

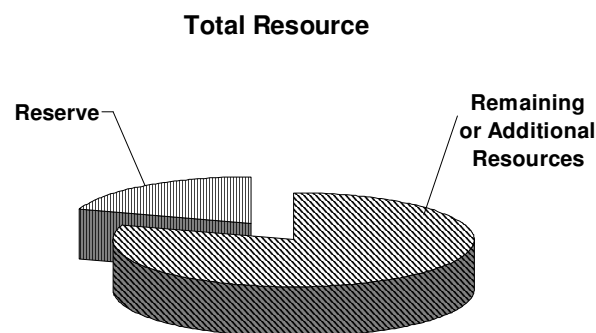
## 11.1 United Nations Framework Classification (UNFC) System - Concepts and Terminologies

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

11.2 : Reserves/Resources of Minerals as on 1.4.2010 : India

Mineral	Unit	Reserves						Remaining Resources						Total Resources (A+B)		
		Proved		Probable		Total Feasibility		Measured		Indicated		Inferred			Reconnaissance	
		STD 111	STD121	STD122	STD121	STD211	STD221	STD222	STD331	STD332	STD333	STD334	STD333		STD334	(B)
Andalusite	'000 tonnes	0	0	0	0	0	0	0	0	0	0	0	18450	0	18450	18450
Antimony Ore	tonne	0	0	0	0	0	0	0	0	0	0	0	10588	0	10588	10588
Antimony Metal	tonne	0	0	0	0	0	0	0	0	0	0	0	174	0	174	174
Apatite	tonne	2088536	0	1680	2090216	0	0	1225345	2281521	11481250	6132768	1017646	22138530	24228746	24228746	
Asbestos	tonne	1700152	4588	806101	2510841	109641	3072849	3257941	100687	2527918	10528926	57800	19655762	22166603	22166603	
BallClay	tonne	12292820	350832	4134190	16777842	6122450	3906958	12387575	268486	2279330	41650863	0	66615662	83393504	83393504	
Barytes	tonne	29557972	90844	1935312	31584128	179447	4288189	2608562	207384	1269214	32491229	105721	411149746	72733874	72733874	
Bauxite	'000 tonnes	321258	89223	182457	592938	105894	245091	274165	655673	431006	1155570	19283	2886682	3479620	3479620	
Bentonite	tonne	0	11415982	13644526	25060508	0	3067	0	26519818	225744237	265309715	25730000	543306838	568367346	568367346	
Borax	tonne	0	0	0	0	0	0	0	0	0	0	0	74204	74204	74204	
Calcite	tonne	1265135	38525	1360678	2664338	665454	227265	3126218	9122235	1236864	3805598	97476	18281110	20945448	20945448	
China Clay	'000 tonnes	124118	11034	42006	177158	24543	22980	71270	284781	412852	1651286	60338	2528049	2705207	2705207	
Chromite	'000 tonnes	31652	7165	15153	53970	1371	1407	4431	31787	36525	52497	21359	149376	203346	203346	
Cobalt Ore	mill.tonnes	0	0	0	0	0	0	0	30.63	2	0.28	12	44.91	44.91	44.91	
Copper Ore	'000 tonnes	133388	127100	133884	394372	15781	21323	12429	147989	224976	741588	0	1164086	1558458	1558458	
Copper Metal	'000 tonnes	1604.73	1508.36	1655.24	4768.33	213.01	223.01	23.45	1453.04	1686.84	3918.99	0	7518.34	12286.67	12286.67	
Chalk	'000 tonnes	3266	537	528	4332	184	5	127	0	0	269	0	585	4917	4917	
Corundum	tonne	0	310	288	598	5824	763	115167	13	38	92389	526000	740194	740792	740792	
Diamond	Carat	1045318	0	0	1045318	0	0	0	304601	1524317	29047514	0	30876432	31921750	31921750	
Diaspore	tonne	1469687	1106296	283691	2859674	187821	714316	488395	248880	133360	1306306	46068	3125144	5984818	5984818	

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NATIONAL MINERAL INVENTORY - AN OVERVIEW

Mineral	Unit	Reserves										Remaining Resources				Total Resources (A+B)		
		Proved		Probable		Total		Pre-feasibility		Measured		Indicated		Inferred			Reconnaissance	
		STD 111	STD121	STD122	STD121	STD122	STD211	STD221	STD222	STD331	STD332	STD333	STD334	(A)	(B)		(B)	
Diatomite	'000 tonnes	0	0	0	0	634	0	0	0	0	0	0	0	0	2251	0	2885	2885
Dolomite	'000 tonnes	431567	157442	149176	738185	149971	227173	316967	268726	687617	5189186	152732	6992372	7730557				
Dunite	'000 tonnes	14894	0	2243	17137	130	4717	107597	24516	1164	21471	8637	168231	185368				
Feldspar	tonne	24545334	8278221	11679685	44503240	14672107	4427797	12967154	4191330	9874858	41549070	149895	87832212	132335451				
Fireclay	'000 tonnes	14376	7358	8371	30104	10020	19215	21775	47666	54377	529173	1190	683415	713519				
Fluorite	tonne	4566234	0	146082	4712316	673889	745390	529966	1713833	6218421	3474906	145183	13501588	18213904				
Fuller's Earth	tonne	0	0	58200	58200	0	0	0	0	912340	255681539	0	256593879	256652079				
Garnet	tonne	3252107	4712202	11360484	19324793	9270	81901	207041	117887	10226689	26995243	0	37638032	56962824				
Gold Ore (Primary)	tonne	16045673	7215335	863529	24124557	1823133	790000	1104647	38101248	70154052	213408962	144188333	469570375	493694912				
Metal (Primary)	tonne	71.02	31.77	7.75	110.54	5.54	2.49	4.35	144.47	143.92	188.22	60.31	549.3	659.84				
Ore (Placer)	tonne	0	0	0	0	0	0	0	0	2552000	23569000	0	26121000	26121000				
Metal (Placer)	tonne	0	0	0	0	0	0	0	0	2.29	3.57	0	5.86	5.86				
Granite (Dimension Stone)	'000 cu.m	35741	201377	26574	263692	38462	51990	8234	837325	2063964	42499338	467296	45966608	46230300				
Graphite	tonne	3685172	2266174	2080518	8031864	102173	1409511	3078665	224859	6603670	19736371	135662532	166817781	174849645				
Gypsum	'000 tonnes	22494	239	16363	39096	8502	73651	17659	8455	710853	428272	10	1247402	1286498				
Iron Ore (Hematite)	'000 tonnes	5982042	1173324	938180	8093546	515353	756190	494738	540188	1197539	3942673	2341870	9788551	17882098				

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	STD121	STD122	(A)	STD211	STD221	STD222	STD331	STD332	STD333		STD334	(B)
Iron Ore (Magnetite)	'000 tonnes	15973	3672	2111	21755	189478	1714	50816	1513168	1984566	6313583	568980	10622305	10644060
Kyanite	tonne	551529	524485	498839	1574853	322622	25917	1238407	578607	3590902	95914312	0	101670767	103245620
Laterite	'000 tonnes	13936	2172	8607	24714	1830	60	2625	0	1107	230865	209632	446119	470833
Lead & Zinc Ore														
Ore	'000 tonnes	20215	87569	1196	108979	129	1077	3983	21433	221601	325051	3340	576614	685593
Lead Metal	'000 tonnes	398.42	1817.89	28.7	2245.01	0	34.32	50.95	472.37	2915.7	5831.04	0	9304.38	11549.39
Zinc Metal	'000 tonnes	1938.37	10460.72	54.17	12453.26	5.2	4.71	86.91	1168.96	9607.12	13237.09	101.65	24211.64	36664.9
Lead & Zinc Metal	'000 tonnes	0	0	0	0	0	0	0	0	0	118.45	0	118.45	118.45
Limestone	'000 tonnes	8978583	3650574	2297234	14926392	1827583	3739470	6309489	6858999	22040640	124835558	4396981	170008720	184935112
Magnesite	'000 tonnes	20851	7786	13313	41950	1776	2244	32326	59010	59652	138169	45	293222	335172
Manganese Ore	'000 tonnes	97425	11590	32962	141977	23529	27594	51074	5732	23726	151704	4644	288003	429980
Marble	'000 tonnes	103736	172661	98	276495	0	29842	72289	0	107129	1445708	0	1654968	1931463
Marl	tonne	133236150	4650000	2090000	139976150	11704870	0	0	0	0	0	0	11704870	151681020
Mica	kg	169840721	15268960	5631767	190741448	21427000	11317310	118867638	52723690	42504035	94427443	228415	341495531	532236979
Molybdenum Ore	tonne	0	0	0	0	0	1500000	0	36000	569304	17013628	167800	19286732	19286732
Cotained MoS <sub>2</sub>	tonne	0	0	0	0	0	1050	0	83	287	11169.23	50.34	12639.57	12639.57
Nickel Ore	mill.tonnes	0	0	0	0	0	21	21	31	53	63	0	189	189
Ochre	tonne	39863403	683093	14395680	54942176	15897677	13232482	21008598	2477593	3232246	32701243	769250	89319089	144261265
Perlite	'000 tonnes	140	0	288	428	0	683	307	0	0	0	988	1978	2406

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	STD121	STD122	STD122	STD221	STD222	STD211	STD221	STD222	STD331						
Platinum Group of Metals (PGM)	In tonnes of Metal content million tonnes	0	0	0	0	0	0	0	0	7.7	0	0	0	6.5	1.5	15.7	15.7
Potash	'000 tonnes	0	0	0	0	0	0	0	0	0	0	18142	3652	22	21815	21815	
Pyrite	'000 tonnes	0	0	0	0	27129	0	32597	0	32597	9590	77729	1527356	0	1674401	1674401	
Pyrophyllite	tonne	12146045	6888351	4241055	23275450	3256515	4919285	6595687	0	6595687	3976532	3963980	9786686	308766	32807450	56082901	
Quartz & Silica Sand	'000 tonnes	272972	35079	121173	429223	185399	322454	321760	0	321760	58683	259116	1907994	14402	3069808	3499031	
Quartzite	'000 tonnes	59004	1647	25948	86599	33217	105018	147686	0	147686	93116	113611	669453	2548	1164648	1251247	
Rock	tonne	20697294	3352994	10728362	34778650	26826747	21273335	24226125	0	24226125	2912633	3549750	182717111	0	261505701	296284351	
Phosphate	'000 tonnes	10036	0	5990	16026	0	0	0	0	0	0	0	0	0	0	16026	
Rock Salt	'000 tonnes	143	0	93	236	0	0	3165	0	3165	286	38	1623	0	5113	5349	
Ruby	kg	0	0	0	0	0	0	0	0	0	0	0	450	0	450	450	
Sapphire	kg	14992	76	263	15331	0	0	245	0	245	0	0	252	83	580	15911	
Shale	'000 tonnes	1693000	1602228	789824	4085052	317869	124000	20082855	0	20082855	4579816	17795772	16152473	3849600	62902385	66987437	
Sillimanite	tonne	46109414	17655843	123793411	187558668	3375000	1048700	5404862	0	5404862	11140000	86286000	172171729	0	279426291	466984959	
Silver Ore	tonne	1591.85	1949.65	4498.07	8039.57	270.00	27.60	54.30	0	54.30	1045.40	6212.66	11978.72	0	19588.68	27628.25	
Metal	'000 tonnes	0	0	0	0	0	113	1187	0	1187	0	0	1069	0	2369	2369	
Slate	'000 tonnes	0	0	0	0	0	0	0	0	0	0	0	210	0	210	210	
Sulphur (Native)	'000 tonnes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

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	STD121	STD122	(A)	STD211	STD221	STD222	STD331	STD332	STD333						
Talc / Soapstone	'000 tonnes	54615	8772	26640	90026	9732	12773	27080	6403	7256	115195	558	178996	269023			
Tin Ore	tonne	4404	1015	1713	7131	22592692	2326	31330000	168622	561080	29064345	0	83719066	83726197			
Metal	tonne	925.75	189.76	16.92	1132.43	32222.43	652.89	54032.8	894.91	231.63	13107.75	0	101142.41	102274.84			
Titanium Minerals	tonne	15271219	4274178	2484826	22030223	5198882	151888	0	2046780	50177023	314391121	0	371965694	393995917			
Ilmenite	tonne	13369586	4090393	2209232	19669211	4970726	151888	0	1090326	39870981	269835940	0	315919861	335589072			
Rutile	tonne	933502	183785	132553	1249840	228156	0	0	4460	3331042	8584030	0	12147688	13397528			
Leucocoxene	tonne	674592	0	25625	700217	0	0	0	1994	0	341949	0	343943	1044160			
Anatase	tonne	0	0	0	0	0	0	0	0	3345000	0	0	3345000	3345000			
Titaniferous Magnetite	tonne	293539	0	117416	410955	0	0	0	950000	3630000	35629202	0	40209202	40620157			
Tungsten Ore	tonne	0	0	0	0	2230000	0	173063	19611152	23435954	25356049	16581246	87387464	87387464			
Cotained WO <sub>3</sub>	tonne	0	0	0	0	3568	0	450	9914	20180.92	103415.15	4566.28	142094.35	142094.35			
Vanadium Ore	tonne	293539	0	117416	410955	0	1720000	4000000	0	232000	18355933	0	24307933	24718888			
Contained V <sub>2</sub> O <sub>5</sub>	tonne	1144.8	0	457.92	1602.72	0	2835	5600	0	487.2	54362.25	0	63284.45	64887.17			
Vermiculite	tonne	1628475	24593	50939	1704007	22733	75790	71744	35195	24930	569012	3600	803003	2507010			
Wollastonite	tonne	2289869	0	197253	2487122	3750545	0	3724191	76088	3325042	3206885	0	14082751	16569873			
Zircon	tonne	1025942	146085	175443	1347470	649938	0	0	81741	338525	716279	0	1786483	3133953			

figures rounded off.

**11.3: All India Mineral Resources as on 01.04.2010 - Summary**

Sl. No	Mineral	Unit	Reserves	Remaining Resources	Total Resources
1	Alexandrite	-	N.E	N.E.	N.E
2	Andalusite	'000 tonnes	-	18450	18450
3	Antimony				
	Ore	tonne	-	10588	10588
	Metal	tonne	-	174	174
4	Apatite	tonne	2090216	22138530	24228746
5	Asbestos	tonne	2510841	19655762	22166603
6	Ball clay	tonne	16777842	66615662	83393504
7	Barytes	tonne	31584128	41149746	72733874
8	Bauxite	'000 tonnes	592938	2886682	3479620
9	Bentonite	tonne	25060508	543306838	568367346
10	Borax	tonne	-	74204	74204
11	Calcite	tonne	2664338	18281110	20945448
12	Chalk	'000 tonnes	4332	585	4917
13	China clay	'000 tonnes	177158	2528049	2705207
14	Chromite	'000 tonnes	53970	149376	203346
15	Cobalt (Ore)	million tonnes	-	44.91	44.91
16	Copper				
	Ore	'000 tonnes	394372	1164086	1558458
	Metal	'000 tonnes	4768.33	7518.34	12286.67
17	Corundum	tonne	597	740194	740792
18	Diamond	carat	1045318	30876432	31921750
19	Diaspore	tonne	2859674	3125144	5984818
20	Diatomite	'000 tonnes	-	2885	2885
21	Dolomite	'000 tonnes	738185	6992372	7730557
22	Dunite	'000 tonnes	17137	168232	185369
23	Emerald	-	N. E.	N. E.	N. E.
24	Feldspar	tonne	44503240	87832212	132335452
25	Fire clay	'000 tonnes	30104	683415	713519
26	Fluorite	tonne	4712316	13501588	18213904
27	Fullers Earth	tonne	58200	256593879	256652079
28	Garnet	tonne	19324793	37638032	56962824
29	Gold				
	Ore (Primary)	tonne	24124537	469570375	493694912
	Metal (Primary)	tonne	110.54	549.30	659.84
	Ore (Placer)	tonne	-	26121000	26121000
	Metal (Placer)	tonne	-	5.86	5.86
30	Granite (Dimension Stone)	'000 cum	263692	45966608	46230300
31	Graphite	tonne	8031864	166817781	174849645
32	Gypsum	'000 tonnes	39096	1247402	1286498

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Sl. No	Mineral	Unit	Reserves	Remaining Resources	Total Resources
33	Iron Ore(Hematite)	'000 tonnes	8093546	9788551	17882097
34	Iron Ore (Magnetite )	'000 tonnes	21755	10622305	10644060
35	Kyanite	tonne	1574853	101670767	103245620
36	Laterite	'000 tonnes	24714	446119	470833
37	Lead and zinc				
	Ore	'000 tonnes	108980	576615	685595
	Metal Lead	'000 tonnes	2245.01	9304.38	11549.39
	Zinc	'000 tonnes	12453.26	24211.64	36664.90
	Lead +Zinc	'000 tonnes	0	118.45	118.45
38	Limestone	'000 tonnes	14926392	170008720	184935112
39	Magnesite	'000 tonnes	41950	293222	335172
40	Manganese ore	'000 tonnes	141977	288003	429980
41	Marble	'000 tonnes	276495	1654968	1931463
42	Marl	tonne	139976150	11704870	151681020
43	Mica	kg.	190741448	341495531	532236979
44	Molybdenum				
	Ore	tonne	-	19286732	19286732
	Contained MOS <sub>2</sub>	tonne	-	12640	12640
45	Nickel (Ore)	million tonnes	-	189	189
46	Ochre	tonne	54942176	89319089	144261265
47	Perlite	'000tonnes	428	1978	2406
48	PGM (Metal)	tonnes			
		of metal content	-	15.7	15.7
49	Potash	million tonnes	-	21816	21816
50	Pyrite	'000 tonnes	-	1674401	1674401
51	Pyrophyllite	tonne	23275451	32807451	56082902
52	Quartz/ Silica Sand	'000 tonnes	429223	3069808	3499031
53	Quartzite	'000 tonnes	86599	1164649	1251248
54	Rock Phosphate	tonne	34778650	261505701	296284351
55	Rock Salt	'000 tonnes	16026	-	16026
56	Ruby	kg	236	5112	5348
57	Sapphire	kg	-	450	450
58	Shale	'000 tonnes	15331	580	15911
59	Sillimanite	tonne	4085052	62902385	66987437
60	Silver				
	Ore	tonne	187558668	279426291	466984959
	Metal	tonne	8039.57	19588.68	27628.25
61	Slate	'000 tonnes	-	2369	2369
62	Sulphur (Native)	'000 tonnes	-	210	210
63	Talc/Steatite/Soapst	'000 tonnes	90026	178996	269022

(Contd.)

NATIONAL MINERAL INVENTORY - AN OVERVIEW

(Concl.)

<b>Sl. No</b>	<b>Mineral</b>	<b>Unit</b>	<b>Reserves</b>	<b>Remaining Resources</b>	<b>Total Resources</b>
64	Tin				
	Ore	tonne	7131	83719066	83726197
	Metal	tonne	1132.43	101142.41	102274.84
65	Titanium minerals	tonne	22030223	371965694	393995917
66	Tungsten				
	Ore	tonne	-	87387464	87387464
	Contained WO <sub>3</sub>	tonne	-	142094.35	142094.35
67	Vanadium				
	Ore	tonne	410955	24307933	24718888
	Contained V <sub>2</sub> O <sub>5</sub>	tonne	1602.72	63284.45	64887.17
68	Vermiculite	tonne	1704007	803003	2507010
69	Wollastonite	tonne	2487122	14082751	16569873
70	Zircon	tonne	1347470	1786482	3133952

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