

BAUXITE



# Indian Minerals Yearbook 2022

(Part- III : MINERAL REVIEWS)

61<sup>th</sup> Edition

**BAUXITE**

**(ADVANCE RELEASE)**

**GOVERNMENT OF INDIA  
MINISTRY OF MINES  
INDIAN BUREAU OF MINES**

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## 3 Bauxite

**B**auxite is basically an aluminous rock that contains hydrated aluminium oxide as main constituent and iron oxide, silica & titania as minor constituents present in varying proportions. Hydrated aluminium oxides present in the bauxite ore are diasporite and boehmite,  $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$  ( $\text{Al}_2\text{O}_3$ :85%; Al:45%); gibbsite or hydrargillite,  $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$  ( $\text{Al}_2\text{O}_3$ :65.4%; Al:34.6%), and bauxite (containing colloidal alumina hydrogel),  $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$  ( $\text{Al}_2\text{O}_3$ :73.9%; Al:39.1%). The iron oxide in bauxite ore is present as haematite or goethite; silica as clay; and free quartz & titania as leucosene or rutile. Bauxite is the principal ore of aluminium which is one of the most important non-ferrous metals used in the modern industry. It is also an essential ore for Refractory and Chemical industries.

### RESERVES/RESOURCES

Reserves/Resources of bauxite in the country as on 1.4.2020, as per NMI database, based on UNFC system have been placed at 4958 million tonnes. These resources include 646 million tonnes Reserves and 4311 million tonnes Remaining Resources. The country is endowed with huge quantities metallurgical grade bauxite. By grades, about 79% resources are of Metallurgical grade (I, II & Mixed). The resources of Refractory and Chemical grades are limited and together account for about 4%. By States, Odisha alone accounts for 41% of country's resources of bauxite followed by Chhattisgarh 20%, Andhra Pradesh (12%), Gujarat (8%), Jharkhand (6%), Maharashtra (5%) and Madhya Pradesh (4%). Major bauxite resources are concentrated in the East Coast bauxite deposits in Odisha and Andhra Pradesh (Table-1).

### EXPLORATION & DEVELOPMENT

The exploration & development details, if any, are covered in the Review on "Exploration & Development" under "General Reviews".

### PRODUCTION & STOCKS

The production of bauxite at 22494 thousand tonnes in 2021-22 increased by about 10% as compared to that of the previous year.

There were 126 reporting mines in 2021-22 as against 134 in the previous year. Besides, production of bauxite was reported as an associated mineral by 9 mines during the year. In all, 55 producers reported production of bauxite in 2021-22. Out of these, ten principal producers having 41 mines contributed about 91.40% of the total production.

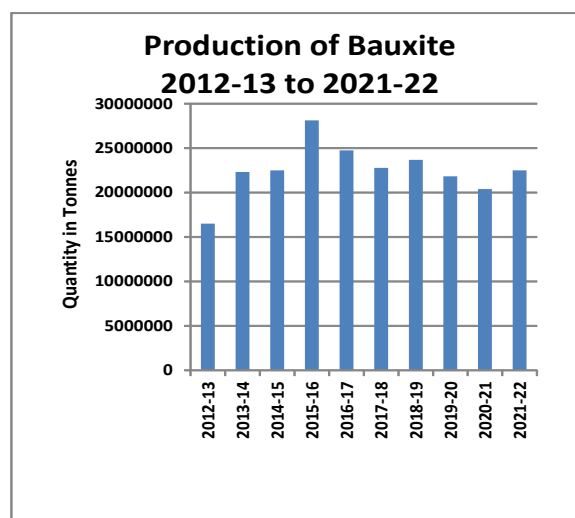
NALCO is the leading producer of bauxite and contributed 33% of the total production. The share of Public Sector mines was about 49% of the total production in 2021-22, as against 52% in the previous year.

About 80% of the total production of bauxite was of 40–45%  $\text{Al}_2\text{O}_3$  grade followed by 11% of Cement grade, 6% of 45% to 50%  $\text{Al}_2\text{O}_3$  grade, 1% by refractory grade and the remaining production was reported in grades (below 40% grade, Abrasive grade & Chemical grade) during the year 2021-22.

Odisha emerged as the leading producing State accounting for about 73% of the total production during 2021-22 (Tables-2 to 5).

Mine-head closing stocks of bauxite in 2021-22 were 17285 thousand tonnes as compared to 17116 thousand tonnes in the previous year. About 84% of the total stock was held in Gujarat at the end of the year (Tables- 6 'A' & 6 'B').

The average daily employment of labour in bauxite mines was 5,015 in 2021-22 as against 5,041 in the previous year.



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**Table – 1 : Reserves/Resources of Bauxite as on 1.4.2020 (P)**  
**(By Grades/States)**

(In '000 tonnes)

Grade/State	Reserves			Remaining Resources						Total Resources (A+B)		
	Proved STD111	Probable		Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333		Reconnaissance STD334	Total (B)
		STD121	STD122		STD221	STD222						
<b>All India : Total By Grades</b>	<b>560865</b>	<b>15553</b>	<b>70076</b>	<b>646493</b>	<b>268598</b>	<b>128409</b>	<b>316835</b>	<b>843058</b>	<b>2044653</b>	<b>184116</b>	<b>4311754</b>	<b>4958248</b>
Chemical	5454	480	706	6639	1936	4819	528	2877	5063	-	15405	22044
Refractory	30120	437	11806	42363	5705	8788	46667	6737	31999	628	100709	143072
Chemical/Refractory	1301	120	154	1575	6037	3202	793	3378	11161	-	24786	26362
Mixed with others												
Metallurgical-1	468244	9495	29788	507527	164431	44265	188496	390814	1410328	19573	2645493	3153020
Metallurgical-2	27772	986	8342	37100	25714	21567	37982	19638	334894	7640	585786	622886
Metallurgical mixed	6443	310	2030	8783	8463	5085	7378	58958	38329	16846	146366	155149
Low Grade	7920	2673	16056	26649	22851	4619	17908	24414	151151	88692	521473	548122
Beneficial	832	-	-	832	-	756	-	34424	4610	39260	79050	79883
Mixed grade Excluding Chem./Refrac.	7503	561	339	8403	22017	12399	7563	6839	13387	-	66576	74979
Abrasive	-	-	-	-	264	740	123	92	961	840	3076	3076
Others	3192	-	855	4047	5971	137	8754	11999	9250	1545	43257	47304
Unclassified	2084	491	-	2576	4303	22033	643	535	12093	8954	57500	60076
Not-known	-	-	-	-	706	-	-	5	21427	138	22276	22276
<b>By States</b>												
Andhra Pradesh	-	-	-	-	-	-	-	188971	138120	288176	-	615267
Bihar	-	-	-	-	-	-	-	-	4114	-	4114	4114
Chhattisgarh	19202	1073	3420	23695	14306	4727	46620	37763	771015	18747	968860	992555
Goa	7963	-	1650	9613	5222	1097	8195	6820	36910	-	58244	67857
Gujarat	83448	2005	15777	101230	86746	41434	21913	29145	82774	11678	295797	397027
Jammu & Kashmir	-	-	-	-	-	-	-	1323	1220	-	2725	2725
Jharkhand	29524	731	9717	39972	25895	7647	14969	25962	70527	41050	249272	289244
Karnataka	126	194	4887	5207	2468	864	88	82	35520	-	41242	46449
Kerala	-	-	-	-	29	-	24	2037	2722	-	19449	19449
Madhya Pradesh	13584	631	4349	18564	20389	13358	7138	22060	54577	-	167695	186259
Maharashtra	18833	3573	16065	38472	15794	1981	21023	38931	83354	-	193958	232430
Meghalaya	-	-	-	-	-	-	-	-	4300	-	4300	4300
Odisha	388184	7346	14210	409740	97550	56160	193301	161842	596940	112642	1647284	2057024
Rajasthan	-	-	-	-	-	-	-	-	528	-	528	528
Tamil Nadu	-	-	-	-	-	1141	3564	960	8363	-	24112	24112
Uttar Pradesh	-	-	-	-	-	-	-	10390	8018	-	18908	18908

Figures rounded off

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**Table – 2 : Principal Producers of Bauxite, 2021-22**

Table- 2 (Concl'd)

Name & address of producers	Location of mine		Name & address of producer	Location of mine	
	State	District		State	District
National Aluminium Co. Ltd, NALCO Bhawan, Bhubaneswar-751 061, Odisha.	Odisha	Koraput	Gujarat Mineral Development Corporation Ltd, Khanij Bhavan, 132 Feet Ring Road, Near University Ground, Vastrapur, Ahmedabad -380 052, Gujarat.	Gujarat	Devbhoomi-Dwarka Kutch
Utkal Alumina International Ltd, J-6, Jayadev-Vihar, Bhubaneswar-751 013, Odisha.	Odisha	Raygada	Minerals & Minerals Ltd, Court Road, Lohardaga-835 302, Jharkhand.	Jharkhand	Lohardaga Gumla
Odisha Mining Corporation Ltd. OMC House, Unit-V, Post Box No. 34, Bhubaneswar- 751 001 Odisha .	Odisha	Koraput	Infrastructue Logistics Pvt. Ltd., Maharashtra 205, 2nd floor, Kamat Metropolis-I, St Inez, Goa North Goa -403004, Goa	Maharashtra	Ratnagiri
Hindalco Industries Ltd, Ahura Centre, 1 <sup>st</sup> Floor, B-Wing, Mahakali Caves Road, Andheri (East), Mumbai-400 093, Maharashtra.	Chhattisgarh Jharkhand Maharashtra	Surguja Gumla Latehar Lohardaga Kolhapur	Alimiya Imamali Saiyad, FF/16, Samruddhi Complex, Near L.I.C. Office, Himmatnagar, Dist, Sabarkantha-383 001 Gujarat.	Gujarat	Sabarkantha
Mr.Sanjay Kumar Trikamlal Shah 2, Arbudan agar -1 Ratnakar Mata Kapadwanj Kheda - 386720 Gujarat.	Gujarat	Kheda	Smt P. H. Joshi 216, Shivam Complex, Opp. Hetarth party plot, Sola science city Road Gujarat-388225, Ahmedabad	Gujarat	Kheda

(Contd.)

**Table – 3 : Production of Bauxite, 2019-20 to 2021-22  
(By States)**

(Quantity in tonnes; Value in ₹'000)

States	2019-20		2020-21		2021-22 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>21825227</b>	<b>16299333</b>	<b>20380548</b>	<b>16793448</b>	<b>22493947</b>	<b>24767048</b>
Chhattisgarh	1565307	1609377	716296	751459	968247	1085795
Gujarat	2076329	1439889	1497716	1198490	2018309	1683681
Jharkhand	1418793	1400830	1497472	1607332	1808725	2334128
Madhya Pradesh	685929	546953	632385	479818	608925	493590
Maharashtra	595562	401196	471068	332108	640345	390285
Odisha	15483307	10901088	15565611	12424241	16449396	18779569

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**Table – 4 (A) : Gradewise Production of Bauxite, 2020-21 (P)**  
(By Sectors/States/Districts)

State/District	For use in Alumina & Aluminium extraction : Al <sub>2</sub> O <sub>3</sub> content						For use other than Alumina & Aluminium extraction						Total	
	No. of Mines	60% & above	55-60%	50-55%	45-50%	40-45%	Below 40%	Cement	Abrasive	Refractory	Chemical	Quantity		Value
<b>India</b>	<b>134(7)</b>	-	-	-	<b>877407</b>	<b>17056794</b>	<b>150114</b>	<b>1941472</b>	<b>89821</b>	<b>130735</b>	<b>134205</b>	<b>20380548</b>	<b>16793448</b>	
Public Sector	20	-	-	-	-	10484896	750	15465	-	60697	113815	10675623	9440515	
Private Sector	114(7)	-	-	-	877407	6571898	149364	1926007	89821	70038	20390	9704925	7352933	
<b>Chhattisgarh</b>	<b>14</b>	-	-	-	<b>446215</b>	<b>270081</b>	-	-	-	-	-	<b>716296</b>	<b>751459</b>	
Kabirdham	2	-	-	-	-	575	-	-	-	-	-	575	582	
Kondagaon	2*	-	-	-	-	-	-	-	-	-	-	-	-	
Surguja	10	-	-	-	446215	269506	-	-	-	-	-	715721	750877	
<b>Gujarat</b>	<b>63</b>	-	-	-	-	<b>51506</b>	<b>750</b>	<b>1172536</b>	<b>89821</b>	<b>69288</b>	<b>113815</b>	<b>1497716</b>	<b>1198490</b>	
Amreli	1	-	-	-	-	-	-	500	-	-	-	500	422	
Devbhoomi Dwarka	34	-	-	-	-	51506	-	170578	87877	48211	-	358172	307280	
Kheda	10	-	-	-	-	-	750	457090	269	19087	113815	457359	367809	
Kutch	9	-	-	-	-	-	-	257225	1675	1990	-	133652	151416	
Porbandar	5	-	-	-	-	-	-	287143	-	-	-	260890	195283	
Sabarkantha	4	-	-	-	-	-	-	-	-	-	-	287143	176280	
<b>Jharkhand</b>	<b>19</b>	-	-	-	<b>392196</b>	<b>1055260</b>	-	-	-	<b>50016</b>	-	<b>1497472</b>	<b>1607332</b>	
Gumla	13	-	-	-	392196	486185	-	-	-	50016	-	928397	1027353	
Lohardaga	6	-	-	-	-	569075	-	-	-	-	-	569075	579979	
<b>Madhya Pradesh</b>	<b>21(7)</b>	-	-	-	-	<b>68100</b>	-	<b>532464</b>	-	<b>11431</b>	<b>20390</b>	<b>632385</b>	<b>479818</b>	
Anuppur	1	-	-	-	-	-	-	44547	-	-	-	44547	31495	
Jabalpur	2(1)	-	-	-	-	-	-	106442	-	-	2500	108942	74143	
Katni	9(3)	-	-	-	-	-	-	272860	-	-	-	272860	196924	
Rewa	1	-	-	-	-	-	-	12255	-	-	-	12255	10417	
Sanna	3(3)	-	-	-	-	-	-	8995	-	4046	17890	30931	32579	
Shahdol	2	-	-	-	-	68100	-	65115	-	-	-	133215	93695	
<b>Maharashtra</b>	<b>12</b>	-	-	-	<b>38996</b>	<b>195600</b>	-	<b>236472</b>	-	<b>7385</b>	-	<b>471068</b>	<b>332108</b>	
Kolhapur	6	-	-	-	38996	195600	-	-	-	-	-	234596	223798	
Raigad	3	-	-	-	-	-	-	97894	-	-	-	<b>97894</b>	53156	
Ratnagiri	3	-	-	-	-	-	-	138578	-	-	-	138578	55154	
<b>Odisha</b>	<b>5</b>	-	-	-	-	<b>15416247</b>	<b>149364</b>	-	-	-	-	<b>15565611</b>	<b>12424241</b>	
Koraput	3	-	-	-	-	10383785	-	-	-	-	-	10383785	9102691	
Raygada	1	-	-	-	-	5032462	149364	-	-	-	-	5181826	3321550	
Sundargarh	1*	-	-	-	-	-	-	-	-	-	-	-	-	

Figures in parentheses indicate number of associated mines. \* Only labour reported.

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**Table – 4 (B) : Gradewise Production of Bauxite, 2021-22 (P)**  
(By Sectors/States/Districts)

State/District	No. of Mines	For use in Alumina & Aluminium extraction : Al <sub>2</sub> O <sub>3</sub> content						For use other than Alumina & Aluminium extraction						Total	
		60% & above	55—60%	50—55%	45—50%	40—45%	Below 40%	Cement	Abrasive	Refractory	Chemical	Quantity	Value	Quantity	Value
<b>India</b>	<b>126(9)</b>	-	-	-	<b>1377785</b>	<b>18042239</b>	<b>75187</b>	<b>2496196</b>	<b>86184</b>	<b>263739</b>	<b>152617</b>	<b>22493947</b>	<b>24767048</b>		
Public Sector	19	-	-	-	80589	10590726	-	115960	113	126309	152387	11066084	14876391		
Private Sector	107(9)	-	-	-	1297196	7451513	75187	2380236	86071	137430	230	11427863	9890657		
<b>Chhattisgarh</b>	<b>13</b>	-	-	-	<b>802000</b>	<b>166247</b>	-	-	-	-	-	<b>968247</b>	<b>1085795</b>		
Kabirdham	2	-	-	-	-	127	-	-	-	-	-	127	83		
Kondagaon	2*	-	-	-	-	-	-	-	-	-	-	-	-		
Surguja	9	-	-	-	802000	166120	-	-	-	-	-	968120	1085712		
<b>Gujarat</b>	<b>58</b>	-	-	-	<b>80589</b>	-	-	<b>1522811</b>	<b>86184</b>	<b>176338</b>	<b>152387</b>	<b>2018309</b>	<b>1683681</b>		
Anreli	-	-	-	-	-	-	-	-	-	-	-	-	-		
Devbhoomi Dwarka	34	-	-	-	80589	-	-	292986	86184	95201	-	554960	482210		
Kheda	9	-	-	-	-	-	-	790176	-	-	-	790176	561814		
Kutch	9	-	-	-	-	-	-	-	80037	152387	-	232424	357859		
Porbandar	3	-	-	-	-	-	-	181600	-	1100	-	182700	108629		
Sabarkantha	3	-	-	-	-	-	-	258049	-	-	-	258049	173169		
<b>Jharkhand</b>	<b>19</b>	-	-	-	<b>456196</b>	<b>1300383</b>	-	-	-	<b>52146</b>	-	<b>1808725</b>	<b>2334128</b>		
Gumla	13	-	-	-	456196	619590	-	-	-	52146	-	1127932	1457176		
Lohardaga	6	-	-	-	-	680793	-	-	-	-	-	680793	876952		
<b>Madhya Pradesh</b>	<b>18(9)</b>	-	-	-	-	-	-	<b>573440</b>	-	<b>35255</b>	<b>230</b>	<b>608925</b>	<b>493590</b>		
Anuppur	-	-	-	-	-	-	-	-	-	-	-	-	-		
Jabalpur	2(2)	-	-	-	-	-	-	127030	-	-	-	127030	80972		
Katni	7(3)	-	-	-	-	-	-	249775	-	-	-	249775	177478		
Rewa	1	-	-	-	-	-	-	13620	-	-	-	13620	11348		
Satna	3(4)	-	-	-	-	-	-	27140	8011	230	35381	47488			
Shahdol	2	-	-	-	-	-	-	130743	-	-	-	130743	81803		
Sidhi	3	-	-	-	-	-	-	25132	27244	-	52376	94501			
<b>Maharashtra</b>	<b>12</b>	-	-	-	<b>39000</b>	<b>201400</b>	-	<b>399945</b>	-	-	-	<b>640345</b>	<b>390285</b>		
Kolhapur	6	-	-	-	39000	201400	-	-	-	-	-	240400	210678		
Raigad	3	-	-	-	-	-	-	97880	-	-	-	97880	44046		
Ratnagiri	3	-	-	-	-	-	-	302065	-	-	-	302065	135561		
<b>Odisha</b>	<b>6</b>	-	-	-	-	<b>16374209</b>	<b>75187</b>	-	-	-	-	<b>16449396</b>	<b>18779569</b>		
Koraput	4	-	-	-	-	10450506	-	-	-	-	-	10450506	14142591		
Raygada	1	-	-	-	-	5923703	75187	-	-	-	-	5998890	4636978		
Sundargarh	1*	-	-	-	-	-	-	-	-	-	-	-	-		

Figures in parentheses indicate number of associated mines. \* Only labour reported.

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**Table – 5 : Production of Bauxite, 2020-21 and 2021-22  
(By Frequency Groups)**

(Quantity in tonnes)

Production group	No. of mines		Production for the group		Percentage to total production		Cumulative percentage	
	2020-21	2021-22 (P)	2020-21	2021-22 (P)	2020-21	2021-22 (P)	2020-21	2021-22 (P)
<b>Total</b>	<b>134(7)</b>	<b>126(9)</b>	<b>20380548</b>	<b>22493947</b>	<b>100.00</b>	<b>100.00</b>	-	-
Up to 1000	57(1)	45(1)	4013	2230	0.02	0.01	0.02	0.01
1001 — 3000	5(1)	6(1)	10556	11814	0.05	0.05	0.07	0.06
3001 — 5000	3	3	12290	11308	0.06	0.05	0.13	0.11
5001 — 10000	6	6(1)	42665	54197	0.21	0.24	0.34	0.35
10001 — 25000	16(2)	16(3)	279588	318923	1.37	1.43	1.71	1.78
25001 — 50000	18	15(2)	728459	661668	3.57	2.94	5.28	4.72
50001 and above	29(3)	35(1)	19302977	21433807	94.71	95.28	100	100.00

Figures in parentheses indicate number of associated mines

**Table – 6 (A) : Mine-head Closing Stocks of Bauxite, 2020-21  
(By States & Grades)**

(Quantity in tonnes)

State	For use in Alumina & Aluminium metal Extraction Al <sub>2</sub> O <sub>3</sub> Content						For use other than Alumina & Aluminium metal extraction				
	60% & above	55—60%	50—55%	45—50%	40—45%	Below 40%	Cement	Abrasive	Refractory	Chemical	Total
<b>India</b>	-	-	-	<b>640750</b>	<b>2423793</b>	<b>215398</b>	<b>12862061</b>	<b>418588</b>	<b>395172</b>	<b>159947</b>	<b>17115710</b>
Chhattisgarh	-	-	-	19719	31090	-	-	94	1255	1261	53419
Gujarat	-	-	-	499725	461173	46523	11783532	418494	372010	128741	13710198
Jharkhand	-	-	-	22328	85037	12878	7	-	-	-	120250
Karnataka	-	-	-	-	-	-	9000	-	-	-	9000
Madhya Pradesh	-	-	-	3999	51720	33122	602827	-	21908	29945	743521
Maharashtra	-	-	-	81790	197495	111702	466695	-	-	-	857682
Odisha	-	-	-	13189	1597278	11172	-	-	-	-	1621639

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**Table – 6 (B) : Mine-head Closing Stocks of Bauxite, 2021-22 (P)**  
**(By States & Grades)**

State	For use in Alumina & Aluminium metal Extraction Al <sub>2</sub> O <sub>3</sub> Content						For use other than Alumina & Aluminium metal extraction				(Qty in tonnes)
	60% & above	55%- 60%	50%- 55%	45%- 50%	40%- 45%	Below 40%	Cement	Abrasive	Refractory	Chemical	Total
	<b>India</b>	-	-	-	<b>100444</b>	<b>1729610</b>	<b>478873</b>	<b>13972363</b>	<b>507393</b>	<b>346032</b>	<b>149957</b>
Chhattisgarh	-	-	-	24563	105930	690	-	95	1255	1261	133794
Gujarat	-	-	-	9171	450174	46501	13108616	507298	319239	118043	14559042
Jharkhand	-	-	-	28798	158097	12858	-	-	-	-	199753
Karnataka	-	-	-	-	-	-	9000	-	-	-	9000
Madhya Pradesh	-	-	-	-	552	297039	465100	-	25538	30653	818882
Maharashtra	-	-	-	24723	125867	111649	389647	-	-	-	651886
Odisha	-	-	-	13189	888990	10136	-	-	-	-	912315

## MINING & TRANSPORT

The mining of bauxite is carried out by opencast method. The mines are classified in the following three categories depending upon the level of mechanisation:

- (i) Manually operated mines
- (ii) Semi-mechanised mines
- (iii) Mechanised mines

### Manually Operated Mines

Many bauxite mines are small and produce less than 10,000 tpy. The entire work of overburden removal, extraction of bauxite and loading of bauxite on to trucks is carried out manually and the bauxite is transported to respective railway siding or plants by road.

### Semi-mechanised Mines

In semi-mechanised mines, mining operations are carried out by jack hammer drilling and normally ANFO mixture is used as an explosive for blasting in mineralised zone as well as in overburden, if required. Loading of mineral on to trucks or dumpers is done by payloaders or manually. Since bauxite occurs as small lenses or pockets or boulders or as segregations in murrum and laterite, it is difficult to mechanise the mining operations.

### Mechanised Mines

Mechanised mining operations are carried out in a few captive mines of the alumina/aluminium

plants. These mines use Rock breakers for loosening the overburden, compressed-air drills for drilling blastholes. Sometimes, compressed-air jack hammer drills are also used for drilling blastholes for secondary blasting of boulders and also for toe drilling in irregular bauxite faces caused due to improper fragmentation of bauxite. The blasted overburden/ore materials are handled and transported separately by using shovels or excavators and trucks/dumpers. Separate benches are maintained for overburden and ores. The height of benches in ore varies from 1.5 to 7.5 m. Tippers for hauling of OB to the waste dump and bull dozer for leveling the dumped material, bauxite excavation through drilling, blasting and sizing through crusher and loading into the trucks for transportation to plants etc.

Computerised mine planning, use of mobile crusher, simultaneous land reclamation, restricting operations to small portions of mining area at a time, etc. have greatly helped in conserving energy and faster land rehabilitation.

## CONSUMPTION

In 2021-22, the apparent consumption of Bauxite was about 24.95 million tonnes as against 21.35 million tonnes during preceding year, which has been a increase about 16.90 %. The sources of supply of Bauxite to Alumina plants is given under Table-7.



## BAUXITE

**Table – 7 : Domestic Sources of Supplies of Bauxite to Alumina Plants**

Producer	Plant	Source of supply
NALCO	Damanjodi, Koraput (Odisha)	Captive mines at Panchpatmali Hills, Koraput distt. Odisha.
BALCO	Korba (Chhattisgarh)	Captive mines in Surguja & Bodai-Daldali in Kabirdham (Kawardha) distt. Chhattisgarh.
Hindalco Industries	Renukoot (Uttar Pradesh)	Captive mines in Shahdol distt. Madhya Pradesh; Gumla & Lohardaga distts. Jharkhand and Surguja distt. in Chhattisgarh. Also other suppliers include suppliers from Odisha, Madhya Pradesh and Jharkhand; Katni Bauxite Pvt. Ltd, Satna, Laxmidasji Ramji, Katni; and Minerals & Minerals Corp., Gujarat.
	Belagavi (Karnataka), Muri, Ranchi (Jharkhand)	Captive mines in Chandgad & Durgmanwadi, Kolhapur distt. Maharashtra and Lohardaga distt. in Jharkhand. Udgeri, Gudeghar, Kolhapur distt., Maharashtra and Bhoomi Resources Pvt Ltd, Maharashtra.
Utkal Alumina	Odisha	Baphlimali bauxite mine (Odisha)
Vedanta Aluminium	Lanjigarh (Odisha)	Supplier from Gujarat, BALCO, Bagmar Bauxite Industries Pvt Ltd, Chhattisgarh; LDR, M.P. and abroad.

## USES & SPECIFICATIONS

Bauxite is primarily used to produce alumina through the Bayer process. Aluminium Industry normally uses bauxite containing minimum 40% Al<sub>2</sub>O<sub>3</sub>. However, slightly inferior grades with a suitable blend are also used depending upon other characteristics, such as, solubility in caustic soda and absence of silica. The BIS has specified IS:5953-1985(Reaffirmed 2008 & 2014) specifications for metallurgical grade bauxite. Details of the industries are provided in a separate Review 'Aluminium and Alumina'.

In Steel Industry, bauxite is used as a slag corrector in place of fluorite and generally bauxite, containing 45 to 54% Al<sub>2</sub>O<sub>3</sub> and 5% SiO<sub>2</sub> (max.) is consumed. Size preference is 25 to 125 mm with a tolerance of 5% (max.) for -25 mm & +100 mm fractions.

BIS has prescribed the specifications of bauxite 'IS : 10817-1984 (Reaffirmed in 2020) for Refractory Industry.

The IS specifications of bauxite for consumption in Chemical and Petroleum industries are given in 'IS : 3605-1984 (Reaffirmed 2020).

Apart from the chemical specifications, the physical requirements are that the material passing through 90-micron IS sieve but retained on 212-micron IS sieve should be 90% maximum; that passing through 300-micron IS sieve shall be 1% by mass maximum; and that passing through 212-micron IS sieve but retained on 300-micron IS sieve should be 10% maximum.

The other specifications laid down by BIS are 'IS:8228-1976 (Reaffirmed 2020)' for bauxite sand and 'IS:8988-1978 (Reaffirmed 2019)' for bauxite powder for foundry washes.

As per Ministry of Mines Notification dated 25<sup>th</sup> April 2018, the threshold value of bauxite mineral has been classified into the following two categories:

- (i) For Aluminous laterite: Al<sub>2</sub>O<sub>3</sub> – 20% (min.)
- (ii) For Bauxite: Al<sub>2</sub>O<sub>3</sub> – 30% (min.) and SiO<sub>2</sub> (Total) – 7% (max.)

## SUBSTITUTION

There is no substitute for bauxite as source for aluminium metal extraction carried out on a large scale. However, calcined clay can be substituted for refractory bauxite but only with reduction in time and stock resistance. Sillimanite, alumina, silicon carbide, magnesite–chromite and carbon–magnesite refractories are the other alternatives for high-alumina material but these would entail higher cost. Silicon carbide and diamonds can substitute for fused aluminium oxide in abrasive use but these would entail again at higher cost. Synthetic mullite is a probable substitute for bauxite-based refractories.

Silicon carbide and alumina–zirconia are costlier substitutes for bauxite-based abrasives. The raw material like alunite, anorthosite, coal wastes and oil shales are other potential sources of alumina. The extraction, however, would require new plants with different technology. These non-bauxitic materials could satisfy the demand for primary metal, refractories, aluminium chemicals and abrasives.

## TRADE POLICY

As per the Foreign Trade Policy 2015-2020 and policy on export and import, imports of aluminium ores and concentrates including natural bauxite, calcined and activated bauxite and others are permitted free. There are no policy restrictions on the export of bauxite.

## WORLD REVIEW

The world bauxite reserves are estimated at 31 billion tonnes and are located mainly in Guinea (24%), Vietnam (19%), Australia (16%), Brazil (9%), Jamaica (6%), Indonesia (3%), China, India & Russia (2% each). Countrywise reserves of bauxite are furnished in Table-8.

The world production of bauxite decreased by 2% to 343 million tonnes in 2021 as compared to 349 million tonnes in preceding year. Australia continued to be the major producer and accounted for about 30% share in the total production, followed by Guinea (26%), China (12%), Brazil (11%), Indonesia & India (6% each) (Table-9).

To provide generalised view of the development in various countries the country wise description sourced from latest available publication of USGS, Mineral Year Book, 2018 is detailed below:

**Table – 8 : World Reserves of Bauxite  
(By Principal Countries)**

(In '000 tonnes)	
Country	Reserves
<b>World: Total (rounded off)</b>	<b>31000000</b>
Guinea	7400000
Vietnam	5800000
Australia	5100000*
Brazil	2700000
Jamaica	2000000
Indonesia	1000000
China	710000
India*	660000
Russia	500000
Saudi Arabia	180000
Kazakhstan	160000
United States	20000
Other countries	5100000

**Source:** USGS, Mineral Commodity Summaries, 2023.

(a) For Australia, joint Ore Reserves Committee - compliant reserves were 1.7 billion tons.

\* As on 1.4.2020, as per NMI database, based on UNFC system Reserves/Resources of bauxite in India have been placed at 4958 million tonnes.

## Australia

The Huntly Mine capacity was 26 Mt/yr and the Willowdale Mine capacity was 10 Mt/yr. The mines and refineries were operated by Alcoa (60%) as part of its joint venture with Alumina Ltd (40%). Rio Tinto plc continued construction of the Amrun Mine in Queensland and made the first shipment of bauxite from the mine.

## Brazil

An expansion project, started in 2016, was completed at the Juruti Mine, increasing capacity to 6.5 Mt/yr from 5.7 Mt/yr. The mine was a joint venture of Alcoa (60%) and Alumina Ltd. (40%).

## Canada

Orbite Technologies Inc. was repairing equipment that failed during trial production from its high-purity alumina refinery in Cap-Chat, Quebec.

## China

The increased production in China was attributed to production from new capacity and restarts of capacity at several refineries that had been temporarily shut down to comply with environmental regulations. Alumina capacity at yearend 2018 was estimated to be 83.4 Mt/yr, a 3% increase from 81 Mt/yr at yearend 2017. Approximately 73.5 Mt/yr of capacity was in use at year end. Although new capacity was added, some startups were delayed until permits were issued and because of limited bauxite supplies at some refineries in the northern part of the country. Many of the new alumina refineries under construction or planned for construction were located in port cities rather than adjacent to inland bauxite deposits. Stricter enforcement of environmental regulations and decreasing quality of bauxite reserves discouraged new refineries in many inland cities while availability of abundant bauxite imports made port locations more attractive.

The Government of China ordered alumina refineries and aluminum smelters in certain regions to shut down 30% of capacity from November 15, 2017, until March 15, 2018. The order to shut down capacity cited environmental concerns about pollution produced by refineries, smelters and power plants during the winter. Refineries and smelters in 31 cities, mainly in the Central and Eastern Provinces, were affected by the order. When the restrictions expired, some of the capacity affected by the policy was restarted. The Government instituted a similar shutdown from October 1, 2018, to March 31, 2019, to reduce pollution during the winter, requiring alumina refineries and aluminum smelters in 26 cities to close 30% of their capacity.

## BAUXITE

### Indonesia

The Government of Indonesia issued export licenses to PT Aneka Tambang Tbk (Antam) and PT Bintan Alumina Indonesia Ltd. (Bintan) so that they could use proceeds of bauxite sales to finance construction of alumina refineries. The permit system was scheduled to end in 2023. Antam

completed a bankable feasibility study for a 1-Mt/yr alumina refinery in Mempawah, West Kalimantan Province, with PT Indonesia Asahan Aluminium Ltd (Inalum). Bintan was a joint venture among Shandong Nanshan Aluminum Co. Ltd (China) (94%), Redstone Alumina International Pte. (Australia) (5%), and PT Makhota Karya Utama (1%). A construction schedule was not available.

**Table – 9 : World Production of Bauxite 2019 to 2021  
(By Principal Countries)**

Country	2019	2020	2021
<b>World: Total (rounded off)</b>	<b>329600</b>	<b>349000</b>	<b>342600</b>
Australia	105544	103627	103266
Brazil	31938	32898	36000 <sup>e</sup>
China <sup>e</sup>	42000	42000	40000
Guinea (a)	70173	87766	87439
India*(b)	22073	19700 <sup>e</sup>	19700 <sup>e</sup>
Indonesia	16593	25860	21500
Jamaica	9022	7616	5937
kazakhstan	4118	4058	4370 <sup>e</sup>
Russia	5574	5570	5679
Saudi Arabia	5127	5227	5488
Other countries	17502	14721	13236

*Source: BGS World Mineral Production, 2017-2021.*

*(e) Estimated*

*(a) No adjustment has been made for moisture content*

*(b) Years ended 31 March following that stated.*

*\*India's production of bauxite during 2019-20, 2020-21 and 2021-22 was 21.82 million tonnes, 20.38 million tonnes and 22.49 million tonnes, respectively.*

## FOREIGN TRADE

### Exports

In 2021-22, exports of bauxite increased by 57 % to 378 thousand tonnes from 241 thousand tonnes in the previous year. Exports were mainly to Nepal (53%), Oman (16%), Kuwait & Qatar (13% each) and Slovenia (4%). Exports of bauxite other (aluminium ores & concentrate) increased by 56% to 276 thousand tonnes from 177 thousand

tonnes in the previous year. Exports were mainly to Nepal (61%), Oman (22%) and Qatar (17%). Export of bauxite (aluminium & concentrate) also increased by 60% to 102 thousand tonnes during 2021-22 from 64 thousand tonnes in the preceding year. Exports were mainly to Kuwait (50%), Nepal (30%), Slovenia (14%), Saudi Arabia (2%) and France (1%). (Tables-10 to 12).

BAUXITE

**Imports**

Imports of bauxite slightly decreased by 1 % to 3009 thousand tonnes during 2021-22 from 3034 thousand tonnes in the previous year. Imports were mainly from Guinea (95%) and China (3%). Imports of bauxite other (aluminium ores & concentrates) increased by 48% to 492 tonnes

during 2021-22 from 333 tonnes in the previous year. Imports were mainly from Turkey (66%), China & Sri Lanka (13% each) and USA (4%). Imports of bauxite (aluminium & concentrates) slightly decreased by 1% to 3009 thousand tonnes during 2021-22 from 3034 thousand tonnes in the preceding year. Imports were mainly from Guinea (95%) and China (3%) (Tables-13 to 15).

**Table – 10: Exports of Bauxite  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>240841</b>	<b>951442</b>	<b>378081</b>	<b>1005256</b>
Nepal	158165	331823	199669	397096
Slovenia	11407	178458	14754	250302
Kuwait	380	7681	50650	100735
Oman	54703	123786	59539	96788
Qatar	300	8085	47298	62563
Nigeria	75	1844	883	27269
Saudi Arabia	750	6660	1887	16845
France	1191	18222	1049	16153
Australia	714	14989	528	13824
Malaysia	500	10701	270	5608
Other Countries	12656	249193	1554	18073

Figures rounded off

**Table – 11 : Exports of Bauxite: Other  
Aluminium Ores & Concentrates  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>176955</b>	<b>389007</b>	<b>276039</b>	<b>506683</b>
Nepal	122172	264087	168792	340162
Oman	54690	123435	59539	96788
Qatar	--	--	47295	62447
Nigeria	--	--	118	3150
Bangladesh	--	--	151	1993
Saudi Arabia	--	--	100	776
Egypt, A Rp	--	--	27	665
Netherlands	--	--	1	267
Baharain	--	--	1	151
U A E	1	28	5	147
Other Countries	92	1457	10	137

Figures rounded off

BAUXITE

**Table – 12 : Exports of Bauxite: (Aluminium & Concentrates)  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty	Value	Qty	Value
	(t)	(₹'000)	(t)	(₹'000)
<b>All Countries</b>	<b>63886</b>	<b>562435</b>	<b>102042</b>	<b>498573</b>
Slovenia	11407	178458	14754	250302
Kuwait	380	7681	50650	100735
Nepal	35993	67736	30877	56934
Nigeria	75	1844	765	24119
France	1191	18222	1049	16153
Saudi Arabia	750	6660	1787	16069
Australia	714	14989	528	13824
Malaysia	500	10701	270	5608
Italy	1583	36292	208	3344
Korea	3243	11881	820	2786
Other Countries	8050	207971	334	8699

Figures rounded off

**Table – 13: Imports of Bauxite  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty	Value	Qty	Value
	(t)	(₹'000)	(t)	(₹'000)
<b>All Countries</b>	<b>3034041</b>	<b>13709540</b>	<b>3009079</b>	<b>18963241</b>
Guinea	2931220	11040863	2857828	15185138
China	86044	2371446	78724	2513910
Guyana	8324	98512	34877	513532
Hong Kong	5516	124781	14362	352361
Bolivia	--	--	10000	154300
Trinidad	--	--	8793	129187
Singapore	1175	34591	1075	48924
U S A	245	3806	1952	30680
Netherlands	294	13528	286	14265
U K	221	6073	179	6056
Other Countries	1002	15940	1003	14888

Figures rounded off

**Table – 14: Imports of Bauxite:Other Aluminium Ores & Concentrates  
(By Countries)**

Country	2020-21 (R)		2021-22(P)	
	Qty	Value	Qty	Value
	(t)	(₹'000)	(t)	(₹'000)
<b>All Countries</b>	<b>333</b>	<b>8419</b>	<b>492</b>	<b>17181</b>
USA	++	126	19	4719
Turkey	160	3424	324	4616
Sri Lanka	--	--	63	3221
China	47	1119	64	1434
Netherlands	8	622	17	1434
UK	5	889	4	1058
Thailand	--	--	1	675
France	--	--	++	22
Ireland	--	--	++	1
Singapore	--	--	++	1
Other Countries	113	2239	--	--

Figures rounded off

**Table – 15 : Imports of Bauxite: Aluminium & Concentrates  
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty	Value	Qty	Value
	(t)	(₹'000)	(t)	(₹'000)
<b>All Countries</b>	<b>3033708</b>	<b>13701121</b>	<b>3008587</b>	<b>18946060</b>
Guinea	2931220	11040863	2857828	15185138
China	85997	2370327	78660	2512476
Guyana	8324	98512	34877	513532
Hong Kong	5516	124781	14362	352361
Bolivia	--	--	10000	154300
Trinidad	--	--	8793	129187
Singapore	1175	34591	1075	48923
U S A	245	3680	1933	25961
Netherlands	286	12906	269	12831
U K	216	5184	175	4998
Other Countries	729	10277	615	6353

Figures rounded off

## **FUTURE OUTLOOK**

The total resources of bauxite that comprise various grades, as found to occur in the country as on 1.4.2020, are estimated at 4,958 million tonnes. The resources of Metallurgical grade bauxite are adequate while those of the Chemical and Refractory grade bauxite are relatively limited considering the future requirements. India's strength in aluminium is production is due to its rich reserve of bauxite, a core resources used in production of aluminium. As per provision made in Mineral (Auction) Rule 2015, a total of 32 bauxite blocks (including blocks of Bauxite and other associated minerals) were auctioned till 22<sup>nd</sup> Sept. 2023 in the State of Maharashtra (8 blocks) and Madhya Pradesh (8 block), Gujarat (07 blocks), Chhatisgarh (05 blocks), Odisha (03 blocks) and Jharkhand (01 block).

As per the FITCH Report, the production of bauxite is estimated to grow to 50.7 million tonnes by 2027.

Aluminium industry is one of the leading segments of the Indian economy and is expected to play a significant role in the country's future growth. Apart from its potentially large growing market, India is endowed with large deposits of high-quality bauxite ore, resources for power generation (coal) and formidable pool of manpower – both skilled and unskilled. Indian aluminium industry is forging ahead with rapid expansion in both primary metal and downstream sectors.

The demand for aluminium is expected to move upward with shifting demand of consumers towards electric vehicles. Also, the recyclable nature of the metal puts up with goal of reducing carbon emission of many countries. The demand for aluminium will be supported from sectors like aviation, construction, renewable energy production, consumer goods, defence etc.