Threshold Value of Minerals

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2. BASIC FEATURES

- Minerals being a valuable resource the extraction of mineral resources located through exploration and prospecting has to be maximised through scientific methods of mining, beneficiation and economic utilisation.
- Zero waste mining will be the national goal and mining technology will be upgraded to ensure extraction and utilisation of the entire run-of-mines

7.2. Conservation and Mineral Development

- Conservation of minerals shall be construed not in the restrictive sense of abstinence from consumption or preservation for use in the distant future but as a positive concept leading to augmentation of reserve base through improvement in mining methods, beneficiation and utilisation of low grade ore and rejects and recovery of associated minerals.
- There shall be an adequate and effective legal and institutional framework mandating zero-waste mining as the ultimate goal and a commitment to prevent sub-optimal and unscientific mining.
- Mineral sectoral value addition through latest techniques of beneficiation, calibration, blending, sizing, concentration, pelletisation, purification and general customisation of product will be encouraged.

10.3 Mineral Processing and Beneficiation

- Attention will be given to beneficiation and agglomeration techniques to bring lower grades and finer size material into use.
- Research and development shall be oriented to ensure maximum economic recovery of the associated minerals and valuabl.e metals

'Minerals (Evidence of Mineral Contents) Rules, 2015'

"Threshold Value of minerals" means limit prescribed by the Indian Bureau of Mines from time to time based on the beneficiability and or marketability of a mineral for a given region and a given time, below which a mineral obtained after mining can he discarded as waste."

Mineral Conservation and Development Rules, 2017" (MCDR, 2017).

"Rule 12(7)-Indian Bureau of Mines shall review the threshold values of minerals periodically in consultation with the stake holders."

- To achieve the target of zero waste mining the lessee should explore possibility of utilization/selling of sub grade mineral/reject for value creation
- Optimum mineral utilization
- The disposal of waste dumps/quarry rejects being progressively generated
- State of art beneficiation technique for utilization of low grade ore

- Fixing of threshold limit on judicious basis will avoid storage of non-usable minerals resulting in environmental related problems
- Scientific mining includes maximizing the percentage extraction of ore body
- In countries like Australia, Japan and Sweden there are mines where the percentage extraction is close to 100% while it is much less in India.

Iron Ore (Hematite Grades)

NMI Grade (Haematite)	MCDR Grade			Royalty Rate	Threshold Value
	(i)**Lumps:**	**(ii) Fines:**	**(iv) Calibrated Lump Ore (CLO)**	15% of average sale price on ad valorem basis.	(i)Hematitic iron ore : 45% Fe(Min)
(a) High Grade (Fe: (+) 65%) (lump & fines)	(a) ≥65% Fe	(a) ≥65% Fe	**≥65% Fe** (a)CLO others (b) 10-40 mm size CLO (c) (5-18 mm size CLO)		(ii) Hematitic Siliceous Ore (For ore of Goa Origin): 35% Fe (Min)
(b) Medium Grade (Fe: 62 to 65%) (lump & fines)	(b) 62% to < 65% Fe ROM	(b) 62% to < 65% Fe	**62% to < 65% Fe** (d) CLO others (e) 10-40 mm size CLO (f) 5-18 mm size CLO		
(c) Low Grade (Fe : (-) 62%) (lump & fines)	(c)60% to <62% Fe (d) 58% to <60% Fe (e) 55% to <58% Fe (f) 51% to <55% Fe (g)Below 51% Fe	(c)60% to < 62% Fe (d) 58% to <60% Fe (e) 55% to <58% Fe (f) 51% to <55% Fe (g)Below 51% Fe	(g) < 62% Fe (CLO any size) **(iii) Concentrates**		
(d) Unclassified (The range of minimum and maximum values of chemical constituents is too wide to be fitted into any of the above grades.)					
(e) Not Known (The information on chemical analysis is not available or potential/actual use is not known.					
(f) Black iron ore (Haematite containing 10% manganese.)					
(g) Others (Estimation for marketable grades which could not be classified into above grades.)					

Iron Ore (Magnetite Grades)

NMI Grade	MCDR Grade	Royalty Rate	Threshold Value
(a) **Metallurgical:** Average (+) 38% Fe	Not separate grades for Magnetite. Same grades as mentioned in Hametite.	15% of average sale price on ad valorem basis.	No threshold value for Magnetite ore.
(b) **Coal Washery:** 64% Fe (min)			
(c) **Foundry** (Actual use reported by exploitation agencies)			
(d)**Unclassified** (Minimum & maximum range of values of chemical constituents are too wide to be fitted into any of the above grades.)			
(e) **Not Known** (The information on chemical constituents is not available or potential/actual use is not reported)			
(f) **Others** : (Those grades which could not be classified into above grades.)			

Bauxite Grades

NMI Grade	MCDR Rule	Royalty Rate	Threshold Value
(1) Metallurgical Grade (a) Metallurgical Grade – I (Predominantly Trihydrate) : Al_2O_3 (+) 40% (b) Metallurgical grade – II (Mixture of trihydrate and monohydrate): Al_2O_3 (+) 40%	**(i) For use in alumina and aluminium extraction:-** a) 40% to below 45% Al_2O_3 (b) 50% to below 55% Al_2O_3 (c) 55% to below 60% Al_2O_3 (d) 45% to below 50% Al_2O_3 (e) 60% and above Al_2O_3 (f) Below 40% Al_2O_3	**(a) Metallurgical Grade:** 0.60 % of London Metal Exchange Aluminium metal price chargeable on the contained aluminium metal in ore produced for those dispatched for use in alumina and aluminium metal extraction.	(i) For aluminous laterite: Al_2O_3 20 % (Min) (ii) For Bauxite : Al_2O_3 - 30 % (Min) and silica (reactive) 5% (Max)
Non Metallurgical Grades (2) **Refractory Grade-** Al_2O_3 55% (min.) (3) **Abrasive grade**- Al_2O_3 45% (min.) (4) **Chemical grade**- Al_2O_3 58% (min.) (5) **Low Grade-** Al_2O_3 35 to 40%	**(ii) For use other than alumina and aluminium metal extraction** (a) Refractory (b) Abrasive c) Chemical (d) Cement	**(b) Non Metallurgical Grade:** 25% of average sale price on ad valorem basis for those dispatched for use other than alumina & aluminium metal extraction.	
(6) Chemical/refractory mixed grade (7) Metallurgical mixed grade (8) Mixed grade excluding chemical and refractory (9) Others (10) Unclassified (11) Not Known			

Reserves & Resources of Low grade & Benefi ciable Grade

Mineral	Resources As On				
	2000	**2005**	**2010**	**2013**	**2015**
Iron Ore(Heamatite) **Low grade** (Lump & Fines) **:** Fe (-) 62% SiO2 4.5% (Max) Al2O3 4% (Max) P 0.1% (Max) **Beneficiable grade:** i)Fe 45% (min) for ore other that Goa ii) Fe 35% (min) for siliceous ore of Goan origin (Million Tonnes)	2,879 (22%)	3,677 (25%)	3,559 (20%)	3,892 (19%)	4,995 (22%) (Inclusive 422 Beneficiable grade 2%)
Bauxite **Low grade:** Al2O3 35-40% SiO2 10% (Max) **Beneficiable grade:** i)Aluminous laterite Al2O3 20% (min) ii)Bauxite Al2O3 30% (min) Silica (reactive) 5% (max) (Million Tonnes)	206 (7%)	228 (7%)	273 (8%)	264 (7%)	322.74 (8%) 55.0 (1%)
Chromite **Low grade:** Chemical and physical properties fall below the specification of the different grades mentioned above. **Beneficiable Grade:** Cr2O3 10% (min) (Thousand Tonnes)	664 (0.4%) 30649 (17%)	970 (0.5%) 42681 (20%)	3765 (2%) 34978 (17%)	3765 (1%) 68711 (21%)	3765 (1%) 85697 (25%)

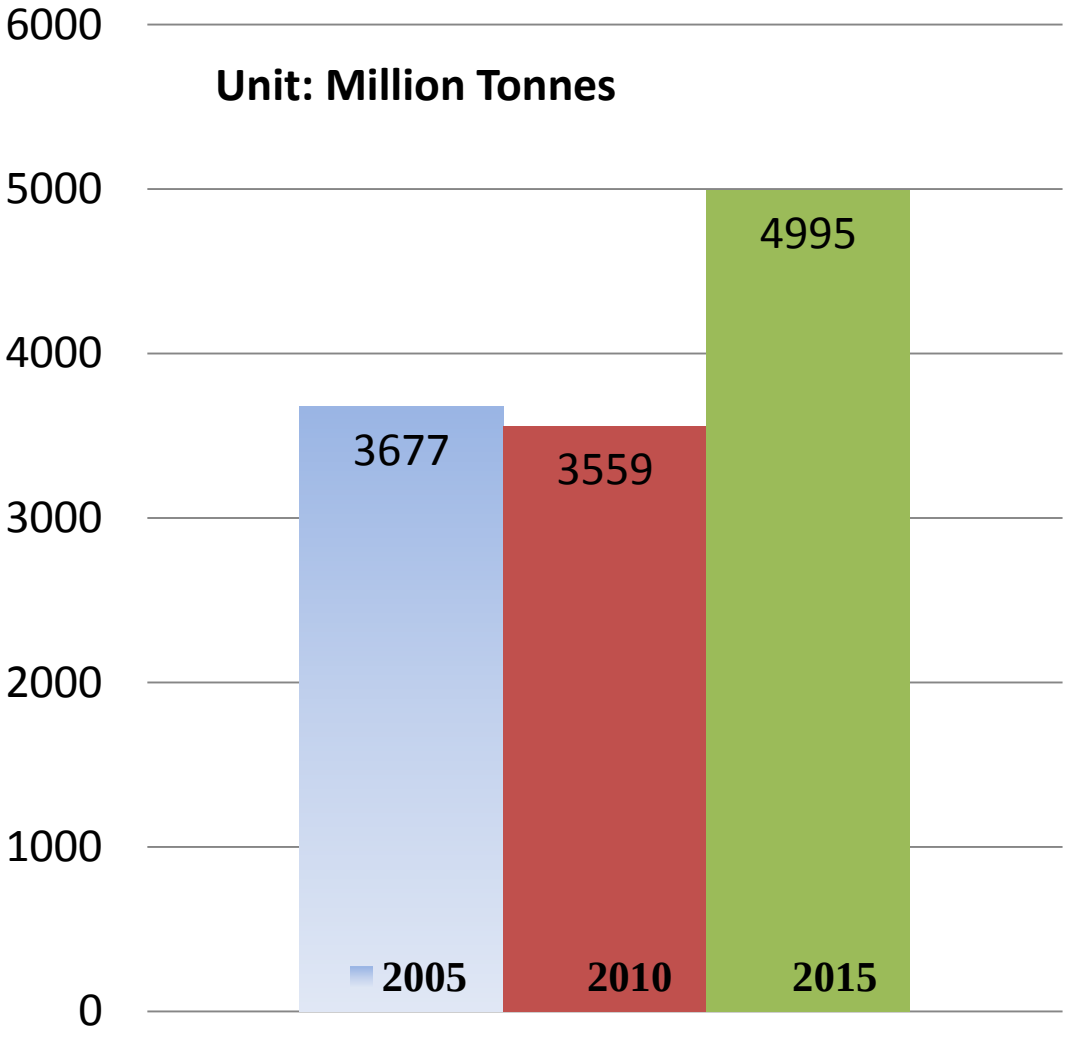
Reserves & Resources of Low grade & Benefi ciable Grade

Mineral	Resources As On				
	2000	**2005**	**2010**	**2013**	**2015**
Limestone **Cement (Blendable/Beneficiable):** CaO 38% to 44% MgO 5% (max) (Million Tonnes)	-	2671 (1.51%)	911 (0.5%)	-	1474.79 (1%)
Manganese ore **Low-25% Mn:** Mn(+) 18% to (-)25% **Beneficial grade:** Mn 10% (Million Tonnes)	1.785 (0.6%)	5.171 (1.4%)	9.152 (21%)	14.996 3%	29.29 (6%) 9.35 (2%)
Fluorite **Low grade:** Fluorite containing below 10% CaF_2 (Thousand Tonnes)	3192.15 (25%)	3169.48 (16%)	3169.48 (17%)	3169.48 (17%)	3169.48 (17%)
Graphite **Low grade:** Techno-economic feasibility for beneficiation has been established and this grade is accepted as feed for beneficiation plants. (10-40% FC) **Beneficiable grade:** i)2% FC (min) for flaky variety ii) 10% FC (min) for atmorphous variety (Thousand Tonnes)	19521 (12%)	21229 (13%)	22688 (13%)	36309 (19%)	40658 (21%)

Reserves & Resources of Low grade & Benefi ciable Grade

Mineral	Resources As On				
	2000	**2005**	**2010**	**2013**	**2015**
Magnesite **Beneficiable/Low grade:** a) MgO 38% to (-)42.5%: Magnesite amenable to reduce silica content by simple dressing and sorting. b) MgO 35% (min) CaO 3% (max) Fe_2O_3%(max): This is beneficiated by floatation or other methods. (Million Tonnes)	160 (43%)	143 (42%)	153 (46%)	153 (47%)	154.80 (40%)
Barytes **Low grade:** $BaSO_4$: Less than 90% **Beneficiable Grade:** Ba SO4 - 50% (min) Sp.Gr. - 3.5(min) (Million Tonnes)	41.39 (52%) -	25.50 (34%) -	23.90 (33%) -	- - 	23.72 (27%) -

Iron Ore Beneficiable Grade & Low Grade



Threshold Value Change on 16.10.2009

A)Goan Iron Ores:

(i) Siliceous ore - 40% Fe (ii) Hematitic ore - 55% Fe

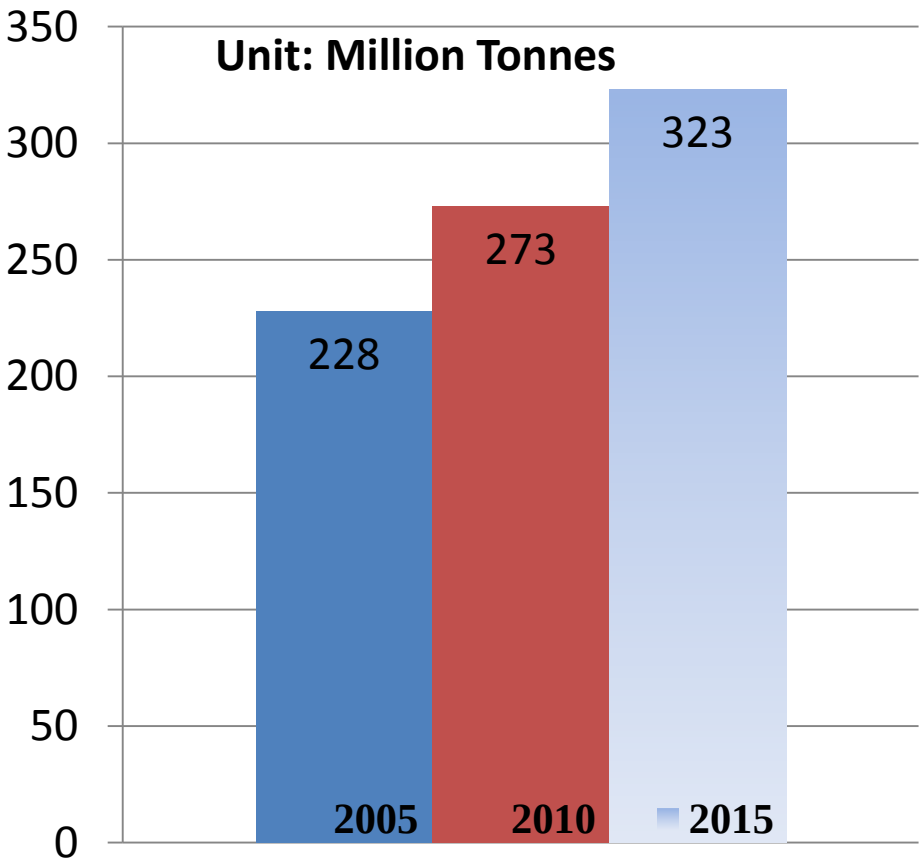
B) Bellary Hospet region - 58% Fe

Before

(I)Hematitic Iron Ore: 45% Fe(MIN)

(ii) Hematitic Siliceous Ore (For ore of Goan Origin): 35% Fe(MIN)

Bauxite Beneficiable Grade & Low Grade



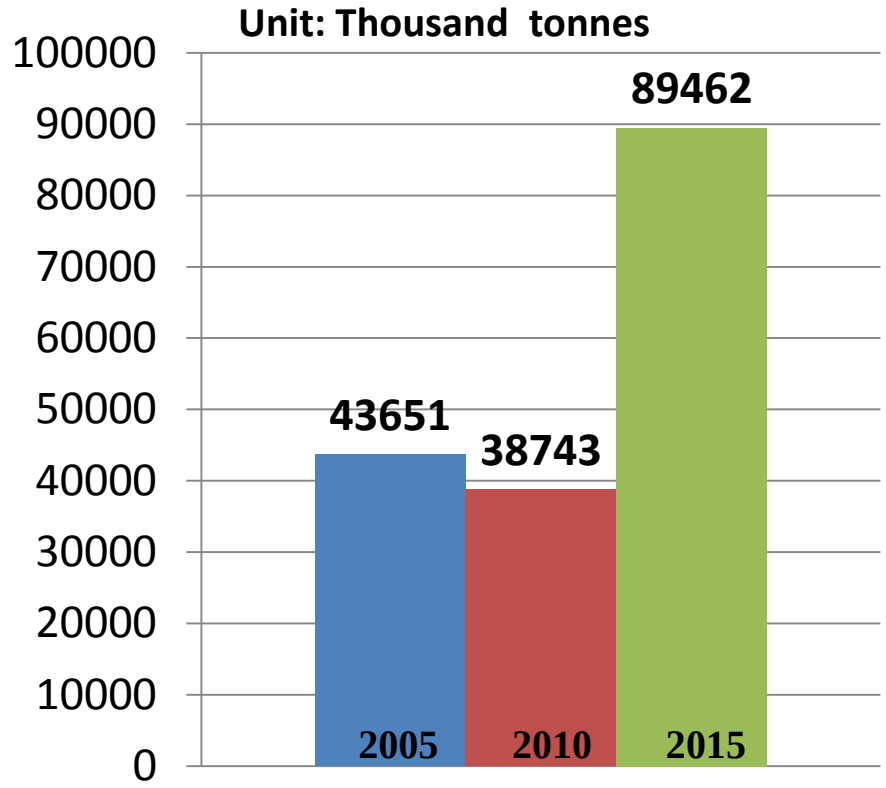
Threshold Value Change on 16.10.2009

(i)FOR ALUMINOUS LATERITE: AL_20_3- 20% (MIN)
(ii) FOR BAUXITE:
AL_20_3- 30% (MIN) & SILICA (REACTIVE) - 5% (MAX)

Before

Eastern Ghat- Al2O3 <35%
Western Ghat –Al2O3<44%
Coastal Plans-Al2O3<42%

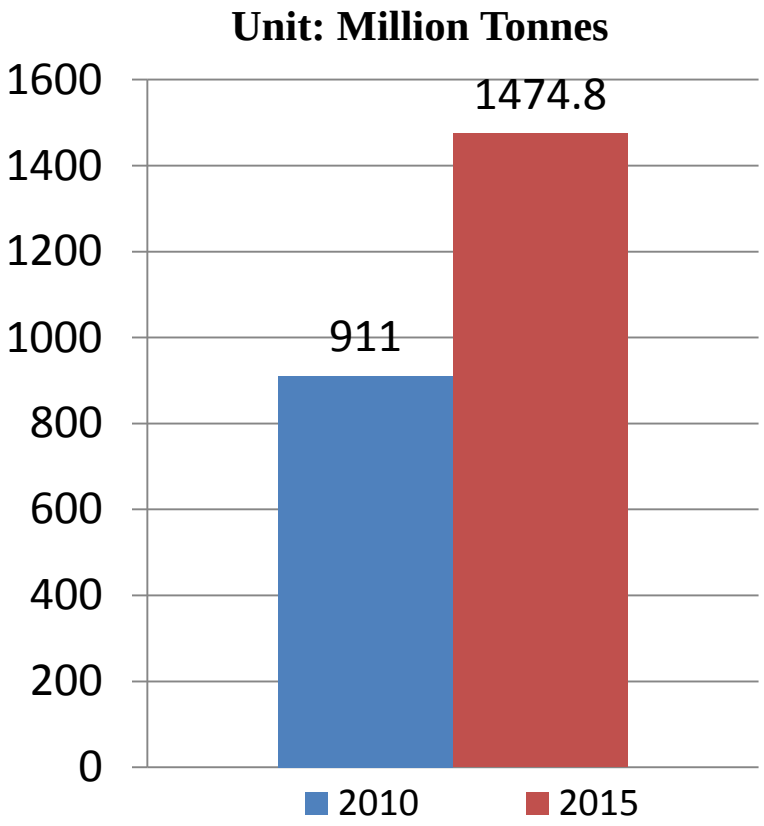
Chromite Beneficiable Grade & Low Grade



Threshold Value
Change on 16.10.2009

Cr203: 10%(MIN)
Before
No Threshold value

Limestone Blendable/ Beneficiable Grade



Threshold Value Change on 16.10.2009

(i)For Limestone Deposits in Chhattisgarh, Gujarat, Himachal Pradesh, Madhya-Pradesh, Maharashtra, Rajasthan, Uttarakhand & Uttar Pradesh: Ca0 - 34% (MIN), Mg0 - 4% (MAX),
(ii) For Limestone Deposits of Andhra Pradesh, Jharkhand, Karnataka, Kerala,Orissa & Tamilnadu: Ca0 - 35% (MIN), Mg0 - 4% (MAX), Si02- 18%(MAX) & Alkalies - 0.5%(max)

Before

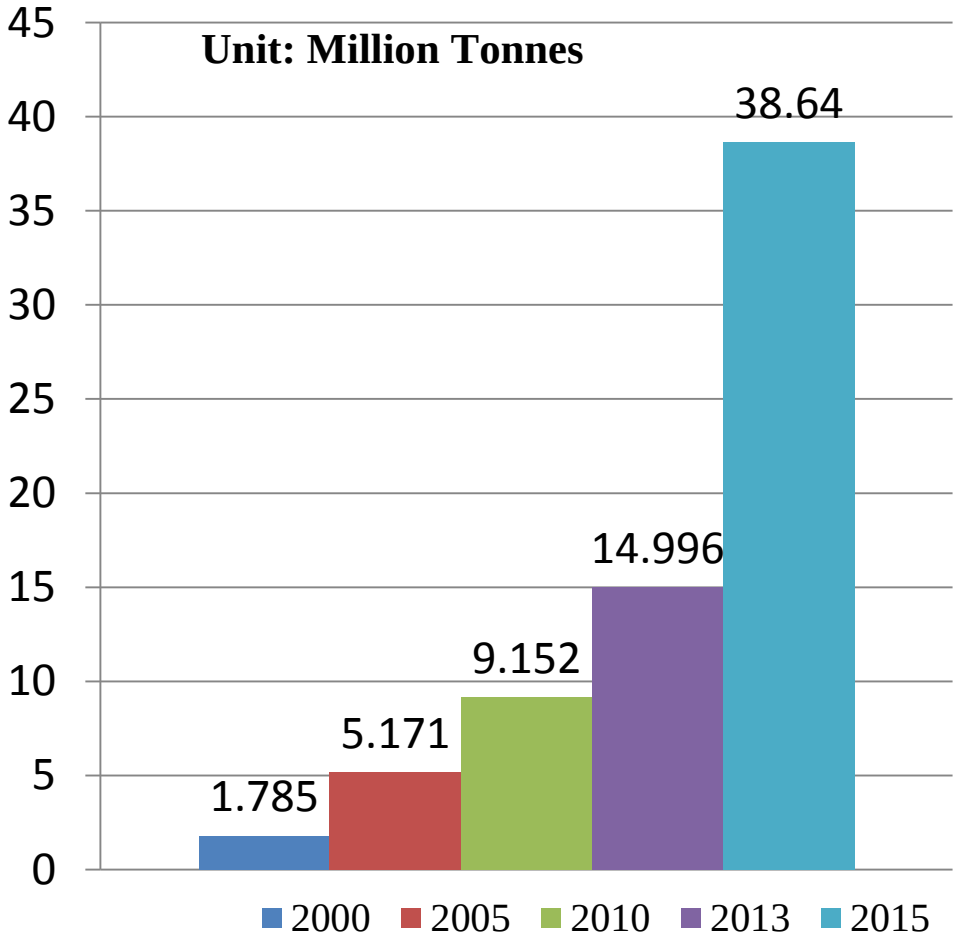
Northern & Western State

CaO-34% (Min), MgO-4% (Max.)
SiO2-18%(Max.), Alkalies-0.5% (Max.)

Southern States

CaO-35% (Min), MgO-4% (Max.)
SiO2-18%(Max.), Alkalies-0.5% (Max.)

Manganese Ore (Low & Beneficaible Grade)

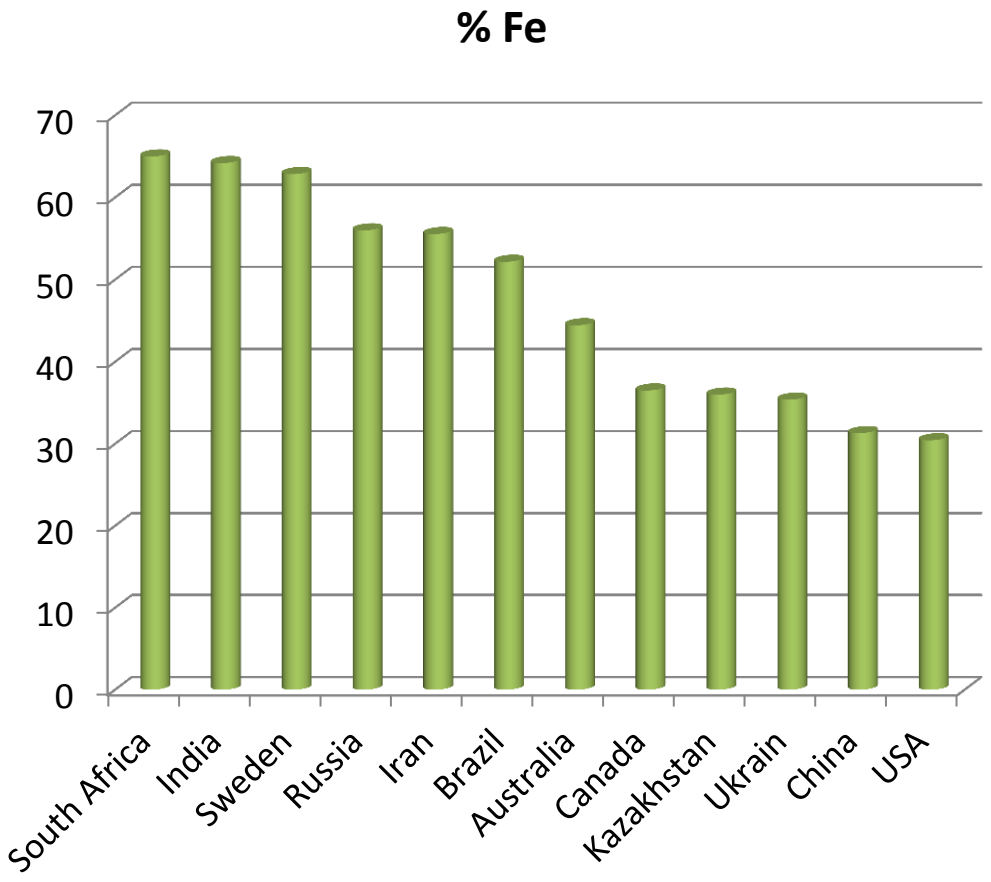


Threshold Value Change on 16.10.2009

(Mn : 10% (MIN)

World Scenario of Iron Ore

Countries	% Fe
South Africa	65
India	64
Sweden	63
Russia	56
Iran	56
Brazil	52
Australia	44
Canada	37
Kazakhstan	36
Ukrain	35
China	31
USA	30

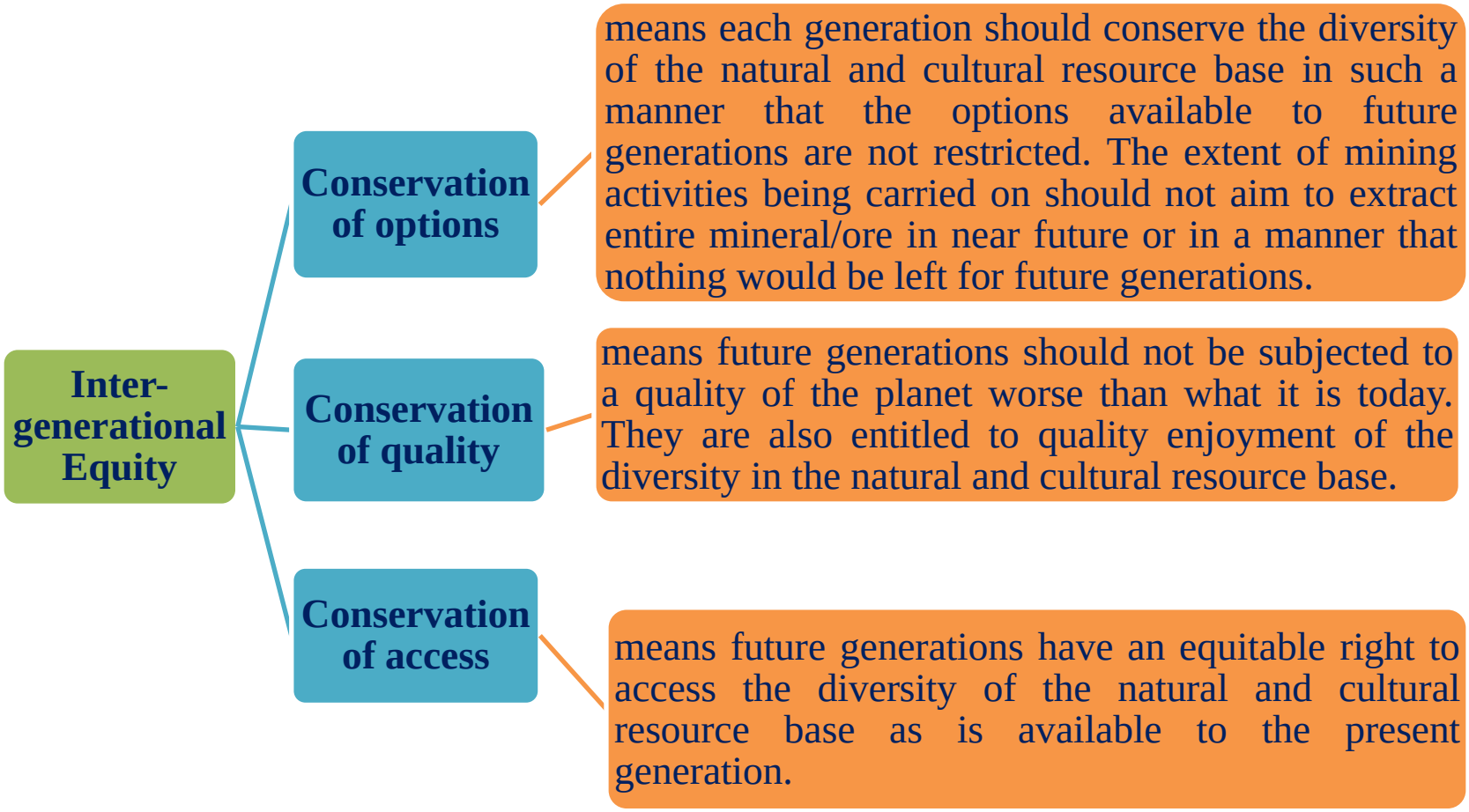


Source: USGS

World Scenario of Low Grade Bauxite

Country/ Locations	Al2O3	SiO2	Fe2O3	Tio2	LOI	Main Al2O3 and SiO2 bearing Minerals
USA, Arkansas	50-55	11-13	2-6	3-4	28-30	Gibbsite, Kaolinite, quartz
Russia, Arkhangelsk district	51-56	16-20	6-9	2-2.8	16-17	Boehmite, Kaolinite
Komi Republic	45-50	5-12	25-30	2-5	12-16	Boehmite, Shamozite
Kazakhstan	41-46	10-13	15-16	1.8-2.2	23-24	Gibbsite, Kaolinite
Australia, Weipa	54-55.5	5-6	11-14	-	24-26	Gibbsite, Boehmite, Kaolinite
China	68.7	9.07	5.22	3.32	13.93	Diaspore, illite

Inter-generational Equity



Why lowering of threshold value for mineral?

- Leading to augmentation of mineral reserves/resources.
- Provide opportunity for up-gradation of technologies for utilization of low-grade ores.
- Facilitate mineral conservation through improved zero-waste mining, beneficiation and utilization of low grade ore and rejects
- Increases the target areas where exploration needs to be taken up.
- Increases Life index which expands horizon for planning for future.

Recommendation/Suggestion

- Regular lowering of threshold value of minerals, based on scientific studies, should be the part of new National Mineral Policy.
- IBM should expand the perspective of the threshold value by fixing up for all minerals for which MCR, 2016 is applicable after considering the present advancement of ore beneficiation techniques as well as changing scenario of the consumption pattern of different minerals.
- Many of the industries are averse to utilize low grade ore and lowering of threshold value for mineral result in increase of inventory of low grade ore which may be utilised by providing incentive to industries.
- Consider Zero waste mining while fixing threshold value for mineral.
- Separate threshold value for Magnetite ore. As M/s JSW upgrading of low grade of iron ore from 25% Fe to 65% Fe, threshold value of Magnetite Iron Ore may be of 20% Fe.

Conclusion

- Rechristening of threshold values of minerals keeping the forth coming availability to advance technical knowhow and specifications of the industry as well as augmentation of mineral resources.

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Thank You!