

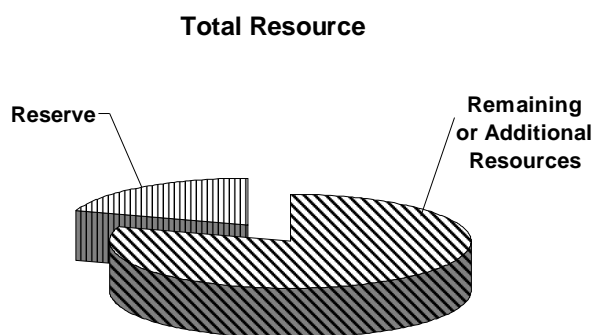
11.1 United Nations Framework Classification (UNFC) System - Concepts and Terminologies

The UNFC consists of a three-dimensional system with the following three axes : Geological Assessment, Feasibility Assessment and Economic Viability. The process of geological assessment is generally conducted in stages of increasing details. The typical successive stages of geological investigations, i.e., reconnaissance, prospecting, general exploration and detailed exploration, generate resource data with a clearly defined degree of geological assurance. These four stages are, therefore, used as geological assessment categories in the classification. Feasibility assessment studies form an essential part of the process of assessing a mining project. The typical successive stages of feasibility assessment, i.e., geological study as initial stage followed by prefeasibility study and feasibility study/mining report are well-defined. The degree of economic viability (economic or sub-economic) is assessed in the course of prefeasibility and feasibility studies. A prefeasibility study provides a preliminary assessment with a lower level of accuracy as compared to that of a feasibility study which assess the economic viability in detail.

It is a three-digit-code-based system, the economic viability axis representing the first digit, the feasibility axis, the second digit and the geologic axis, the third digit. The three categories of economic viability have codes 1, 2 and 3 in decreasing order. Similarly, the three categories of feasibility study have also codes 1, 2 and 3 while the four stages of geological assessment are represented by 4 codes, i.e., 1 (detailed exploration), 2 (general exploration), 3 (prospecting) and 4 (reconnaissance). Thus, the highest category of resources under UNFC system will have the code (111) and lowest category, the code (334). The various terms used in this classification and their definitions in brief are as follows :

Total Mineral Resources

Reserve plus Additional or Remaining Resource comprise the Total Resource, or Total Resource minus Reserve gives the Remaining Resource.



Diagrammatic Representation of Reserve and Resource

A. Mineral Reserve

Economically mineable part of measured and/or indicated mineral resource.

(i) Proved Mineral Reserves (111)

Economically mineable part of Measured Mineral Resource.

(ii) Probable Mineral Reserves (121 & 122)

Economically mineable part of indicated or in some cases, a measured mineral resource.

B. Mineral Resource

A Mineral Resource (Remaining or Additional Resource) is the balance of the Total Mineral Resources that have not been identified as Mineral Reserve.

(i) Measured Mineral Resource (331)

That part of mineral resource for which tonnage, density, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence, i.e., based on detailed exploration.

(ii) Indicated Mineral Resource (332)

Tonnage, density, shape, physical characteristics grade and mineral content can be estimated with reasonable level of confidence based on exploration, sampling and testing information, location of borehole, pits, etc.

(iii) Inferred Mineral Resource (333)

Tonnage, grade and mineral content can be estimated with low level of confidence inferred from geological evidence.

(iv) Reconnaissance Mineral Resource (334)

Estimates based on regional geological studies and mapping, airborne and indirect methods, preliminary field inspections as well as geological inference and extrapolation.

(v) Prefeasibility Mineral Resource (221 and 222)

That part of an indicated and in some circumstances measured mineral resource that has been shown by prefeasibility study as not economically

mineable or can become economically viable subject to changes in technological, economic, environmental and/or other relevant conditions.

(vi) Feasibility Mineral Resource (211)

That part of measured mineral resource, which after feasibility study has been found to be economically not mineable.

Definition of Uneconomic Occurrence

Materials of estimated quantity, that are too low in grade or for other reasons are not considered potentially economic. Thus, Uneconomic Occurrence is not part of a mineral resource. If quantity and quality are considered worthy of reporting, it should be recognised that an Uneconomic occurrence cannot be exploited without major technological and/or economic changes, which are not currently available.

Mineral Occurrence

A mineral occurrence is an indication of mineralisation that is worthy of further investigation. The term mineral occurrence does not imply any measure of volume /tonnage or grade/ quality and is thus not part of a mineral resource.

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Mineral	Unit	Reserves										Remaining Resources					Total Resources (A+B)	
		Proved		Probable		Total		Feasibility		Pre-feasibility		Measured	Indicated	Inferred	Reconnaissance			Total
		STD 111	STD 112	STD 121	STD 122	STD 211	STD 212	STD 221	STD 222	STD 331	STD 332				STD 333	STD 334		
Diatomite	'000 tonnes	0	0	0	0	634	0	0	0	0	0	0	0	2251	0	2885	2885	
Dolomite	'000 tonnes	431750	107364	138770	677884	372515	323183	537932	307103	757005	5215075	224194	7737007	8414891				
Dunite	'000 tonnes	10848	18	1901	12768	436	1925	108887	25202	1087	23832	13680	175049	187818				
Emerald	Kgs	0	0	0	0	0	0	0	0	0	0	55869	55869	55869				
Feldspar	tonne	173383004	103054634	43403974	319841612	45903221	42467787	40160373	13882441	17928113	150012330	3371567	313725831	633567443				
Fireclay	'000 tonnes	13295	5035	8707	27037	13878	30155	18260	49290	54093	524011	6104	695791	722829				
Fluorite	tonne	224824	63860	0	288684	4976749	745390	571311	1713833	6218421	3522537	145183	17893423	18182107				
Fuller's Earth	tonne	3941000	0	0	3941000	0	0	58200	0	912340	256467419	0	257437959	261378959				
Garnet	tonne	9917936	278493	2587427	12783856	84320	1643412	3287667	121099	10247428	27992906	333	43377166	56161022				
Gold Ore	tonne	10404349	6401725	422100	17228174	1925669	1303000	1968176	30333248	70136727	233608305	145336333	484611458	501839632				
Granite (Dimension Stone)	'000 cu.m	35741	201377	26574	263692	38462	51990	8234	837325	2063964	42543908	512216	46056098	46319790				
Graphite	tonne	4229675	1204423	2526694	7960793	9571933	3825575	3593404	741377	7368340	22361229	139464128	186925987	194886779				
Gypsum	'000 tonnes	35141	311	1169	36621	10826	93127	33419	9071	713834	428097	4518	1292892	1329513				
Iron Ore (Hematite)	'000 tonnes	4053032	449917	918801	5421751	3444103	1573822	1496674	1762741	1798557	4498142	2491176	17065214	22486965				

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NATIONAL MINERAL INVENTORY - AN OVERVIEW

India (Contd.)

Mineral	Unit	Reserves										Remaining Resources					Total Resources (A+B)	
		Proved		Probable		Total		Feasibility		Pre-feasibility		Measured	Indicated	Inferred	Reconnaissance			Total
		STD 111	STD 121	STD 122	STD 121	STD 122	(A)	STD 211	STD 221	STD 222	STD 331				STD 332	STD 333		
Iron Ore (Magnetite)	'000 tonnes	30352	2311	20037	52699	223388	15494	64091	1513195	1984566	6351286	584436	10736455	10789155				
Kyanite	tonne	639121	0	48958	688079	1505114	568205	2193427	579619	3577402	95869713	0	104293480	104981559				
Laterite	'000 tonnes	98598	12527	13608	124733	49655	8960	22724	3352	2626	243535	250787	581819	706552				
Lead & Zinc Ore																		
Ore	'000 tonnes	31662	68687	5767	106116	5564	17411	31297	37055	192083	355403	4530	643343	749459				
Lead Metal	'000 tonnes	624.56	1666.02	191.76	2482.34	119.31	521.74	780.56	690.65	2171.43	6237.67	0	10521.36	13003.7				
Zinc Metal	'000 tonnes	2871.75	6728.14	399.63	9999.52	364.08	940.26	1362.05	1941.94	7931.06	13722.2	101.65	26363.24	36362.76				
Lead & Zinc Metal	'000 tonnes	0	0	0	0	0	0	0	0	0	120.76	22.37	143.13	143.13				
Limestone	'000 tonnes	9438939	3015917	3880897	16335753	4870440	4852713	8623172	7111337	22629060	130787772	8014504	186888998	203224752				
Magnesite	'000 tonnes	77867	165	4244	82276	6210	9345	45574	59010	59652	131707	213	311711	393988				
Manganese Ore	'000 tonnes	62982	19715	10778	93475	70742	44606	73823	18189	42803	135722	16513	402399	495874				
Marble	'000 tonnes	0	0	4551	4551	104236	202003	72387	0	107129	1453386	2200	1941341	1945891				
Marl	tonne	117115856	4650000	2090000	123855856	11704870	0	0	0	0	0	0	11704870	135560726				
Mica	kg	82187635	20035595	12209547	114432777	38252500	10605400	124089303	143353477	56528016	144446953	3593715	520869364	635302141				
Molybdenum Ore	tonne	0	0	0	0	0	1500000	0	36000	569304	17098594	167800	19371698	19371698				
Cotained MoS ₂	tonne	0	0	0	0	0	1050	0	83	287	11198.03	50.34	12668.37	12668.37				
Nickel Ore	mill. tonnes	0	0	0	0	0	21	21	31	53	63	0	189	189				
Ochre	tonne	21959552	4448341	10525912	36933805	44924890	13936202	31896176	2559245	3560819	32369262	1612607	130859201	167793006				
Perlite	'000 tonnes	0	0	0	0	140	683	595	0	0	0	988	2406	2406				

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NATIONAL MINERAL INVENTORY - AN OVERVIEW

India (Concid.)

Mineral	Unit	Reserves						Remaining Resources						Total Resources (A+B)		
		Proved		Probable		Total		Measured		Indicated		Inferred			Reconnaissance	
		STD 111	STD121	STD122	(A)	STD211	STD221	STD222	STD331	STD332	STD333	STD334	(B)		(A+B)	
Talc / Steatite / Soapstone	'000 tonnes	72172	8067	26251	106490	18178	13020	32221	2994	8126	128620	6275	209434	315924		
Tin Ore	tonne	2067	897	1455	4419	22594200	2653	31330072	168457	561080	29064288	0	83720749	83725168		
Tin Metal	tonne	44.56	94.02	15.62	154.2	33139.45	842.8	54049.65	813.29	231.63	13182.34	0	102259.16	102413.36		
Titanium Minerals	tonne	13552280	0	868436	14420716	19311670	31365	117416	2198668	52373956	325171754	0	399204829	413625545		
Ilmenite	tonne	12980540	0	832970	13813510	17294168	0	0	1242214	41973121	280193087	0	340702590	354516100		
Rutile	tonne	558825	0	35466	594291	1099060	0	0	4460	3425835	9007516	0	13536871	14131162		
Leucoxene	tonne	0	0	0	0	624903	0	0	1994	0	341949	0	968846	968846		
Anatase	tonne	0	0	0	0	0	0	0	0	3345000	0	0	3345000	3345000		
Titaniferous Magnetite	tonne	0	0	0	0	293539	0	117416	950000	3630000	35629202	0	40620157	40620157		
Not Known	tonne	12915	0	0	12915	0	31365	0	0	0	0	0	31365	44280		
Tungsten Ore	tonne	0	0	0	0	2230000	0	173063	19611152	23435954	25356049	16581246	87387464	87387464		
Contained WO ₃	tonne	0	0	0	0	3568.00	0	450.00	9914.00	20180.92	103415.15	4566.28	142094.35	142094.35		
Vanadium Ore	tonne	0	0	0	0	276530	1720000	4108100	0	232000	18297225	0	24633855	24633855		
Contained V ₂ O ₅	tonne	0	0	0	0	1106.12	2835	6032.40	0	487.2	54133.29	0	64594.01	64594.01		
Vermiculite	tonne	1582906	19413	30566	1632885	36411	26196	39794	58396	20179	538607	0	719582	2352467		
Wollastonite	tonne	1953384	48075	240003	2241462	3750118	12000	3748191	76088	3325042	3316385	0	14227824	16469286		
Zircon	tonne	1012205	146085	0	1158290	655020	0	105773	81741	377825	1044554	0	2264913	3423203		

figures rounded off.

11.3 : All India Mineral Resources as on 01.04.2015 - Summary

Sl. No	Mineral	Unit	Reserves	Remaining Resources	Total Resources
1	Alexandrite	-	N.E	N.E.	N.E
2	Andalusite	'000 tonnes	-	28201	28201
3	Antimony				
	Ore	tonne	-	10588	10588
	Metal	tonne	-	174	174
4	Apatite	tonne	29395	24016082	24045477
5	Asbestos	tonne	24633	22922751	22947384
6	Ball clay	tonne	49493621	85249716	134743337
7	Barytes	tonne	51346825	35323825	86670650
8	Bauxite	'000 tonnes	656422	3240442	3896864
9	Bentonite	tonne	14585633	286302781	582888414
10	Borax	tonne	-	74204	74204
11	Calcite	tonne	3448867	19555082	23003949
12	Chalk	'000 tonnes	5064	1687	6751
13	China clay	'000 tonnes	229469	2711777	2941247
14	Chromite	'000 tonnes	102210	241806	344016
15	Cobalt (Ore)	million tonnes	-	45	45
16	Copper				
	Ore	'000 tonnes	207767	1303730	1511498
	Metal	'000 tonnes	2734.62	9423.53	12158.15
17	Corundum	tonne	200	293497	293697
18	Diamond	carat	959659	30876432	31836091
19	Diaspore	tonne	7882434	2310817	10193251
20	Diatomite	'000 tonnes	-	2885	2885
21	Dolomite	'000 tonnes	677884	7737007	8414891
22	Dunite	'000 tonnes	12768	175049	187818
23	Emerald	Kilogram	-	55869	55869
24	Feldspar	tonne	319841612	313725831	633567443
25	Fire clay	'000 tonnes	27037	695791	722829
26	Fluorite	tonne	288684	17893423	18182107
27	Fullers Earth	tonne	3941000	257437959	261378959
28	Garnet	tonne	12783856	43377166	56161022
29	Gold				
	Ore (Primary)	tonne	17228174	484611458	501839632
	Metal (Primary)	tonne	70.09	584.65	654.74
	Ore (Placer)	tonne	-	26121000	26121000
	Metal (Placer)	tonne	-	5.86	5.86
30	Granite (Dimension Stone)	'000 cum	263692	46056098	46319790
31	Graphite	tonne	7960793	186925987	194886779
32	Gypsum	'000 tonnes	36621	1292892	1329513

(Contd.)

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Sl. No	Mineral	Unit	Reserves	Remaining Resources	Total Resources
33	Iron Ore(Hematite)	'000 tonnes	5421751	17065214	22486965
34	Iron Ore (Magnetite)	'000 tonnes	52699	10736455	10789155
35	Kyanite	tonne	688079	104293480	104981559
36	Laterite	'000 tonnes	124733	581819	706552
37	Lead and zinc				
	Ore	'000 tonnes	106116	643343	749459
	Metal Lead	'000 tonnes	2482.34	10521.36	13003.7
	Zinc	'000 tonnes	9999.52	26363.24	36362.76
	Lead +Zinc	'000 tonnes	-	143.13	143.13
38	Limestone	'000 tonnes	16335753	186888998	203224752
39	Magnesite	'000 tonnes	82276	311711	393988
40	Manganese ore	'000 tonnes	93475	402399	495874
41	Marble	'000 tonnes	4551	1941341	1945891
42	Marl	tonne	123855856	11704870	135560726
43	Mica	kg.	114432777	520869364	635302141
44	Molybdenum				
	Ore	tonne	-	19371698	19371698
	Contained MOS ₂	tonne	-	12668.37	12668.37
45	Nickel (Ore)	million tonnes	-	189	189
46	Ochre	tonne	36933805	130859201	167793006
47	Perlite	'000tonnes	-	2406	2406
48	PGM (Metal)	tonnes			
	of metal content		-	15.71	15.71
49	Potash	million tonnes	-	22508	22508
50	Pyrite	'000 tonnes	-	1674401	1674401
51	Pyrophyllite	tonne	24932958	34682745	59615703
52	Quartz/ Silica Sand	'000 tonnes	647522	3260298	3907819
53	Quartzite	'000 tonnes	83472	1575325	1658798
54	Rare Earth Elements	tonne	-	25493	25493
55	Rock Phosphate	tonne	45807485	266871130	312678615
56	Rock Salt	'000 tonnes	-	16025	16025
57	Ruby	kg	-	5349	5349
58	Sapphire	kg	-	450	450
59	Shale	'000 tonnes	15472	3781	19253
60	Sillimanite	tonne	6502115	63702027	70204142
61	Silver				
	Ore	tonne	150443903	361510732	511954635
	Metal	tonne	7171.94	22809.88	29981.82
62	Slate	'000 tonnes	20286	2586	22872
63	Sulphur (Native)	'000 tonnes	-	210	210
64	Talc/Steatite/Soapst	'000 tonnes	106490	209434	315924

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NATIONAL MINERAL INVENTORY - AN OVERVIEW

(Concl.d.)

Sl. No	Mineral	Unit	Reserves	Remaining Resources	Total Resources
65	Tin				
	Ore	tonne	4419	83720749	83725168
	Metal	tonne	154.20	102259.16	102413.36
66	Titanium minerals	tonne	14420716	399204829	413625545
67	Tungsten				
	Ore	tonne	0	87387464	87387464
	Contained WO ₃	tonne	0	142094.35	142094.35
68	Vanadium				
	Ore	tonne	0	24633855	24633855
	Contained V ₂ O ₅	tonne	0	64594.01	64594.01
69	Vermiculite	tonne	1632885	719582	2352467
70	Wollastonite	tonne	2241462	14227824	16469286
71	Zircon	tonne	1158290	2264913	3423203

Figures rounded off. N.E. :- Not Estimated