Indian Minerals Yearbook 2022

(Part- I)

61st Edition

STATE REVIEWS (Kerala)

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GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

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KERALA

Mineral Resources

Kerala is well-known for its deposits of excellent quality china clay and beach sands containing valuable minerals like ilmenite, rutile, sillimanite, zircon, garnet, leucoxene and monazite. The State is the principal producer of limeshell and sillimanite. The State also accounts for 23% china clay and 10% sillimanite of the country's resources. As per AMDER of the Department of Atomic Energy, Kerala state accouts for 144.02 million tonnes of ilmenite, 7.83 million tonnes of rutile and 7.96 million tonnes of zircon resources.

Important mineral occurrences in the State are: **bauxite** in Kannur, Kasaragod, Kollam & Thiruvananthapuram districts; **china clay** in Alappuzha, Ernakulam, Kannur, Kasaragod, Kollam, Kottayam, Palakkad, Thiruvananthapuram & Thrissur districts; **limestone** in Alappuzha, Ernakulam, Kannur, Kollam, Kottayam, Kozhikode, Malappuram, Palakkad & Thrissur districts; **quartz/silica sand** in Alappuzha, Kasargod, Thiruvananthapuram & Wayanad districts; **sillimanite** in Kollam & Thiruvananthapuram districts; and **titanium minerals** in Kasaragod, Kollam, Pathanamthitta & Thiruvananthapuram districts.

Other minerals that occur in the State are **fire clay** in Alappuzha, Ernakulam, Kannur & Kollam districts; **garnet** in Kollam & Thiruvananthapuram districts; **gold** in Malappuram & Palakkad districts; **granite** in Palakkad & Thiruvananthapuram districts; **graphite** in Ernakulam, Idukki, Kollam, Kottayam & Thiruvananthapuram districts; **iron ore (magnetite)** in Kozhikode & Malappuram districts; **kyanite** in Kollam & Thiruvananthapuram districts; **lignite** in Kannur districts; **magnesite** in Palakkad district; and **steatite** in Kannur & Wayanad districts (Tables - 1 and 2).

Exploration & Development

Details of exploration carried out by GSI during 2021-2022 are furnished in Table-3.

Production

Limestone is only the important minerals produced in Kerala State. The value of minor minerals' production is estimated as ₹ 3374 crore for the year 2021-22. There was only one reporting mines in 2021-22 in case of MCDR of minerals.(Table-4).

Mineral-based Industry

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

Table –2 : Reserves/Resources of Lignite as on 1.4.2023 : Kerala

(In million tonnes)

District	Proved	Indicated	Inferred	Total
Total/Kannur	–	–	**9.65**	**9.65**

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

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

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						
Bauxite	'000 tonnes	-	-	-	-	29	-	24	2037	14637	2722	-	19449	19449
Garnet	tonne	-	-	-	-	-	-	45797	100874	-	52190	-	198861	198861
Gold					-									
Ore (Primary)	tonne	-	-	-	-	-	-	-	462280	96180	-	-	558460	558460
Metal (Primary)	tonne	-	-	-	-	-	-	-	0.17	0.03	-	-	0.2	0.2
Ore (Placer)	tonne	-	-	-	-	-	-	-	-	2552000	23569000	-	26121000	26121000
Metal (Placer)	tonne	-	-	-	-	-	-	-	-	2.29	3.57	-	5.86	5.86
Graphite	tonne	-	-	15443	15443	-	8376	-	-	1088550	322606	-	1419532	1434975
Iron Ore (Magnetite)	'000 tonnes	-	-	-	-	-	-	-	-	59912	23523	-	83435	83435
Kyanite	tonne	-	-	-	-	-	-	-	174733	-	10000	-	184733	184733
Limestone	'000 tonnes	10475	-	65	10540	123286	103	-	21161	2888	36622	-	184059	194599
Magnesite	'000 tonnes	-	-	-	-	-	-	-	2	-	38	-	40	40
Pt.Group of Metals	'000 tonnes	-	-	-	-	-	-	-	-	-	0.18	-	0.18	0.18
Sillimanit	tonne	553000	-	-	553000	432713	-	-	2564254	-	3369200	-	6366167	6919167
Titanium	toone	2370712	-	-	2370712	10597943	-	-	-	19961000	87048716	-	117607659	119978371
Zircon	'000 tonnes	156509	-	-	156509	400650	-	-	123426	-	716279	-	1240355	1396864

Figures rounded off.

Table –3 : Details of Exploration Activities in Kerala, 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							
Gold							
Palakkad and Malappuram	Mulliakurssi - Vattathur area	1:12500	100	-	-	256	Large scale mapping of 100 sq.km was carried out on 1:12500 scale in toposheet nos. 58A04, 58A08, 58B01 and 58B05 with collection of 108 bedrock samples, 50 trench samples, 25 regolith samples and 50 stream sediment samples, 13 petrochemical samples, 5 XRD samples and 5EPMA samples. The area exposes rocks viz. include banded magnetite quartzite, pyroxene granulite, amphibolte and metapyroxenite of Wayanad Group, charnockite of Charnockite Group and biotite gneiss and granite gneiss of Peninsular Gneissic Complex. Younger granites and quartz-pegmatite veins are the major acidic intrusive and dolerites are the major mafic intrusive in the area. The rock units in the area underwent insitu weathering and resulted in the formation of laterite. The general trend of the pervasive foliation was NW-SE to ESE-WNW with moderate to steep dip to northerly and southerly. Shear indicators like asymmetric augens/clast, quartz ribbons, tight isoclinals folds, pinch and swell structure and boudiange structure were quite frequent in the high strained zones. Indications of mineralisation in the form of pyrite disseminations, chalcopyrite, pyrrhotite and bornite were observed in quartz veins, gneisses and banded magnetite quartzite. Intense limmonitisation and silicification of BMQ also act as surface indications of mineralisation. 23 old workings in the form of inclines, shafts and narrow trenches were observed near Maruthumppara, Vettathur, Nattukal, Thazhekkod and Telakkad in BMQ bands and associated laterites and the excavations followed the trend of

(contd)

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		
							BMQ bands. 2 to 9 m wide and 10 to 40m long NW-SE trending three leached zones were mapped around Pattikkad, Ponniyamkurussi, Vettathur and Mulliakurussi areas within charnockite and gneisses. In this leached/limonitic zone fresh pyrite, chalcopyrite was noticed and sensed smell of sulphur from this zone. These also indicated the evidence of mineralisation. Available analytical results showed Au values in bedrock samples were below detection level, ie, <0.05ppm and that in stream sediments (2 nos.) analysed 0.2ppm.
Rare Earth Elements (REE) and Rare Metals							
Idukki	Devikulam	1:12500	100	-	-	-	To evaluate the REE and rare metal potential in Devikulam area, large scale mapping on 1: 12,500 scale has been carried out and 100 sq. km area was covered. Geologically the area consists of calc-granulite and garnetiferous hornblende-biotite gneiss of Khondalite Group, charnockite of Charnockite Group, hornblende-biotite gneiss of Peninsular Gneissic Complex-II with foliated granite, granite and pegmatite. The field study implied that the granite and associated pegmatites were the favorable rock for REE mineralisation. In the study area, number of non-mappable pegmatites was observed within different lithounits. Systematic sampling was carried out to know the concentration of REE along with Augur drilling was also carried out in gridded pattern where soil samples developed over granite. In hornblende biotite gneiss, the SLREE values ranges from 402.97 to 840.42 ppm with mean value of 621.70 ppm, the SHREE values ranges from 9.46 to 20.84 ppm with mean value of 15.15 ppm and the SREE values ranges from 412.44 to 861.26 ppm with mean

(contd)

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		
							value of 636.85 ppm. In foliated granite, the SLREE values ranges from 157.18 to 1288.85 ppm with mean value of 592.94 ppm, the SHREE values ranges from 3.07 to 62.31 ppm with mean value of 24.29 ppm and the SREE values ranges from 161.39 to 1351.18 ppm with mean value of 617.24 ppm. In granite, the SLREE values ranges from 39.23 to 5145.41 ppm with mean value of 533.05 ppm, the SHREE values ranges from 0.87 to 33.37 ppm with mean value of 9.31 ppm and the SREE values ranges from 40.19 to 5178.79 ppm with mean value of 542.32 ppm. In pegmatite, the SLREE values ranges from 64.225 to 11136.06 ppm with mean value of 820.72 ppm, the SHREE values ranges from 1.50 to 191.52 ppm with mean value of 16.44 ppm and the SREE values ranges from 66.96 to 11327.59 ppm with mean value of 837.22 ppm. In regolith samples, the SLREE values ranges from 112.45 to 4994.51 ppm with mean value of 784.47 ppm, the SHREE value ranges from 6.12 to 82.89 ppm with mean value of 20.25 ppm and the SREE value ranges from 129.11 to 5077.40 ppm with mean value of 804.73 ppm. In core samples, the SLREE values ranges from 85.80 to 4149.8 ppm with mean value of 777.42 ppm, the SHREE value ranges from 11.11 to 43.50 ppm with mean value of 21.80 ppm and the SREE value ranges from 97.50 to 4169.27 ppm with mean value of 799.23 ppm. In stream sediment samples, the SLREE values ranges from 85.80 to 4149.8 ppm with mean value of 777.42 ppm, the SHREE value ranges from 11.11 to 43.50 ppm with mean value of 21.80 ppm and the SREE value ranges from 97.50 to 4169.27 ppm with mean value of 799.23 ppm.

(contd)

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		
Molybdenum							
Wayanad	Mandat block	1:1000	-	-	-	-	The detailed mapping on 1:1000 scale along with sampling was carried out in Mandat block as part of G3 stage investigation during FS 2021-22. The study area forms northern part of Southern Granulite Terrain and the rock type exposed in this area was younger acid intrusive known as Kalpatta granite and associated pegmatite/quartz veins. Pegmatites of three stages were identified, in which the youngest one with NE-SW trend, mainly carried molybdenum mineralisation in association with sulphides. The molybdenite was noticed as bluish grey flaky aggregate, associated with chalcopyrite, pyrite and fluorite in pegmatite and quartz veins. These pegmatites were pinkish coloured, consists mainly orthoclase and 5 cm to 1 m wide. The compositional zoning with quartz at the core and orthoclase at the rim and quartz-orthoclase ladder type pattern also observed. The geophysical survey delineated chargeability zones approximately 180m west of established mineralised zone with trend parallel to established mineralised zone. The chargeability profile shows that the cumulative length of this chargeability zone was 707 m and avg. width was 88 m.The dipole-dipole survey along two traverselines indicates that the depth to top of probable mineralised zone was approx. 27 m on S5 traverse and 20 m on S2 traverse. The negative SP anomaly testified in the area indicated that the area was favourable for mineralisation. The geophysical surveys ascertained that the mineralisation was structurally controlled. Base on the integration of geological, geochemical and geophysical studies four first level boreholes were planned to intersect the

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Table – 3 (concld)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Meterage		Reserves/Resources estimated
							mineralisation at 30m vertical depth. The available analytical results yielded Mo in bedrock samples ranged from 0.30 to 4624.61 ppm with an average of 175.97 ppm, Cu- 8 to 200 ppm and SREE- 9.27 to 495.03 ppm. From the received analytical results of 30 soil samples it was understood that the Mo varied from 4.62 ppm to 32.59 ppm with an average of 12.13 ppm and the average concentration of Mo, Cu, Pb, Zn in soil samples were very low. Average total REE concentration in soil samples was 265.26 ppm. Thirty-five samples were collected from channel 1 at an interval of 1m, Mo concentration in channel-1 ranged from 6.16 to 16140.37 ppm with an average of 1144.93 ppm analysed in ICPMS and the samples were also analysed in ASS in which Mo varied from 30.00 ppm to 38340 ppm with an average of 2951.98 ppm. The channel-1 delineated 70 m Mo mineralised zone with weighted average of 0.29% Mo (ASS) and 0.11% Mo (ICPMS).

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

(Value in ₹'000)

Mineral	Unit	2019-20			2020-21			2021-22 (p)		
		No. of mines	Quantity	Value	No. of mines	Quantity	Value	No. of mines	Quantity	Value
All Minerals		**2**		**31123523**	**1**		**16486191**	**1**		**34086624**
Limestone	'000t	1	398	342144	1	376	331191	1	379	345424
Limeshell	t	1	3583	15679	-	-	-	-	-	-
Sulphur #	t	-	227253	-	-	142166	-	-	182352	-
Minor Minerals		-	-	30765700	-	-	16155000	-	-	33741200

Note: *The number of mines excludes Minor minerals.*
 # Recovered as by-product from oil refinery.
@ Figures for earlier years have been repeated as estimates because of non-receipt of data for 2019-20.

Table – 5 : Principal Mineral-based Industries

Industry/Plant	Capacity ('000 tpy)
Abrasives	
Carborandum Universal Ltd, Ernakulam	NA
Carborandum Universal Ltd, Thrissur	NA
Carborandum Universal Ltd, Pattanamthitta	NA
Asbestos Products	
Hyderabad Industries Ltd (formerly, Malabar Building Products Ltd) Mulagunnathukavu, Distt. Thrissur	84
Cement	
J K Tex Coats Nadama, Kanayannur	0.030 (Cerastone) 0.025 (Rock tiles) 0.35 (Others)
Malabar Cements, Walayar, Distt. Palakkad	660
Malabar Cement, Cherthala, Distt. Alappuzha (G)	200
The Travancore Cements Ltd, Nattakom, Distt. Kottayam	81
Ceramic	
Kerala Ceramics Ltd, Kundara, Distt. Kollam	18000
Tata Ceramics, Kozhikode	NA
FACR-RCF Building Product Ltd (FRBL), Kochi.	NA
Chemical	
Tecil Chemicals and Hydro Power Ltd, Chingavanam, Distt. Kottayam	30 (calcium carbide) 2 (acetylene black) 7.5 (ferrosilicon)
Cochin Minerals and Rutile Ltd, Kadungalloor, Alwaye	50 (Synthetic Rutile) 82.5 (Ferrous cloride) 30 (Ferric cloride) 8 (Recovered Tio_2) 6 (Recovered Upgraded Ilmenite)

(contd)

Table – 5 (concld)

Industry/Plant	Capacity ('000 tpy)
Electrode	
Super Electrode, Patlla	0.6
Synthetic Rutile	
CMRL, Edayar, Distt. Ernakulam	50
KMML, Chavara, Distt. Kollam	50
TiO_2 Pigment	
TTPL, Kochuveli, Distt. Thiruvananthapuram	1.8
KMML, Chavara, Distt. Kollam	40
Fertilizer	
FACT Ltd, Udyogmandal, Distt. Ernakulam	148.5 (Complex) 225 (AS)
FACT Ltd, Ambalamedu (Cochin II), Distt. Ernakulam	485 (NP/NPKs)
Ferro-alloys	
INDSIL Electrosmelts Ltd, Pallatheri, Distt. Palakkad.	14
The Silcal Metallurgic Ltd, Wayalur.	3.6
Foundry	
HMT Machine Tools Ltd, Bengaluru.	1500
Glass	
Excel Glass Ltd, Pathirapally, Distt. Alappuzha.	72
Lead-Zinc	
BZL Zinc Ltd, Binanipuram. (Edayar Zinc Ltd)	38 (Zn ingot) 0.08 (Cd ingot) 50 (H_2SO_4)
Petroleum Refinery	
BPCL, Kochi.	12400

G; Grinding Unit

Note: *Data for Fertilizer Industries is taken from Indian Fertilizer Scenario, FAI Statistics.*