# Indian Minerals Yearbook 2021

## (Part-I)

## 60th Edition

## STATE REVIEWS (Odisha)

### (ADVANCE RELEASE)

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# ODISHA

## Mineral Resources

Odisha is the leading producer of chromite, garnet (abrasive), bauxite, manganese ore, iron ore, sillimanite, quartzite and dolomite. The State hosts the country's sole resources of ruby. It accounts for the country's 96% chromite, 93% nickel ore, 90% PGM metal, 69% cobalt ore, 51% bauxite, 44% manganese, 34% iron ore (haematite), 25% sillimanite, 24% fireclay, 23% pyrophyllite, 20% vanadium ore, 17% mica, and 10% dolomite resources. As per AMD of the Department of Atomic Energy, Odisha, accounted for 150.62 million tonnes of rutile resources.

Important minerals that occur in the State are: **bauxite** in Balangir, Kalahandi, Kandhamal, Kendujhar, Koraput, Malkangiri, Rayagada & Sundargarh districts; **china clay** in Bargarh, Boudh, Balangir, Kendujhar, Koraput, Mayurbhanj, Sambalpur & Sundargarh districts; and **chromite** in Balasore, Cuttack, Dhenkanal, Jajpur & Kendujhar districts. Chromite deposits of Sukinda and Nuasahi ultramafic belt constitute 95% of the country's chromite resources. Besides, **coal** occurs in Ib river valley and Talcher coalfield, Dhenkanal district; **dolomite** in Bargarh, Kendujhar, Koraput, Sambalpur & Sundargarh districts; **dunite/pyroxenite** in Kendujhar and Sundargarh districts; **fireclay** in Angul, Cuttack, Dhenkanal, Jharsuguda, Khurda, Puri, Sambalpur & Sundargarh districts; **garnet** in Ganjam, Kalahandi & Sambalpur districts; **graphite** in Bargarh, Boudh, Balangir, Kalahandi, Koraput, Nuapada & Rayagada districts; **iron ore (haematite)** in Dhenkanal, Jajpur, Kendujhar, Koraput, Mayurbhanj, Sambalpur & Sundargarh districts; **iron ore (magnetite**) in Mayurbhanj district; **limestone** in Bargarh, Koraput, Malkangiri, Nuapada, Sambalpur & Sundargarh districts; **manganese ore** in Balangir, Kendujhar, Koraput, Rayagada, Sambalpur & Sundargarh districts; **Pyrophyllite** in Kendujhar district; **quartz/silica sand** in Boudh, Balangir, Kalahandi, Sambalpur & Sundargarh districts; **quartzite** in Balangir, Dhenkanal, Jajpur, Jharsugada, Kendujhar, Mayurbhanj, Sambalpur & Sundargarh districts; **sillimanite** in Ganjam & Sambalpur districts; **talc/ steatite/soapstone** in Mayurbhanj, Sundargarh & Sambalpur districts; **titanium minerals** in Dhenkanal, Ganjam, Jajpur & Mayurbhanj districts; and **zircon** in Ganjam district.

Other minerals that occur in the State are **asbestos** in Kendujhar district; **cobalt** in Cuttack & Jajpur districts; **copper** in Mayurbhanj & Sambalpur districts; **granite** in Angul, Boudh, Balangir, Cuttack, Deogarh, Dhenkanal, Ganjam, Kendujhar, Khurda, Koraput, Mayurbhanj, Nuapada, Rayagada & Sambalpur districts; **lead** in Sargipalli area, Sundargarh district; **mica** in Sonepur district and **nickel** in Cuttack, Kendujhar & Mayurbhanj districts. Occurrences of **ruby** and **emerald** are reported from Balangir and Kalahandi districts, respectively. **Platinum Group of Metals** occur in Kendujhar district; **silver** in Sundargarh district; **tin** in Koraput & Malkangiri districts; and **vanadiferous magnetite** occurs in Balasore & Mayurbhanj districts (Table-1). The various coalfields along with their reserves/resources are given in Table - 2.

## Exploration & Development

The details of exploration activities conducted by GSI for iron ore, manganese ore, coal & REE and other agencies during 2020-21 are furnished in Table - 3.

## Production

The important minerals produced in the state were Coal, Bauxite, Chromite, Iron Ore, Manganese Ore, Graphite and Limestone etc. during 2020-21. The value of minor minerals' production was estimated at Rs. 337 crore for the year 2020-21. The number of reporting mines in 2020-21 was 149 in case of MCDR minerals (Table-4).

**Table – 2: Reserves/Resources of Coal as on 1.4.2021: Odisha**

(In million tonnes)

| Coalfield | Proved | Indicated | Inferred | Total |
|---|---|---|---|---|
| **Total** | **43326** | **35222** | **6330** | **84787** |
| Ib-River | 16365 | 13509 | 2228 | 32102 |
| Talcher | 26961 | 21713 | 4130 | 52776 |

***Source:*** *Coal Directory of India, 2020-21.*

## Table – 1: Reserves/Resources of Minerals as on 1.4.2020: Odisha

| Mineral | Unit | Reserves | | | | Remaining Resources | | | | | | | Total resources (A+B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Proved STD 111 | Probable | | Total (A) | Feasibility STD211 | Pre-feasibility | | Measured STD331 | Indicated STD332 | Inferred STD333 | Reconnaissance STD334 | Total (B) | |
| | | | STD121 | STD122 | | | STD221 | STD222 | | | | | | |
| Asbestos | Tonne | - | - | - | - | - | - | - | 10000 | 37200 | 9500 | - | 56700 | 56700 |
| Bauxite | 000 Tonnes | 388184 | 7346 | 14210 | 409740 | 97550 | 56160 | 193301 | 161842 | 428849 | 596940 | 112642 | 1647284 | 2057024 |
| Chromite | 000 Tonnes | 40453 | 15229 | 22349 | 78031 | 52215 | 10146 | 44289 | 1565 | 52304 | 59284 | 20435 | 240237 | 318269 |
| Cobalt | Million Tonnes | - | - | - | - | - | - | - | 31 | - | - | - | 31 | 31 |
| Copper | | | | | | | | | | | | | | |
| Ore | 000 Tonnes | - | - | - | - | - | - | - | 1340 | 2306 | 8345 | - | 11991 | 11991 |
| Metal | 000 Tonnes | - | - | - | - | - | - | - | 20.63 | 20.14 | 56.26 | - | 97.03 | 97.03 |
| Garnet | Tonne | 8330045 | - | 1 | 8330046 | 5 | - | 1 | - | - | 348001 | 829311 | 1177318 | 9507364 |
| Graphite | Tonne | - | - | 2838414 | 2838414 | 6371790 | 2889564 | 2927932 | 696021 | 838841 | 3119932 | 298628 | 17142707 | 19981121 |
| Iron Ore (Heamatite) | 000 Tonnes | 1817247 | 328296 | 653206 | 2798749 | 1662944 | 1068654 | 770861 | 28824 | 925717 | 2019410 | 134173 | 6610582 | 9409331 |
| Iron Ore (Magnetite) | 000 Tonnes | - | - | - | - | 79 | - | 120 | - | - | 43 | - | 242 | 242 |
| Lead-Zinc Ore | | | | | | | | | | | | | | |
| Ore | 000 Tonnes | - | - | - | - | - | 961 | 119 | - | - | 670 | - | 1750 | 1750 |
| Lead metal | 000 Tonnes | - | - | - | - | - | 34.32 | 4.25 | - | - | 38.39 | - | 76.96 | 76.96 |
| Limestone | 000 Tonnes | 388084 | 67346 | 13150 | 468580 | 156898 | 456006 | 260485 | 139924 | 239877 | 435449 | 38785 | 1727424 | 2196004 |
| Manganese Ore | 000 Tonnes | 7535 | 1511 | 2423 | 11470 | 39091 | 22916 | 33968 | 10260 | 12219 | 32657 | 8947 | 160058 | 171528 |
| Nickel Ore | Million Tonnes | - | - | - | - | - | 21 | 21 | 31 | 51 | 51 | - | 175 | 175 |
| Pt. Group Of Metals | Tonne | - | - | - | - | - | - | - | - | 7.7 | 6.5 | - | 14.2 | 14.2 |
| Rare Earth Elements | Tonne | - | - | - | - | - | - | - | - | 6353 | 19140 | - | 25493 | 25493 |
| Ruby | Kilogram | - | - | - | - | - | 429 | 3296 | - | - | 1623 | - | 5349 | 5349 |
| Sillimanite | Tonne | 5640985 | - | - | 5640985 | - | - | 6557013 | - | - | 4943600 | 561595 | 12062208 | 17703193 |
| Silver | | | | | | | | | | | | | | |
| Ore | Tonne | - | - | - | - | - | 960500 | 119000 | - | - | 670000 | - | 1749500 | 1749500 |
| Metal | Tonne | - | - | - | - | - | 27.34 | 3.4 | - | - | 34.17 | - | 64.91 | 64.91 |

(contd)

Table – 1 (concld)

| Mineral | Unit | Reserves | | | | Feasibility | Pre-feasibility | | Remaining Resources | | | | | Total resources (A+B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Proved STD 111 | Probable | | Total (A) | STD211 | | | Measured STD331 | Indicated STD332 | Inferred STD333 | Reconnaissance STD334 | Total (B) | |
| | | | STD121 | STD122 | | | STD221 | STD222 | | | | | | |
| Tin | | | | | | | | | | | | | | |
| Ore | Tonne | - | - | - | - | 12749 | 653 | 40 | - | 1166 | 1010 | - | 15618 | 15618 |
| Metal | Tonne | - | - | - | - | 73.91 | 512.47 | 27.59 | - | 22.2 | 16.56 | - | 652.73 | 652.73 |
| Titanium | Tonne | 12654141 | - | 0 | 12654141 | - | - | - | 950000 | 2196933 | 48612331 | 1259798 | 53019062 | 65673202 |
| Vanadium | | | | | | | | | | | | | | |
| Ore | Tonne | - | - | - | - | - | 1220000 | - | - | 232000 | 3412795 | - | 4864795 | 4864795 |
| Metal | Tonne | - | - | - | - | - | 2135 | - | - | 487.2 | 10935.74 | - | 13557.94 | 13557.94 |
| Zircon | Tonne | 476672 | - | - | 476672 | - | - | - | - | 39300 | 303491 | 47456 | 390247 | 866919 |

*Figures rounded off.*

**Table –3 : Details of Exploration Activities in Odisha, 2020-21**

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| **GSI** | | | | | | | |
| **Iron** | | | | | | | |
| Kendujhar | Jajang Block | 1: 4000 | 1.0 | - | - | - | General exploration (G2) was carried out for iron and manganese ore in Jajang Block, Kendujhar district. The block belongs to the eastern limb part of the horse shoe shaped Bonai-Keonjhar iron ore belt. Detailed mapping of 1.0 sq. km area on 1: 4000 scale along with 25 cu. m of pitting/trenching has been carried out in the block. The major rock types in the area include banded hematite quartzite, banded hematite jasper, banded hematite chert, cherty quartzite, ferruginous shale / tuffaceous shale and laterite. Hard massive iron ore is exposed on mine face and benches in the western part of the block. Manganese ore occurs within shale and laterite in the northern part. Lateritic iron ore, hard massive iron ore, hard laminated ore, soft laminated and powdery iron ores have been intersected in the boreholes. The iron ore is mainly hematite. |
| Kendujhar | Jalahuri Block | 1: 4000 | 1.82 | - | 87.6 | - | General exploration (G2) was carried out for iron and manganese ore in Jalahuri Block, Kendujhar district. The block belongs to the eastern limb part of the horse shoe shaped Bonai-Keonjhar iron ore belt. An area of 1.82 sq. km area has been covered by DM on 1: 4000 scale along with 50 cu.m of pitting / trenching. The litho-sequence belongs to the Iron Ore group and it comprises banded iron formation (BIF), shale, chert, quartzite and iron ore (soft laminated ore, hard massive ore, lateritised ore, powdery ore). The ore mineral is mainly hematite. Massive ore is present as pockets within the laterite cappings. Soft laminated ore was also observed to be inter-bedded with the ferruginous shale. A total of 87.6m has been drilled in one borehole (OKJL-2) which has intersected mainly shale and BHC with thin bands of iron ore. |
| Sundargarh | Patamunda East block | - | 1 | - | - | - | Preliminary exploration was carried out for iron and manganese ore this block. Sundargarh district, Odisha |

(contd)

Table – 3 (contd)

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | (G3): Patamunda Block is located in the southern part of the Jamda-Koira valley of Bonai-Kendujhar iron ore belt. The East block comprising an area of 5.1 sq km lies just east of Patmunda west block where active mining was going on for manganese till it was suspended in late 2000. An area 1 sq. km was mapped on the available topographic map of Lessee. The area is represented by Banded Iron Formation, Ferruginous Shale/Phyllite and manganiferous shale/phyllite. BIF is exposed in the northeastern part of Patmunda East block where as a major part of the block is occupied by ferruginous shale. The western fringe of the East block has few exposures of manganiferous shale which continues to the West block where old mines are located. Drilling is being planned across several profiles, to ascertain the extension of manganiferous shale horizon in the East Block. Prima facie the block does not hold much potential for manganese mineralisation except the western fringe part. The BIF exposed in the north eastern part is likely to have low grade iron ore in addition to float ore. This area too will be probed by systematic drilling. |
| Kendujhar | Roida-I Block | 1:4000 | 1 | 11 | 1005.9 | - | General exploration (G2) for iron ore was carried out in Roida-I Block. Detailed mapping on 1:4000 scale was carried out over an area of 1.0 sq. km area. The lithounits exposed in the area are ferruginous laterite, hard and soft laminated iron ore, blue dust, BHQ/ BHJ/ BHC and shale of the Koira Group of rocks. The iron ore is capped by ferruginous and aluminous laterite. Considerable thickness of high grade ore band has been exposed in the quarry section. The ore zone consists of mainly powdery ore, soft and hard laminated ore, blue dust and occasionally hard lateritized ore. The average strike length of the mineralised zone is around 500m. A total of 1005.90 m of drilling meterage has been achieved by 11 boreholes. All |

(contd)

Table – 3 (contd)

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | the boreholes drilled during this investigation have intersected considerable thickness of ore zone. The borehole ODKR-1 has intersected High grade iron ore comprising of powdery iron ore, blue dust, SLO, HLO between 00-50.00 m (63.08%Fe) and 58.00m to 94.00m and low grade iron ore comprising of powdery iron, soft laminated ore and ferruginous shale between 50.00 to 53.00 m ( 50% Fe). The borehole ODKR-2 has intersected High grade iron ore comprising of powdery iron ore, blue dust, SLO, HLO between 00-22.00 m (63.25%Fe), 30.00m to 55.00 m (61.11% Fe) and low grade iron ore comprising of powdery iron, soft laminated ore and ferruginous shale between 22.00 to 30.00m (47.79% Fe), 55.00 to 85.00 m (47.01% Fe) and 88.00 to 94.00 m (45.75% Fe). The borehole ODKR-3 has intersected low grade iron ore comprising of powdery iron, soft laminated ore and ferruginous shale between 0 m to 34.00m with average grade of 47.88% Fe and 42.60 to 44.90 m with average grade of 53.60% Fe. The borehole ODKR-4 has intersected low grade iron ore comprising of lateritic ore with powdery ore and Ferruginous shale from 0.00 to 13.35 m (47.63% Fe) and 52.40 to 54.40 m (49.87% Fe) and High grade iron ore comprising of powdery iron, blue dust ,SLO, HLO between 56.40 to 127.40 m (65.26% Fe). The borehole ODKR-5 has intersected High grade iron ore comprising of powdery iron ore, blue dust, SLO, HLO between 00-149.25 m. The borehole ODKR-6 has intersected powdery ore and SLO iron ore between 0.00-88.05 m. The borehole ODKR-7 has intersected powdery ore with Fe shale between 0.00-20.00 m, powdery ore and SLO between 38.00-173.00 m. |
| Kendujhar | Balita & Inganijharan Blocks | - | 0.36 | - | - | - | General exploration (G2) was carried out for iron and manganese ore in Balita and Inganijharan Blocks. Detailed mapping in an area of 0.36 |

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Table – 3 (contd)

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | sq. km was carried out in Balita block along with 15 cu. m. of pitting and trenching. Banded hematite quartzite (BHQ), banded hematite jasper (BHJ) and ferruginous shale are exposed in the old quarry of the block. The iron ore is restricted to the central part of the quarry and the general trend of the iron ore is N-S, with moderatly westernly dipping. The total thickness of the iron ore varies from 50 m to 180 m and it is extended up to about 400m in the strike direction. The thickness of the individual jasper/ quartzite bands in the BHJ/BHQ bands varies from 0.1 cm to 3 cm. At places, pockets of powdery ore and soft laminated ore are observed in the old quarry. In the mine section, the depth of the lateritic soil is extended up to 4m. In the northern corner of the block, another band of iron ore is exposed, which is hard and massive in nature for about 20 m of length and 10 m of width. |
| **Base Metal** | | | | | | | |
| Mayurbhanj | Kesharpur East block | - | - | 7 | 1569.65 | - | General exploration (G2) was carried out for copper and associated precious metals in this block. A total of 1569.65 m of drilling was carried out in 7 nos. of which includes 01 no. of first level, 05 nos. of second level and 01 no. third level boreholes. The surface manifestation of mineralisation in the area is in the form of old workings, malachite and azurite stains. The sulphide phases identified are chalcopyrite, pyrrhotite and pyrite. The mineralisation occurs in the form of dissemination, stringers, veinlets, shear parallel and occasionally in a massive form. Chalcopyrite is the chief ore mineral, pyrite and pyrrhotite being other sub-ordinate sulphide minerals. The host rock for mineralisation is the hornblende-biotite-schist, silicified schist, hornblende gneiss and metabasics. The sulphides are concentrated along shear and fracture planes and are more or less concordant with the foliation planes of the host rocks. Massive chalcopyrite mineralisation (15 cm) in silicified schist in borehole ODKE-29. The analytical results of Borehole ODKE-25 indicate two copper mineralised zones/lodes viz. from |

(contd)

Table – 3 (contd)

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | 163.50 to 165.50 m = 2.00 m x 0.36 %Cu and from 180.95 to 182.95 m = 2.00 m x 0.4%Cu. |
| Mayurbhanj | Madansahi block | - | - | 24 | 6173.45 | - | General exploration (G2) was carried out for copper and associated precious metals in this block. A total of 6173.45 m drilling had been done in 24 nos. of inclined boreholes. As part of surface investigation, 135 cu.m of trenching/pitting was carried out with 12 trenches across the mineralised zone. The block exposes patchy outcrops of granitoids and intrusive dolerite. Surface evidences of mineralisation are marked by presence of feeble malachite-azurite stains and occasional fine specks and disseminations of pyrite and chalcopyrite. Principle ore mineral is chalcopyrite with association of pyrite, pyrrhotite and pentlandite. Accessory sulphide phases identified are molybdenite, galena and covellite with minor gold. The mineralisation is hosted within the hornblende biotite schist, silicified metabasics and gneiss restricted to foliation, shear fabrics, fracture and secondary quartz-calcite-chlorite vein and veinlets in form of streaks, disseminations, stringers, and at places breccias filling. The cumulative sulphide zone thickness varies from 7.00 m to 84.50 m with an average thickness of 33.00 m considering up to 3rd level of intersection. The borehole ODMS-20 drilled in central part intersects a copper lode of 34.00 m with average 0.60% Cu, which includes a copper lode of 11 m width with 1.01%Cu. The 3rd level borehole ODMS-30 intersects three copper lodes i.e. two shallow zones from depth 49.00 m to 51.00 m (2.00 m x 0.96 %Cu), 59.20 m to 64.20 m (5.00 m x 0.31%Cu) and third one is from 260.50 m to 276.00 m (15.50 m x 0.59%Cu). In eastern part of the prospect, one 2nd level borehole ODMS-37 intersects five copper lodes from 30.45 m to 34.95 m (4.50 m x 0.70%Cu), 43.20 m to 48.25 m (5.05 m x 0.30%Cu), 54.00 m to 56.05 m (2.05 m x 0.20%Cu), 156.35 m to 171.35 m (15.00 m x 0.59%Cu) and 175.35 m to 181.90 m (6.55 m |

(contd)

Table – 3 (contd)

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | x 0.67%Cu) with cumulative of 33.15 m with 0.55%Cu, which remains open in further east. Based on the present available assay, the average copper lode thickness is about 15.00 m with average copper grade of 0.55% Cu at 0.20% Cu, disposing a linear pinch and swell lensoidal body behaviour both in strike as well as depth. |
| Mayurbhanj | Nimaidihi block | 1:2000 | 1.0 | - | - | - | Preliminary exploration (G3) was carried out for copper and associated precious metals in Nimaidihi block. The exploration work included DM of 1.0 sq. km on 1:2000 scale along with ground geophysical survey, pitting/trenching and collection of samples for petrographic and other laboratory studies.The rocks exposed in the area include quartzite and hornblende biotite schist which are later intruded by granites and granite gneisses which are traversed by series of newer dolerite sills/dykes. The mineralisation in the form pyrite and chalcopyrite is associated with hornblende biotite schist as well as granite gneiss and their silicified equivalent in the area. The presence of malachite, azurite stains, disseminated fine specks of chalcopyrite and pyrite, fracture filled limonite within quartz veins, boxwork structure are the surface evidences of mineralisation, besides old prospecting pits and slag heaps near northern part of the area. Self -Potential anomaly along with moderate resistivity and high chargeability has been identified in the central part which may indicate presence of sulphide mineralisation. The analytical results of boreholes have been recalculated at 0.2% Cu cut-off and two copper lodes in KW-02, four copper lodes in KW-05 and five copper lodes in KW-06 have been delineated. |
| Deogarh | Rampali Block | - | - | 9 | 2552 | - | General exploration (G2) was carried out for copper and associated metals this Block. Deogarh district. |

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Table – 3 (contd)

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | The area forms a part of the Eastern Ghats Mobile Belt and exposes mainly ferruginous oxidised quartzite, garnet biotite gneiss/schist and pyroxene granulite, granite. Quartzites in the area are capped by laterite, goethite and devoid of gossans. The surface manifestation of mineralisation in Rampalli Block is in the form of oxidation, ferruginisation and limotinisation within the pyroxene granulite and brecciated quartzite. Pyroxene-granulite is the main host rock for the copper mineralisation as observed from the borehole intersections. Disseminations of sulphides are also seen in the garnet biotite schist and quartzite on either side of the mineralised zones in the boreholes. During G-3 stage, two lodes were established and 0.172 million tonnes resource of 0.66% average grade Cu at 0.4% Cu cut-off up to 210 m vertical depth (30m R.L.) was estimated. Sulphide mineralisation occurs in the form of dissemination, stringers and veinlets. Chalcopyrite is the major ore mineral associated with pyrite and pyrrhotite and occasionally observed Bornite & covellite within silicified pyroxene granulite. The present work includes a total of 2552m drilling carried out in nine boreholes (ODR-01 to ODR-09). The boreholes were planned at 100m strike interval for each level excluding fourth level borehole (ODR-1). As per the visual estimate, all the boreholes have intersected ore zones. The dusty dissemination/ specks/vein type of chalcopyrite which is observed in the boreholes contains 0.2%-0.8% Cu as per visual estimation. |
| **Manganese Ore** | | | | | | | |
| Kendujhar | Chormalda Block | - | 1.41 | - | - | - | General exploration (G2) was carried out for manganese and iron ore in Chormalda Block, Kendujhar District. An area of 1.41 sq. km were covered by detailed geological mapping along with 57 cu.m of pitting and trenching. The area forms part of the Iron Ore Group (IOG) se- |

(contd)

Table – 3 (contd)

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | quence of Bonai-Kendujhar Belt in Kendujhar district of Odisha. The litho units are feebly metamorphosed Precambrian volcano- sedimentary sequence laid between Singhbhum granite on east, Bonai granite on west and are classified as Iron ore Group. The litho units are disposed as low northerly plunging horse-shoe shaped synclinorium. Ferruginous shale, manganiferrous shale, iron and manganese laterite are the dominant unit exposed in the study area. A part of the block is covered with float hematite ore. Laterite hosts varying proportion of hematite angular fragments, psilomelane nodules/botroids with occasional shale and goethite. Below the laterite/lateritised float ore manganese occurs as detached lenses, pockets of Wad +Psilomelane+Goethite. Iron and/or manganese float ore were subjected to in situ residual enrichment due to lateralisation. |
| Sundargarh | Orahuri, Kusumdihi & Banjikusum | 1:2000 | 1.41 | 21 | 1444.60 | 624 | General exploration (G2) was carried out for manganese ore in Orahuri, block. The exploration work in these three non- working mine blocks were taken up by GSI, on request from Govt. of Odisha. An area of 1 sq. km was mapped on 1: 2,000 scale with 1444.60 m drilling and collection of 624 nos. of core samples. The manganese ore in Orahuri Block is generally associated with laterites and Lower Shale Formation of Koira Group. The ore body occurs as irregular tabular type and at places as lensoid/ pocket type and trend in nearly NNE-SSW direction. A total of 685.30 m drilling has been carried out in thirteen boreholes over 0.51476 sq. km. area. All the 13 boreholes have intersected manganese ore with more than 10% Mn content. The total manganese resource estimated up to a maximum depth of 79.00 m at 10% and 25% Mn cut-off are 7.18 MT with 21.39% Mn and 2.42 MT with 32.39% Mn respectively. In Banjkusum block, a total of 380.00 m drilling has been carried in 0.08134 sq. km area. The total resource estimated at 10% Mn cut-off is 0.097 |

(contd)

Table – 3 (contd)

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | MT with 11.34% average Mn. In Kusumdihi block, a total of 8 boreholes were drilled with total meterage of 379.30 m and collection of 62 nos. core samples. Three boreholes have intersected manganese ore with more than 10% Mn content and one borehole has intersected iron ore zone with above 45% Fe content. The total manganese resource at 10% Mn cut-off is 0.0944 MT with 13.64% Mn over an area of 0.31549 sq. km. The resource has been estimated up to a maximum depth of 18.00 m. |
| Sundargarh | Patamunda West Block | 1: 4000 | 0.59 | - | - | 5 | General exploration (G2) was carried out for manganese detailed mapping in Patamunda West block along with drilling and collection of petrographic and core samples. Patamunda West Block is occupied by thin layer of laterite and manganiferous laterite at the top which is underlain by white shale, variegated soft friable manganiferous shale and hard compact, fine-grained purple colour phyllite / shale. During the FS 2020-21, detailed mapping of 0.59 sq. km on 1: 4000 scale, 5 nos. of PS and OM samples has been completed. |
| Koraput | Upardhodshi Block | - | 1.016 | - | - | 155 | Preliminary exploration (G3) for Manganese Ore was carried out in Upardhodshi block. The 1.016 sq km area were mapped by DM, 20.2 L km gravity and magnetic survey were carried out in the block and 115 cu m pitting and trenching, 61 nos. of pit- trench samples and 60 nos. of bedrock samples were collected and analysed to evaluate the surface potential of manganese ore. A total of 34 nos. of petrological samples including 30 samples for thin polished section and 4 samples for polished section studies, were also collected and studied to identify manganese ore minerals in Upardhodshi block. The block forms part of the Eastern Ghat granulite terrain and falls within the 32 km long and over 5 km wide Kutinga- Nishikhal manganese ore |

(contd)

Table – 3 (contd)

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | belt in southern Odisha. The rock types exposed in the block are khondalite, quartzite, calc- silicate and granite gneiss. Manganese ore bodies are confined to the highly weathered khondalite and quartzite in the area and occurs in the form of fine disseminations, streaks, lenses, bands, patches along the foliation planes and fracture filling. On the basis of surface indication and analytical results of bedrock and trench samples Mn bands (Band I to V) are delineated in the area. The manganese ore bands have a cumulative strike length of 115 m and 10 m average width (Band-I); 230 m cumulative strike length and 35.5 m average width (Band-II); 174 m cumulative strike length and 45.5 m average width (Band-III), 120 m cumulative strike length and 6 m average width (Band-IV) and 110 m cumulative strike length and 8 m average width (Band-V) with smaller outcrop of siliceous manganese ore in western part of the block and isolated patch of Mn in the southern part of block. Surface sampling i.e., channel sampling and trenching was done at 50 to 100 m interval. Analytical results of channel samples show Mn content varies from 0.80 to 60.01 % and in PTS samples varies from 1.46% to 31.20%. |
| **Directorate of Geology, Odisha** | | | | | | | |
| **Manganese Ore** | | | | | | | |
| Keonjhar | Roida-D area | 1:12500 | - | 10 | - | 143 | In Odisha, a exploration in Roida-D area was carried out with the objectives to assess manganese ore resources with its grade. Two irregular sporadic outcrops were delineated. The manganese exposure at the central part has the maximum length of 10 m and average width of 4 m. The cumulative thickness of ore body encountered in boreholes is about 47.55 m. The study involved drilling of 10 boreholes, at grid spacing of 100 m * 50 m, to a total depth of 354 m and collection 143 samples. Exploration is continuing in the area. |

(contd)

Table – 3 (contd)

| Agency/ Mineral/ District | Location Area/ Block | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|---|---|---|---|---|---|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| Keonjhar | Tentuliguda area | 1:12500 | 121 | - | - | 37 | Tentuliguda area, Keonjhar district, exploration was taken up to assess manganese ore resources in the area. One manganese ore body admeasuring 15 m * 30 m has been located at west of Bagchuan village. The study involved geological mapping of 121 sq.km area on 1:12500 scale and collection of 37 samples. Exploration suspended due to local problems in the area. |
| **MECL** | | | | | | | |
| **Manganese Ore** | | | | | | | |
| Bolangir | Tamiya | 1:4000 | 8.05 | - | - | 893 | In Odisha, a G2 stage exploration in Tamiya village, Patangarh tehsil, was carried out with the broad objectives to carry out detailed geological mapping and estimate indicated category resources of manganese ore in the area. The study involved mapping of 8.05 sq.km area on 1:4000 scale with collection of about 893 samples along with a trenching and 5 pittings of dimension 1m x 1m x 1m. Resources in the area has been estimated at about 633 thousand tonnes of manganese ore with 23.04% Mn under indicated category. |
| Bolangir | Rengali block | 1:12500 | 1.83 | - | - | 1556 | A G2 stage exploration was carried out over an area of 1.831 sq.km in Rengali block with the broad objectives to carry out detailed geological mapping and estimate indicated category resources of manganese ore in the area.The study involved mapping of 1.83 sq.km area on 1:12,500 scale with collection of different types of 1,556 samples along with a trenching and 5 nos of pittings admeasuring 1m x 1m x 1m. Resources in the area has been estimated at 328 thousand tonnes of manganese ore with 21.37% Mn, 15.82% Fe and 0.28% P under indicated category. |

**Table - 4 : Mineral Production in Odisha, 2018-19 to 2020-21**
**(Excluding Atomic Minerals)**

(Value in ₹'000)

| Mineral | Unit | 2018-19 | | | 2019-20 | | | 2020-21 (P) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of mines | Qty | Value$ | No. of mines | Qty | Value$ | No. of mines | Qty | Value$ |
| **All Minerals** | | **134** | | **306536247** | **130** | | **343507062** | **149** | | **283343864** |
| Coal | '000t | - | 144312 | - | - | 143016 | - | - | 154151 | - |
| Bauxite | t | 5 | 15413642 | 11000292 | 5 | 15483307 | 10901088 | 5- | 15565611 | 12324450 |
| Chromite | t | 22 | 3970691 | 36850747 | 20 | 3929260 | 32134395 | 21 | 2863869 | 22910242 |
| Iron Ore | '000t | 62 | 113119 | 251111210 | 64 | 146637 | 293179734 | 80 | 104631 | 240326857 |
| Manganese Ore | t | 31 | 476821 | 3048997 | 27 | 537325 | 3161505 | 28 | 483069 | 2135372 |
| Garnet (abrasive) % | t | - | 38376 | 545745 | - | - | - | - | - | - |
| Graphite (r.o.m.) | t | 3 | 23199 | 18259 | 5 | 12564 | 34838 | 5 | 12767 | 41633 |
| Iolite | kg | 3 | 73 | 684 | 2 | 90 | 579 | 3 | 16 | 73 |
| Sillimanite | t | 1 | 17930 | 143870 | - | - | - | - | - | - |
| Limestone | '000t | 7 | 5289 | 1728521 | 7 | 5627 | 1848621 | 7 | 7187 | 2234688 |
| Sulphur# | t | - | 239344 | - | - | 253697 | - | - | 209387 | - |
| Minor Minerals | | - | - | 2087922 | - | - | 2246302 | - | - | 3370549 |

***Note:*** *The number of mines excludes Fuel and Minor minerals.*
*$ Excludes the value of Fuel minerals.*
*% Associated with Sillimanite.*
*# Recovered as by-product from oil refinery.*

## Mineral-based Industry

The present status of each mineral-based industry is not readily available. However, the important large and medium mineral-based industries in organised sector in the State are given in Table - 5.

**Table – 5: Principal Mineral-based Industries**

| Industry/plant | Capacity ('000 tpy) |
|---|---|
| **Aluminium/Alumina** | |
| Hindalco Industries Ltd, Hirakud | 215 (aluminium) |
| Hindalco Industries Ltd, Aditya Aluminium, Lapanga, Distt. Sambalpur | 360 (aluminium) |
| NALCO, Damanjodi, Distt. Koraput | 2275 (alumina) |
| NALCO, Angul | 460 (aluminium) |
| Utkal Aluma, Rayagada | 1500 (alumina) |
| Vedanta Aluminium Ltd, Lanjigarh, Distt. Kalahandi | 2000 (alumina) 1500(Venadium) |
| Vedanta Aluminium Ltd, Jharsuguda, Distt. Sambalpur | 1750 (aluminium) |
| **Asbestos Products** | |
| UAL Industries Ltd, Korian, Distt. Dhenkanal | NA |

(contd)

Table - 5 (contd)

| Industry/plant | Capacity ('000 tpy) |
|---|---|
| Konark Cement & Asbestos Industries Ltd, Bhubaneshwar | NA |
| **Cement** | |
| ACC Ltd,Bargarh Cement Ltd, Bargarh | 2140 |
| Ultra-Tech Cement Ltd, Jharsuguda (G) | 2600 |
| OCL India Ltd, Rajgangpur, Distt. Sundargarh | 4000 1064(Refractory) 2900(Clinker) |
| OCL India Ltd, Kapilas (G). Cuttack | 1350 |
| Toshali Cements Pvt Ltd, Ampavalli, Distt. Koraput | 200 |
| **Ceramics** | |
| Prabhu Ceramics & Minerals Pvt Ltd, Majhipali, Rengali, Sambalpur | 24( Acidic Ramming Mass) 9.6(EBT Filling Mass) |
| **Chemical** | |
| Arrow Minerals & Metals Pvt. Ltd,Vejidihi, Banspal | 1.8(Manganese Oxide) 2.25(Manganese dioxide powder) |
| **Chrome Concentrate** | |
| K L Resources PVT. Ltd, Sundaria, Dharmsala | 74.7 |

(contd)

Table - 5 (contd)

| Industry/plant | Capacity ('000 tpy) |
|---|---|
| Maharaja Minerals Pvt. Ltd, Soso Hatadidi | 60 |
| Anand Exports, Nimmapali, Sukinda | 60 |
| **Fertilizer** | |
| IFFCO, Paradeep | NA |
| Paradeep Phosphates Ltd, Paradeep | NA |
| SAIL Fertilizer Plant, Rourkela, Distt. Sundargarh | NA |
| Graphite Concentrate | |
| Pradhan Industries , Katra, Kana Laxmipur | 2.88 |
| **Iron & Steel** | |
| SAIL, Rourkela Steel Plant, Rourkela, Distt Sundargarh | 5300 (sinter)<br>3470(pig iron)<br>4400 (crude/liquid steel)<br>85 (tin plates) |
| Bhushan Power & Steel, Sambalpur | 1000 (sinter)<br>2420(crude steel) |
| Bhushan Steel Ltd, Dhenkanal | 5625 (crude Steel)<br>6680(Sinter)<br>3200(Finished steel) |
| Jindal Stainless Steel Ltd, Kalinganagar, Gadapur | 1000 (Stainless steel)<br>250 (ferro alloys) |
| Neelachal Ispat Nigam Ltd, Khurunti, Godigotha, Sarangapur | 1710 (sinter)<br>855 (pellets)<br>1100(Pig Iron)<br>920 (crude/liquid steel)<br>900(Semifinised Steel)<br>13 (A/S)<br>35(Crude Tar) |
| OCL India Ltd, Lamloi, Distt Sundargarh | 120 (sponge iron)<br>85 (billets) |
| Orissa Sponge Iron Ltd, Palaspanga, Distt Keonjhar | 250(Ssponge iron)<br>100 (steel ingot) |
| Shree Jagannath Steel & Power Ltd Uliburu Barbil | 115.5 (Sponge iron)<br>112.86( M S billets) |
| Visa Steel Ltd, Kalinganagar, Distt Jajpur | 225 (pig iron)<br>300 (sponge iron)<br>500 (special steel) |
| Tata Steel Ltd Duburi Sukinda | 3200(pig iron)<br>3000 (crude/liquid steel)<br>5750 (sinter) |
| Manhole Cover Utkal Modular, Cover) Kaurmundu | 10.752(GI. Manhole<br>2.73(DI. Manhole Cover) |
| **Pellet** | |
| Arya Iron & Steel Co. Pvt Ltd, Barbil. | 1200 (pellets) |
| Essar Steel Ltd, Paradip | 6000 (pellets) |

(contd)

Table - 5 (contd)

| Industry/plant | Capacity ('000 tpy) |
|---|---|
| Jindal Steel & Power Ltd, Barbil. | 9000 (pellets) |
| Pro Minerals Pvt. Ltd,Basantpur, Jhumpura | 1000 (pellets) |
| Rexon Strips Ltd, Kumakela, Distt Sundargarh | 300 (pellets)<br>60 (sponge iron)<br>25 (M. S. ingots) |
| Shivom Mineral Limited Kusumdih, Koira | 120 (Lump CLO) |
| Tata Steel Ltd, Kalinga nagar works, Kalinganagar, Odisha | 2800 |
| **Pig Iron** | |
| IDCOL Kalinga Iron Works Ltd, Barbil, Distt Keonjhar | 180 |
| IKIW. Ltd, Matkambeda Barbil | 170 |
| **Sponge Iron** | |
| Action Ispat & Power (P) Ltd, Pandripather, Distt. Jharsuguda | 250 |
| Adhunik Metaliks Ltd, Chandrihariharpur, Distt. Sundargarh | 270 |
| Aarti Steel limited, Ghantikhal, Athagarh, Cuttack | 320 |
| Bhaskar Steel & Ferroalloys Pvt. Ltd, Badtumkela Rajamunda | 120 |
| Beekay Steel & Power Ltd, Uliburu, Distt Barbil. | 115.5 |
| Bhusan Steels Ltd, Meramandali, Distt. Dhenkanal | 900 |
| Brand Steel & Power Pvt. Ltd, Murusuan, Keonjhar | 60 |
| Crackers India (Alloy) Ltd, Gobardhanpur, Distt. Keonjhar | 73 |
| Dinabandhu Steel & Power Ltd, Kalinganagar, Distt Jajpur. | 60 |
| Ganesh Sponge Pvt Ltd, Krushnachandrapur, Distt. Angul | 90 |
| Jay Iron & Steel Ltd, Balanda, Rourkela, Distt. Sundargarh | 60 |
| Jindal Steel & Power Ltd, Nisha, Dist. Angul | 1800 |
| Kamaljit Singh Alluwalia Steel & Power Div. Barpada, Barbil | 300 |
| L. N. Metallics Ltd, Sripura Jharsuguda | 60 |
| MGM Minerals Ltd, Forest Park, Bhubaneswar | 105 |
| Rungta Mines Ltd, | |

(contd)

Table - 5 (contd)

| Industry/plant | Capacity ('000 tpy) |
|---|---|
| Unit-I, Karakola, Barbil, Distt. Kendujhar | 180 |
| Unit-II, Kamand, Koira Distt Sundargarh | 556.5<br>277.2 (Semi Fin. Steel) |
| SMC Power Generation Ltd, Jharsuguda | 200<br>350(Billet) |
| Scaw Industries Pvt. Ltd, Gundichapara, Distt. Dhenkanal | 100 |
| Sponge Udyog Pvt. Ltd, Jai Bahal, Lathikata | 60 |
| Sree Metallic Ltd, Loidapada, Distt. Kendujhar | 300 |
| Suraj Products Ltd, Barpalli, Distt. Sundargarh | 36 |
| Swastik Ispat pvt. Ltd | 45 |
| Tata Sponge Iron Ltd, Joda, Distt. Kendujhar | 465 |
| Vikram Pvt Ltd, Tumkela, Distt. Sundargarh | 60 |
| Viraj Steel & Energy Ltd, Gurupali, Rengali | 220 |
| Vishal Metallics Pvt. Ltd, Barahamusa, Bonai | 60 |
| Yedani Steel & Power Ltd, Manitra Donagadi | 60 |
| **Ferro Alloys** | |
| Aarti Steel limited, Ghantikhal, Athagarh, Cuttak | 50 (Ferrochrome<br>200 (Finished Steel) |
| Balasore Alloys Ltd, Balgopalpur, Distt. Balasore | 145 (H. C. Ferro chrome) |
| FACOR, Charge Chrome Plant, Randia, Distt. Bhadrak | 65 |
| Ferro alloy Corporation Ltd, Bhadrak | 75 |
| IDCOL Ferro Chrome & Alloys Ltd, Distt. Jajpur | 18 |
| Indian Metal & Ferro alloys Ltd (Indian Charge Chrome Ltd, Choudwar | 168 |
| Indian Metals & Ferro Alloys Ltd, Therubali, Distt. Cuttack | 116.4 |
| Jeypore Sugar Co. Ltd, Rayagada | 22.5 |
| Jindal Stainless Ltd, Kalingnagar, Jajpur | 250 |
| Nav Bharat Ventures Ltd, Ferro Alloys Plant, Khargprasad, Distt. Dhenkanal | 75 |
| Rohit Ferro-Tech Ltd, Kalinganagar, Distt. Jajpur | 110 |
| Sagar Mining & Metal Industries Pvt. Ltd, Nayagarh, Barbil | 3.6 (L.C. Fe/mn)<br>6.0 (M. C Fe/mn) |
| Stork Ferro& Mineral Industries Pvt. Ltd, Somanthpur, Remuna | 25 (Ferro chrome) |

Table - 5 (concld)

| Industry/plant | Capacity ('000 tpy) |
|---|---|
| Tata Steel Ltd (Ferroalloys and Minerals Div.), Joda, Distt. Kendujhar | 50.4 |
| Tata Steel Ltd (Ferroalloys and Minerals Div.), Bamnipal, Distt. Kendujhar, Jhumpura | 65 |
| Tata Steel Ltd (Ferroalloys and Minerals Div.), Distt. Cuttack | 50 |
| Tata Steel Ltd (Ferro Chrome plant Chamakhandi.), Chatrapur | 55 |
| T.S.Alloys Ltd, Anantpur, (Rawmet Ferrous Industries Ltd), Cuttack | 52 |
| Visa Steel, Kalinganagar (Manganese oxide) | 180 |
| **Refractory** | |
| IFGL Refractory Ltd, Kalunga, Distt. Sundargarh | 80000 pc (continuous casting refractories) |
| Khemka Refractories (P) Ltd, Khatukhura, Dhenkanal | 35.4 |
| Orissa Industries Ltd, Lakhikata, Distt. Sundargarh | 125 |
| Kalinga Refractories, Brundammal, Badmal, Jharsuguda | 7.2 (Fire Bricks)<br>1.2 (F. C. Mortar) |
| Maruti Monolithics Pvt. Ltd, Gopalpur, Tangi Choudwar | 2.0( Basic fettling Mass)<br>2.75(Basic mortar) |
| Total solution, Piplimal, Lakhanpur | 10 (Mag- chrome Powder)<br>10 (Mag- chr. Powder, normal)<br>10 (Mill scale Powder) |
| Orissa Industries Ltd, Barang, Distt. Cuttack | 19<br>5 (DBM) |
| TRL Krosaki Refractories Ltd, Belpahar, Distt. Jharsuguda. | 247.89<br>18 (Taphole clay) |
| **Silicon Carbide** | |
| Indian Metals & Carbide Ltd, Therubali | NA |
| **Synthetic Rutile** | |
| IREL, Orissa Sands Complex, Ganjam | 100 |
| **Petroleum Refinary** | |
| IOCL Paradeep Odisha | 15000 |

***(G):*** *Grinding units.*

***Note:*** *Data, not readily available for fertilizer and cement industries on respective websites.*