

LATERITE



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**LATERITE**

**(FINAL RELEASE)**

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

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# 31 Laterite

The mineralogical & chemical composition of laterite depends on their parent rock. Laterite is a residual ferruginous rock commonly found in tropical regions and has close genetic association with bauxite. The term 'laterite' was originally used for highly ferruginous deposits first observed in Malabar Region of coastal Kerala and Dakshin Kannad & other parts of Karnataka. It is a highly weathered material, rich in secondary oxides of iron, aluminium or both. It is either hard or capable of hardening on exposure to moisture and drying.

Laterite and bauxite show a tendency to occur together. Aluminous laterites and ferruginous bauxites are quite common. The most common impurity in both is silica. Laterite gradually passes into bauxite with decrease in iron oxide and increase in aluminium oxide. The laterite deposits may be described on the basis of the dominant extractable minerals in it: (i) aluminous laterite (bauxite), (ii) ferruginous laterite (iron ore), (iii) manganiferous laterite (manganese ore), (iv) nickeliferous laterite (nickel ore) and (v) chromiferous laterite (chrome ore). Laterite with  $Fe_2O_3:Al_2O_3$  ratio more than one, and  $SiO_2:Fe_2O_3$  ratio less than 1.33 is termed as ferruginous laterite, while that having  $Fe_2O_3:Al_2O_3$  ratio less than one and  $SiO_2:Al_2O_3$  ratio less than 1.33 is termed as aluminous laterite.

Laterite can be considered as polymetallic ore as it is not only the essential repository for aluminium, but also a source of iron, manganese, nickel and chromium. Furthermore, it is the home for several trace elements like gallium and vanadium which can be extracted as by-products.

## RESOURCES

Laterite occurrences are widespread in the country. Almost all Indian bauxite deposits are associated with laterite, except those in Jammu & Kashmir. Laterite generally occurs as capping on the hills and plateaus of Madhya Pradesh and in some states of the Deccan peninsula at altitudes ranging from coastal to 2,000 m with thickness up to 60 m.

As per UNFC System as on 1-04-2010, the total resources of laterite are placed at 471 million tonnes. Out of these, 24.7 million tonnes are the reserves and 446.12 million tonnes are the remaining resources. Major share of about 87.5% resources was distributed in two states namely Madhya Pradesh (61%) and Rajasthan (26%). The remaining 13% of resources are spread over in the states of Andhra Pradesh, Kerala, Gujarat, Maharashtra and Jharkhand. Gradewise and Statewise reserves resources are given in Table-1.

**Table - 1 : Reserves/Resources of Laterite as on 1.4.2010  
(By Grades/States)**

(In '000 tonnes)

Grade/State	Reserves				Remaining Resources							
	Proved STD111	Probable		Total Feasibility (A) STD211	Pre-feasibility		Indicated STD332	Inferred STDD333	Reconn- aissance STD334	Total (B)	Total Resources (A+B)	
		STD121	STD122		STD221	STD222						
<b>All India: Total</b>	<b>13936</b>	<b>2172</b>	<b>8607</b>	<b>24714</b>	<b>1830</b>	<b>60</b>	<b>2625</b>	<b>1107</b>	<b>230865</b>	<b>209632</b>	<b>446119</b>	<b>470833</b>
<b>By Grades</b>												
Unclassified	13936	2172	8607	24714	1830	60	2625	1107	230865	209632	446119	470833
<b>By States</b>												
Andhra Pradesh	4349	2172	6942	13463	1830	60	2625	1107	6895	277	12794	26257
Gujarat	9406	-	164	9570	-	-	-	-	-	-	-	9570
Jharkhand	-	-	-	-	-	-	-	-	570	-	570	570
Kerala	180	-	1500	1680	-	-	-	-	-	16717	16717	18397
Madhya Pradesh	-	-	-	-	-	-	-	-	158910	129778	288688	288688
Maharashtra	-	-	-	-	-	-	-	-	4000	-	4000	4000
Rajasthan	-	-	-	-	-	-	-	-	60490	62860	123350	123350

Figures rounded off.

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### EXPLORATION & DEVELOPMENT

No exploration was reported during 2011-12 specially for laterite.

However, occurrences of laterite were reported in association with bauxite by GSI in Sindhudurg belt in the lateritic terrain adjoining either sides of Voghotan River in parts of Ratnagiri and Sindhudurg districts, Tantar and Tainchi blocks in Dindori district of Madhya Pradesh and in the area around Ukheda, Daban and Wamti Naniand Khanapur in Kachchh districts of Gujarat.

### PRODUCTION, STOCKS AND PRICES

The production of laterite at 1,666 thousand tonnes in 2011-12 decreased by 37% as compared to that of the previous year owing to more demand in market.

There were 38 reporting mines during 2011-12 as against 23 in the previous year. Besides, the production of laterite was reported as associated mineral by 15 mines in both the years. Seven principal producers accounted for about 78% of the total production. Twenty three mines, which include 19 mines of laterite and four associate mines each producing more than 10,000 tonnes annually, accounted for 97% of the total production during the period under review. About 12% of the total production was reported from captive mines in 2011-12 as against 20% in the preceding year.

Andhra Pradesh was the leading state in laterite production contributing 61% of the total production, followed by Gujarat (12%), Madhya Pradesh (10%), Karnataka (9%), Kerala (7%), the remaining 1% was contributed by Jharkhand & Maharashtra.

Gradewise analysis of production in 2011-12 revealed that the bulk of production was of cement grade, accounting for 91% of the total production during the year. Eight percent production was in below 40% Al<sub>2</sub>O<sub>3</sub> grade which was reported from Andhra Pradesh, Kerala, Madhya Pradesh and Jharkhand. Nominal production of Abrasive and Chemical grades were reported by Gujarat and Karnataka, respectively (Tables 2 to 5).

Mine-head stocks of laterite at the end of 2011-12 were 691 thousand tonnes as against 209 thousand tonnes in the beginning of the year (Tables 6(A) & 6 (B)).

**Table – 2 : Principal Producers of Laterite  
2011-12**

Name and address of producer	Location of mine	
	State	District
S. Soban Babu, D.No.23-16-25/A, Lalitha Nagar, Rajamundry, East Godavari, Andhra Pradesh.	Andhra Pradesh	East Godavari
S. Lakshmana Reddy, Chithaluru, East Godavari, Andhra Pradesh.	Andhra Pradesh	East Godavari
Sanghi Industries Ltd, P.O. Motiber - 370 655, Taluka - Abdasa, Dist. - Kachchh, Gujarat.	Gujarat	Kachchh
Belgaum Minerals, # 91, Ganesh Krupa, Vinayak Nagar, Hinidalga Road, Belgaum - 591 108, Karnataka.	Karnataka	Belgaum
V. Prabhakar Rao, H. No. 7-1-469, Mankammathota, Karimnagar, Andhra Pradesh.	Andhra Pradesh	Warangal
Maheswari Minerals, 1-1-37/1, Kondaiahpalem, Gangeyulu, Vari Street, Near Nukamma Temple, Kakinada, East Godavari, Andhra Pradesh.	Andhra Pradesh	East Godavari
Kerala Clays & Ceramic Products Ltd, Pappinisseri, Kannur - 670 561. Kerala.	Kerala	Kasargod

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**Table – 3 : Production of Laterite, 2009-10 to 2011-12(P)**  
(By States)

(Quantity in tonnes; value in ₹'000)

States	2009-10		2010-11		2011-12	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>1300772</b>	<b>177376</b>	<b>1220304</b>	<b>147948</b>	<b>1665820</b>	<b>226797</b>
Andhra Pradesh	596318	60449	633253	70005	1022873	133828
Gujarat	184840	8343	234548	15733	208058	19151
Jharkhand	5084	667	1220	183	1550	310
Karnataka	203378	69711	130300	17119	149600	21111
Kerala	69171	15322	88444	34913	110992	41210
Madhya Pradesh	133080	7269	132539	9995	166247	10634
Maharashtra	108901	15615	-	-	6500	553

**Table – 4 (A) : Gradewise Production of Laterite, 2010-11**  
(By Sectors, States and Districts)

(Quantity in tonnes; value in ₹'000)

State / District	No. of mines	For use in alumina & aluminium extraction, Production by Grades : Al <sub>2</sub> O <sub>3</sub> Content		For use in other than alumina & aluminium extraction			Total	
		Below 40%	40-45%	Cement	Chemical	Refractory	Quantity	Value
<b>India</b>	<b>23(15)</b>	<b>81017</b>	<b>6200</b>	<b>1132037</b>	<b>900</b>	<b>150</b>	<b>1220304</b>	<b>147948</b>
Public Sector	2(1)	-	-	63995	-	-	63995	26351
Public Sector	21(4)	81017	6200	1068042	900	150	1156309	121597
<b>Andhra Pradesh</b>	<b>9(1)</b>	<b>4403</b>	<b>-</b>	<b>628850</b>	<b>-</b>	<b>-</b>	<b>633253</b>	<b>70005</b>
East Godavari	3(1)	-	-	479240	-	-	479240	58400
Khammam	1	4403	-	-	-	-	4403	735
Rangareddy	5	-	-	149610	-	-	149610	10870
<b>Gujarat</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>234548</b>	<b>-</b>	<b>-</b>	<b>234548</b>	<b>15733</b>
Kachchh	1	-	-	234498	-	-	234498	15711
Porbandar	1	-	-	50	-	-	50	22
<b>Jharkhand</b>	<b>(1)</b>	<b>1220</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1220</b>	<b>183</b>
Lohardaga	(1)	1220	-	-	-	-	1220	183
<b>Karnataka</b>	<b>3</b>	<b>15800</b>	<b>6200</b>	<b>107250</b>	<b>900</b>	<b>150</b>	<b>130300</b>	<b>17119</b>
Belgaum	3	15800	6200	107250	900	150	130300	17119
<b>Kerala</b>	<b>3(2)</b>	<b>32404</b>	<b>-</b>	<b>56040</b>	<b>-</b>	<b>-</b>	<b>88444</b>	<b>34913</b>
Alappuzha	1	22000	-	-	-	-	22000	7040
Kannur	1	10199	-	-	-	-	10199	3009
Kasargod	1	-	-	56020	-	-	56020	24817
Kollam	(1)	-	-	20	-	-	20	6
Thiruvananthapuram	(1)	205	-	-	-	-	205	41
<b>Madhya Pradesh</b>	<b>5(11)</b>	<b>27190</b>	<b>-</b>	<b>105349</b>	<b>-</b>	<b>-</b>	<b>132539</b>	<b>9995</b>
Jabalpur	3(1)	13378	-	23750	-	-	37128	4661
Rewa	(1)	-	-	6200	-	-	6200	248
Satna	2(7)	13765	-	75019	-	-	88784	5000
Shahadol	(1)	-	-	380	-	-	380	82
Sidhi	(1)	47	-	-	-	-	47	4
<b>Rajasthan</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Chittaurgarh*	1	-	-	-	-	-	-	-

\* Reported production of ochre only.

Figures in parentheses indicate number of associated mines.

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**Table – 4 (B) : Gradewise Production of Laterite, 2011-12(P)**  
(By Sectors, States and Districts)

(Quantity in tonnes; value in ₹'000)

State/District	No. of mines	For use in alumina & aluminium extraction, Production by Grades:Al <sub>2</sub> O <sub>3</sub> Content	For use in other than alumina & aluminium extraction			Total		
			Below 40%	Cement	Chemical	Abrasive	Quantity	Value
<b>India</b>	<b>38(15)</b>	<b>130594</b>	<b>1520991</b>	<b>1085</b>	<b>13150</b>	<b>1665820</b>	<b>226797</b>	
Public sector	2	-	82492	-	-	82492	31765	
Private sector	36(15)	130594	1438499	1085	13150	1583328	195032	
<b>Andhra Pradesh</b>	<b>16(1)</b>	<b>94696</b>	<b>928177</b>	-	-	<b>1022873</b>	<b>133828</b>	
Cuddapah	1	-	140	-	-	140	7	
East Godavari	4(1)	-	735562	-	-	735562	90733	
Khammam	1	1326	-	-	-	1326	221	
Rangareddy	5	-	136799	-	-	136799	6350	
Warangal	5	93370	55676	-	-	149046	36517	
<b>Gujarat</b>	<b>2</b>	-	<b>194908</b>	-	<b>13150</b>	<b>208058</b>	<b>19151</b>	
Kachchh	1	-	194868	-	-	194868	8684	
Porbandar	1	-	40	-	13150	13190	10467	
<b>Jharkhand</b>	<b>(1)</b>	<b>1550</b>	-	-	-	<b>1550</b>	<b>310</b>	
Lohardaga	(1)	1550	-	-	-	1550	310	
<b>Karnataka</b>	<b>1</b>	-	<b>148515</b>	<b>1085</b>	-	<b>149600</b>	<b>21111</b>	
Belgaum	1	-	148515	1085	-	149600	21111	
<b>Kerala</b>	<b>3(1)</b>	<b>23917</b>	<b>87075</b>	-	-	<b>110992</b>	<b>41210</b>	
Alapuzha	1	15617	-	-	-	15617	4734	
Kannur	1	8300	2000	-	-	10300	2662	
Kasargod	1	-	70868	-	-	70868	29532	
Thiruvananthapuram	(1)	-	14207	-	-	14207	4282	
<b>Madhya Pradesh</b>	<b>14(12)</b>	<b>10431</b>	<b>155816</b>	-	-	<b>166247</b>	<b>10634</b>	
Jabalpur	4(5)	10431	44602	-	-	55033	3655	
Katni	3	-	365	-	-	365	18	
Satna	7(7)	-	110849	-	-	110849	6961	
<b>Maharashtra</b>	<b>1</b>	-	<b>6500</b>	-	-	<b>6500</b>	<b>553</b>	
Chandrapur	1	-	6500	-	-	6500	553	
<b>Rajasthan</b>	<b>1</b>	-	-	-	-	-	-	
Chittorgarh*	1	-	-	-	-	-	-	

\* Reported production of ochre only.

Figures in parentheses indicate number of associated mines.

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**Table – 5 : Production of Laterite, 2010-11 & 2011-12(P)  
(By Frequency Groups)**

(Quantity in tonnes)

Production group	No. of mines		Production		Percentage in total production		Cumulative percentage	
	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12
<b>Total</b>	<b>23(15)</b>	<b>38(15)</b>	<b>1220304</b>	<b>1665820</b>	<b>100.00</b>	<b>100.00</b>		
Up to 1000	5(7)	11(4)	1646	2765	0.13	0.17	0.13	0.17
1001-2000	(2)	3(3)	2720	10399	0.22	0.62	0.35	0.79
2001-5000	2(1)	3(1)	10515	14360	0.86	0.86	1.21	1.65
5001-10000	2(1)	2(3)	23045	28925	1.89	1.74	3.10	3.39
10001-50000	9(4)	12(4)	309300	391673	25.35	23.51	28.45	26.90
50001 & above	5	7	873078	1217698	71.55	73.10	100.00	100.00

Figures in parentheses indicate number of associated mines.

**Table – 6 (A) : Mine-head Stocks of Laterite at the beginning of the year 2011-12  
(By States/Grades)**

(In tonnes)

State	For use in alumina & aluminium extraction		For use in other than alumina & aluminium metal extraction				Total
	Al <sub>2</sub> O <sub>3</sub> Content		Chemical	Cement	Refractory	Abrasive	
	Below 40%	40-45%					
<b>India</b>	<b>9083</b>	<b>665</b>	<b>84</b>	<b>195395</b>	<b>48</b>	<b>4030</b>	<b>209305</b>
Andhra Pradesh	-	-	-	71202	-	-	71202
Gujarat	-	-	-	1697	-	4030	5727
Jharkhand	39	-	-	97	-	-	136
Karnataka	4354	665	84	8092	48	-	13243
Kerala	1834	-	-	-	-	-	1834
Madhya Pradesh	2856	-	-	114222	-	-	117078
Tamil Nadu	-	-	-	85	-	-	85

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**Table – 6 (B) : Mine-head Stocks of Laterite at the end of the year 2011-12(P)  
(By States / Grades)**

(In tonnes)

State	For use in alumina & aluminium extraction Al <sub>2</sub> O <sub>3</sub> Content		For use in other than alumina & aluminium metal extraction				Total
	Below 40%	40-45%	Chemical	Cement	Refractory	Abrasive	
<b>India</b>	<b>70643</b>	<b>3333</b>	<b>279</b>	<b>605341</b>	<b>48</b>	<b>11590</b>	<b>691234</b>
Andhra Pradesh	-	-	-	220777	-	-	220777
Gujarat	-	-	-	1737	-	11590	13327
Jharkhand	983	-	-	20	-	-	1003
Karnataka	-	-	279	9746	48	-	10073
Kerala	1109	-	-	537	-	-	1646
Madhya Pradesh	68551	3333	-	368526	-	-	440410
Maharashtra	-	-	-	3913	-	-	3913
Tamil Nadu	-	-	-	85	-	-	85

## USES & SPECIFICATIONS

The compact and ferruginous variety of laterite is used widely as a road metal and as a local stone for culverts and buildings. It cannot withstand heavy pressure and as such it is used for construction of light structures, partition walls, boundary walls, etc. Laterite as a building stone possesses one advantage that it is soft when quarried and can be easily cut and dressed into blocks and bricks which on exposure to air become hard.

The industrial use of laterite is in the cement industry. It is used as an additive for lowering the clinkerisation temperature and supplementing aluminous and iron contents required in the manufacture of cement. It is also reported that laterite is capable of removal of phosphorus from solutions and percolating columns of laterite remove cadmium, chromium and lead to very low concentrations. Specifications of laterite for cement industry are given in Table - 7.

**Table – 7: Specifications of Laterite Consumed in Different Cement Plants**

(In Percentage)

Plant	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>
ACC Ltd, Wadi Cement Works, Dist. Gulbarga, Karnataka.	36-45	-	-
Anjani Portland Cement Ltd, Anjanipuram, Dist. Nalgonda, Andhra Pradesh.	20-40	-	-
Birla Cement Works, Chandera, Dist. Chittorgarh, Rajasthan.	17	50	18
Birla Corporation Ltd, P.O. Birla Vikas, Dist. Satna, Madhya Pradesh.	26	37	17
Cement Corporation of India, Tandur, Dist. Rangareddy, Andhra Pradesh.	> 22	> 40	-
The India Cements Ltd, Chilamkur, Dist. Cuddapah, Andhra Pradesh.	22-37	22-36	21-30
The India Cements Ltd, Vishnupuram, Wadapally Dist. Nalgonda, Andhra Pradesh.	12-18	45-50	12-18

(Contd.)

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Table - (Contd.)

Plant	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>
The India Cements Ltd, Malkapur, Dist. Rangareddy, Andhra Pradesh.	12-15	40-43	-
Heidelberg Cements (Diamond Cements) P.O. Narsingarh, Dist. Damoh, Madhya Pradesh.	5-8	42-47	-
Jaypee Rewa Cement, Jaypee Nagar, Dist. Rewa, Madhya Pradesh.	15(min.)	30(min.)	10-12
J.K. Cement Works, Nimbahera and Mangrol, Dist. Chittorgarh, Rajasthan.	10-15	40-55	12-27
Kakatiya Cement & Sugar Industries, Dist. Krishna, Andhra Pradesh.	40-45	9	10
J.K.Cement Works, P.O. Gotan, Dist. Nagaur, Rajasthan.	-	>50	-
Keerthi Industries Ltd, Mellacheruvu, Dist. Nalgonda, Andhra Pradesh.	25.52	31.05	30.54
Kesoram Cement, P.O. Basantnagar, Dist. Karimnagar, Andhra Pradesh.	35-38	-	-
The KCP Ltd, Macherla, Dist. Guntur, Andhra Pradesh.	-	45-55	-
Madras Cements Ltd, Kumarasamy, Raja Nagar Dist. Krishna, Andhra Pradesh.	-	-	12 (max.)
Maihar Cement,(Unit -2) P.O. Sarla Nagar, Maihar, Dist. Satna, Madhya Pradesh.	-	>45	< 18
Malabar Cements Ltd. Walayar, Dist. Palakkad, Kerala.	38	30	10
Manikgarh Cement, Gadchandur, Dist. Chandrapur, Maharashtra.	>25	>30	-
Mancherial Cement Company (P) Ltd, Mancherial, Dist. Adilabad, Andhra Pradesh.	-	32-40	16-22

(Contd.)

Table - (Contd.)

Plant	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>
Orient Cement, Devapur Cement Works, Dist. Adilabad, Andhra Pradesh.	22-35	27-45	-
Panyam Cements & Mineral Industries Ltd, Cement Nagar, Dist. Kurnool, Andhra Pradesh.	-	24-42	10-14
Penna Cement Ind. Ltd, Ganeshpahad, Dist.Nalgonda, Andhra Pradesh.	35	30	14
Penna Cement Ind. Ltd, Boyareddypalli Dist. Anantapur, Andhra Pradesh.	-	38	-
Penna Cement Ind. Ltd, Vill. Talaricheruvu, Dist. Anantapur, Andhra Pradesh.	42	25	14
Rajashree Cements, Malkhed Road, Dist. Gulbarga, Karnataka.	20	44	19
Rain Commodities Ltd, Dist. Nalgonda, Ramapuram, Andhra Pradesh.	-	35(min.)	-
Sanghi Cement Sanghipuram, Kachchh, Gujarat.	15-20	18-25	25-30
Satna Cement Works, Ghurdang, Dist. Satna, Madhya Pradesh.	26	37	17
Shree Cements, Beawar, Dist. Ajmer, Rajasthan.	-	70-94	-
Shri Durga Cement Company Ltd, Hesla, Ramgarh Cantt; Ramgarh, Jharkhand.	36	34	6
Ultra Tech Cement Ltd. Adityanagar, Malkhed Road, Gulberga, Karnataka.	21	42	19
Ultra Tech Cement Ltd. (Unit-Vikram Cement Works) Vill. Khor, Kheda Rathore, etc. Teh. Jewad, Neemuch, Madhra Pradesh.	68	58	12-14

(Contd.)



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Table - (Concl'd.)

Plant	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>
Sri Vishnu Cement Ltd, Dondapadu, Dist. Nalgonda, Andhra Pradesh	36-42	-	18-22
Toshali Cements Pvt. Ltd, Dist. Koraput, Ampavalli, Odisha.	10	8	10
Vasavadatta Cement, Sedam, Dist. Gulbarga, Karnataka.	-	55	< 30
Vikram Cement, Vikram Nagar, Khor, Dist. Neemuch, Madhya Pradesh.	-	58 (min)	12-14
Zuari Cement, Krishna Nagar Dist. Cuddapah, Andhra Pradesh.	16-24	24-39	28-35
Zuari Cement Ltd, Sitapuram, P.O. Dondapadu Dist. Nalgonda. Andhra Pradesh.	35-42	-	20-22

*Source : Individual plants.*

## CONSUMPTION

Laterite is used as an additive in cement industry. The estimated industrial end-use consumption of laterite in 2009-10, 2010-11 and 2011-12 was approximately 3.61 million tonnes, 3.74 million tonnes and 3.83 million tonnes, respectively. Other consuming sectors are building construction and road metal.

## FUTURE OUTLOOK

Though vast resources of laterite are available in India, systematic exploration and estimation of resources need to be taken up. There seems to be no major change in the end-use pattern of laterite. The consumption of laterite in cement has increased due to increased demand of cement in the country. In future, laterite could be used as a source of metallic minerals like iron, aluminium, chromite and of trace elements like gallium and vanadium.