

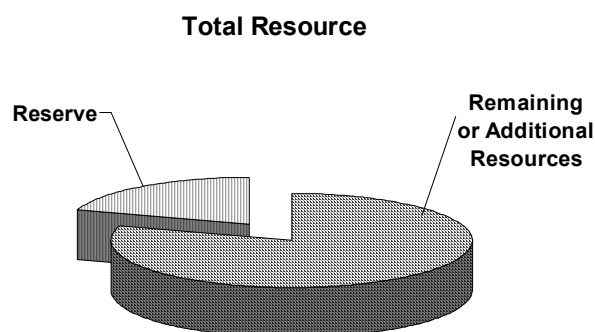
## 10.1 United Nations Framework Classification (UNFC) System - Concepts and Terminologies

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.

**10.2 : Reserves/Resources of Minerals as on 1.4.2015 : India**

**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	STD334	(B)	(A+B)
Andalusite	'000 tonnes	0	0	0	0	0	0	0	0	58040	56210	11800	126050	126050
Antimony Ore	tonne	0	0	7503	7503	0	0	592	0	0	10588	0	11180	18683
Metal	tonne	0	0	75	75	0	0	5.92	0	0	174	0	179.92	254.92
Apatite	tonne	27715	0	1680	29395	499149	0	0	2281521	11481250	5801338	1017646	21080904	21110299
Asbestos	tonne	0	0	0	2488022	3113446	4062376	100687	2527959	843058	10557777	57800	22908067	22908067
Bauxite	'000 tonnes	560865	15553	70076	646493	268398	128409	316835	526286	843058	2044653	184116	4311754	4958248
Borax	tonne	0	0	0	0	0	0	0	0	0	0	74204	74204	74204
Chromite	'000 tonnes	40635	15229	22672	78535	52696	10545	44395	1630	53008	70440	20435	253150	331685
Cobalt Ore	mill.tonnes	0	0	0	0	0	0	0	30.63	2	0.28	12	44.91	44.91
Copper Ore	'000 tonnes	128267	20045	15580	163891	83102	111376	41368	135884	340902	778987	5360	1496979	1660870
Metal	'000 tonnes	1664.12	313.64	183.81	2161.57	873.59	428.09	246.48	1655.35	2748.95	4051.37	31.69	10035.52	12197.09
Diamond	Carat	847400	0	159	847559	0	0	0	304601	1524317	29047514	0	30876432	31723991
Diatomite	'000 tonnes	0	0	0	0	634	0	0	0	0	2251	0	2885	2885
Emerald	Kgs	0	0	0	0	0	0	0	0	0	0	55869	55869	55869
Fluorite	tonne	228393	163860	11988	404241	9340556	771934	768573	1727945	6239589	1578067	161575	20588239	20992480
Garnet	tonne	8539521	50946	5	8590472	1835546	1624128	4622014	138905	10226601	28066885	902574	47416654	56007126
Gold Ore (Primary)	tonne	20271400	3420000	36700	23728100	4498133	3821500	1741321	9658248	109446798	238863938	126476333	494506270	518234370
Metal (Primary)	tonne	79.26	13.44	0.06	92.76	16.93	9.11	5.64	22.05	159.41	236.26	65.1	514.5	607.26
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

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NATIONAL MINERAL INVENTORY - AN OVERVIEW

Mineral	Unit	Reserves										Remaining Resources				Total Resources (A+B)
		Proved		Probable		Feasibility		Pre-feasibility		Measured	Indicated	Inferred	Reconnaissance		Total	
		STD 111	STD 121	STD 122	STD 121	STD 211	STD 221	STD 222	STD 331				STD 332	STD 333		
Graphite	tonne	4386467	0	4176944	8563411	7964326	3461288	6166401	796464	10679490	31827080	142165128	203060176	211623587		
Iron Ore (Hematite)	'000 tonnes	4559856	508158	1141019.5	6209034	3181005	2404790	2005363	1010483.61	1805532	4827512	2614185	17848870	24057905		
Iron Ore (Magnetite)	'000 tonnes	71930	385	130508	202823	307652	16082	72127	1513168	2036982	6383274	695507	11024791	11227614		
Kyanite	tonne	393358	331193	122314	846865	1331061	940452	1864398	561680	3577402	96560462	0	104835455	105682321		
Lead & Zinc Ore																
Ore	'000 tonnes	28791	63331	11153	103275	4627	23663	13784	51613	196911	368094	4530	663222	766497		
Lead Metal	'000 tonnes	503.70	1188.47	208.02	1900.19	140.42	534.83	286.02	1117.33	2283.43	6607.77	0	10969.80	12869.99		
Zinc Metal	'000 tonnes	2356.56	4592.03	489.46	7438.05	448.15	1121.12	599.62	3540.38	5840.74	14080.66	101.65	25732.32	33170.37		
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	14701910	1065305	3261256	19028470	7665106	6442697	9261072	7528921	32250068	135833401	9579524	208560789	227589259		
Magnesite	'000 tonnes	57934	6354	1782	66070	80983	24858	40132	59010	59652	128104	309	393047	459118		
Manganese Ore	'000 tonnes	61510	6081	7450	75041	76106	51162	80580	29600	61205	117986	11944	428583	503624		
Marl	tonne	50825000	17210000	110000	68145000	26474477	4189000	0	0	0	390000	0	31053477	99198477		
Molybdenum Ore	tonne	0	0	0	0	0	1500000	0	2382000	3269204	19884394	167800	27203398	27203398		
Cotained MoS <sub>2</sub>	tonne	0	0	0	0	0	1050	0	1599.54	1733.29	12457.39	50.34	16890.56	16890.56		
Nickel Ore	mill.tonnes	0	0	0	0	0	21	21	31	53	63	0	189	189		
Perlite	'000 tonnes	0	0	0	0	140	683	595	0	0	0	988	2406	2406		
Platinum Group of Metals (PGM)	In tonnes of Metal content	0	0	0	0	0	0	0	0	11.66	7.4	1.86	20.92	20.92		

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NATIONAL MINERAL INVENTORY - AN OVERVIEW

India (Contd.)

Mineral	Unit	Reserves										Remaining Resources				Total Resources	
		Proved		Probable		Total		Feasibility		Pre-feasibility		Measured	Indicated	Inferred	Reconnaissance	Total	(A+B)
		STD 111	STD121	STD122	STD121	STD122	(A)	STD211	STD221	STD222	STD331						
Potash	million tonnes	0	0	0	0	0	0	0	0	0	0	18151	4125	814	23091	23091	23091
Pyrite	'000 tonnes	0	0	0	0	27129	0	32597	9590	77729	1527356	0	1674401	0	1674401	1674401	1674401
Rare Earth Elements	tonnes	0	0	0	0	0	0	0	0	430353	26042.49	3332	459727.49	3332	459727.49	459727.49	459727.49
Rock Phosphate	tonne	27103158	0	3772935	30876093	13669080	29796846	34526541	2879833	3539750	186657066	9308275	280377392	280377392	311253485	311253485	311253485
Rock Salt	'000 tonnes	0	3860	0	3860	3360	940	4620	0	0	0	0	8920	0	8920	12780	12780
Ruby	kg	0	0	0	0	0	429	3296	0	0	1623	0	5349	0	5349	5349	5349
Sapphire	kg	0	0	0	0	0	0	0	0	0	450	0	450	0	450	450	450
Sillimanite	tonne	7968445	3655	290200	8262300	503301	23406	20549508	4771654	17630364	16115664	4411195	64005091	64005091	72267391	72267391	72267391
Silver Ore	tonne	61604192	67971000	40870828	1.7E+08	2330000	18445543	53914460	41320000	70926000	211261729	0	398197732	0	398197732	568643752	568643752
Silver Metal	tonne	2155.3	4981.73	570.04	7707.07	172.2	824.44	663.67	3881.88	4575.73	12442.92	0	22560.84	0	22560.84	30267.91	30267.91
Sulphur (Native)	'000 tonnes	0	0	0	0	0	0	0	0	0	210	0	210	0	210	210	210
Tin Ore	tonne	2075	0	25	2101	22594540	3213	31330134	168457	561080	29063370	0	83720794	0	83720794	83722895	83722895
Tin Metal	tonne	963.19	0	10.8	973.99	33384.66	1116.41	54089.46	813.29	231.63	13147.46	0	102782.91	0	102782.91	103756.9	103756.9
Titanium Minerals	tonne	15914697	64860	19068	15998625	10928991	91828	0	2610618	49666080	344212444	3598565	411108526	411108526	427107150	427107150	427107150
Tungsten Ore	tonne	0	0	0	0	2230000	0	173063	23276152	23259954	23912049	16581246	89432464	89432464	89432464	89432464	89432464
Tungsten Contained WO <sub>3</sub>	tonne	0	0	0	0	3568	0	450	19298.8	16994.84	99772.15	4566.28	144650.07	144650.07	144650.07	144650.07	144650.07

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NATIONAL MINERAL INVENTORY - AN OVERVIEW

India (Concl.)

Mineral	Unit	Reserves					Remaining Resources					Total Resources (A+B)			
		Proved		Probable		Total	Feasibility		Pre-feasibility		Total				
		STD 111	STD121	STD121	STD122	(A)	STD211	STD221	STD222	STD331	STD332		STD333	STD334	(B)
Vanadium Ore Contained V <sub>2</sub> O <sub>5</sub>	tonne	0	0	0	0	0	276530	1720000	4108100	0	232000	18297225	0	24633855	24633855
Vermiculite	tonne	0	0	0	0	0	1106.12	2835	6032.4	0	487.2	54133.29	0	64594.01	64594.01
Wollastonite	tonne	1562108	0	28888	1590996	76900	71397	25956	9800	20179	552279	8716	765227	2356223	2356223
Zircon	tonne	2388641	190739	101598	2680978	4563016	1245009	8559760	0	3325042	4597200	137461	22427488	25108466	25108466
	tonne	669466	0	0	669466	422758	4225	0	140926	39300	1019770	47456	1674435	2343901	2343901

183 figures rounded off.

**10.3 : 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	0	126,050	126,050
3	Antimony				
	Ore	tonne	7,503	11,180	18,683
	Metal	tonne	75	179.92	254.92
4	Apatite	tonne	29,395	21,080,904	21,110,299
5	Asbestos	tonne	0	22,908,067	22,908,067
6	Bauxite	'000 tonnes	646,493	4,311,754	4,958,248
7	Borax	tonne	-	74,204	74204
8	Chromite	'000 tonnes	78,535	253,150	331,685
9	Cobalt (Ore)	million tonnes	-	45	45
10	Copper				
	Ore	'000 tonnes	163,891	1,496,979	1,660,870
	Metal	'000 tonnes	2,161.57	10,035.52	12197.09
11	Diamond	carat	847,559	30,876,432	31,723,991
12	Diatomite	'000 tonnes	-	2,885	2,885
13	Emerald	Kilogram	-	55,869	55,869
14	Fluorite	tonne	404,241	20,588,239	20,992,480
15	Garnet	tonne	8,590,472	47,416,654	56,007,126
16	Gold				
	Ore (Primary)	tonne	23,728,100	494,506,270	518,234,370
	Metal (Primary)	tonne	92.76	514.5	607.26
	Ore (Placer)	tonne	-	26,121,000	26,121,000
	Metal (Placer)	tonne	-	5.86	5.86
17	Graphite	tonne	8,563,411	203,060,176	211,623,587
18	Iron Ore(Hematite)	'000 tonnes	6,209,034	17,848,870	24,057,905
19	Iron Ore (Magnetite )	'000 tonnes	202,823	11,024,791	11,227,614
20	Kyanite	tonne	846,865	104,835,455	105,682,321
21	Lead and zinc				
	Ore	'000 tonnes	103,275	663,222	766,497
	Metal Lead	'000 tonnes	1,900.19	10,969.8	12,869.99
	Zinc	'000 tonnes	7,438.05	25,732.32	33,170.37
	Lead +Zinc	'000 tonnes	-	143.13	143.13
22	Limestone	'000 tonnes	19,028,470	208,560,789	227,589,259
23	Magnesite	'000 tonnes	66,070	393047	459,117
24	Manganese ore	'000 tonnes	75,041	428,583	503,624
25	Marl	tonne	68,145,000	31,053,477	99,198,477
26	Molybdenum				
	Ore	tonne	-	27,203,398	27,203,398
	Contained MOS <sub>2</sub>	tonne	-	16,890.56	16,890.56
27	Nickel (Ore)	million tonnes	-	189	189

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## NATIONAL MINERAL INVENTORY - AN OVERVIEW

Sl. No	Mineral	Unit	Reserves	Remaining Resources	Total Resources
28	Perlite	'000tonnes	-	2,406	2,406
29	PGM (Metal)	tonnes			
		of metal content	-	20.92	20.92
30	Potash	million tonnes	-	23,091	23,091
31	Pyrite	'000 tonnes	-	1,674,401	1,674,401
32	Rare Earth Elements	tonne	-	459,727	459,727
33	Rock Phosphate	tonne	30,876,093	280,377,392	311,253,485
34	Rock Salt	'000 tonnes	3,860	8,920	12,780
35	Ruby	kg	-	5,349	5,349
36	Sapphire	kg	-	450	450
37	Sillimanite	tonne	8,262,300	64,005,091	72,267,391
38	Silver				
	Ore	tonne	170,446,020	398,197,732	568,643,752
	Metal	tonne	7,707.07	22,560.84	30,267.91
39	Sulphur (Native)	'000 tonnes	-	210	210
40	Tin				
	Ore	tonne	2,101	83,720,794	83,722,895
	Metal	tonne	973.99	102,782.91	103,756.9
41	Titanium minerals	tonne	15,998,625	411,108,526	427,107,150
42	Tungsten				
	Ore	tonne	0	89,432,464	89,432,464
	Contained WO <sub>3</sub>	tonne	0	144,650.07	144,650.07
43	Vanadium				
	Ore	tonne	0	24,633,855	24,633,855
	Contained V <sub>2</sub> O <sub>5</sub>	tonne	0	64,594.01	64,594.01
44	Vermiculite	tonne	1,590,996	765,227	2,356,223
45	Wollastonite	tonne	2,680,978	22,427,488	25,108,466
46	Zircon	tonne	669,466	1,674,435	2,343,901

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