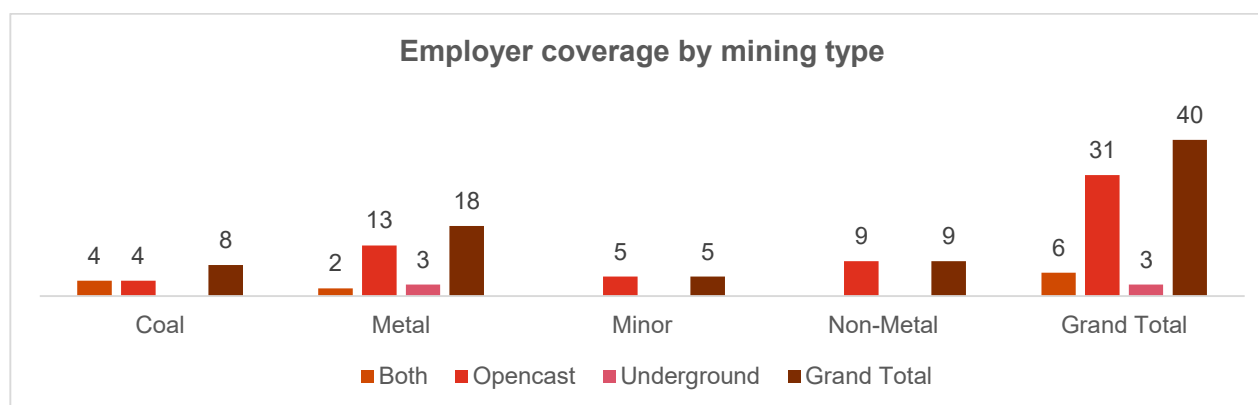
Mineral Type	Large	Medium	Small	Total	Share: Large	Share: Medium	Share: Small	Total share
Coal/Lignite	25 ⁵	0	0	25	100%	0%	0%	28%
Metal	16	5	5	26	62%	19%	19%	30%
Non Metal	9	6	4	19	47%	32%	21%	22%
Minor ⁶	10	3	5	18	56%	17%	28%	20%
Grand Total	60	14	14	88	68%	16%	16%	100%

- **Employer coverage by Mineral Types:** Based on the population level analysis of employers across various mineral types, we propose to cover a sample of 40 employers from the four types of mineral described above as a part of the employer survey. The sample of 40 employers has been divided across large, medium and small categories in proportion to their distribution at the population level. Minor minerals have been given a small share of 5 companies because they will largely be covered as a part of unorganized sector. The table below represents the distribution of employers by size and mineral type that will be covered as a part of the employer survey.

Mineral Type	Large	Medium	Small	Total
Coal/Lignite	8 (6 for coal; 2 for Lignite)	0	0	8
Metal	12	4	2	18
Non Metal	5	3	1	9
Minor	2	1	2	5
Total	27	8	5	40

Further, employer wise data on production of fuel minerals⁷ suggests a positive relationship between revenue and production variables. Therefore, owing to unavailability of employer wise production data, we have considered this positive correlation across all other mineral types (except a few minerals like copper and gold) as well. Thus, the sample ensures employer coverage basis the production/ output generated across all mineral types. In addition to this, other parameters have also been taken into account to make the sampling more comprehensive. These are:

- **Employer coverage by mining type:** Based on secondary research⁸, DGMS data⁹ and understanding of mineral genesis, the employers have been broadly categorized into three types of evacuation/mining techniques i.e. Opencast, underground and both.



⁵ All coal companies fall in the category of large employers with Coal India having 80% of the market share

⁶ Distribution of employers across minor minerals is fragmented and they will largely be covered under unorganized sector

⁷ Statistics of mines in India: Vol I, DGMS (2015)

⁸ Indian Mineral Industry at a Glance 2015-16: only a small proportion of mines across metals and non-metals are engaged in underground mining

⁹ It categorizes major coal mining employers across types of mining

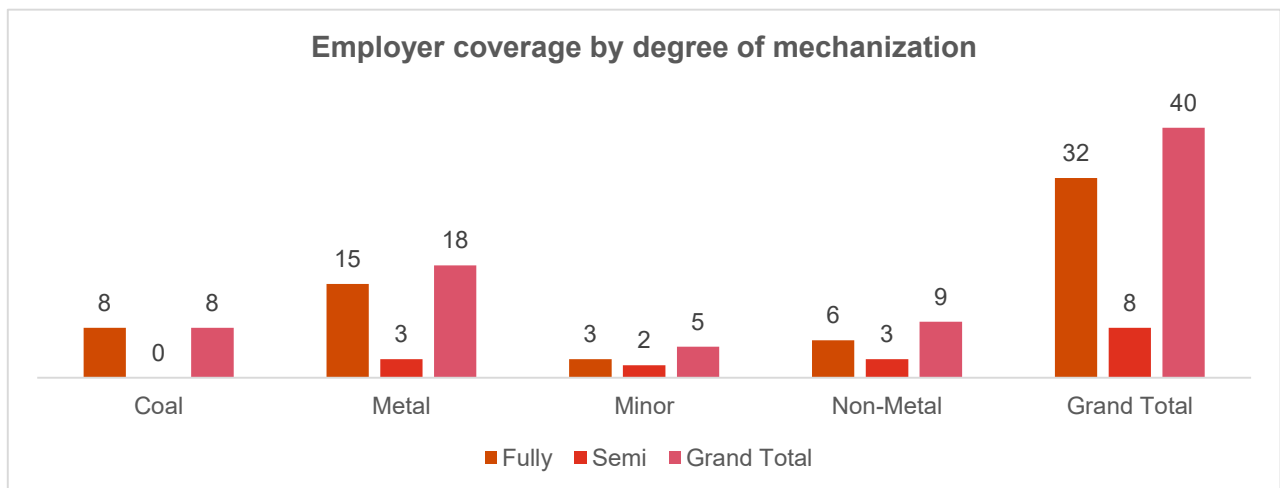
- **Employer coverage by degree of mechanization:** We have also categorized employers for each mineral type basis the degree of mechanization.

For coal, the following definition¹⁰ has been used to bifurcate employers basis degree of mechanization:

- *Underground mining:*
 - Fully Mechanised - where coal is cut and loaded by machines
 - Semi Mechanised - where coal is cut by coal cutting machines and blasted with explosives
 - Manual - where coal is obtained by solid blasting (with one free face) or where coal is cut and loaded by manual means only.
- *Opencast mining:*
 - Fully Mechanised - where coal is obtained by deep hole blasting and heavy Earth Moving Machineries
 - Semi Mechanised - where coal is obtained by compressed air / power drills but hand loaded
 - Manual - where coal is cut and loaded by manual means only.

For non-coal minerals the following definition has been used to bifurcate employers basis degree of mechanization¹¹:

- Fully: where same level of machines as used in semi mechanization are used, except that drilling is by down-the-hole drills capable of drilling holes of 150-200 dia. of + 40 m length¹².
- Semi: where jumbos, trackless equipment such as LHDs, low profile dumpers and small capacity trucks are used
- Manual: where there is no usage of heavy mining machinery and equipment i.e. usage of conventional pusher leg drills, rocker shovels, loco haulage and blast hole drills of 50-60 mm.

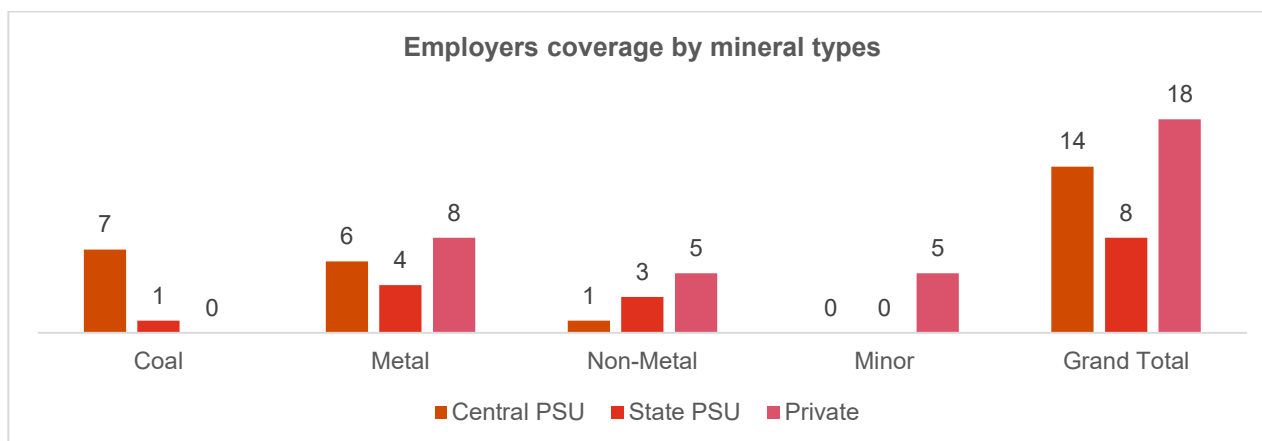


- **Employer coverage by type of ownership:** We have categorized employers for each mineral type basis the type of ownership. A total of 18 private and 22 PSUs (14 central and 8 state) have been proposed to be covered as a part of the survey. The exhibit below shows coverage of employers by type of ownership.

¹⁰ The definition has been used from the Statistics of mines in India: Vol I, DGMS (2015)

¹¹ The definition has been used from the 'Surface and underground excavations', Page 532, Ratan Raj Tatiya

¹² The definition has been used from the 'Surface and underground excavations', Page 532, Ratan Raj Tatiya



- Employer coverage by mining clusters/geography**

Given the study focus on 13 states (Karnataka, Goa¹³, Tamil Nadu, Andhra Pradesh, Odisha, Telangana, Gujarat, Rajasthan, Chhattisgarh, West Bengal, Maharashtra, Madhya Pradesh and Jharkhand) ensuring adequate geographical coverage is equally important. We mapped the employers basis their geographical presence and shortlisted the most prominent mining clusters for each one of them based on secondary research as well as referring to the list of major mining clusters shared with us by SCMS. We have ensured 65% coverage of the total 33 minor minerals listed in the RFP for 'Human Resource and Skill Requirement Study for the Indian Mining Sector' published on 29th January 2019. The list below shows coverage of employers across states and respective clusters.

State and Clusters	Number of Organised Sector Employer/Organizations to be covered
Andhra Pradesh	3
Kurnool	2
Srikakulam	1
Chhattisgarh	3
Raigarh	1
Surguja	2
Gujarat	4
Bharuch	3
Bhavnagar	1
Jharkhand	1
West Bokaro	1
Jamshedpur	1
Karnataka	4
Bellary	3
Raichur	1
Madhya Pradesh	3
Balaghat	1
Satna	1
Singrauli	1
Maharashtra	3
Bhandara	2
Chandrapur	1

¹³ Considering that mining activities are currently stalled in Goa, the state will be covered only through high level consultations

State and Clusters	Number of Organised Sector Employer/Organizations to be covered
Odisha	9
Balangir	1
Jajpur	2
Keonjhar	3
Koraput	1
Sundargarh	2
Rajasthan	4
Bundi	1
Dungarpur	1
Rajasmand	1
Udaipur	1
Tamil Nadu	3
Nyaveli	1
Salem	2
Telangana	1
Khammam, Adilabad	1
West Bengal	1
Paschim Bardhman	1
Grand Total	40

We have thus identified employers/target sample ensuring adequate representation across all the above mentioned parameters¹⁴. The list on page 7 shows shortlisted employers disaggregated by mineral type, size, geographical coverage/ mining clusters, type of mining, type of organization and degree of mechanization.

Note: The list of clusters may be subject to minor changes considering inputs from state DMGs and consultations with other key stakeholders. Further, the list of employers may also be subject to minor changes considering their availability. Incase of replacements, it will be ensured that employers are replaced with a similar organisation meeting all the parameters.

¹⁴ Due to unavailability of data on employer workforce, sample coverage basis employment has been kept excluded.

S.No.	Name of Employer/Organization	Type of Organization	Mineral Type	Mineral sub-category	Size	State	Clusters	Degree of Mechanization	Mining Type
1.	Neyveli Lignite Corporation Limited	Central PSU	Coal	Lignite	Large	Tamil Nadu	Nyaveli	Fully	Opencast
2.	Central Coalfields Limited	Central PSU	Coal	Coal	Large	Jharkhand	West Bokaro	Fully	Opencast
3.	Eastern Coalfields Ltd	Central PSU	Coal	Coal	Large	West Bengal	Paschim Bardhman	Fully	Both
4.	Gujarat industries power company ltd (Vasthan)	State PSU	Coal	Lignite	Large	Gujarat	Bharuch	Fully	Opencast
5.	The Singareni Collieries Company Limited	Central PSU	Coal	Coal	Large	Telangana	Khammam, Adilabad	Fully	Both
6.	Mahanadi Coalfields Limited	Central PSU	Coal	Coal	Large	Odisha	Sundargarh	Fully	Both
7.	Northern Coalfields Limited	Central PSU	Coal	Coal	Large	Madhya Pradesh	Singrauli	Fully	Opencast
8.	Western Coalfields Ltd.	Central PSU	Coal	Coal	Large	Maharashtra	Chandrapur	Fully	Both
9.	Odisha Mining Corporation	State PSU	Metal	Bauxite, Iron Ore, Manganese	Large	Odisha	Jajpur, Joda	Fully	Opencast
10.	NALCO	Central PSU	Metal	Bauxite	Large	Odisha	Koraput	Fully	Opencast
11.	BALCO	Central PSU	Metal	Bauxite	Large	Chhattisgarh	Surgujha	Fully	Opencast
12.	Hindustan Zinc Ltd.	Private	Metal	Zinc, lead	Large	Rajasthan	Rajasmand	Fully	Underground
13.	Sesa Goa/Vedanta Limited	Private	Metal	Iron ore, zinc-lead, silver, copper, aluminum	Large	Karnataka	Bellary	Fully	Opencast
14.	TATA Steel	Private	Metal	Iron ore, chrome, manganese	Large	Jharkhand, Odisha	Jamshedpur	Fully	Both

S.No.	Name of Employer/Organization	Type of Organization	Mineral Type	Mineral sub-category	Size	State	Clusters	Degree of Mechanization	Mining Type
15.	SAIL	Central PSU	Metal	Iron ore	Large	Odisha	Sundargarh	Fully	Both
16.	NMDC Ltd.	Central PSU	Metal	Iron ore, diamond	Large	Karnataka	Bellary	Fully	Opencast
17.	Hutti Gold Mines Company Ltd.	State PSU	Metal	Gold	Large	Karnataka	Raichur	Fully	Underground
18.	MOIL Ltd.	Central PSU	Metal	Manganese	Large	Maharashtra	Bhandara	Fully	Opencast
19.	Hindalco Industries	Private	Metal and Coal	Bauxite, Coal	Large	Chhattisgarh	Raigarh	Fully	Opencast
20.	Idcol Ferro Chrome And Alloys Limited	State PSU	Metal	Chromite	Medium	Odisha	Jajpur	Semi	Opencast
21.	Rungta Mines Limited	Private	Metal	Iron Ore	Medium	Odisha	Keonjhar	Fully	Opencast
22.	MG Mohanty	Private	Metal	Iron Ore	Medium	Odisha	Keonjhar	Fully	Opencast
23.	Chhattisgarh Mineral Development Corporation Ltd.	State PSU	Metal	Bauxite	Medium	Chhattisgarh	Surguja	Semi	Opencast
24.	Bellary Iron Ores Pvt.Ltd.	Private	Metal	Iron ore	Small	Karnataka	Bellary	Fully	Opencast
25.	K C Pradhan Mineral Private Limited	Private	Metal	Iron Ore	Small	Odisha	Kheonjhar	Semi	Opencast
26.	Hindustan Copper Ltd.	Central PSU	Metal	Copper	Large	Madhya Pradesh	Balaghat	Fully	Underground
27.	ACC Cement	Private	Non-Metal	Cement	Large	Rajasthan	Bundi	Fully	Opencast
28.	Wolkem India Limited	Private	Non-Metal	Wollastonite	Medium	Rajasthan	Dungarpur	Semi	Opencast
29.	Rajasthan State Mines & Minerals Ltd	State PSU	Non-Metal	Rock phosphate	Large	Rajasthan	Udaipur	Fully	Opencast
30.	Trimex sands	Private	Non-Metal	Garnet	Large	Andhra Pradesh	Srikakulam	Fully	Opencast

S.No.	Name of Employer/Organization	Type of Organization	Mineral Type	Mineral sub-category	Size	State	Clusters	Degree of Mechanization	Mining Type
31.	Maharashtra State Mining Corporation Limited	State PSU	Non-Metal	Sillimanite, Fluorite	Small	Maharashtra	Bhandara	Fully	Opencast
32.	Gandhamardhan Graphite Udyog	Private	Non-Metal	Graphite	Medium	Odisha	Balangir	Semi	Opencast
33.	Tamil Nadu magnesite Ltd.	State PSU	Non-Metal	Magnesite	Medium	Tamil Nadu	Salem	Semi	Opencast
34.	Gujarat Fluoro Chemicals Ltd	Private	Non-Metal	Fluorite	Large	Gujarat	Bharuch	Fully	Opencast
35.	SAIL Refractory Co. Ltd	Central PSU	Non-Metal	Magnesite	Large	Tamil Nadu	Salem	Fully	Opencast
36.	Ultra Tech cement	Private	Minor	Limestone	Large	Gujarat	Bhavnagar	Fully	Opencast
37.	Prism Cement Limited	Private	Minor	Limestone	Large	Madhya Pradesh	Satna	Fully	Opencast
38.	South West Mining Ltd, Andhra Pradesh	Private	Minor	Dolomite	Medium	Andhra Pradesh	Kurnool	Fully	Opencast
39.	Veejee Mines & Minerals, Andhra	Private	Minor	Quartz	Small	Andhra Pradesh	Kurnool	Semi	Opencast
40.	Bhavani Minerals, Gujarat	Private	Minor	Silica sand	Small	Gujarat	Bharuch	Semi	Opencast

Note: Considering that mining activities are currently stalled in Goa, the state will be covered only through high level consultations

2. Identifying the target sample for Ancillary activities

We propose to cover 15 employers across key ancillary activities. Basis each activity type's share in the population (as indicated in the table below), we have arrived at the target sample for each one of them. The table below gives an overview of the sample that will be covered as a part of the study:

S.No.	Type of ancillary activity	Population	Share	Target Sample
1.	Logistics	10	29%	6
2.	Manufacturing of Equipment	20	59%	7
3.	Mining Explosive Contractors	4	12%	2
4.	Total	34	100%	15

The list of employers that we have shortlisted across ancillary activities is attached below:

List of employers by activity type

S.No.	Activity type	Name of organization
1	Manufacturing of Equipment	Atlas Copco
2	Manufacturing of Equipment	L&T
3	Manufacturing of Equipment	TATA
4	Manufacturing of Equipment	Ashok Leyland
5	Manufacturing of Equipment	Mahindra
6	Manufacturing of Equipment	Volvo
7	Manufacturing of Equipment	JCB
8	Manufacturing of Equipment	Komatsu
9	Manufacturing of Equipment	Sandvik
10	Manufacturing of Equipment	CATERPILLAR
11	Manufacturing of Equipment	Rana sales and services pvt. Ltd.
12	Manufacturing of Equipment	Mitsubishi Corp India Pvt Ltd
13	Manufacturing of Equipment	FLSmith Ludowici India
14	Manufacturing of Equipment	Heavy Engineering Corporation Ltd
15	Manufacturing of Equipment	FLSmith Ludowici India
16	Manufacturing of Equipment	Heavy Engineering Corporation Ltd
17	Manufacturing of Equipment	Phil Minerals Benefication & Energy Pvt. Ltd.
18	Manufacturing of Equipment	Fuelco Coal India Limited
19	Manufacturing of Equipment	Ap Coal Washeries Private Limited
20	Manufacturing of Equipment	Clean Coal Enterprises Pvt. Ltd.
22	Explosive Contractors (including manufacturing)	Indian Explosives Limited
23	Explosive Contractors (including manufacturing)	Salvo Explosives
25	Explosive Contractors (including manufacturing)	Bharat Explosives
26	Explosive Contractors (including manufacturing)	C DET Explosives Industries
27	Logistics and transportation	Fomentn Resources
28	Logistics and transportation	Frontline Corporation Ltd.
29	Logistics and transportation	Mercator Ltd.
30	Logistics and transportation	Fairwood Holdings Pvt.Ltd.
31	Logistics and transportation	Apparlav Coal Transport Private Limited
32	Logistics and transportation	Pushpak Logistics Pvt. Ltd
33	Logistics and transportation	Paras Transport Company
34	Logistics and transportation	Fuelcoal Corporation India Limited
35	Logistics and transportation	Karam Chand Thapar & Bros. (Coal Sales) Ltd.
36	Logistics and transportation	Rungta Projects Limited

Note: The proposed sample will be chosen from the above list based on convenience and availability of the respondents.

3. Identifying the target sample for Prospecting and Exploration

Based on suggestions during the Board Meeting of SCMS, the following two organizations have been identified and shortlisted for consultations under this category:

- Geological Survey of India
- Mineral Exploration Corporation Limited (MECL)

4. Identifying the target sample for Contractors and MDOs

Based on inputs from PwC mining sector experts and suggestions from SCMS, we propose to cover 20 MDOs and Contractors as a part of the survey.

S.No.	Name of Organization/Entity
1.	Adani Enterprises
2.	Thriveni Earthmovers
3.	Indu Projects
4.	Sadbhav Enterprises
5.	IVRCL
6.	Maheshwari Mining Pvt. Ltd
7.	BGR Mining
8.	Sainik Mining and Allied Services Ltd.
9.	Sical Logistics
10.	Ambey Mining
11.	Dilip Buildcon
12.	VPR Mining
13.	AMR
14.	Monte Carlo
15.	Essel Mining Pvt. Ltd.
16.	Mahalaxmi Mining
17.	Laxyo group
18.	Saumya Mining Limited
19.	Sacheti Mine Services
20.	TCL

Unorganized sector

As indicated above, we shall cover a sample of 75 employers from the unorganised sector. The proposed sample will have representation from different sub-sectors and mineral types. We will adopt non-probability sampling approach for reaching out to the employers in this sector. Due to non-availability of data on employers in unorganized sector, we will connect with local industry associations and state departments to gather names of employers who have been granted mining leases, as suggested by Steering Committee¹⁵. SCMS's support will be crucial in this case to retrieve the mining lease documents. Thus, only employers who have been given mining leases will be a part of the unorganized sector sample for the survey.

Considering that a large proportion of employers in the minor mineral segment will fall in the unorganised category, based on discussions with internal PwC mining experts as well as sectoral expert (Mr. AK Bhandari) and ensuring logistical feasibility, we have mapped minor minerals to the shortlisted clusters in Annexure A.2.

¹⁵ Suggested as part of the Steering Committee Meeting on 15th April 2019

We have ensured 65% coverage of the total 33 minor minerals listed in the RFP for 'Human Resource and Skill Requirement Study for the Indian Mining Sector' published on 29th January 2019.

2. Sampling approach for the mining workers survey

A sample size of 800 employees has been proposed as a part of the mining workers survey for the study. The sample size has been estimated based on the formulae given below. Using the formulae, we estimated a sample of 768. However, accounting for non-response rate, we inflated the estimated sample size and planned to cover a sample of 800 employers.

$$N = \frac{D*P*Q*Z^2}{E^2} = 768$$

Where

N= Sample Size

P = Population proportion

Z = Z score corresponding to confidence interval of 95%

E = Standard Error = ± 5%

Q = 1-P

D = Design effect = 2

As a first step, we will reach out to the sampled employers (as mentioned in the sections above) across the organised and unorganised sectors. Subsequently, mining workers will be selected from the sampled employers. Further, appropriate representation of gender and other socioeconomic characteristics will be ensured in the sample of mining workers.

Annexure

A.1. Work plan for the study

The detailed work plan for the study as proposed during the steering committee meeting is attached below:

#	Activities	M1	M2	M3	M4	M5	M6
1	Inception and Design Phase	<i>Kick off meeting</i>					
1.1	Inception meeting and finalisation of scope						
1.2	Finalization of approach and methodology and work plan for implementation of study						
1.3	Mapping of stakeholders for conducting primary						
1.4	Identification of secondary sources						
1.5	Analysis of secondary data (including literature review)						
1.6	Developing of tools for conducting primary research	<i>Industry overview and labour market trends</i>		<i>Situation analysis for critical success factors of SCMS</i>			
1.7	Piloting and finalisation of tools						
2	Data Collection Phase						
2.1	Consultation with key stakeholders						
2.2	Primary data collection with employers and mining workers						
2.3	FGDs with communities					<i>Employment and skilling need of ancillary</i>	
2.4	Analysis of primary data						<i>HR and Skill Requirement forecast</i>
3	Reporting Phase					<i>Study of Minor Minerals</i>	
3.1	Presentation of interim findings						
3.2	Draft interim report						
3.3	Incorporating feedback						<i>Roadmap and Action plan</i>
3.4	Presentation of final findings						
3.5	Final Report						<i>Final report</i>

Deliverables as per ToR

Meeting with steering committee

A.2. Tentative list of minor mineral clusters

S.No.	State	Clusters	Minor Minerals
1.	Rajasthan	Barmer	Granite, Quartz and Silica sand, Gypsum, Fireclay
2.	West Bengal	Paschim Bardhman,	Limestone, fireclay, quartz & felspar, silica sand
3.	Gujarat	Bharuch	Ball Clay, Fireclay, Limestone, Quartz/Silica sand, calcite
4.	Maharashtra	Chandrapur	China clay, dolomite, fireclay, limestone, quartz & silica sand, quartzite, granite, marble, ochre, shale, barytes
5.	Odisha	Koraput	China Clay, Dolomite, Graphite, Limestone, Granite
6.	Rajasthan	Rajasmand	Barytes, Felspar, Dolomite, Granite, , Quartz and silica sand Limestone, Pyrophyllite, Talc/steatite/soapstone
7.	Karnataka	Raichur	Quartz/silica sand, talc/steatite/soapstone,
8.	Chhattisgarh	Raigarh	Quartzite, dolomite, limestone, quartz/silica sand, fire clay,
9.	Odisha	Jajpur	Quartzite
10.	Chhattisgarh	Surguja, Surajpur	Granitestone, limestone, clay
11.	Odisha	Kheonjhar	China Clay, Dolomite, Pyrophyllite, Quartzite, Granite, Dunite/Pyroxenite
12.	Odisha	Ganjam	Granite,
13.	Rajasthan	Dungarpur	Limestone, Talc and steatite, Marble
14.	Rajasthan	Udaipur	Barytes, Calcites, China Clay
15.	Andhra Pradesh	Srikakulam	granite, fireclay, Limestone, quartz, Silica,sand, quartzite
16.	Maharashtra	Bhandara	China Clay, Pyrophyllite, quartz & silica sand, granite, Corundum, marble, steatite
17.	Odisha	Balangir	China Clay, Quartz/silica sand, Quartzite,
18.	Tamil Nadu	Salem	Felspar, Granite, Limestone, Quartz/Silica sand Talc/Steatite/Soapstone, Calcite, Dolomite
19.	Madhya Pradesh	Satna	Limestone, china clay,
20.	Andhra Pradesh	Kurnool	Quartz, barytes, calcite, china clay, fire clay, limestone, quartz, silica sand, quartzite, soapstone,
21.	Telangana	Khammam	Limestone, granite, barytes, dolomite, mica, Steatite and Talc.
22.	Telangana	Adilabad	china clay, fireclay, limestone,
23.	Odisha	Sundargarh	Dunite/Pyroxenite
24.	Chhattisgarh	Baloda Bazar	Limestone, dolomite
25.	Rajasthan	Jodhpur	Limestone, dolomite, quartz and silica sand, granite, sandstone

Source: Indian Bureau of Mines Indian Mineral Yearbook 2017

Building relationships to create value

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