Indian Minerals Yearbook 2013

(Part- I)

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STATE REVIEWS
(Andhra Pradesh)

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ANDHRA PRADESH

Mineral Resources

Andhra Pradesh is the leading producer of apatite, barytes, ball clay, dolomite, garnet, laterite, mica, limestone and vermiculite. The State is the sole producer of asbestos. It accounts for 94% barytes, 78% kyanite, 70% corundum, 61% ball clay, 21% limestone, 41% mica and 33% garnet resources of the country. Andhra Pradesh is endowed with the internationally known black, pink, blue and multicoloured varieties of granites. Krishna-Godavari basin areas in this State have emerged as new promising areas for hydrocarbons, especially natural gas.

Important minerals occurring in Andhra Pradesh are: **apatite** in Visakhapatnam district; **asbestos** in Cuddapah district; **ball clay** in West Godavari district; **barytes** in Anantapur, Cuddapah, Khammam, Krishna, Kurnool, Nellore and Prakasam districts; **calcite** in Anantapur, Cuddapah, Kurnool and Visakhapatnam districts; **china clay** in Adilabad, Anantapur, Chittoor, Cuddapah, East Godavari, West Godavari, Guntur, Kurnool, Mahabubnagar, Nalgonda, Nellore, Rangareddi, Visakhapatnam and Warangal districts; **coal** in Adilabad, East Godavari and West Godavari, Karimnagar, Khammam and Warangal districts; **corundum** in Anantapur and Khammam districts; **dolomite** in Anantapur, Khammam, Kurnool and Warangal districts; **felspar** in Anantapur, Cuddapah, West Godavari, Hyderabad, Khammam, Mahabubnagar, Medak, Nellore, Rangareddi and Vizianagaram districts; **fireclay** in Adilabad, Chittoor, Cuddapah, East Godavari, West Godavari, Kurnool, Nalgonda and Srikakulam districts; **garnet** in East Godavari, Khammam and Nellore districts; **granite** in Anantapur, Chittoor, Cuddapah, Guntur, Karimnagar, Khammam, Krishna, Mahabubnagar, Medak, Nalgonda, Nellore, Prakasam, Rangareddi; Srikakulam, Vizianagaram and Warangal districts; **iron ore (hematite)** in Anantapur, Cuddapah, Guntur, Khammam, Krishna, Kurnool and Nellore districts; **iron ore (magnetite)** in Adilabad, Prakasam and Warangal districts; **lead-zinc** in Cuddapah, Guntur and Prakasam districts; **limestone** in Adilabad, Anantapur, Cuddapah, East Godavari, West Godavari, Guntur, Hyderabad, Karimnagar, Krishna, Kurnool, Mahabubnagar, Nalgonda, Nellore, Rangareddi, Srikakulam, Visakhapatnam and Vizianagaram districts; **manganese ore** in Adilabad, Srikakulam and Vizianagaram districts; **mica** in Khammam and Nellore districts; **ochre** in Cuddapah, West Godavari, Guntur, Kurnool and Visakhapatnam districts; **pyrophyllite** in Anantapur district; **quartz/silica sand** in Anantapur, Chittoor, Cuddapah, West Godavari, Guntur, Hyderabad, Khammam, Krishna, Kurnool, Mahabubnagar, Medak, Nalgonda, Nellore, Prakasam, Rangareddi, Srikakulam, Visakhapatnam, Vizianagaram and Warangal districts; **quartzite** in Kurnool, Srikakulam, Visakhapatnam and Vizianagaram districts; **talc/soapstone/steatite** in Anantapur, Chittoor, Cuddapah, Khammam and Kurnool districts and **vermiculite** in Nellore and Visakhapatnam districts. **Petroleum & natural gas** deposits of importance are located in the onshore and offshore areas of Krishna-Godavari basin of the State.

Other minerals that occur in the State are **bauxite** in East Godavari and Visakhapatnam districts; **chromite** in Khammam and Krishna districts; **copper** in Guntur, Khammam, Kurnool and Prakasam districts; **diamond** in Anantapur, Krishna and Kurnool districts; **fuller's earth** in Medak and Rangareddi districts; **gold** in Anantapur, Chittoor and Kurnool districts; **graphite** in East Godavari, West Godavari, Khammam, Srikakulam, Visakhapatnam and Vizianagaram districts; **gypsum** in Guntur, Nellore and Prakasam districts; **kyanite** in Khammam, Nellore and Prakasam districts; **magnesite** in Cuddapah district; **marble** in Khammam district; **pyrite** in Kurnool district; **sillimanite** in West Godavari district; **silver** in Guntur district; **titanium minerals** in East Godavari, Krishna, Nellore, Srikakulam and Visakhapatnam districts; and **tungsten** in East Godavari district (Tables - 1 and 2).

Exploration & Development

The details of exploration activities conducted by various agencies for coal and other minerals during 2012-13 are furnished in Table - 3.

Table –1: Reserves/Resources of Minerals as on 1.4.2010 : Andhra Pradesh

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						
Apatite	tonnes	36019	-	1680	37699	-	-	-	-	-	200163	-	200163	237862
Asbestos	tonnes	5754	-	9028	14782	856	3117	9191	-	1500	27085	-	41749	56531
Ball clay	tonnes	6017412	-	1288720	7306132	1821233	2806267	9512513	-	2279330	27555824	-	43975167	51281299
Barytes	tonnes	29396236	79736	1845270	31321242	173429	4252061	2500159	105872	387394	29632557	105721	37157193	68478435
Bauxite	'000 tonnes	-	-	-	-	-	-	-	188971	138120	288176	-	615267	615267
Calcite	tonnes	3267	500	-	3767	-	-	104970	8562700	5200	122148	-	8795018	8798785
China clay	'000 tonnes	2524	339	2205	5068	683	1490	1147	126	691	61883	3088	69108	74176
Chromite	'000 tonnes	-	-	-	-	-	-	-	-	15	172	-	187	187
Copper														
Ore	'000 tonnes	-	-	-	-	686	666	105	-	5791	1000	-	8248	8248
Metal	'000 tonnes	-	-	-	-	6.88	9.12	1.05	-	97.45	8.32	-	122.82	122.82
Corundum	tonnes	-	-	-	-	5824	7	9282	-	-	62008	-	77121	77121
Diamond	carat	-	-	-	-	-	-	-	200483	1524317	98155	-	1822955	1822955
Dolomite 1182453	'000 tonnes	55507	2082	10708	68297	50324	2851	29135	554	132589	896855		1848	1114156
Felspar	tonnes	5469094	408487	2301765	8179346	2504362	274566	2181547	60776	5476671	2975298	145995	13619215	21798561
Fireclay	'000 tonnes	548	647	381	1576	50	735	1314	56	908	18444	132	21638	23214
Fuller's earth	tonnes	-	-	-	-	-	-	-	-	-	25523983	-	25523983	25523983
Garnet	tonnes	2911387	4500	710000	3625887	9051	42033	-	-	8800000	6587776	-	15438860	19064747

(Contd.)

Table - 1 (contd.)

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						
Gold														
Ore (primary)	tonnes	-	-	-	-	655133	-	889515	8059000	55000	2616699	-	12275347	12275347
Metal(primary)	tonnes	-	-	-	-	2.45	-	3.57	16.93	0.17	12.60	-	35.72	35.72
Granite (Dim. stone)	'000 cu m	-	-	-	-	-	-	-	-	-	2405890	-	2405890	2405890
Graphite	tonnes	-	-	-	-	-	-	1135	-	124759	301306	-	427200	427200
Gypsum	'000 tonnes	-	-	-	-	-	-	-	-	-	404	-	404	404
Iron ore (hematite)	'000 tonnes	60038	58011	34167	152216	551	20988	32475	377	4624	169955	291	229261	381477
Iron ore (magnetite)	'000 tonnes	-	-	-	-	43034	-	-	13800	1266666	140027	14	1463541	1463541
Kyanite	tonnes	-	-	-	-	-	-	399	-	-	80353829	-	80354228	80354228
Laterite	'000 tonnes	4349	2172	6942	13463	1830	60	2625	-	1107	6895	277	12794	26257
Lead-zinc														
Ore	'000 tonnes	-	-	-	-	-	-	-	1000	4159	17530	-	22689	22689
Lead metal	'000 tonnes	-	-	-	-	-	-	-	28.70	119.53	688.65	-	836.88	836.88
Zinc metal	'000 tonnes	-	-	-	-	-	-	-	12.40	43.57	7.19	-	63.16	63.16
Limestone	'000 tonnes	2483095	581935	983048	4048078	311682	64645	460685	215847	1075504	28112011	3147926	33388300	37436378
Magnesite	'000 tonnes	-	-	-	-	-	-	-	-	-	80	-	80	80
Manganese ore	'000 tonnes	1719	596	1841	4156	412	130	251	188	4176	7877	410	13444	17598
Marble	'000 tonnes	-	-	-	-	-	-	-	-	-	3	-	3	3
Mica	tonnes	162325	15247	2790	180362	7794	5101	-	3750	5502	18277	-	40424	220786

(Contd.)

Table - 1 (concld.)

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						
Ochre	tonnes	1692839	344121	631277	2668237	-	97810	1199762	347681	-	6569575	-	8214828	10883065
Pyrite	'000 tonnes	-	-	-	-	-	-	-	-	-	880	-	880	880
Pyrophyllite	tonnes	245019	41841	171143	458003	121475	33360	-	-	75201	662193	-	892229	1350232
Quartz-silica sand	'000 tonnes	33590	3320	35772	72682	16664	6242	25109	5404	10965	65867	6099	136350	209032
Quartzite	'000 tonnes	2114	406	2131	4651	548	1009	7481	-	4390	5209	295	18932	23583
Sillimanite	tonnes	518000	-	170000	688000	-	-	-	-	7430300	1526200	-	8956500	9644500
Shale	'000 tonnes	14992	76	263	15331	-	-	245	-	-	252	83	580	15911
Slate	'000 tonnes	-	-	-	-	-	113	1187	-	-	1069	-	2369	2369
Silver														
Ore	tonnes	-	-	-	-	-	-	-	-	-	16950000	-	16950000	16950000
Metal	tonnes	-	-	-	-	-	-	-	-	-	128.13	-	128.13	128.13
Talc/soapstone/ steatite	'000 tonnes	1031	1044	3060	5135	71	168	1187	-	369	3777	537	6109	11244
*Titanium minerals	tonnes	-	-	-	-	-	-	-	-	-	76702509	-	76702509	76702509
Tungsten														
Ore	tonnes	-	-	-	-	-	-	-	3640000	4700800	5952500	509000	14802300	14802300
Contained WO_3	tonnes	-	-	-	-	-	-	-	5096.00	6574.64	8273.65	318.28	20262.57	20262.57
Vermiculite	tonnes	102058	24593	50939	177590	1912	3981	2750	35195	9878	119270	3600	176586	354176

Figures rounded off.

** Resources of ilmenite, rutile, leucoxene and zircon as per Department of Atomic Energy are provided in the respective Mineral Reviews.*

The proved and indicated balance recoverable reserves of crude oil and natural gas as on 1.4.2013 in the State are 7.42 million tonnes and 48.21 billion cu m, respectively.

Table – 2: Reserves/Resources of Coal as on 1.4.2013 : Andhra Pradesh

(In million tonnes)

Coalfield	Proved	Indicated	Inferred	Total
Total/Godavari Valley	9604.46	9553.91	3048.59	22206.96

Source: *Coal Directory of India, 2012-13.*

Table – 3 : Details of Exploration Activities in Andhra Pradesh, 2012-13

Agency/ Mineral/ District	Location	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Base - metals							
Anantapur	Cherlapalle Kanganapalle area	1:2,000	-	7	818.30	-	Prospecting stage (G-3) exploration for copper was carried out to assess copper mineralisation in quartz reef by detailed mapping, trenching and pitting and collection of bedrock samples followed by exploratory drilling. The work was taken up based on encouraging results of base metal mineralisation in quartz reef located SW of Cherlapalle FS 2008-10. The mineralised quartz reef having strike length of 1.2 km and width 1 m to 12 m has been delineated at the sheared contact between granite-granodiorite and amphibolite. The surface manifestation of base metal mineralisation occurs as malachite stains, box work and cavities due to leaching of sulphides. Most of the BRS samples indicated copper value less than 0.2%. Trench sections across the quartz reef show composite quartz veins. From the analytical results of the trench samples, it is found that the copper concentration in the mineralised body is 0.11% (wt. Av) over a strike length of 1 km. This is wider in the middle part and pinches out towards both north and south ends. In Cherlapalle block (6 boreholes to intersect the mineralised zone at 60 m vertical depth and one borehole to intersect at 120 m vertical depth). Four mineralised zones have been identified in BH-1 (i) 2.5 m x 0.24% Cu between 40.55 m and 43.05 m depth (ii) 2.5 m X 0.21% Cu between 45.85 m and 48.35 m depth (iii) 1.5 m X 0.2% Cu between 64.65 m and 66.15 m depth (iv) 4.10 m X 0.23% Cu between 67.15 m and 71.25 m depth and one zone in RCD-3 i.e. (i) 2.5 m x 0.38% Cu between 47.50 m and 50.00 m depth. The analytical results of BH-4, 5, 6 and 7 are awaited. The copper mineralisation in all the boreholes is in the form of malachite and covellite (up to 30 m to 35 m depth) and fine disseminated fresh chalcopyrite at deeper level. Wall rock alteration is seen in the form of chloritisation, silicification and epidotisation. The exploration work has been completed.

(Contd.)

Table – 3 (Contd.)

Agency/ Mineral/ District	Location	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Coal							
Khammam	Bugga-Khammamtogu	1:10,000	1.50	3	625.05	-	Regional exploration for coal was continued in Southern Part of main basin,Godavari Valley Coalfield, to explore and evaluate coal resource potentiality of Barakar coal seams already established in the adjoining Manuguru Mining Block lying to the north-east. During the period a total of 578.00 m GP logging was completed. Three Barakar coal/carbonaceous shale bands varying in thickness from 0.50 m to 1.90 m were intersected between 537.85 m and 556.20 m depth in borehole BH-2, whereas nine coal/ carbonaceous shale bands and six Barakar coal/carbonaceous shale bands varying in thickness from 0.50 m to 2.00 m were intersected between 57.36 m and 371.60 m depths in borehole BH-4. The work is in progress.
-do- (Godavari Valley Coalfield)	Pagaderu (West) Sector	-	-	04	1387.60	-	Regional exploration for coal in Southern part of main basin, Godavari Valley Coalfield, was carried out to explore and evaluate coal potentiality of Lower Kamthi and Barakar coal seams in the down dip side of adjoining Manugu mining blocks and north-east of Bugga-Khammamtogu sector. During the period a total of 224.00 m GP logging was completed.Thirteen Lower Kamthi coal/carbonaceous shale bands and four Barakar coal/carbonaceous shale bands varying in thickness from 0.30 m to 2.10 m were intersected between 15.90 m and 236.87 m depths in borehole BH-1. Fifteen coal/ carbonaceous shale bands varying in thickness from 0.55 m to 1.96 m were intersected between 196.95 m and 443.59 m depths in GPDW-2, whereas eight coal/ carbonaceous shale bands of Lower Kamthi Formation varying in thickness from 0.50 m to 1.35 m were intersected within shallow depth range from 33.90 m to 86.00 m in borehole BH-3. Thirty coal/carbonaceous shale bands varying in thickness from 0.50 m to 1.45 m were intersected between 30.86 m and 373.18 m depths in borehole BH-4. The work is in progress.

(Contd.)

Table – 3 (Contd.)

Agency/ Mineral/ District	Location	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Coal							
Khammam & West Godavari	Vutasamudram-Venkatapuram area	-	-	01	67.70	-	Reconaissance stage (G-4) exploration by scout drilling was continued during FS 2012-13 in this area**,** Southern sub-basin of Godavari Valley Coalfield, to explore and evaluate coal potentiality of Barakar and Lower Kamthi formations, already established in Northern adjoining Narayanpuram-Pattayagudem and Sitanagaram areas and to decipher the structural and stratigraphic set up of the area. During the period a total of 390.00 m GP logging was completed.The borehole intersected Lower Kamthi Formation and the investigation was completed.
Chromite							
Krishna & Khammam	Kondapalli & Gangineni	1:2,000	-	-	-	215	Reconnaissance stage (G-4) exploration for Chromite and PGE was carried out to delineate mineralised zones of chromite and PGE. The area is represented by high grade granulite and gneisses belonging to the Khondalite and Charnockite suite belonging to the Eastern Ghat Supergroup. The acid and basic charnockites are the predominant rock types, which are represented by hypersthene-K-felspar-quartz-garnet-gneiss, pyroxene granulite, meta gabbro, etc. The ultramafic suite of rocks occur as lensoid bands and thin sheets within acid and basic charnockites. Chromite occurs within the ultramafic rocks particularly serpentinite and pyroxenite as lenses, veins, pockets, bands and as disseminations. These bands vary in dimension from quarry to quarry ranging from few centimeters to 1.5 m to 2.00 m. The detailed mapping was carried out in the old working area of Gangineni quarry block and Nakkerlapadu- Jangambodu quarry block. Gangineni quarry shows several bands of chromite varying in thickness from 30 cm to 3-4 m. Chromite occurs as patches, pods or pockets, lenses, veins, etc within pyroxenite. Nakkerlapadu quarry is an old pit where lumpy and massive chromite occur as small vertical and parallel bands and also in the form of disseminated chromite grains within pyroxenite. The mineralised zones within pyroxenite trend in N20°W direction and are ~ 1m in width. Towards SE side of the main Nakkerlapadu quarry a zone of chromiferrous pyroxenite of approx. 2 m has been traced within a trial trench. A zone of weathered pyroxenite of ~2m width has

(Contd.)

Table – 3 (Contd.)

Agency/ Mineral/ District	Location	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Chromite							
Krishna & Khammam	Kondapalli & Gangineni (Concld.)	1:2,000	-	-	-	215	been noticed along with sulphide staining within the Jangambodu quarry. At place pyroxenite occurs as conformable bands and lenses of variable dimensions from 1 m – 20 m in length and 0.5 m to 5 m in width, with sharp contacts. Systematic sampling has been done during the mapping from significant locations of contact/alteration zones, sulphide enrichment zones, in ultramafic bodies for chromite /PGE minera-lisation. Chemical analysis results of 174 Nos. of bedrock samples out of 200 shows Cr ranging from 1.11% to 36.3% with Ni value ranging from 1087 ppm to 2658 ppm showing favou-rable locale for PGE mineralisation. Cr % from Gangineni quarry area ranges from 1.11% to 34.68%, Nakkerlapadu quarry area 1.49% to 36.3%, Jangambodu quarry area 1.51% to 33.19% making them suitable for metallurgical purpose. The EPMA study of chromite and chromiferous pyroxenite shows that the composition of Cr_2O_3 ranges from 30.05-54.38 wt%, FeO from 6.64-27 wt%, Al_2O_3 from 10-14.48 wt%, MgO from 6.36-32 wt%. EPMA Analyses of chromitites revealed the presence of significant Al_2O_3 (up to 14.48%) indicating that the major part of Chromitite is made up of chrome-spinel showing presence of PGE. At places notable MgO contents(up to 9.5%) are analysed indicating the presence of subordinate magnesio - chromite content. The ortho-pyroxenes may be ferro-hypersthene, present as a major silicate. Chromite ore also shows presence of sulphide minerals like pyrrhotite, chalcopyrite, pyrite, molybdenite which indicate the presence of sulphide phase along with oxide phase of chromite. The geophysical survey has been also carried out in the Gangineni quarry block (3.6 Gravity survey / 5.1 Magnetic surveys) for locating potential ultramafic bodies and to ascertain the depth persistence, overal disposition and expected volumetric dimension of host rock of mineralisation, but the data is awaited. The investigation will be continued during FS 2013-14.

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Table – 3 (Contd.)

Agency/ Mineral/ District	Location	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Diamond							
Kurnool	Chelima-Velugodu block	-	-	-	-	-	Reconnaissance stage (G-4) investigation was carried out for search of Kimberlite/ Lamproite. Total 150 stream sediment samples were collected from Chelima block from suitable trap sites covering an area of 720 sq. The major heavy mineral population recovered after processing includes magnetite, spinels, epidote, garnet, zircon, amphibole, ilmenite, hematite and iron hydroxide. The stream sediment samples no.CH-8 and CH-63 and CH- 150 yielded chrome spinels. Few of the analytical results of chrome spinel suggest it to be coming from close to diamond stability field. Besides systematic stream sediment sampling, close spaced traverses were also carried out in the study area which led to the discovery of a new Lamproite body 3 km south of Village Pachcharla and small outcrops of lamproite in old working, 3 km east of Sarva Narasimha Swami temple. The investigation has been completed.
- do - Mahabubnagar & Rangareddy	Koilkonda-Devarakadra block	-	-	-	-	160	Reconnaissance stage (G-4) investigation was carried out for search of Kimberlite/ Lamproite. A total of 1440 sq km area falling in Toposheet number 56 H/13 bounded by latitudes 16° 45' N to 17° 00' N and longitudes 77° 45'E to 78° 00' E was covered. An integrated structural lineament map was prepared with the aid of satellite imagery, aerial photo-graphs, toposheet and geological map. Additional inputs, like structural trends of the known kimberlite occurrences from adjoining areas were taken into consideration for preparation of inte-grated map. A total 160 numbers of stream sediment samples from appro-priate trap sites from 2nd, 3rd, 4th and 5th order streams were collected. The heavy mineral study indicated assemblages of magnetite, spinels, epidote, garnet, zircon, amphibole, ilmenite, goethite hematite which are typical of granitoids and gneiss- migmatite provenance. Few ilmenite (KIM) grains were identified as Mn-ilmenite (pyrophanite) after EPMA examination. The Mn-ilmenites can be suspected as possible Kimberlite indi-cator mineral as it has been seen in adjoining Narayanpet Field. To target the source of the Mn-ilmenite (Kimberlites) additional stream samples were collected to narrow down the target area coupled with close spaced intense ground check in those upstream area from where Mn-ilmenite were recovered. The investigation has been completed.

(Contd.)

Table – 3 (Contd.)

Agency/ Mineral/ District	Location	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Limestone							
Guntur	Macherla - Rentachintala-Gurajala	1: 12,000	200.0	-	-	390	Reconnaissance stage (G-4) investigation for preliminary assessment of cement grade limestone was taken up in the area between Macherla-Rentachintala-Gurajala. BRS samples, petrochemical samples, 50 pitting/trenching samples and petro-logical samples have been collected. Analytical results of two hundred samples are received, out of which one hundred samples are showing encouraging CaO values (40.52%) with corresponding low (<18%) SiO_2 value. The investigation has been completed.
- do -	Pulipadu & Gangavaram	1:5,000	5.0	20	-	-	Prospecting stage (G-3) exploration for assessment of limestone resources in the area was taken up. An area between Gangavaram and Pulipadu village has been mapped. A total number of 20 boreholes of 60 m depth have been drilled in 500 m x 500 m grid. Core drilling has been done for 3 boreholes (BH-20, BH-9 and BH-16) and the DTH drilling has been carried out for the remaining 17 boreholes. In all the bore holes limestone is present beyond the depth of 60 m. In Northern part of the area the soil and weathered limestone thickness is very high (~90ft). Towards the surface (up to 5 m - 7 m depth) the colour of limestone is grey. The variegated nature is observed up to the depth of ~30 m. At higher depth, the colour of limestone turns to grey to dark grey. Narrow bands of shaly limestone (< 1m thick) and thin brecciated zones (few cm thick) are also present. Chemical result of bedrock samples shows more than 50% of the samples contain high (>40%) CaO, but the SiO_2 content is inversely proportional with CaO. Resource estimation work for different grades of limestone is in progress. Investigation has been completed.

(Contd.)

Table – 3 (Contd.)

Agency/ Mineral/ District	Location	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Phosphorite							
Kurnool & Anantapur	Ankireddypalli & Owk	1: 12,500	200.0	-	-	220	Reconnaissance stage (G-4) investigation for reappraisal of Phosphorite potential in the area was initiated with the objective of delineating the potential zones of Phosphorite. An area was mapped in and around Bugga-Kolimigundla-Petnikota area. The rocks exposed in the area are of Tadpatri and Gandikota Formations of Chitravathi Group belonging to Mesoptroterozoic Cuddapah Supergroup and Banaganapalle quartzite, Narji limestone, Owk shale, Paniam quartzite of Neoptroterozoic Kurnool Group. Besides large scale mapping, bedrock, trench and pit samples were collected for analysing P_2O_5 and other associated oxides such as CaO, MgO, SiO_2 and R_2O_3. The ridges in the area comprises of Narji limestone at the bottom, which is overlain by Owk shale and Paniam quartzite. The Owk shales host the phosphatic bands. The Owk Formation in the area has a variable thickness of 50 m to 100 m and comprises of lower calcareous Khaki green shale (40 m to 70 m) and upper non-calcareous variegated shale (10 m to 30 m). The phosphatic bands are mainly associated with the Khaki-green shale at the interface of Khaki-green and variegated shale. Maximum of seven thin phosphatic bands in Kalina Konda (474 m) and five thin phosphatic bands in Veduru Konda hill (440 m) sections were delineated based on its different

(Contd.)

Table – 3 (Contd.)

Agency/ Mineral/ District	Location	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Phosphorite							
Kurnool & Anantapur	Ankireddypalli & Owk (Concld)	1: 12,500	200.0	-	-	220	physical appearance, nature of weathering. About 5 cm to 35 cm thick phosphatic bands are recorded associated within the Khaki green shale of Owk Formation. The lower phosphatic bands are hard and compact, fine grained and jet black in colour, but the upper interface band between the Khaki green and variegated shale is often greyish white to greyish black in colour and comparatively has more aerial exposure in the mapped area. These bands are discontinuously exposed but its structural disposition shows they are extending laterally. Out of the available analytical results of 220 bedrock samples, 84 samples have indicated P_2O_5 content ranging from 5.02% to 19.08% and from 55 trench samples 18 samples gave P_2O_5 content ranging from 5.6% to 15.1%. The presence of fluorapatite in phosphatic bands is confirmed by XRD analysis. Large Scale Mapping reveals that phosphatic bands are sheet-like bodies having a maximum thickness up to 35 cm. The investigation will be continued.

(Contd.)

Table – 3 (Concld.)

Agency/ Mineral/ District	Location	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
REE/RM							
Nellore	Vutukuru & Kalichedu	1: 125000	-	-	-	-	Reconnaissance stage (G-4) investigation for REE in the area between Vutukuru and Kalichedu was initiated to delineate REE zones within pegmatite by large scale mapping, pitting, trenching and sampling. Heavy mineral concentrates comprising ilmenite, hornblende, tourmaline, staurolite, hematite, garnet, magnetite and corundum were recovered during the course of stream sediment sampling in the Kalichedu block. The stream sediment samples collected in and around Ammavaripalem area shows anomalous REE values. The source for the anomalous value may be granite. Ilmenite mineralisation in the form of thin ramified veins within the pegmatites were observed and mapped near Peramallapodu area. Thirteen pegmatite bodies were observed and mapped in the Kalichedu block. The samples collected from Kalichedu block reveals that the rocks are metaluminous to peraluminous. They possess sub-alkaline character and rarely alkaline character. Bedrock samples of mainly pegmatite and quartzite shows the presence of hafnium. Three hundred samples were submitted for ICP-MES study (for REE and trace elements) at chemical division, GSI(SR), Hyderabad. The results are awaited and interpretation is in progress. The item will be continued during FS 2013-14.

Production

The value of mineral production in Andhra Pradesh at ₹ 24,859 crore in 2012-13 was 3% higher as compared to that in the previous year. Almost, all important minerals are produced in Andhra Pradesh. The principal minerals produced in the state were coal, natural gas (utilised), limestone, barytes and petroleum (crude) which together accounted for 49% of total value of mineral production in the state during 2012-13. Coal alone contributed about 37% and minor minerals accounted for about 50% of the total value of mineral production in the State.

Andhra Pradesh is ranked third position among the states with a contribution of 9% to the total value of the mineral production in the country. It was the sole producer of apatite and asbestos in India and also contributes almost entire output of barytes. In addition, it was the leading producer of mica (crude), vermiculite, laterite, sand (others), quartz, sillimanite, quartzite, mica (waste & scrap), silica sand and limestone with a share of 94%, 80%, 77%, 71%, 59%, 55%, 49%, 47%, 45% and 22% in the total production of respective minerals in the country. It is the second leading producer of felspar (34%), dolomite (23%) and ball clay (10%).

Among the important minerals produced in the state, the output of quartzite increased by 82%, quartz 70%, garnet (abrasive) 58%, felspar 54%, clay (others) 47%, laterite 45%, asbestos 40%, dolomite 19%, limestone 14%, manganese ore 13%, shale 7%, silica sand 4% and that of coal by 2 percent. However, a decline in production was observed in barytes 2%, petroleum (crude) 3%, natural gas (utilised) 8%, steatite and sand (others) 13% each, sillimanite 25%, vermiculite 29%, kaolin 33%, mica (crude) 34%, ball clay 34%, iron ore 37%, fireclay and ochre 50% each, lime kankar 67% and apatite 80% as compared to the output in the previous year. (Table-4).

The production value of minor minerals was estimated at ₹12,336 crore for the year 2012-13. The number of reporting mines in the State was 680 in 2012-13 as against 621 in the previous year.

The index of mineral production in Andhra Pradesh (base 2004-05=100) was 141.3 in 2012-13 as compared to 139.2 in the previous year.

Table – 4 : Mineral Production in Andhra Pradesh, 2010-11 to 2012-13
(Excluding Atomic Minerals)

(Value in ₹ '000)

Mineral	Unit	2010-11			2011-12			2012-13 (P)		
		No. of mines	Quantity	Value	No. of mines	Quantity	Value	No. of mines	Quantity	Value
All Minerals		**456**		**218645465**	**621**		**241467938**	**680**		**248592274**
Coal	'000 t	50	51333	81106100	50	52211	90008100	50	53190	91695800
Natural Gas (ut.)	mcum	-	1386	8871786	-	1363	9804492	-	1249	10329390
Petroleum (crude)	'000 t	-	305	5568745	-	305	5541226	-	295	5361853
Iron Ore	'000 t	34	1560	478212	40	1776	691697	36	1111	598025
Manganese Ore	t	38	290785	526834	39	327387	588258	40	369442	524427
Apatite	t	1	2585	6134	1	2917	6164	1	572	1208
Asbestos	t	3	268	13341	3	276	13347	3	387	17900

(Contd.)

Table – 4 : (Concld.)

(Value in ₹ '000)

Mineral	Unit	2010-11			2011-12			2012-13 (P)		
		No. of mines	Quantity	Value	No. of mines	Quantity	Value	No. of mines	Quantity	Value
Ball Clay	t	12	259380	70384	14	276799	88705	13	181870	92596
Barytes	t	7	2332701	2695846	11	1768925	1681549	13	1731472	5616338
Clay (others)	t	6	84875	8402	10	99919	8502	12	146672	15400
Corundum	kg							1	-	-
Dolomite	t	20	1216373	363958	39	1299126	431236	35	1549395	445927
Felspar	t	20	208740	57878	23	289261	79262	38	445001	134639
Fireclay	t	9	26423	5871	16	55578	10103	14	28028	6204
Garnet (abrasive)	t	2	153574	183821	2	54213	262194	2	85581	474141
Kaolin	t	8	10431	1440	11	75115	11775	8	50236	8370
Sillimanite	t	-	17849	136438	-	31992	304402	-	23896	204341
Laterite	t	9	633253	70005	26	1800704	260228	37	2610853	368734
Limestone	'000 t	82	52633	7375266	97	54602	7777269	99	62115	8643469
Lime Kankar	t	1	615	215	2	830	355	2	275	138
Mica (crude)	t	28	1317	44124	29	1784	61967	27	1176	37649
Mica (waste & Scrap)*	t	-	4648	-	-	7313	-	-	6944	-
Ochre	t	3	39376	6194	8	189087	32921	11	94186	13537
Pyrophyllite	t	-	-	-	-	-	-	-	-	-
Quartz	t	32	214626	40845	74	361566	73655	107	616053	144637
Quartzite	t	4	7717	4275	10	98955	44330	15	180485	73101
Silica Sand	t	45	1239896	82650	65	1582312	142157	61	1649138	235393
Sand (others)	t	11	1673153	91014	8	2157012	134198	8	1871036	150235
Shale	t	2	123106	7941	4	115998	8833	4	124025	8789
Slate	t	-	-	-	-	-	-	-	-	-
Talc/steatite soapstone	t	25	59336	25684	35	91646	34941	38	79546	25474
Vermiculite	t	4	17081	8314	4	8652	3631	5	6169	2118
Minor Minerals@	-	-	-	110793748	-	-	123362441	-	-	123362441

Note: *The number of mines excludes petroleum (crude), natural gas (utilised) and minor minerals.*

** Includes mine waste obtained while dressing of crude mica.*

@ Figures for earlier years have been repeated as estimates, wherever necessary, because of non-receipt of data.

Mineral-based Industry

The principal large and medium-scale mineral-based industries in the Organised Sector in the State are given in Table - 5.

Table – 5 : Principal Mineral-based Industries in Andhra Pradesh

Industry/plant	Capacity ('000 tpy)
Abrasives	
Grindwell Norton Ltd, Renigunta, Distt. Chittoor.	5
Aluminium Foil	
Indal, Kollur.	3
Asbestos Products	
Bhagyanagar Wood Plast Ltd, Nandikandi, Distt. Medak.	60
Hyderabad Industries Ltd, Sanathnagar, Distt. Rangareddi.	160
Hyderabad Industries Ltd, Thimmapur.	230
Hyderabad Industries Ltd, Ibrahimpatnam, Distt. Krishna.	45
J.J. Spun Pipe Industries, Arsapalli, Distt. Nizamabad.	4.5
Ramco Industries, Ibrahimpatnam, Distt. Krishna.	225
Visaka Industries Ltd, Medak.	36
Bleaching Clay	
Ashapura Clay Tech. Ltd, Dharur, Distt. Rangareddi.	20 (Fuller's earth granules) 15 (Bentonite granules)
Cement	
ACC Ltd, Mancherial, Distt. Adilabad.	325
Andhra Cements Ltd, Gandhi Nagar, Vijayawada (G).	240
Andhra Cements Ltd (Visaka Cement Works), Durga Nagar, Distt. Visakhapatnam (G).	1120
Andhra Cements Ltd, Durga Cement Works, Dachepalli, Distt. Guntur.	800
Anjani Portland Cements Ltd, Anjanipuram, Distt. Nalgonda.	297
Bhagya Lakshmi Cement Ltd, Vajinapalli, Distt. Nalgonda.	99

(Contd.)

Table - 5 (Contd.)

Industry/plant	Capacity ('000 tpy)
CCI Ltd, Adilabad, Distt. Adilabad.	400
CCI Ltd, Tandur, Distt. Rangareddi.	1000
Chanakya Cements Ltd, Wadapalli, Distt. Nalgonda.	400
Dalmia Cement (Bharat) Ltd, Cuddapah.	2660
Deccan Cements Ltd, Bhavanipuram, Distt. Nalgonda.	797
Grey Gold Cements Ltd, Mattampally, Distt. Nalgonda.	50
Hemadri Cements Ltd, Vedadri, Distt. Krishna.	181
Kesoram Cement, Basantnagar, Distt. Karimnagar.	1500
Koramandal Cements Ltd, Ramapuram, Distt. Nalgonda.	66
Kakatiya Cement and Sugar Industries Ltd, Dondapadu, Distt. Nalgonda.	302
Keerthi Industries Ltd, Mellacheruvu, Distt. Nalgonda.	297
Lanco Industries Ltd, Chittoor.	80
Madras Cements Ltd, Jayantipuram, Distt. Krishna.	2800
Maata Cements Ltd, Dopperla, Distt. Visakhapatnam.	99
Mancherial Cement Co. (P) Ltd, Mancherial, Distt. Adilabad.	335
My Home Cement Industries Ltd, Mellacherur, Distt. Nalgonda.	3200
Nagarjuna Construction Co. Ltd, Rachorla, Distt. Kurnool.	198
Orient Cement, Devapur, Distt. Adilabad.	2400
Panyam Cements & Mineral Industries Ltd, Cement Nagar, Distt. Kurnool.	531
Penna Cement Industries Ltd, Talaricheruvu, Distt. Anantapur.	1500
Penna Cement Industries Ltd, Boyareddy Palli, Distt. Anantapur.	2000

(Contd.)

Table - 5 (Contd.)

Industry/plant	Capacity ('000 tpy)
Penna Cement Industries Ltd, Ganeshpahad, Distt. Nalgonda.	1000
Rain Commodities Ltd (Priyadarshini Cements), Ramapuram, Distt. Nalgonda.	1000
Sagar Cements Ltd, Mallapally, Distt. Nalgonda.	198
Shri Chakra Cements Ltd, Guntur.	698
Shez Cements Ltd, Chintalapalem, Distt. Nalgonda.	200
The India Cements Ltd, Chilamkur, Distt. Cuddapah.	1550
The India Cements Ltd, Malkapur, Distt. Rangareddi.	2100
The India Cements Ltd, Yeraguntla.	520
Raasi Cements, Wadapally, Distt. Nalgonda.	
The KCP Ltd, Macherla, Distt. Guntur.	660
Toshali Cement Ltd, Visakhapatnam.	132
Ultra-Tech Cements Ltd, Tadipatri, Distt. Anantapur.	5600
Visaka Cement Industries Ltd, Malkapur, Distt. Rangareddi.	1120
Zuari Cements Ltd (Sri Vishnu Cements Works), Dondapadu, Distt. Nalgonda.	1679
Zuari Cement, Krishna nagar, Distt. Cuddapah.	2079
Chemical	
A.P. Carbides Ltd, Kurnool.	23 (calcium carbide)
Andhra Sugars Ltd, Saggonda, Distt. West Godavari.	132 (caustic soda) 99 (H_2SO_4)
Shree Rayalseema Alkalies & Allied Chem. Ltd, Gondiparla, Distt. Kurnool.	69.5 (caustic soda) 49.8 (Cl) 24.7 (HCl) 23.1 (KOH)
Shree Rayalseema High Strength Hypo Ltd, Gondiparla, Distt. Kurnool.	9 (bleaching powder) 45 (H_2SO_4) 15 (Oleum)
Ceramic	
Hindustan Sanitaryware & Industries Ltd, Bibinagar, Distt. Nalgonda.	18

(Contd.)

Table - 5 (Contd.)

Industry/plant	Capacity ('000 tpy)
Montana International Ltd, Faralwadi, Distt. Medak.	3.6
RAK Ceramics India Pvt Ltd, Jaggammagaripeta, Distt. East Godavari.	NA
Restile Ceramics Ltd, Mikapur.	1.4 (mill. sq m)
Sentini Ceramics Pvt Ltd, Kanukollu, Distt. Krishna.	75
Spartek Ceramics India Ltd, Narsingapuram, Distt. Chittoor.	NA
Fertilizer	
Coromandel Fertilizer Ltd, Vizag.	124.00 (N_2) 166.00 (P_2O_5)
Coromondel Fertilizers Ltd, (Formerly Godavari Fertilizers & Chemicals Ltd), Kakinada, Distt. East Godavari.	1000 (NPK)
Krishna Industrial Corpn. Ltd, Nidadavole, Distt. West Godavari.	66.00 (SSP) 33.5 (H_2SO_4)
Nagarjuna Fertilizers & Chemicals Ltd, Kakinada, Distt. East Godavari.	549.60 (N_2)
Subhodaya Chemicals, Govaripatnam, Distt. West Godavari.	100 (SSP)
The Andhra Sugars Ltd, Kovvur, Distt. West Godavari.	66 (SSP) 45 (H_2SO_4)
Pesticides	
Jayalakshmi Fertilizers, Tanuku, Distt. West Godavari.	2.4
Glass	
Ceat Ltd, Thimmapur, Distt. Mahabubnagar.	10
Triveni Glass Ltd, Kondagudem, Distt. West Godavari.	10 (mill. sq m)
Iron & Steel	
Visakhapatnam Steel Project, Visakhapatnam.	5256 (sinter) 3400 (pig iron) 2656 (saleable steel) 3000 (crude/liquid steel) 42 (amm. sulphate)
Pig Iron	
Lanco Industries Ltd, Rachaguneri, Distt. Chittoor.	165
Mid-west Iron & Steel Co Ltd, Dusi, Distt. Srikakulam.	90

(Contd.)

Table - 5(Contd.)

Industry/plant	Capacity ('000 tpy)
Sathavahana Ispat Ltd, Haresamudram, Distt. Anantapur.	120
Pellets	
Essar Steel Ltd,Visakhapatnam.	8000
Sponge Iron	
Ashirwad Steels & Ind. Ltd, Veliminedu, Distt. Nalgonda.	60
Anand Metallics & Power Pvt. Ltd, Kodi Cherla, Distt. Mahbubnagar.	NA
Bright Star Iron & Steel Ltd, Mekaguda, Distt. Mahabubnagar	NA
Binjusaria Sponge & Power Pvt. Ltd, Farooq Nagar, Distt. Mahabubnagar.	30
GSAL (India) Ltd, Sriramapuram, Distt. Vizianagaram.	220
Kumar Metallurgical Corpn. Ltd, Nalgonda.	60
Lakshmi Gayatri Iron & Steel, Kethepally, Distt. Nalgonda.	NA
Reactive Metals of India Ltd, Appajipally, Distt. Mahabubnagar.	100 (TPD)
Sunder Steels Ltd, S.D. Road, Secunderabad.	24
Sponge Iron India Ltd, Paloncha, Distt. Khammam.	60
Sree Rayalseema Green Steloy Ltd, Gooty, Distt. Anantapur.	36
Sri Venkateshwara Sponge & Power Pvt Ltd, Merlapaka, Distt. Chittoor.	90
Maa Mahamaya Industries Pvt Ltd, Relligaurammapeta, Distt. Vizianagaram.	NA
Ferro-alloys	
Andhra Ferro Alloys Ltd, Kothavalasa, Distt. Vizianagaram.	20

(Contd.)

Table - 5(Concld.)

Industry/plant	Capacity ('000 tpy)
FACOR, Ltd, Shreeramnagar, Distt. Vizianagaram.	72.5
GMR Technologies & Ind, Ltd, Ravivalasa, Distt. Srikakulam.	25
Jindal Strips Ltd, Kothavalasa, Distt. Vizianagaram.	40
Nav Bharat Ferro Alloys Ltd, Paloncha, Distt. Khammam.	125
Shree Sarda Alloys Ltd, Ravivalasa.	6
VBC Ferro Alloys Ltd, Rudraram, Distt. Medak.	37
Refractory	
Carborandum Universal Ltd, Visakhapatnam.	3.6
MPR Refractories Ltd, Medak.	9.5
RHI Clasil Ltd, Venkatapuram, Visakhapatnam.	50
Raasi Refractories, Narketapally, Distt. Nalgonda.	35
Vesuviusindia Ltd, Visakhapatnam.	24
Sea Water Magnesia	
Birla Periclase, Visakhapatnam	50
Indian Rayon & Industries Ltd, Visakhapatnam.	NA
Lead-zinc	
HZL, Vizag Zinc Smelter, Visakhapatnam.	56 (Zn)
Petroleum Refinery	
HPCL, Vizag.	8300
ONGC, Tatipaka	70

Note: *As per All India Graphite Crucible Manufacturers Association, Rajahmundry, about 44 graphite crucible plants operate in the region in small and medium scale. However, information on installed capacity is not available.*