BALDOTA

WE ARE LIFE

BENEFICIATION A NEED OF THE HOUR

DR. MEDA VENKATAIAH

National Mining Conclave 2024

(Sustainable Mining for Brighter future)

MSAK

28,29TH June 2024,

Indian Institute of Science,

BANGALORE

DISCUSSION ON

- **WHAT HAPPENED IN THE PAST**
- **NATIONAL MINERAL POLICY – HIGHER STEEL PRODUCTION/IRON ORE**
- **PRESENT STATUS OF MINING (IRON ORE /other ores)**
- ***THRESHOLD VALUE CHANGING***
- ***CHANGE OF RESOURCES /grades***
- ***DRI PROCESS - ENVIRONMENT PROTECTION***

WHAT HAPPENED IN THE PAST (PRE- INDEPENDENCE)

- MANGANESE ORE
- GOLD
- LEAD AND ZINC
- IRON ORES
- EASILY MINEABLE AND HIGH GRADE ORES ARE EXTRACTED

- NO DOUBT THE PRODUCTION FIGURES OF ORES ARE NO WHERE COMAPARABLE TO THE PRESENT/FUTURE DEMAND

Ø

IRON ORE MINING

- During 1923 Iron extraction started in Karnataka for supply to Steel Plant established at Bhadravati
- 1907 TISCO, 1954 and then PUBLIC SECTOR intergrated plants
- STC/MMTC Exported High grade ores to Japan and Far east : lost High grade ores till 1990
- Sponge plants from 1980s : calibrated ores produced leaving fines
- Chinese Market 1996 to 2013
- NMP - BAN OF EXPORTS

NATIONAL MINERAL POLICY

1	STEEL DEMAND BY 2030-31 2015 -16	230MT 81.5 MT	Based on the anticipated Rural development, Urban infrastructure, Roads, High ways & Railways
2	STEEL CAPACITY REQUIREMENT	300 MT	Generates 36 lac employment from present 25 lac anticipated
3	Raw material –IRON ORE	Around 480 MT	Present production 277 MT GROWTH OF 80% in 6 years

STEEL CONSUMPTION	INDIA	WORLD
PER CAPITA	70 KGS	210 KGS
THERE IS A NEED FOR IMPROVEMENT		

End Use Demand Estimation of Steel Production in India

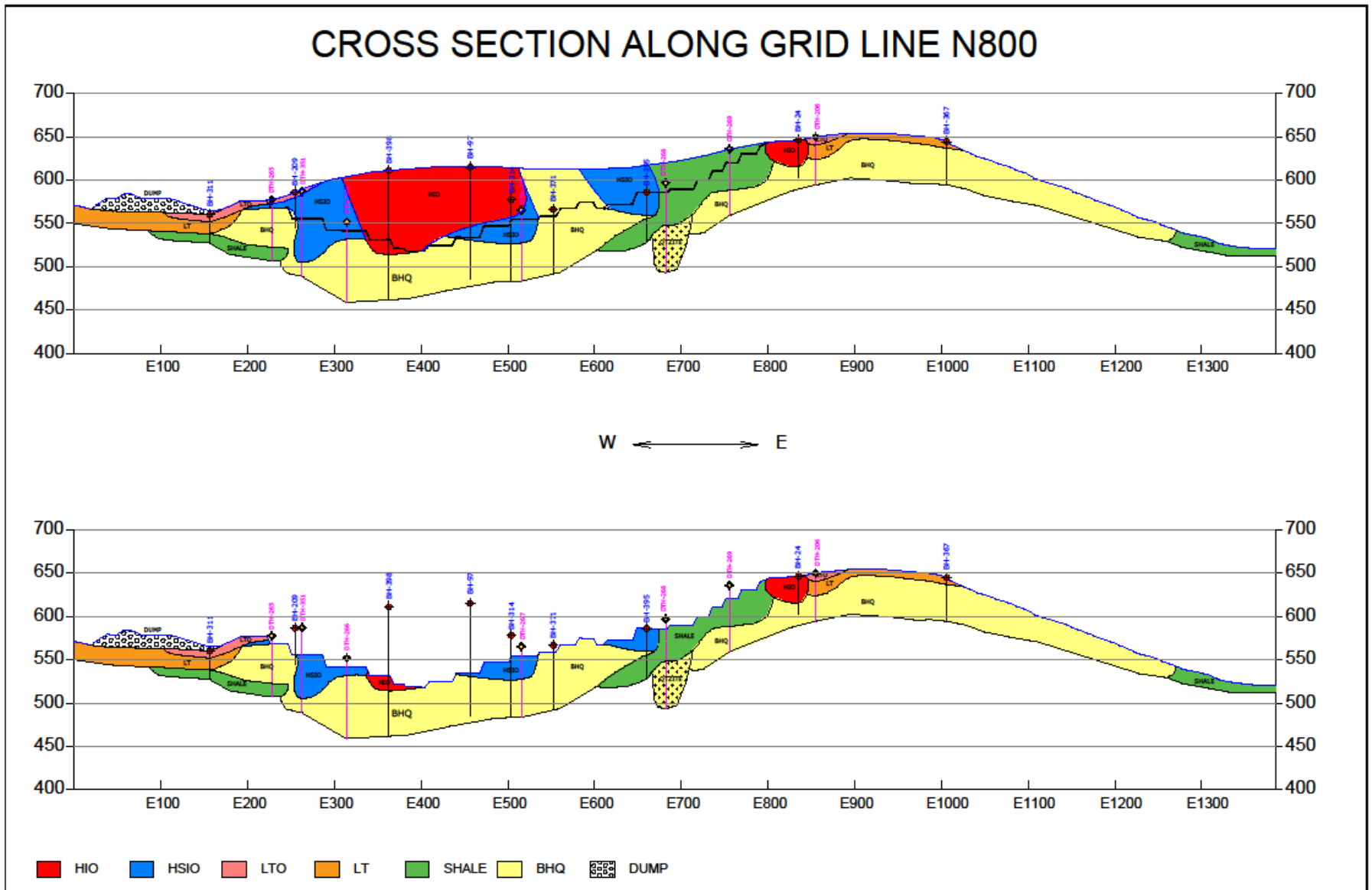
NITI Aayog

For **projecting future production of finished steel in India, a regression is performed between the historical values of per capita GDP and per capita finished steel production, considering a saturation level of 646 kg per capita of (China's current per capita steel consumption).**

The projected values of finished steel production are:

	2020	2022	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
Per capita finis steel prod. (kg)	67.73	88.14	117.54	156.6	202	253.71	307.56	362.29	414.82	452.41	478.05	495.85
Finished Steel Prod (MT)	92.23	122.28	167.40	231.75	308.41	396.49	488.44	582.63	672.59	736.37	777.68	802.63

TYPICAL CROSS SECTION
Past and present



THRESHOLD VALUES- RESOURCES

"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 different regions, below which a mineral obtained after mining can he discarded as waste.“

Threshold Value and provisions for revision

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

CHANGE OF THRESHOLD VALUES- RESOURCES

1990:

Iron ore:

A)Goan Iron Ores:

(i) Siliceous ore - 40% Fe

(ii) Hematitic ore - 55% Fe (Both Lumpy and Powdery ore)

B) Bellary Hospet region - 58% Fe (Provisional)

October 2009:

(i) Hematitic iron ore: 45% Fe(min)

(ii) Hematitic siliceous ore (for ore of Goan origin): 35% Fe(min)

2018 Notification

Iron Ore

(i)Hematitic Ore - 45% Fe(Min.)
(ii) Hematitic Siliceous Ore - 35% Fe(Min.)
(iii) Magnetite Ore-15% Fe (Min.)

Ø

MSPL as early as 1989-90 took decision to conserve Iron Ore Fines incidentally produced. There was no market for these Fines except MMTC was taking small quantities on quota system.

Downhill Conveyor was established with screening and crushing facilities and produced more than one Million tons fines and stocked in anticipation of future market.

HATS OFF TO MSPL MANAGEMENT FOR ACEPTING THE IDEA GIVEN BY ME

Ø

Threshold value & EFFECT ON PRODUCTION

Whenever threshold of any mineral changes the resources/reserves are recalculated with/without additional exploration.

- Average Fe% of resources available left over resources in the working mines will reduce.
- Approval of Mining Plans
- Increase of Annual production Capacity – approvals – This is a lengthy and painful job for managements.

Typical Analysis Details of Iron Ore for 51 & 54 % Fe					
Slab	Fe%	SiO2%	Al2O3%	P%	LOI%
51 %	51.00	20.78	3.66	0.060	2.16
	50.01	21.78	3.73	0.062	1.72
55 %	54.01	12.08	5.60	0.058	4.07
	54.89	11.18	5.61	0.06	3.66

DRI PROCESS for STEEL MAKING

DRI route of steel making reduces/controls the emissions and good for better Ecology and environment.

But DRI requires High Grade Iron ores / pellets as a feed.

As High-grade iron ores are diminishing after 75 years of mining. Most of the deposits are associated volcano-sedimentary Banded Iron Formations (BIF) of Precambrian age.

DRI PROCESS for steel making

Haematitic Siliceous ores as termed by IBM under their new classification with values of +35%Fe. Magnetite ores of +15% Fe are taken as the Threshold values for exploitation of mineral.

Unless these low grades ores or blended, there is no chance to conserve. Otherwise beneficiate to the requirement grades acceptable by the user

Ø

DRI PROCESS- BETTER ENVIRONMENT

There are two ways to meet the demand anticipated by 2030 480 MT of Iron ore as main raw material for Steel production.

Beneficiation of low-grade ores at the mine and supply required grade to Steel Plants

Alternatively, Steel plants purchase all the grades available in the market and establish beneficiation plants to achieve the required grade for pellet making/steel production.

Ø

DRI PROCESS- BETTER ENVIRONMENT

One estimate is the Hematite ores left over is only 28% of total resources of Iron ore in the country. Karnataka share is very minimal compared to Orissa.

Hence, beneficiation - Sinter/pellet route is necessary to prepare raw material for Steel through DRI for better environment.

Ø

LET US DISCUSS MAIN ISSUES OF BENEFICIATION OF LOW GRADES

Ø

LIBERATION - TAILINGS

As per Studies by various testing agencies, Iron ore has a liberation of 75-90% at 150 micron size for threshold value of 45% Fe. For 35% Fe, the liberation is still at finer size

- At -1mm+0.15mm liberation is about 60-80%

- Without complete liberation, higher Fe also reports in tails

- Grinding to complete liberation is costly, but there is no alternate but to produce higher grade superfines to supply to pellet – steel plants.

SiO_2, Al_2O_3% plays important roles

Marketability of Iron ore depends

High SiO_2 increases the slag volume while high Al_2O_3 generate viscous slag.

Al:Si ratio should be between 1.0 to 1.5.

High Al_2O_3 % increases the energy consumption and decreases the productivity in a blast furnace

1% increase in Al_2O_3 content increases coke rate by 2.2% decreases productivity by 4% and increases flux consumption by 30kg/t of hot metal production.

HENCE THERE IS NEED TO PLAN BENEFICIATION to achieve

- ZERO WASTE
- NET ZERO EMISSION
- RECLAMATION OF MINES
- TO ACHIEVE NATIONAL GOALS OF STEEL MAKING FOR
  - INFRASTRUCTURE DEVELOPMENT OF OUR NATION

HENCE THERE IS NEED TO PLAN BENEFICIATION

- FOR CONSERVATION/USE OF LOW-GRADE MINERALS

- SUSTAIANBLE MINING FOR BRIGHTER FUTURE

Ø

THANK YOU ALL

Ø