Indian Minerals Yearbook 2022

(Part-I)

61st Edition

STATE REVIEWS (Odisha)

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GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

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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, Keonjhar, Koraput, Malkangiri, Rayagada & Sundargarh districts; **china clay** in Bargarh, Boudh, Balangir, Keonjhar, Koraput, Mayurbhanj, Sambalpur & Sundargarh districts; and **chromite** in Balasore, Cuttack, Dhenkanal, Jajpur & Keonjhar 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, Keonjhar, Koraput, Sambalpur & Sundargarh districts; **dunite/pyroxenite** in Keonjhar 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, Keonjhar, Koraput, Mayurbhanj, Sambalpur & Sundargarh districts; **iron ore (magnetite)** in Mayurbhanj district; **limestone** in Bargarh, Koraput, Malkangiri, Nuapada, Sambalpur & Sundargarh districts; **manganese ore** in Balangir, Keonjhar, Koraput, Rayagada, Sambalpur & Sundargarh districts; **Pyrophyllite** in Keonjhar district; **quartz/silica sand** in Boudh, Balangir, Kalahandi, Sambalpur & Sundargarh districts; **quartzite** in Balangir, Dhenkanal, Jajpur, Jharsugada, Keonjhar, 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 Keonjhar district; **cobalt** in Cuttack & Jajpur districts; **copper** in Mayurbhanj & Sambalpur districts; **granite** in Angul, Boudh, Balangir, Cuttack, Deogarh, Dhenkanal, Ganjam, Keonjhar, Khurda, Koraput, Mayurbhanj, Nuapada, Rayagada & Sambalpur districts; **lead** in Sargipalli area, Sundargarh district; **mica** in Sonepur district and **nickel** in Cuttack, Keonjhar & Mayurbhanj districts. Occurrences of **ruby** and **emerald** are reported from Balangir and Kalahandi districts, respectively. **Platinum Group of Metals** occur in Keonjhar 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 gold, diamond, iron ore, manganese ore, coal & REE and other minerals during 2021-22 are furnished in Table - 3.

Production

The important minerals produced in the state during 2021-22 were Coal, Bauxite, Chromite, Iron Ore, Manganese Ore, Graphite and Limestone etc.. The value of minor minerals' production was estimated at ₹ 147 crore for the year 2021-22**.** The number of reporting mines in 2021-22 was 128 in case of MCDR minerals. (Table-4).

Table – 2: Reserves/Resources of Coal as on 1.4.2023: Odisha

(In million tonnes)

Coalfield	Proved	Indicated	Inferred	Total
Total	**52046**	**37536**	**4936**	**94519**
Ib-River	17506	20096	2228	39830
Talcher	34540	17440	2708	54689

Source: *Coal Directory of India, 2022-23.*

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 (Haematite)	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

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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	-	-	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, 2021-22

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Manganese Ore							
Keonjhar	Kendudihi-Parulipada Block	-	-	24	1163.75	-	A total of 1,163.75 m has been drilled from 24 of boreholes at 100 m x 100 m grid interval. Analytical results of borehole OKKP-1, 2, 3, 4, 5, 8, 9, 11, 14, 15, 16, 18, 19, 21, 25 and 26 show, the cumulative Mn ore zone is 1 m, 2.40 m, 5.10 m, 13 m, 6.70 m, 2 m, 2.30 m, 1.50 m, 1.8 m, 3.5 m, 7 m, 0.5 m, 1.60 m, 1 m, 5.2 m, 2.10 m thick having 10.53%, 12.40%, 10.17%, 16.57%, 14.09%, 11.86%, 12.36%, 13.24%, 13.42%, 13.86%, 10.90%, 10.10%, 12.31%, 29.09%, 14.08%, and 15.26% of Mn respectively. Analytical results of core samples from 24 boreholes show that the width of mineralized zone varies from 0.50 m to 13.00 m with an average grade of 13.53% of Mn. Petrography study of ore samples show the Mn ores are psilomelane and pyrolusite. The manganese ore occurs in discrete isolated pockets/ lenses in form of powdery and pisolitic ore hosted in shale. No correlation of mineralized zones is observed between adjacent boreholes drilled during FS 2021-22. The mineralized zones are occurred as small isolated pockets. The manganese ore zones are occurring at different depths with different thickness. The exploration was is continued during FS 2022-23 with a total drilling target of 4800 m and detailed geological mapping of 0.6 sq. km.
Balangir	Uchhabapalli-Thakurpalli Block	-	2.05	-	386	-	The major lithounits in the block are khondalite (quartz – feldspar-garnet-sillimanite+graphite schist/ gneiss), calc-silicate rocks (calc gneiss and calc-granulite), quartzite, and late intrusives include pegmatite and quartz-veins. General strike varies from NNE-SSW directions with sub-vertical dip towards east in Thakurpalli block in the south to NW-SE directions in Uchhabapalli area in the north. The area has undergone polyphase deformation. The Mn ore occurs within shallow synformal structure of the calc-sili-

(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		
							cate rock. A total 2.05 sq. km. detailed geological mapping is carried out in the block alongwith 55 cu. m Pitting / trenching. The average grade of channel sample is 15.95% Mn. A total 386 m drilling has been carried during FS 2021-22. All the boreholes intersected mineralized zone with cumulative thickness 2 m to 15 m except ODUT-3 and the strike length of mineralized zone is approximately 2700 m in Uchhabapalli-Thakurpalli area.
Gold							
Keonjhar	Gopur Block	1:1000	1.5	9	1563.15	-	Preliminary exploration for gold in Gopur Block was carried out with a total drilling of 1563.15 m and 1.5 sqkm detailed mapping in 1:1000 scale. The area belongs to Iron Ore Group exposing meta-volcanics (Pillowed metabasalt & pyroclastic). Exposures of quartz – sericite schist in Sankarkhol hill (In the southern part of the block) also observed. Gold mineralisation in the IOG is associated with zone of intense silicification and hydrothermal alteration within the metabasalt. The IOG rocks are overlain by gritty sandstone and conglomerate containing clasts of quartz, meta-chert, and quartzite and observed as capping on the Sankarkhol hill and in the south-eastern part of Sankarkhol Hill. Palaeoplacer rich in gold and uranium mineralisation is recorded in this siliciclastic sediment in its type area near Mankarchhua. Two NNE-SSW trending subparallel auriferous lodes have been delineated in the exploration area. The NNE-SSW trending central lode has been probed with 9 boreholes with 100 m spacing. Among which sulphide mineralisation zone is encountered in eight boreholes (OKG-1 to OKG-7 and OKG-9). In the southern part, there is another lode, where four first level boreholes OKG-11, OKG-12, OKG-13, OKG-14 and one second level borehole OKG-16 was drilled with 100 m spacing. Among which sulphide mineralisation zone

(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		
							is encountered in three boreholes (OKG-11, OKG-12 and OKG-16). The sulphide mineralisation zones observed in boreholes drilled for central lode is, 1) OKG-1, 64.25-77.25 2) OKG-2, 59.92-79.29 mts 3) OKG-3, 70.85-73.00 mts & 81.7-84.85 mts 4) OKG-4, 69.41-77.23 mts) OKG-5, 46.7-51.5 mts 6) OKG-6, 70.8-71.63 mts & 77.4-78.35 mts 7) OKG-7, 82.7-85.7 mts 8) OKG-9, 49.1-53.4 mts, 95.00-95.93 mts & 126.90-128.97 mts. The sulphide mineralisation zones observed in boreholes drilled for eastern lode is OKG-11, 80.00-85.40 mts (5-8%), OKG-12, 85.00-92 mts (5-8%) & OKG-16, 149.60-155.60 mts. The sulphide mineralisation such as pyrite, arsenopyrite, very few chalcopyrite and gold (observed from ore petrography study) has been observed within metabasalt with quartz, epidote and carbonate veins. The sulphide mineralisation was observed along the foliation planes and in association with quartz and epidote veins.
Diamond							
Bargarh	Padampur - Paikamal-Jharbandh area	-	675	-	-	-	An integrated approach to find out primary source rock for diamond was adopted encompassing aerial reconnaissance and remote sensing studies over 675 sq. km area, study of lineament tectonics and aero-magnetic map of the area with delineation of anomalous zones, geological traverses along the suspected zones such as Craton-Mobile Belt boundary followed by stream sediment sampling from the suspected drainage networks with good trap sites. The investigation block around Padampur-Paikamal area exposes lithounits of Bastar Craton, western margin of Eastern Ghat Mobile Belt (EGMB) and parts of Chhattisgarh sedimentaries. The cratonic lithounits include granite gneisses of different varieties mostly banded gneisses with minor migmatitic and porphyritic varieties, quartz mica schist and minor unmappable units of low-grade

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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		
							metasedimentary schists. The litho-units of EGMB occupy major parts of the study area which include garnetiferous granite gneiss, khondlite and quartzite. The Chhattisgarh Supergroup exposes ferruginous and khaki green shale, arenite and limestone mostly confined to the central portion of the area in contact with both the cratonic and EGMB blocks. Digital image processing using ASTER imagery along with study of NGLM data was carried out to prepare the lineament map of the area. ALOS PALSAR DEM (12.5 resolution) was used to prepare drainage basin and watershed map of the area. The lineaments prepared were superimposed on the geological map as well as drainage map of the area to mark some important blocks for detailed study and sample collection. Heavy minerals such as garnet, ilmenite, spinel, zircon, amphiboles, pyroxenes and epidote were recovered after separation from the stream sediment samples. A total of 110 such suspected heavy mineral grains were selected for further analysis by EPMA and SEM, of which 67 grains were selected for EMPA and 43 grains were selected for SEM studies. These heavy minerals include 52 of suspected garnets, 16 of suspected ilmenites, 06 of suspected spinel, 31 of suspected diopside grains and 05 of suspected grains which could not be identified by microscopic observation.
Copper and associated precious metals							
Mayurbhanj	Kesharpur East block	-	-	15	2243.55	385	A total of 2243.55 m drilling, 10 cu m pitting and trenching was carried out with collection of 335 CS, PS, 10 OM, 10 XRD, 10 EPMA, 10 sulphur isotope and 10 fluid inclusion samples for petrographic and other laboratory studies. The study area belongs to part of the SOI toposheet no. 73 J/12 located in the eastern fringe of Singhbhum shear zone (SSZ). Regionally, the area exposes rocks belonging to the Singhbhum Group intruded by different phases of Mayurbhanj

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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		
							granitoids and dolerite. Different rock types exposed in the area are quartzite, hornblende biotite schist, augen gneiss, hornblende granite gneiss, leuco granite and dolerite with numerous quartz veins. The general strike of the lithologies vary from WNW-ESE in western part to ENE-WSW in eastern part with moderate to steep dips towards north forming a synformal structure. The surface manifestation of mineralisation in the area is in the form of old workings, malachite and azurite stains. Surface investigation trenching has been carried out along the borehole profile lines perpendicular to the strike to expose the host rock across the mineralised zone. The analytical results of trench vary from 79 ppm to 9230 ppm. During FS 2020-22, A total of 15 of boreholes have been drilled and the average thickness of sulphide zone is 40 m which varies from 15 m to 80 m. The cumulative thickness of copper lode intersected is 26.20 m. The average grade of Cu varied from 0.25% to 1.26% and thickness varied from 2.20 m to 22.65 m. The work is in progress and resource estimation will be done after receiving complete analytical results and interpretation.
Basemetal, Graphite and REE							
Bolangir	Ampali-Badipura-Saintala area	1:12500	60	6	446.0	-	During FS 2021-22, an area of 60 sq. km has been mapped by large scale mapping (1:12,500 scale) followed by 446.0 m of drilling in 06 of scout boreholes (ODBD-1 to ODBD-6) with collection of 46 channel samples, 53Pit/Trench samples, 21 Regolith samples and 37 core samples. The occurrence of lead ore as stringers and specks of galena in a brecciated quartz vein at Badipura and Jalorpadar area have been observed. The old workings near Badipura and Jalorpdar area for galena observed well within the brecciated quartz veins, on surface old working pits are of roughly 15 m X 20 m and 25 m X 20 m in dimension respectively. The

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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		
							allanite-fluorite outcrop of about 8 m thick and about 45 m of strike length, near Bibina area has been observed, which is a potential rock hosting REEs. Channel sampling has been carried out on the brecciated quartz veins and allanite-fluorite rock and sent for chemical analysis to test its potential for basemetal and REE mineralisation respectively. The analytical results of channel samples (7 nos) of allanite rich rock shows total REE ranges from 12.60% to 14.29% and it shows an enrichment of LREE mostly La and Ce up to a value of 5.15% and 6.10% respectively while it is remarkably low in HREE ranges from 398.71 ppm to 437.32 ppm. In almost all the boreholes the brecciated zone has been intersected showing specks of sulphides mostly pyrite and few chalcopyrite. In borehole ODBD-5 a 4.75 m thick zone of allanite-fluorite-calcite has been intersected, which also shows cluster of sulphides and along fracture planes chalcopyrite and pyrite are most commonly observed. In borehole ODBD-6, a 4.0 m thick sulphide zone consists of pyrite and chalcopyrite in khondalite has been observed.
REE & RM mineralization							
Nayagarh	Khuntapada-Purushottampura area	1:12500	-	-	-	-	Reconnaissance survey for REE & RM mineralisation around Khuntapada- Purushottampura area, Nayagarh district, Odisha was taken up for LSM on 1:12500 scale along with pitting/ trenching, regolith sampling, stream sediment sampling and laboratory studies. The area of investigation being part of the EGMB, lithounits exposed in the area are khondalite, granite gneiss, leptynite, pyroxene granulite, leptynite and pegmatite. Large scale as well as detail mapping revealed that granite gneissic country rock is intruded by several leucocratic coarse grained to pegmatoidal syenite veins. A dark coloured pyroxenite dyke was delineated near Khuntapada whose intrusive nature in to the granite gneiss country rock is evident 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		
							straight and sharp contact between pyroxenite and country rock, cross cutting the foliation in the Granite gneiss. Xenoliths of syenite with irregular outline are found floating in the pyroxenite dykes. Titanite crystals are also found associated with the pyroxenite bodies which could be the source of REE. The petrographic studies of syenite, pyroxenite and their contact reveal that heavy minerals like alanite and titanite are present in pyroxenite and along the contact between pyroxenite and syenite which could be the possible source of REE. Analytical results for regolith samples indicate that tREE content in regolith varies from 184.90 ppm to 3847.48 ppm with an average of 782.83 ppm. Whereas, in BRS total REE varies from 84.409 ppm to 7436.458 ppm.and in stream sediment samples it varies from 214.87 to 1118.19 ppm. Rubidium concentration in regoliths vary from 30.46 ppm to 314.23 ppm with an average of 166.18 ppm. which is more than the average crustal abundance of 150 ppm in granitic rocks. After XRD and EPMA study, the mineral phases contributing for REE & RM content can be identified.
Graphite							
Nayagarh	Daspalla Block	-	2.3	23	1733.5	69	As a part of G-3 exploration programme, detailed mapping of 2.3 sq. km., drilling of 1733.5 m and 50 cubic metre of pitting and trenching work have been completed so far. The ore body (graphite) is hosted within khondalite and migmatised khondalite and graphite occurs as disseminations. The graphite is flaky in nature with greasy lustre. There are five occurrences of graphite mineralisation, near Tumandi-Narajipara area as observed in the quarry and pond. All the quarry sections are aligned in N-S direction. Apart from that 33 BRS samples and 36 of trench and pit samples are collected in study area as well as in the periphery of the study area. All the 69 samples are showing high values of fixed

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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		
							carbon (FC%). The FC value varies from 3.6% to 21.56% in trench samples and 2.13% to 25.02% in BRS in the study area. As the graphite body is mostly concealed beneath the surface, 1st level boreholes are planned on the N-S aligned quarry sections based on results oftrenches. Out of 23 of borehole drilled so far,20 are 1st level boreholes and 03 are 2ndlevel boreholes. 410 of core samples havebeen collected so far from 23 boreholes. As per the visual estimation of all the drilled boreholes, 26 m of graphite occurrences are delineated in borehole no. ODT-6 from 26.5 m to 52.5 m and as per the chemical analysis, three graphite zones are delineated having 3.47% FC from 28 m to 38.5 m depth, 3.13% of FC from 41 m to 46 m and 3.04% of FC from 47.5 m to 53.5 m depth. All the boreholes have intersected graphite zones except borehole ODT-9 & ODT-14. The thickest graphite zone is delineated in borehole no. ODT-22 i.e. 29.5 m graphite zone from 24.5 m to 54 m depth. As per the visual estimation of graphite zones in all the 20 of 1st level boreholes, geological profile lines of 8 boreholes i.e. ODT-5, 6, 7, 8, 15, 16, 17 & 22 are selected for 2nd level drilling.
Coal							
Angul	Kanaloi Area, Talcher Coalfield	1:10000	-	-	-	-	The detailed geological map (1:10,000 scale) of the Kanaloi area have been prepared with the help of available surface as well as projected sub-surface data. Kamthi Formation, Barren Measures and Barakar Formation are exposed in the study area from south to north direction. Outcrops of the Barakar Formation are well preserved in nala cutting section in the area whereas rocks of the Kamthi Formation are exposed in the hillocks of the Kanaloi Reserve Forest area. Kamthi Formation occurs as an overlapping sequence above either Barakar Formation or Barren Measures. The lithounits of Barren

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Table – 3 (concld)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							Measures (36.80 m-38.09 m), Barakar Formation (202.39 m to 309.10 m), Karharbari Formation (119.80 m to 170.11m) and Talchir Formation (11.30 m to 33.30 m) have been intersected downward sequentially in the boreholes. In Kanaloi area three regional coal seam zones (II, II and Combine VI-VIII in ascending order) of the Barakar Formation and one regional coal seams zone (I) of Karhabari Formation were intersected between the depth ranges from 30.25 m to 372.40 m in the boreholes. Borehole-wise cumulative coal thickness was varying from 55.20 m to 95.77 m. Seam zone II and III are the most important seam in Barakar Formation in their regional continuity and thickness and seam zone thickness of II and III in borehole was varying from 36.60 m to 47.25 m and 36.85 m to 50.10 m respectively. The parting thickness between seam zone II and III are varying from 11.90 m to 18.95 m. Seam zone combine VI-VIII is degenerated in TKNL-3. Coal splits section in Karharbari Formation are varying from 5nos to 9nos and thickness of the individual coal split section ranges from 0.50 m to 3.96 m. Exploration data in Kanaloi area has established the regional continuity of thick coal seam zone at shallow (<300m) depth along 8km along strike direction and 2 km along dip direction which further enhance the prospect of open cast mining in the area. Coal samples of boreholes have been submitted to CIMFR, Bilaspur for band-by-band as well as GCV analysis.

Table - 4 : Mineral Production in Odisha, 2019-20 to 2021-22
(Excluding Atomic Minerals)

(Value in ₹'000)

Mineral	Unit	2019-20			2020-21			2021-22 (P)		
		No. of mines	Qty	Value$	No. of mines	Qty	Value$	No. of mines	Qty	Value$
All Minerals		**130**		**343507062**	**154**		**303806246**	**128**		**586973477**
Coal	'000t	-	143016	-	-	154151	-	-	185068	-
Bauxite	t	5	15483307	10901088	5	15565611	12424241	6	16449396	18779569
Chromite	t	20	3929260	32134395	22	2830413	21862796	18	3785625	47298073
Iron Ore	'000t	64	146637	293179734	82	104485	262035370	68	136696	514531737
Manganese Ore	t	27	537325	3161505	29	482915	1948077	20	512591	2421292
Graphite (r.o.m.)	t	5	12564	34838	6	17697	46633	6	21029	63519
Iolite	kg	2	90	579	3	16	73	3	27	191
Limestone	'000t	7	5627	1848621	7	7186	2118507	7	7059	2410646
Sulphur#	t	-	253697	-	-	209387	-	-	207831	-
Minor Minerals		-	-	2246302	-	-	3370549	-	-	1468450

Note: *The number of mines excludes Fuel and Minor minerals.*
$ Excludes the value of Fuel minerals.
 # 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, Bhubaneswar	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) 3470(pig iron) 4400 (crude/liquid steel) 85 (tin plates)
Bhushan Power & Steel, Sambalpur	1000 (sinter) 2420(crude steel)
Bhushan Steel Ltd, Dhenkanal	5625 (crude Steel) 6680(Sinter) 3200(Finished steel)
Jindal Stainless Steel Ltd, Kalinganagar, Gadapur	1000 (Stainless steel) 250 (ferro alloys)
Neelachal Ispat Nigam Ltd, Khurunti, Godigotha, Sarangapur	1710 (sinter) 855 (pellets) 1100(Pig Iron) 920 (crude/liquid steel) 900(Semifinised Steel) 13 (A/S) 35(Crude Tar)
OCL India Ltd, Lamloi, Distt. Sundargarh	120 (sponge iron) 85 (billets)
Orissa Sponge Iron Ltd, Palaspanga, Distt. Keonjhar	250(Ssponge iron) 100 (steel ingot)
Shree Jagannath Steel & Power Ltd Uliburu Barbil	115.5 (Sponge iron) 112.86(M S billets)
Visa Steel Ltd, Kalinganagar, Distt. Jajpur	225 (pig iron) 300 (sponge iron) 500 (special steel)
Tata Steel Ltd Duburi Sukinda	3200(pig iron) 3000 (crude/liquid steel) 5750 (sinter)
Manhole Cover Utkal Modular, Cover) Kaurmundu	10.752(GI. Manhole 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) 60 (sponge iron) 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. Keonjhar	180
Unit-II, Kamand, Koira Distt Sundargarh	556.5 277.2 (Semi Fin. Steel)
SMC Power Generation Ltd, Jharsuguda	200 350(Billet)
Scaw Industries Pvt. Ltd, Gundichapara, Distt. Dhenkanal	100
Sponge Udyog Pvt. Ltd, Jai Bahal, Lathikata	60
Sree Metallic Ltd, Loidapada, Distt. Keonjhar	300
Suraj Products Ltd, Barpalli, Distt. Sundargarh	36
Swastik Ispat Pvt. Ltd	45
Tata Sponge Iron Ltd, Joda, Distt. Keonjhar	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 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) 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. Keonjhar	50.4
Tata Steel Ltd (Ferroalloys and Minerals Div.), Bamnipal, Distt. Keonjhar, 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) 1.2 (F. C. Mortar)
Maruti Monolithics Pvt. Ltd, Gopalpur, Tangi Choudwar	2.0(Basic fettling Mass) 2.75(Basic mortar)
Total Solution, Piplimal, Lakhanpur	10 (Mag- chrome Powder) 10 (Mag- chr. Powder, normal) 10 (Mill scale Powder)
Orissa Industries Ltd, Barang, Distt. Cuttack	19 5 (DBM)
TRL Krosaki Refractories Ltd, Belpahar, Distt. Jharsuguda.	247.89 18 (Taphole clay)
Silicon Carbide	
Indian Metals & Carbide Ltd, Therubali	NA
Synthetic Rutile	
IREL, Orissa Sands Complex, Ganjam	100
Petroleum Refinery	
IOCL Paradeep Odisha	15000

(G): *Grinding units.*

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