

# CONTENTS

	Page No.
<b>I. Introduction</b>	1
<b>II. Ores &amp; Minerals</b>	2
(i) Iron Ore	3
(ii) Manganese Ore	7
(iii) Chromite	11
(iv) Alumina	14
(v) Barytes	17
(vi) Bentonite	21
(vii) Mica	24
(viii) Building and Monumental Stones	28
(a) Granite	28
(b) Marble	32
(c) Slate	36
(d) Other Building and Monumental Stones	39
(ix) Precious and Semi-precious Stones	42
(a) Diamond	42
(b) Emerald	46
(c) Other Precious and Semi-precious Stones	48
(x) Felspar	52
(xi) Garnet	55
(xii) Ilmenite & Rutile	57
(xiii) Quartz/Silica Sand	61
(xiv) Talc-Steatite	64
(xv) Wollastonite	67
<b>III. Metals &amp; Alloys</b>	70
<b>IV. Summary &amp; Conclusion</b>	75

# ANNEXURES

---

	Page No.
ANNEXURE - I : Recoverable Reserves of Important Minerals In India As on 1.4.1995	..... 80
ANNEXURE - II : Production of Ores and Minerals During 1994-95 to 1998-99	..... 81
ANNEXURE - III : Capacity and Production of Different Mineral Based Products During 1995-96 to 1996-97	..... 83
ANNEXURE - IV : Exports of Ores and Minerals During 1995-96 to 1997-98	..... 84
ANNEXURE - V : Value of Exports of Ores and Minerals During 1995-96 to 1997-98	..... 86
ANNEXURE - VI : Imports of Ores and Minerals During 1995-96 to 1997-98	..... 87
ANNEXURE - VII : Value of Imports of Ores and Minerals During 1995-96 to 1997-98	..... 89
ANNEXURE - VIII : Exports of Metals and Alloys During 1995-96 to 1997-98	..... 90
ANNEXURE - IX : Value of Exports of Metals and Alloys During 1995-96 to 1997-98	..... 91
ANNEXURE - X : Imports of Metals and Alloys During 1995-96 to 1997-98	..... 92
ANNEXURE - XI : Value of Imports of Metals and Alloys During 1995-96 to 1997-98	..... 93

## INTRODUCTION

India is one of the few countries in the world which is abound with vast mineral resource potential. However it is wholly or largely self-sufficient in about 27 minerals, which constitute primary mineral raw material for industries such as iron, & steel, Ferro-alloys, cement, refractory, aluminium, etc.. From Annexure -I which gives the position of recoverable reserves as on 1.4.95, it would be seen that India is comfortably placed as regards the reserves of bauxite, chromite, iron ore, Mn ore, barytes, bentonite, dolomite, felspar, fireclay, fuller's earth, granite, gypsum, ilmenite, china clay, sillimanite, limestone, marble, quartz & silica sand, talc-steatite & wollastonite.

India produces as many as 67 minerals- 4 fuel minerals, 11 metallic minerals and 52 non-metallic (industrial) minerals (Annexure-II).

India's metal industry is gaining grounds. It produces a number of metals & alloys (Annexure III). Apart from catering to the needs of the country, it also exports a sizeable quantity of metals and alloys. With economic liberalisation and privatisation, the way has been paved to establish a strong industrial base.

India's foreign trade includes export of minerals both in the raw form and as semi-processed and processed forms in the nature of mineral based primary manufactured products. The manufactured mineral-based commodities include metals and alloys and products thereof, cement, firebricks etc.

As per the DGCIS, exports of all merchandise in 1994-95, 1995-96 and 1996-97 were Rs. 82,609 crores, Rs. 106,190 crores and Rs. 118,588 crores respectively. In the export earning, the share of ores and minerals was Rs.15,832 crores, Rs. 19,820 crores, Rs. 18,956 crores and Rs.20,643 crores during 1994-95, 1995-96, 1996-97 and 1997-98 respectively (Annexure-IX). Although, India is an important exporter of ores & minerals, it has to resort to imports of some of the commodities including ores, minerals, metals & alloys (Annexures VII and X). As regards ores & minerals, the important commodities were petroleum (crude) (54.1 %), uncut diamonds ( 29.7%), coal (9%), rock-phosphate ( 1.4%) and sulphur (1%). The important metals and alloys imported were iron & steel ( 41%), copper & alloys ( 17.8%), Silver (7.6%), aluminium & scrap (7.4%), nickel & alloys (1.9%), ferro-alloys ( 1.7%), and non-ferrous basemetal scrap ( 1.4%) etc.

In the present bulletin, a comprehensive account of resources position, production capacity, present domestic and foreign demand, world scenario and export prospects of selected minerals and metals & alloys has been presented.

## II

### ORES & MINERALS

India is favourably placed as regards the reserves of a number of ores and minerals (Annexure -I). It also produces a host of minerals (Annexure -II). Besides catering to the domestic demand, it exports sizeable quantities of certain ores and minerals however it has to import some quantities of certain ores and minerals in which India is deficient or high grades are not available.

#### EXPORT TRADE :

India's export trade in ores and minerals is placed at Rs.20,643 crores during 1997-98. A review of the trade statistics indicates that in the value terms, exports had picked up to Rs. 19,819 crores in 1995-96 from Rs.15,831 crores in 1994-95. It however declined to Rs.18,956 crores in 1996-97 and again rose to Rs.20,643 crores in 1997-98. From Annexure-IV and V it would be seen that Diamond (mostly cut) (77.58%), Iron ore (8.57%), Granite (4.64%), Precious & semi precious stones (2.12%), Alumina (1.57%) and Chromite (0.81%) account for about (95%) of total export trade in ores and minerals. The remaining 5% is accounted by a host of minerals.

#### IMPORT TRADE :

India's import trade in ores and minerals is valued at Rs.34,655 crores during 1997-98. Analysis of past data has revealed that the value of imports has increased from Rs.19,365 crores in 1994-95 to Rs. 34,655 crores in 1997-98. Although a number of mineral commodities are being imported, the principal commodities which account for major share in imports are crude petroleum (45.66%), diamond (uncut) (34.88%), coal (10.70%), coke (2.08%), rock phosphate (1.91%), and precious and semi precious stones (1.02%) account for share of 96.25% (Annexure- VI & VII) .

In the following paragraphs, an overall position of reserves, production, trade, and export prospects of selected ores and minerals has been given.

(i) IRON ORE

India is one of the leading producer and exporter of iron ore. Presently the exports of iron ore are placed at 29.5 million tonnes valued at Rs. 1769 crores. The iron ore exports from India commenced in 1951 from Goa with a modest start at 486,000 tonnes valued at Rs.1.35 crores. Exports of iron ore gradually increased to 35.6 million tonnes valued at Rs. 927 crores in 1989-90. However, the export declined from 33.79 million tonnes in 1990-91 to 26.06 million tonnes in 1994-95. Subsequently during 1995-96, it rose to 31.7 million tonnes and declined to 27.6 million tonnes in 1996-97 and again picked up to 29.5 mill. tonnes in 1997-98.

The traditional markets for Indian iron ore are Japan, Korea Rep. Of and Iran. In the recent past China and Chinese Taipei have also emerged as new markets. India's recoverable reserves of iron ore are placed at 13,460 million tonnes (10,052 million tonnes of hematite and 3,408 million tonnes of magnetite). The all-India grade-wise and state-wise recoverable reserves of iron ore as on 1.4.1995 are as follows:

Grades/States	Unit : Million Tonnes			
	Proved	Probable	Possible	Total
<b>HEMATITE</b>				
<b>India : All Grades Total</b>	<b>5106</b>	<b>2369</b>	<b>2577</b>	<b>10052</b>
<b>By Grades</b>				
<b>High Grade</b>				
Lumps	410	294	106	810
Fines	224	95	17	336
Lumps & Fines	44	-	7	51
<b>Medium Grade</b>				
Lumps	1056	751	582	2389
Fines	1600	441	356	2397
Lumps & Fines	150	1	7	158
<b>Low Grade</b>				
Lumps	488	204	358	1050
Fines	900	429	275	1604
Lumps & Fines	23	1	50	74
<b>Unclassified</b>				
Lumps, Fines, Lumps & Fines (mixed)	116	139	794	1049
Blue dust	76	4	-	80
Others (incl. Black iron ore, unclassified and not known)	19	10	25	54

Table contd..

Table concluded

Grades/States	Proved	Probable	Possible	Total
<b>By States</b>				
Andhra Pradesh	2	4	45	51
Bihar	1825	528	304	2657
Goa	405	173	167	745
Karnataka	665	219	188	1072
Madhya Pradesh	771	531	696	1998
Maharashtra	88	58	81	227
Orissa	1349	850	1094	3294
Rajasthan	1	6	2	9
<b>MAGNETITE</b>				
<b>India : All Grades Total</b>	<b>1530</b>	<b>781</b>	<b>1097</b>	<b>3408</b>
<b>By Grades</b>				
Metallurgical	870	258	209	1337
Coal-Washing	1	2	2	5
Foundry	+	+	+	+
Others including unclassified & Not known	659	521	886	2066
<b>By States</b>				
Andhra Pradesh	38	380	-	418
Bihar	1	2	2	5
Goa	64	4	96	164
Karnataka	1427	371	986	2784
Kerala	-	24	12	36
Maharashtra	+	+	+	+
Rajasthan	+	+	+	+
Tamil Nadu	-	-	1	1

Note : Figures rounded off.

**PRODUCTION :**

The production of iron ore which was 56 million tonnes in 1990-91 has increased to 73 million tonnes in 1997-98. The main producers during 1997-98 were Madhya Pradesh, (18.1 million tonnes), Goa (15.6 million tonnes), Karnataka (15.6 million tonnes), Bihar (12.5 million tonnes) and Orissa (11.4 million tonnes). There are about 211 working mines for iron ore in the country. The provisional production during 1998-99 was 71 million tonnes.

### **DOMESTIC DEMAND :**

Iron ore is mainly consumed in iron & steel industry, sponge iron, foundry, alloy-steel, cement, coal washery & ferro-alloys etc. The present domestic consumption is estimated at about 34 million tonnes (1996-97) . The present (1997-98) production of crude steel is around 24 million tonnes. This is projected to go up to 25.6 million tonnes and 34 million tonnes by 2001-02 and 2006-07 respectively.

Four new steel plants are expected to be operational in the next few years. These are Essar Gujrat (2.0 million tonnes ), Nippon Denro Ispat (1.2 million tonnes ), Jindal Vijaynagar Steel (1.6 million tonnes), MESCO Kalinga Steel (2.4 million tonnes ), which together will add a capacity of 7.2 million tonnes . Seventeen major projects with a capacity of 9.2 million tonnes of saleable steel have already been sanctioned by the financial institutions . In view of the new steel plants and capacity addition in existing steel plants due to modernisation the total expected production capacity is expected to go up to 43 million tonnes and 48 million tonnes by 2001-02 and 2006-07 respectively.

With anticipated production of crude steel at 43 million tonnes and 48 million tonnes by 2001-02 and 2006-07 respectively, the corresponding requirements of iron ore for domestic consumption will be around 75 million tonnes and 85 million tonnes.

### **WORLD SCENARIO :**

The world production of iron ore has increased from 934 million tonnes in 1992 to 1062 million tonnes in 1995. It however declined to 1049 million tonnes in 1996. Thirteen countries namely Australia (153 million tonnes), China (252 million tonnes), Brazil (191 million tonnes), USA (62 million tonnes), Russia (72 million tonnes), India (67 million tonnes), Sweden (21 million tonnes), Ukraine (47 million tonnes), Mauritiana (11 million tonnes), South Africa (30 million tonnes), Canada (36 million tonnes), Venezuela (19 million tonnes), Kazakstan (25 million tonnes) accounted for about 94% of the total world production during 1996.

The major exporters of iron ore are Brazil (130 million tonnes), Australia (119 million tonnes), India (32 million tonnes), Canada (29 million tonnes), South Africa (22 million tonnes), Sweden (17 million tonnes), Russia (11 million tonnes), Mauritiana (11 million tonnes), Venezuela (11 million tonnes), Chile (6 million tonnes) and Peru (6 million tonnes) are major exporters accounting for 384 million tonnes of exports. As per the detail available, the total imports are placed at around 430 million tonnes of which 400 million tonnes came from Western World suppliers and 30 million tonnes from the CIS. However, the supply of iron ore is concentrated in relatively small number of producers. The top five, BHP iron ore, Hamersley Iron (HI) and Robe River in Australia and CVRD and MBR in Brazil have together been able to increase their market share during the last two decades and currently account for about 57% of the total iron ore exports.

**EXPORT PROSPECTS :**

It has been estimated that the international import demand for iron ore will reach to about 500 million tonnes by 2010. The prospects for India to increase its market share are bright. During 1996-97 Japan (14,138 thousand tonnes), China Peop. Rep. (3,236 thousand tonnes), Korea Rep. Of (3,448 thousand tonnes), Iran (1,311 thousand tonnes), Italy (821 thousand tonnes), Netherlands (718 thousand tonnes), Romania (707 thousand tonnes), Turkey (349 thousand tonnes) and Indonesia (532 thousand tonnes) accounted for about 94% of the total exports from India.

Analysis of the export statistics reveal that during 1996-97, Japan, China People Rep. of, Korea Rep. of, Iran accounted for 22.1 million tonnes i.e. 80% of the total exports. It would be seen that the major world importers of iron ore which do not figure in the list of principal importers of iron ore from India are United Kingdom, Belgium-Luxembourg, France, Germany, Spain, Czechoslovakia, Poland & USA. . Looking at likely increased import demand, there are prospects to increase the share by making concerted efforts.



**(ii) MANGANESE ORE**

The all-India recoverable reserves of Manganese ore are placed at 167 million tonnes. The grade-wise and State-wise reserves are as follows:

Grades/States	Unit : '000 Tonnes			
	Proved	Probable	Possible	Total
India/Total all grades	40075	49401	77833	167309
<b>By Grades</b>				
Battery/Chemical	1340	425	626	2391
Ferro Manganese	14229	9343	9481	33053
Medium	9077	14716	14839	38632
BF	12607	18344	34539	65490
Ferro Manganese & Medium Mixed	58	82	3615	3755
Medium & BF Mixed	751	2889	4915	8555
Ferro Manganese, Medium & BF Mixed	61	768	501	1330
Ferro Manganese & BF	900	1720	4699	7319
Others	11	-	-	11
Unclassified	1039	1052	1758	3849
Not known	2	62	2860	2924
<b>By States</b>				
Andhra Pradesh	1080	4992	5833	11905
Bihar	542	143	1678	2363
Goa	1817	7694	7354	16865
Gujrat	-	-	1477	1477
Karnataka	6474	10408	24172	41054
Madhya Pradesh	11565	5280	6799	23644
Maharashtra	10323	3614	2720	16657
Orissa	8274	17270	27270	52814
Rajasthan	-	-	430	430
West Bengal	-	-	100	100

Note: Figures rounded off

It would be seen from the above that five States viz. Karnataka, Orissa, Goa, Maharashtra and Madhya Pradesh account for 90% of the total recoverable reserves.

**PRODUCTION :**

India is one of the important producer and supplier of manganese ore in the world. Production of manganese ore during 1997-98 was 1871 thousand tonnes from the States of Andhra Pradesh (86,000 tonnes), Bihar (14,000 tonnes), Goa (18,000 tonnes), Karnatka (391,000 tonnes), Madhya Pradesh (371,000 tonnes), Maharashtra (305,000 tonnes) and Orissa (686,000 tonnes). However, Orissa, Karnataka, Madhya Pradesh & Maharashtra account for over 93% of the total production. The provisional production during 1998-99 was 1526 thousand tonnes. The year-wise production during 1992-93 to 1997-98 is given below:

(Unit : '000 tonnes)

1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99(p)
1640	1903	1696	1643	1797	1606	1871	1526

(p) : Provisional

**DOMESTIC DEMAND :**

The present (1992-93) domestic demand of Manganese ore is around 1.3 million tonnes. Ferroalloys ( 50%) and Iron & Steel ( 47%) account for 97% of the domestic demand. The remaining 3% is consumed in dry cell battery, chemicals, lead & zinc smelters , alloy steel, ceramics, foundry industries etc.

**USES :**

Manganese ore is mainly used in the production of iron & steel. The uses of manganese ore can be grouped under two heads namely (i) metallurgical and (ii) non-metallurgical. The metallurgical uses include production of iron & steel in order to provide adequate strength to steel, ferroalloys and manganese metal. The non-metallurgical uses are (i) dry cell battery (ii) chemicals (iii) glass (iv) ferrites (v) electrolytic zinc & zinc smelting and (vi) ceramics.

**TRADE :****EXPORTS :**

India is traditionally a rich source of manganese ore. It was once one of the world's leading producers and suppliers of manganese ore in the world. In recent years, India has restricted its exports due to declining high grade reserves. The details of India's export of Manganese ore & dioxides for the period 1988-89 to 1997-98 are given below:

Quantity : Lakh Tonnes  
Value : Rs.Crores

Year	Quantity	Value
1988-89	3.08	14.9
1989-90	3.35	38.3
1990-91	3.18	44.2
1991-92	2.65	37.5
1992-93	2.14	37.2
1993-94	2.40	33.2
1994-95	2.77	34.57
1995-96	2.37	29.7
1996-97	3.10	48.08
1997-98	2.59	42.99

It would be seen from the above that the exports of manganese ore have recorded wide fluctuations from year to year. During 1996-97, Japan (206,000 tonnes), China Peoples Rep. (23,000 tonnes), Spain (26,000 tonnes), Korea Dem. Peop. Rep. of (26,000 tonnes) and Pakistan (26,000 tonnes) and USA (2000 tonnes) were the major buyers of Indian manganese ore. The export ceiling for exports from the country were as follows:

- |       |   |                   |
|-------|---|-------------------|
| (i)   | Medium grade ore/blended containing 38% to 46% manganese & more than 0.15% phosphorus.    | : 1 lakh tonnes   |
| (ii)  | Medium grade ore/blended ore containing 38 to 46% manganese & more than 0.10% phosphorus. | : 0.5 lakh tonnes |
| (iii) | Low grade Manganese ore/blended ore containing less than 38% manganese.                   | : 4.0 lakh tonnes |
| (iv)  | Manganese ore fines below 12 mm size containing less than 44% manganese.                  | : 1.5 lakh tonnes |

### WORLD SCENARIO :

The world production of Manganese ore is placed at about 24 million tonnes in 1996. The major producers are China (7.66 million tonnes), South Africa ( 3.25 million tonnes), Brazil ( 2.4 million tonnes), Australia (2.1 million tonnes), Gabon ( 1.98 million tonnes), India (1.87 million tonnes) and accounted for 81% of the production. The major exporters are Gabon (1977,000 tonnes), Australia (1683,000 tonnes), (South Africa 1675,000 tonnes), Brazil (988,000 tonnes), India ( 310,000 tonnes) and Ghana (266,000 tonnes). The principal importers of Manganese ore in the world are Japan, France, Norway, Portugal, USA, Italy, Romania and Korea.

**EXPORT PROSPECTS :**

Due to broad-banding facility and liberalisation policy a number of ferro-alloys units have come up in the country resulting in the creation of surplus production capacity in ferroalloys. Added to this there has been a decline in the international demand for ferroalloys due to global recession in the steel industry. As a result of this the demand for exports of Manganese ore has come down.

Although the exports of the medium and low grade manganese ores are allowed, it never reached the ceiling limit probably due to poor demand for these grades of ores. There might be export demand for high grade ferromanganese ore but the exports of these are banned due to their limited availability.

(iii) CHROMITE

The largest single use of chromite is in the manufacture of stainless steel and chrome metal. Chromium is used in metallurgical industry to enhance the properties like hardenability, creep strength and resistance to corrosion. It is used in the manufacture of various ferroalloys like ferro-chrome, silico-chrome & charge-chrome. It is also used in the manufacture of chromite based refractories. The other important use is for the manufacture of various chromium chemicals.

RESOURCES :

The all-India recoverable reserves of chromite are placed at 86 million tonnes out of which Orissa accounts for about 97% of the total recoverable reserves. The grade-wise and State-wise recoverable reserves of chromite as on 1.4.1995 are as follows:

Grades/States	Unit '000Tonnes			
	Proved	Probable	Possible	Total
India All grade Total	25734	30775	29720	86229
<b>By Grades</b>				
Metallurgical grade	11169	11356	6772	29297
Refractory grade	1195	457	2211	3863
Charge chrome grade	7454	7145	10399	24998
Low grade	-	12	31	43
Beneficiable grade	5428	10194	9129	24751
Others	-	13	+	13
Unclassified	472	1598	1041	3111
Not known	16	-	137	153
<b>By States</b>				
Andhra Pradesh	-	13	103	116
Bihar	13	21	300	334
Karnataka	502	756	194	1452
Maharashtra	14	59	405	478
Manipur	-	-	7	7
Orissa	25199	29926	28477	83602
Tamil Nadu	6	-	234	240

Note : Figures rounded off.

**PRODUCTION :**

Orissa has been the major producer of chromite. During 1997-98, the production was 1564 thousand tonnes, declined to 1404 thousand tonnes in 1998-99. It came mainly from Orissa (97%) and Karnataka (2.3%), while small quantities were reported from Maharashtra and Manipur. The production of chromite during 1991-92 to 1998-99 is given below:

							In '000 tonnes
1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99(p)
1082	1071	1064	1138	1699	1456	1564	1404

p : provisional

**DOMESTIC DEMAND :**

The estimated domestic demand during 1994-95 is placed at about 924,000 tonnes. ferro-chrome (19.6%), charge-chrome (66%), refractory (9.5%) and chemicals (4.8%) industries accounted for almost the entire domestic consumption.

**TRADE :****EXPORTS :**

Chromite is considered as a high value mineral. There has been a good demand for chromite especially for the lumpy variety. China Peop. Rep. (80%) and Japan (18.88%) accounted for 98.88% of the total exports from India. The exports of chromite during the last ten years are as follows :

Year	Qty. (Lakh tonnes)	Value (Rs. in crores)
1988-89	5.26	62.50
1989-90	2.92	67.34
1990-91	2.28	43.00
1991-92	3.97	93.57
1992-93	3.96	78.85
1993-94	3.08	73.52
1994-95	4.90	102.73
1995-96	3.48	160.84
1996-97	5.66	225.40
1997-98	4.39	149.00

The export ceilings on chromite are decided by Commerce Ministry in consultation with Ministry of Mines and as per the policy decided, ceilings for chromite for the year 1997-98 were as follows:

---

(i)	Low silica friable/fine chromite ore with Cr <sub>2</sub> O <sub>3</sub> not exceeding 52% & silica exceeding 4% .	:	3 lakh tonnes.
(ii)	Chromite lumps containing Cr <sub>2</sub> O <sub>3</sub> not exceeding 40% .	:	1 lakh tonnes
(iii)	Beneficiated chromite concentrates(feed grade to be less than 33%)	:	No ceiling.

---

### WORLD SCENARIO :

The world production which was 9.5 million tonnes in 1993, rose to 13 million tonnes in 1995 and declined to 11 million tonnes in 1996. The major producers of chromite in the world are South Africa (5 million tonnes), Kazakstan (1.19 million tonnes), Turkey (1.05 million tonnes), India (1.45 million tonnes) and accounted for 80% of the total world production of 11 million tonnes during 1996.

The major exporters during 1996 were South Africa (1.34 million tonnes), Turkey (374,000 tonnes), Iran (148,000 tonnes), Kazakstan (236,000 tonnes) and India (566,000 tonnes). The major importers of chromite during 1996 are China (764,000 tonnes), Japan ( 686,000 tonnes) USA (25,000 tonnes), Germany (178,000 tonnes) and UK (176,000 tonnes).

### EXPORT PROSPECTS :

The countries which depend on imports of chrome ores and concentrates are Japan, USA, Sweden, China, Yugoslavia, Germany, UK, Poland, Spain etc. The exports of chromite from India have so far been basically to Japan and of late to China. Exports to other markets have been more of an ad-hoc basis rather than on a long term contract. It is necessary for country's long term interest that the export base of Indian chromite should be extended more particularly to Europe, Australia, USA, South Korea etc. which are also dependent on imports.

**(iv) ALUMINA**

Alumina is an important export earning mineral commodity. Its exports during 1996-97 were 5,60,615 tonnes valued at Rs.374 crores. The exports however, declined to 427,184 tonnes valued at Rs. 324 crores in 1997-98. The production of alumina is reported from six plants of five producers. The year-wise production of alumina during the period 1992-93 to 1995-96 is as follows :

Year	Quantity	Quantity: '000 tonnes
		Value : Rs. Crore
1992-93	1475	767
1993-94	1518	946
1994-95	1531	769
1995-96	1673	879
1996-97	1719	10928
1997-98	1838	13578

Major portion of alumina produced is utilized for making aluminium metal. The other uses of alumina are in advanced ceramics, advanced refractories etc. Alumina production capacity in India as on 1995-96 is placed at 1.7 million tonnes in 6 refineries of 5 companies i.e. BALCO, NALCO, INDAL, HINDALCO and MALCO. All these are captive refineries for supplying alumina to smelters of respective companies. There has been marginal increase in production of alumina from 1.35 million tonnes in 1990-91 to around 1.65 million tonnes in 1996-97. More than 90% of the domestic consumption of alumina is for metallurgical purpose while the balance around 50,000 tonnes is used for chemical and refractory purposes. The present capacity of alumina which is placed at 1.7 million tonnes is expected to go up to 2.16 million tonnes by way of expansion in NALCO, HINDALCO and INDAL plants and further to 6.0 million tonnes by way of expansions in NALCO, INDAL and setting up of new plants. Already three proposals of capacity of 4 million tonnes (3 million tonnes in east coast and 1 million tonnes in West Coast) are under various stages of implementation.



WORLD SCENARIO :

The world production of alumina vis-à-vis India during the last five years is given below:

Year	(In '000 tonnes)	
	World	India
1991	41,600	1435
1992	40,400	1484
1993	42,700	1518
1994	41,200	1531
1995	42,600	1673
1996	44,000	-

The world production of alumina was 35 million tonnes in 1980 which has increased to 44 million tonnes in 1996. Although 25 countries reported the production of alumina during 1995, more than 80% of the production came from 12 countries, namely Australia (20.86%), USA (10.64%), Russia (5.4%), Jamaica (7.11%), China (5.2%), Brazil (5.03%), Surinam (3.73%), Venezuela (3.6%), India (3.92%), Germany (1.76%), Canada (2.49%), and Spain (2.56%). About 45% of the alumina produced enter into international trade. This high percentage of trading is mainly because of major primary alumina producers in North America and Western Europe have insignificant resources of bauxite and insufficient capacities for alumina refining compelling them to depend on imports.

The world trade in alumina was of the order of 15.71 million tonnes in 1980 which increased to 20.852 million tonnes in 1995. The principal exporters of alumina during 1996 were Australia (10.7 million tonnes), Jamaica (3 million tonnes), the USA (1 million tonne), Ireland (1.2 million tonnes), Hungary (0.24 million tonne), India (0.45 million tonnes), Germany (0.5 million tonne), Italy (0.47 million tonne) and Spain (0.24 million tonne). The principal importing countries of alumina were the USA (4.38 million tonnes), Canada (3.17 million tonnes), Norway (1.70 million tonnes), UK (0.62 million tonne) and Netherlands (0.74 million tonne). These seven countries accounted for about 70% of the total world imports.

**EXPORT PROSPECTS :**

The country-wise exports of alumina during 1994-95 to 1996-97 is given below :

Country	Quantity :Tonnes Value :Rs.'000					
	1994-95		1995-96		1996-97	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>All Countries Total</b>	<b>479,569</b>	<b>231,38,87</b>	<b>447,988</b>	<b>325,67,65</b>	<b>560,015</b>	<b>374,82,03</b>
Russia	316,653	157,77,09	262,922	194,81,26	155,649	111,55,53
USA	103,979	40,42,85	68,000	44,76,03	127,350	87,68,17
China Peop. Rep.	18,500	7,52,59	42,000	28,09,41	68,349	38,38,30
Indonesia	22	2,81	23,150	17,71,92	66,605	47,34,88
Iran	12,454	5,66,39	12,387	977,01	36,042	23,04,24
Ukraine	13,000	6,94,19	14,700	619,34	21,000	13,05,89
Saudi Arabia	331	40,39	1,27,250	902,19	-	-
Korea DPR	-	-	8,400	84,512	-	-
Other Countries	12,632	12,62,56	3,709	385,37	85,020	53,75,02

It would be seen from above that 85% of the total Indian exports of alumina are accounted by six countries namely Russia, USA, China Peop. Rep., Indonesia, Iran & Ukraine. Considering the world exports of about 21 million tonnes, India's share is just 2 per cent.

Alumina has attained a status of free market commodity due to structural changes in the international markets. India is well placed from the point of view of high grade bauxite deposits in the country for the production of alumina. There are bright prospects for boosting exports of alumina from India.

Indian alumina is at present being exported to Australia, Bangladesh, Belgium, Brazil, China Peoples Republic, Egypt, France, Korea Rep., Netherlands, Pakistan, Saudi Arabia, Singapore, Thailand, USA, USSR and Zimbabwe. Besides the above established markets, potential markets are Norway, Sweden, Switzerland, Hong Kong, Taiwan, Mexico, Argentina, Austria, Finland, Ireland, Poland, South Africa, Cameroon, Ghana, Tunisia, Bahrain, Jordan and New Zealand since these countries are entirely dependent on imports. These markets need to be explored.

(v) BARYTES

India ranks third in the production of barytes in the world and is one of the important exporter in the world market. Barytes ( $BaSO_4$ ) is a relatively soft inert and inexpensive mineral with a high specific gravity (4.5). Most of the world's barytes is being used as a weighing agent for mud circulated in rotary drilling of oil and gas wells in combination with bentonite. Barytes is also used in substantial quantities for production of barium chemicals. It also finds applications as a filler in paints, rubber and paper and as a flux in glass making.

RESOURCES :

The recoverable reserves of barytes are placed at 87 million tonnes, out of which 52.7 million tonnes are in proved category, 27.78 million tonnes in probable category and 6.58 million tonnes in possible categories. Andhra Pradesh account for about 85 million tonnes of reserve accounting for 97.70% of all India reserves. The remaining 2 million tonnes are distributed in the states of Bihar, Himachal Pradesh, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. The Mangampet deposit in Cuddapah district of Andhra Pradesh is the single largest bedded deposit of high grade barytes in the world containing 65 million tonnes of recoverable reserves. The all-India grade-wise and state-wise recoverable reserves of barytes as on 1.4.1995 are as follows:

States/Grades	Unit : '000 tonnes			
	Proved	Probable	Possible	Total
India : Total of All Grades	52705	27780	6577	87062
<b>By Grades</b>				
Chemical -A	3	4	277	284
Chemical -B	241	681	522	1444
Oil well drilling	26129	4866	1237	32232
Paint	64	112	113	289
Low	17463	19283	2770	39516
Others	8724	2635	381	11740
Unclassified	79	186	1163	1428
Not known	3	12	114	129

Table contd.

Table concluded

State/Grade	Proved	Probable	Possible	Total
<b>By States</b>				
Andhra Pradesh	52499	27169	5298	84966
Bihar	-	-	15	15
Haryana	-	-	++	++
Himachal Pradesh	18	35	26	79
Karnataka	-	-	9	9
Madhya Pradesh	3	29	158	190
Maharashtra	44	75	7	126
Rajasthan	141	170	927	1238
Tamil Nadu	-	++	117	117
Uttar Pradesh	-	-	20	20
West Bengal	-	303	-	303

Note : Figures rounded off

### PRODUCTION :

Barytes mining started long back in 1947. The production which was 25000 tonnes in 1947 had touched a level of 645,179 tonnes in 1989-90 which is the highest recorded so far. The production during the period 1989-90 to 1997-98 has recorded a mixed trend, reaching a low level of 382,000 tonnes in 1996-97. It however recovered to 659,000 tonnes in 1998-99. Andhra Pradesh is the dominant producer accounting for 98% of the production, the remaining being accounted for by Rajasthan, Himachal Pradesh and Madhya Pradesh.

### DOMESTIC DEMAND :

The current domestic demand of barytes is around 186,000 tonnes. Major share of domestic consumption goes into oil well drilling for the preparation of drilling muds. Other consuming industries are chemical, paints, glass, and asbestos products etc..

### TRADE :

### EXPORTS :

Barytes is generally exported in two forms namely lumps and powder, and there are no restrictions on either. Exports which were around 15,000 tonnes in 1947, reached the highest level of 433,000 tonnes in 1988-89. It touched a low level of 38,000 tonnes in 1992-93 and again

recovered to 425,000 tonnes in 1995-96 and touched a low level of 24,373 tonnes valued at Rs.4.4 crores in 1997-98. The world demand for barytes is primarily dependent on the demand for oil well drilling mud. The fall in exports might probably be due to the decline in oil and gas well drilling activities. The country-wise exports during the last two years 1995-96 and 1996-97 were as follows :

Year/Countries	1995-96		1996-97	
	Quantity	Value	Quantity	Value
<b>All countries</b>	<b>424,840</b>	<b>397801</b>	<b>140023</b>	<b>172113</b>
USA	301,600	253313	88500	84533
Indonesia	36447	36223	7058	16060
UAE	14188	15922	5041	5628
Oman	12420	14697	16500	16498
Saudi Arabia	11000	8599	1181	11454
Other Countries	49185	69047	21743	37940

USA has been the major buyer of Indian barytes. It accounted for 71% and 63% of the total exports during 1995-96 and 1996-97 respectively. Besides USA, Indonesia, UAE, Oman and Saudi Arabia, other countries which exported sizeable quantities of barytes are Netherlands, former USSR, Myanmar, Iraq etc..

### IMPORTS :

India also imports a meager amount of barytes from other countries. Imports of barytes have increased from three tonnes valued at Rs. 66,000 in 1994-95 to 62 tonnes valued at Rs. 782,000 in 1996-97.

### WORLD SCENARIO :

The identified reserves of barytes are placed at 500 million tonnes. However, the world reserves of barytes are assessed at 170 million tonnes. China, India, USA, Mexico, Morocco, Thailand and former USSR account for major share. The current world production capacity of barytes is around 6 million tonnes per annum. The leading producer are China, India, Mexico, Morocco and others. The major importing countries are United States of America (1.5 million tonnes), Germany (203,000 tonnes), Hungary (142,000 tonnes), Japan (140,000 tonnes), Netherlands (137,000 tonnes), Korea Rep. of (85,000 tonnes) and United Kingdom (85,000 tonnes). Other important producers of barytes in the world were Morocco, Iran, Germany, Turkey, Kazakistan, Romania, Mexico. The world exports of barytes are placed between 1.3 to 3.0 million tonnes. The principal exporting countries are China, France, Mexico, Netherlands, Turkey, India, Thailand, Irish Rep. etc. The world major importers are USA (42%) and UK (8%). Other important importers are Germany, Indonesia, etc.

**EXPORT PROSPECTS :**

The world market conditions for barytes are stable. The barytes market mainly depends on oil/gas drilling activity which is influenced by the price of oil, the state of world economy and political factors. There are alternatives to barytes in the drilling market like celestite, ilmenite, iron ore and synthetic hematite. However, none of these substitutes has had a major impact on the barytes used in oil drilling industry.

The important traditional markets for Indian barytes are USA, UAE, Egypt, Saudi Arabia, Oman, Japan, U.K, Netherlands, former USSR, Indonesia, Myanmar, Iraq, Korea Rep. of etc. The USA was the largest market followed by Kuwait. The chief importers of barytes in the world are the USA, UK, Norway, Japan, Netherlands, Venezuela, Germany, Mexico, Indonesia, Abu Dhabi etc. The countries which consume substantial quantities of barytes and which do not figure in our trade list are Germany, Norway, Venezuela, Mexico, Abu Dhabi, Turkey, Romania, Brazil, Czechoslovakia, France, Belgium, Iran, Canada, Argentina, Poland, Former Yugoslavia, Algeria, Jordan, Malaysia, Thailand etc. These are the possible countries which may be new markets for barytes.

**(vi) BENTONITE**

Bentonite is an important naturally occurring clay of great commercial importance. It possesses bleaching property and is also used as a binding agent in a number of industries. Bentonite is essentially a highly plastic clay containing not less than 85% of the clay mineral montmorillonite. The recoverable reserves of bentonite of all grades in the country are placed at 365 million tonnes. The all-India State-wise and grade-wise recoverable reserves as on 1.4.1995 are as follows:

Grade/ State	Unit : '000 Tonnes			
	Proved	Probable	Possible	Total
<b>All India Total</b>	<b>37200</b>	<b>108766</b>	<b>219523</b>	<b>365489</b>
<b>By Grades</b>				
Drilling Fluid	-	-	9344	9344
Foundry	605	3211	46802	50618
Poor/Blendable	-	-	18561	18561
Unclassified	15639	1725	9101	26465
Not known	20956	103829	135715	260500
<b>By States</b>				
Bihar	2	658	101	761
Gujrat	3392	2990	83190	89572
Jammu & Kashmir	-	-	116	116
Rajasthan	33806	105118	136116	275040

Note : Figures rounded off

Barmer district of Rajasthan (267 million tonnes), Bhavnagar (37 million tonnes) and Kachchh district (50 million tonnes) of Gujrat account for 97% of the all India reserves .

**PRODUCTION :**

India ranks seventh in the world production of bentonite. Production which was around 46,000 tonnes in 1968 increased to 323,000 tonnes in 1994-95. The estimated consumption during 1996-97 was 329,000 tonnes.

**DOMESTIC DEMAND :**

The major use of bentonite is for foundry facings, civil construction work for making embankments and other porous formation water tight, in preparation of drilling muds, as a carrier in insecticides, as decolouriser and as binding material in iron ore pelletisation. Activated bentonite is used in bleaching and refining of oil. The present consumption of bentonite is around 154,000 tonnes. Foundry, civil construction, oil well drilling sectors and pelletisation together accounted for 83% of the total domestic consumption. The remaining 17% is accounted for by industries such as insecticide, fertilizer, refractory, chemicals, ceramics, etc.

**TRADE :****EXPORTS :**

Bentonite is one of the important minerals that is exported. It is exported both in unprocessed (crude) and processed (including activated) form. Exports commenced in 1957 with a small quantity and registered steady growth. The exports touched a highest level of 183,212 tonnes during 1997-98. Exports were destined mainly to Malaysia, Indonesia, Italy, Saudi Arabia, UAE and Russia. Exports of bentonite during 1990-91 to 1997-98 are as follows :

Year	Quantity (Tonnes)	Value (Rs.'000)
1990-91	49011	35226
1991-92	76857	54004
1992-93	112543	73426
1993-94	129960	139473
1994-95	147005	166662
1995-96	147856	187961
1996-97	174118	282124
1997-98	183212	326857

**IMPORTS :**

Small quantity of bentonite are also imported. Imports which were 1437 tonnes valued at Rs.2.5 crores in 1994-95 declined to 252 tonnes valued at Rs.15 lakhs in 1997-98. UK and USA were the major supplier during 1996-97.



### WORLD SCENARIO :

The current world production capacity of bentonite is around 10 million tonnes per annum. USA (4.1 million tonnes) was the leading producer in 1996. Other important producers were Turkey, Italy, Germany and Japan. The major exporters of bentonite during 1996 were USA (796,289 tonnes), India (174,118 tonnes), UK (83,783 tonnes), China (73,169 tonnes) and Turkey (68,124 tonnes). The principal importers of bentonite during 1996 were Canada, UK, Germany, Netherlands, Sweden etc. .

### EXPORT PROSPECTS :

Exports of bentonite from India are allowed freely without any qualitative or quantitative restrictions. The recoverable reserves of Indian bentonite are quite sizeable considering the domestic levels of production and domestic demand. The production of bentonite has been sufficient to meet the internal demand as well as exports. There are very good prospects for Indian bentonite.

**(vii) MICA**

India is one of the largest producers of mica in the world. The country holds a position especially in the production and trade of muscovite sheet mica. Out of the 7 important varieties of mica group, muscovite and phlogopite are the two commercial minerals. Mica is broadly classified into 4 types viz. (i) Natural sheet Mica (blocks, splittings & films), (ii) Manufactured sheet mica (Micanite & Mica paper), (iii) Scrap mica/ground mica and (iv) Synthetic mica. Mica is widely used in electrical and electronic appliances. Other uses include high pressure stream boiler gauge; pyrometers, optical fitters, thermal regulators, stone windows etc.

**RESOURCES :**

Important mica bearing pegmatites occur in Andhra Pradesh, Bihar, Gujrat, Haryana, Karnataka, Kerala, Maharashtra, Orissa, Rajasthan, Tamil Nadu and West Bengal. No systematic estimates of mica reserves have been made so far because of irregular nature of mineralisation of mica in pegmatites. The Indian Bureau of Mines has tentatively estimated the mica reserves in the three producing states of Andhra Pradesh (45,000 tonnes), Bihar (14,000 tonnes) and Rajasthan (1,588 tonnes). The grade-wise and state-wise recoverable reserves of mica is as follows :

Grade/State	(Tonnes)			
	Proved	Probable	Possible	Total
India : Total All Grades	-	-	59980	59980
Unclassified	-	-	59980	59980
<b>By States</b>				
Andhra Pradesh	-	-	44837	44837
Bihar	-	-	13554	13554
Rajasthan	-	-	1589	1589

Note : Figures rounded off.

**PRODUCTION :**

India had enjoyed a monopoly in the production and export of sheet mica in the world since last over hundred years. But in recent past, production of crude mica has shown a continuous declining trend due to declining demand of natural mica in the world markets because of technological advancement in use of mica and development of mica substitutes. From available statistics it is observed that the reported production of crude mica which was at 8,534 tonnes in 1981 has come down to the level of 4,062 tonnes in 1990-91 and to 1962 tonnes in 1996-97. The production of crude mica and mica (waste & scrap) since 1993-94 to 1998-99 is given below :

	(In tonnes)					
	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99(p)
Crude Mica	2124	1988	1832	1954	1678	1492
Mica (Waste & Scrap)	913	1465	1240	1109	1088	889

p : Provisional

### TRADE :

### EXPORTS :

The Government of India had analysed the exports of processed mica through Minerals and Metals Trading Corporation of India Ltd. (MMTC) from January, 1972. Subsequently MMTC has set up a subsidiary organisation viz. The Mica Trading Corporation of India Ltd. (MITCO) with effect from June, 1974. The world market conditions are declining for sheet mica but increasing for ground mica. The factors influencing the marketing of mica are construction activity, uses of plastic, availability of substitutes, technical advancement and economy. Mica paper made from scrap mica can be substituted for sheet mica in electrical uses.

The total exports of mica from 1994-95, 1995-96 and 1996-97 are 30,074 tonnes, 33776 tonnes and 29360 tonnes respectively, which includes unmanufactured & worked mica. The exports picked up to 47892 tonnes valued at Rs. 62.59 crores in 1997-98. Block, splittings condenser films and waste and scrap are included under the unmanufactured category. Condenser films, plates (cut) washer and discs, Sheet and strips, micanite and other built-up mica, powder & bricks etc. are included under worked category of mica. Category-wise exports of mica during last three years is furnished below :

Quantity: Tonnes  
Value : Rs.'000

Category.	1994-95		1995-96		1996-97	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>Mica :Total</b>	<b>30074</b>	<b>387402</b>	<b>33776</b>	<b>472166</b>	<b>29360</b>	<b>468220</b>
<b>I) Unmanufactured</b>	<b>4166</b>	<b>100220</b>	<b>5985</b>	<b>123263</b>	<b>8908</b>	<b>128543</b>
i) Blocks	323	23384	232	16349	648	23910
ii) Splittings	1006	37291	1002	36466	1291	52444
iii) Condenser films	21	990	65	1207	3365	5071
iv) Waste & scrap	2816	38555	4686	69241	3604	47118
<b>II) Worked</b>	<b>25908</b>	<b>287182</b>	<b>27791</b>	<b>348903</b>	<b>20452</b>	<b>339677</b>
i) Condenser films, plates cuts NES	0	112	0	149	15	4164
ii) Washers & discs	5	1363	5	1489	0	595
iii) Micanite & other built up mica	98	26018	87	26635	100	30105
iv) Powder	25493	122164	27387	149869	19687	121555
v) Bricks	0	0	4	2116	0	173
vi) Others	307	134153	304	166669	426	175369

**IMPORTS :**

Although India is an important exporter of mica, it also imports some quantities of mica in different forms. Its imports of mica in various form has increased from 124 tonnes in 1994-95 to 442 tonnes in 1996-97. The imports declined to 346 tonnes valued at Rs. 9.4 crores during 1997-98. The unmanufactured mica accounts for major imports. Detailed statistics is given below:

Category	Quantity: Tonnes Value : Rs.'000					
	1994-95		1995-96		1996-97	
	Qty.	Value	Qty.	Value	Qty.	Value
<b>Mica :Total</b>	<b>124</b>	<b>74817</b>	<b>214</b>	<b>87734</b>	<b>442</b>	<b>71717</b>
<b>I) Unmanufactured</b>	<b>46</b>	<b>2420</b>	<b>100</b>	<b>2464</b>	<b>354</b>	<b>11571</b>
i) Blocks	0	0	26	1050	192	8660
ii) Splittings	46	2420	74	1414	162	2911
<b>II) Worked</b>	<b>78</b>	<b>72397</b>	<b>114</b>	<b>85270</b>	<b>88</b>	<b>60146</b>
i) Condenser films, plates cuts NES	14	8595	9	6934	12	15706
ii) Sheets & Strips	0	298	0	171	13	6737
iii) Micanite & other built up mica	1	258	0	11	0	0
iv) Powder	1	138	5	371	1	156
v) Others	62	63108	100	77783	62	37547

**WORLD SCENARIO :**

The world resources of mica are large but no systematic assessment of reserves has been made because of its sporadic nature of occurrence. The world's production capacity is 300,000 tonnes per annum. The world production of mica increased from 240,000 tonnes in 1992 to 310,000 tonnes in 1995. Production is dominated by scrap and waste mica. Sheet mica which accounts for 3% total world mica production is largely confined to India and to a lesser extent to Russia and China. Phlogopite is produced almost exclusively in Canada with minor contribution from Madagascar. USA is the largest producer of mica accounting for 42% followed by Russia with 13%. The other important producing countries are China, Canada, Taiwan, Brazil, Mexico, Malaysia, Norway, France, etc.

## EXPORT PROSPECTS :

The world exports of mica (all types) was 1.5 lakh tonnes during 1995. China, Canada, France, USA, India, Malaysia, USA, Finland, Brazil and Norway are principal exporters. The principal importing countries are France, Korea, Netherlands, Canada, Belgium-Luxembourg etc. The development of mica substitutes and synthetic mica affected the demand for Indian mica. Decline in the exports of mica began much earlier to the canalisation. An analysis of past data on exports shows that there has been considerable decline in the demand for mica blocks, splittings, films but there appears to be increase in international demand for scrap mica. MITCO has visualised this problem long back and established some mica based units like mica paper, micanite, mica powder (micronised), mica scrap processing etc. These products were mainly exported to Japan, Korea, Poland, Germany, USA, UK, Singapore, Thailand, Belgium etc. under the trade name 'INDRIKA-486-MICA PAPER'. Glass bonded and phosphatic bonded mica products are sheet like ceramic materials and are substitutes for natural sheet mica products.

The main problem is decline in demand of natural sheet mica. Presently the exports are confined to mostly Japan, USA, UK, Belgium, Germany, France, Spain, Norway etc. All these countries have gradually curtailed their quantum of imports of mica from India. The world importers of mica are Japan, UK, Germany, USA, Norway, France, Netherlands, South Korea, Canada, Italy, Spain, Belgium-Luxembourg, Singapore, Taiwan, Australia etc. The countries which do not figure in our export list are Taiwan, Australia, Poland, Mexico, Iran, South Africa, Czechoslovakia, Indonesia, Sweden, Greece, Sri Lanka, Ireland etc. These non-traditional markets need to be explored through systematic efforts.

**(viii) BUILDING AND MONUMENTAL STONES****(a) GRANITE**

Granite is a light coloured acid igneous granular rock of plutonic origin. However in commercial parlance, the term granite is applied to various decorative stones with wide ranging petrological and mineralogical compositions. They include " multi-coloured granite" viz. Granite, granite gneiss, charnokite, leptynite, syenite, anorthosite, migmatite etc. and black granite viz. dolerite, pyroxenite, pyroxene granulite, gabbro etc. These rocks, upon polishing, give almost mirror finish and are not affected by dilute acids, vagaries of weather and polluted atmosphere. Due to these stable properties, they are in great demand abroad and therefore Indian granite industry is expanding rapidly.

**RESOURCES :**

Granite of various colours are widely distributed in India. Indian granites mostly occur in the Archean terrain which covers thousands sq. kilometers areas. Deposits of granites are reported from Andhra Pradesh, Assam, Bihar, Gujrat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. However, main granite centers are located in the Southern States of Andhra Pradesh, Karnataka & Tamil Nadu. So far, no systematic assessment of granite resources has been carried out. First time IBM had attempted to prepare an inventory of granite resources as on 1.4.1990 in the country and the same has been updated as on 1.4.1995. The total recoverable reserves of granite in the country as on 1.4.1995 are estimated at 1027 million cubic meters as given below :

(In'000 Cu.m.)					
State	Proved	Probable	Possible	Total	Grade
<b>All India</b>	<b>11114</b>	<b>332457</b>	<b>683850</b>	<b>1027421</b>	<b>All grades</b>
Andhra Pradesh	-	-	2300	2300	-
Assam	-	205520	-	205520	Black granite
Bihar	-	-	19105	19105	Coloured granite
Gujrat	-	-	23560	23560	-
Haryana-	-	-	13600	13600	-
Karnataka	-	124186	78800	202986	-
Kerala	-	30	514	544	-
Maharashtra	-	-	326561	326561	-
Orissa	-	-	7588	7588	-
Rajasthan	-	4	201692	201696	-
Tamil Nadu	11114	2717	6509	20340	-
West Bengal	-	-	3621	3621	-

Note: Figures rounded off

\* : The reserve estimates are based on available data, are tentative and the coverage is partial.

## DEMAND AND SUPPLY :

Being a minor mineral regulation and development of granite are administered by the respective State Govts., hence statistics on production of granite are not being received by IBM under statutory return of MCDR 1988. However, the States where the main granite quarries are concentrated are Andhra Pradesh, Karnataka, Tamil Nadu and Rajasthan. Of late, other States like Orissa, Gujrat, Bihar, Uttar Pradesh etc. are also coming up as granite producing States. The Indian granite industry is basically export oriented and statistics regarding internal demand are not available. However, it may be noticed that use of granite blocks/products are gradually gaining grounds in Indian building sector. Mining of granite is mostly manual, where drilling and wedge splitting is done. Semi-mechanised mining are also carried out where operations like drilling, wedge splitting, loading and transport are mechanised at one stage or the other. There are also fully mechanised mines. Recovery of useful granite from the total excavated material may generally vary from 10 to 15% in case of coloured granite. It may be envisaged that at the current rate of exports of granite i.e. around 12 lakh tonnes/year, there may not be any problem in supply of this material for a longer period. However, quantum of exports of high dimensional blocks may be reduced gradually and the policy of exports of value added products may be pursued.

## TRADE :

### EXPORTS :

Indian granite has substantial export potentiality and with varied colours and shades it is sought by many countries. Granite has established as one of the leading export earning mineral commodity after iron ore. During the last five years from 1992-93 to 1996-97, the total export value of Indian granite has increased from Rs.504 crores to Rs.1139 crores. The exports however, declined to 708,000 tonnes valued at 958 crores during 1997-98. India exports granite as rough/cut blocks and polished products, however, percentage share of polished and other products in the total value of exports is increasing and it has increased from 35% (Rs.175 crores) in 1992-93 to 53% (Rs.604 crores) in 1996-97. Similarly, during the same period quantity-wise percentage shares of rough granite has decreased from 95% to 84%. Italy, Japan, U.S.A., Germany, Belgium, Singapore are the major importing countries for Indian granite. Category-wise exports of granite during last three years are as under :

Quantity: '000 Tonnes  
Value: Rs.Crores

CATEGORY	1994-95		1995-96		1996-97	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>Granite : Total</b>	<b>1133</b>	<b>905</b>	<b>1277</b>	<b>1083</b>	<b>1172</b>	<b>1139</b>
Crude or roughly trimmed	834	399	826	379	810	424
Cut blocks/ slabs	177	110	305	193	179	111
Polished blocks/ tiles	110	361	128	454	168	557
Others	12	35	18	57	15	47

**IMPORTS :**

In comparison to exports of granite from India, imports of this commodity is rather meager. It comprises crude, cut and polished materials. Total imports of granite has registered an ascending trend from modest 106 tonnes in 1992-93. It increased to 1037 tonnes in 1996-97 and again declined to 913 tonnes valued at Rs. 1.14 crores during 1997-98. The main supplying countries were USA, Chinese Taipei, Italy etc. Category-wise imports of granite during last three years are as follows :

Quantity: Tonnes  
Value: Rs.Crores

CATEGORY	1994-95		1995-96		1996-97	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>Granite : Total</b>	<b>477</b>	<b>14276</b>	<b>588</b>	<b>8863</b>	<b>1037</b>	<b>6658</b>
Crude or roughly trimmed	66	590	380	2857	926	5505
Cut blocks/ slabs	41	581	95	1209	75	805
Polished blocks/ tiles	349	11462	29	1614	18	282
Others	21	1643	84	3183	18	66

**WORLD SCENARIO :**

World granite resources are large and widespread. Most of the countries are producing and trading granite in minor to substantial quantities. Although, complete picture regarding world production of granite is not available however, available data on production of dimension stone including granite indicate an increasing trend. World production of granite during 1981 was at about 20 million tonnes, increased to 25 million tonnes in 1991 and further to over 36 million tonnes in 1994. The major producing countries are Italy, China, India, Greece, Spain, Brazil, France, Portugal, South Africa, South Korea etc.

The world exports of granite has increased from 6.6 million tonnes in 1992 to about 10 million tonnes in 1996 registering about 54% growth. The leading exporting countries are China, India, Sweden, Norway, Spain, Finland, Italy, Portugal, Germany, USA etc. Similarly import of granite has increased from 7.3 million tonnes in 1992 to about 9 million tonnes in 1996 registering about 25% growth. The leading importing countries include Italy, Taiwan Netherlands, Japan, Qatar, Spain, UK, Germany, France, Belgium, Luxembourg, USA etc. It is noticed that the demand of dimension stone is varied as it has ever seen. It is relay the intrinsic characteristics of different types of marble, granites that dictate their respective popularity. Tradition, positive response to technical problems, aesthetic properties and prestige tend to have a more overbearing effect on demand than the promotional initiatives.



## EXPORT PROSPECTS :

It may be seen that Indian granite is well accepted in the international markets and it is rated high. High standards of quality in terms of polishing and cutting are now imperative. It is the endeavor of the Govt. of India to increase more and more exports of granite in the value added forms. A number of incentives have been extended to granite sector. Granite is a non-scheduled industry and does not require any industrial licence . Looking to the export potential of granite the Govt. has been encouraging setting up of 100% EOUs. It is reported that about 500 letter of approvals for setting up of 100% EOUs have been issued during the last decade out of which 75 units are in operation and 200 are under various Stages of implementation. Industry should avail the incentives extended under 80 HHC and EPCG by the Govt. for this sector.

From the export statistics it appears that though India has established itself among the leading players of international market, yet, a number of countries have to be explored for the export of Indian granite. In European continent, countries like Austria, Denmark, France, Portugal, Switzerland etc. are still untapped, although they import granite in substantial quantity. There is a lot of scope for increasing Indian share in the granite market of Canada, Belgium, Germany, Italy, Netherlands, Spain, UK, Switzerland, Japan, Kuwait, Qatar, China, Indonesia, South Korea, Taiwan etc. since in the total quantum of their granite import Indian share is limited. Due to recession in the world economy particularly in the Far East Countries, a static condition in the export of Indian granite seems to be emerged, hence new markets are to be searched in the Latin American and African countries.

India's main exports are of dimensional, blocks in various sizes/volumes along with cut and polished products of widest possible range and there is a bright future for our granite world-wide despite competition both from developed and developing countries.

**(b) MARBLE**

Marble has gained considerable importance as dimension and decorative stone in domestic and international markets. Because of its pleasing colours, attractive patterns and resistance to abrasion, marble not only enhances the aesthetic beauty of a building but also imparts a feeling of dignity to the structure.

**RESOURCES :**

Marble occurrences are widely distributed in India. However, occurrences of economic importance are limited in the States of Rajasthan, Gujrat, Haryana, and Andhra Pradesh. Rajasthan has the largest reserves of good quality marble and important deposits are located around Makrana in Nagaur district, Amet-Lava, Sardargarh, Babarmal, Rajnagar and Kelwa areas in Udaipur district and in various localities in Jaipur, Pali, Banswara, Jaisalmer, Ajmer, Sikar districts. Next to Rajasthan, Gujrat has marble deposits in Banaskantha, Bharuch, Vadodara, Kachchh and Panchmahal districts. Ambaji areas in Banaskantha district is an important marble producing centre. As on 1.4.1995, the total recoverable reserves of marble in the country are estimated at 825 million tones as given below :

Unit : '000 Tonnes					
States	Proved	Probable	Possible	Total	Grades
<b>All India</b>	<b>3294</b>	<b>120292</b>	<b>701038</b>	<b>824624</b>	<b>All grades</b>
	22	1339	3518	4879	White colour
	1136	85625	167404	254165	Off colour
	-	21870	529266	551136	Unclassified
	2136	11458	850	14444	Not known
<b>By States</b>					
Gujrat	-	9375	1545	10920	White colour & Not known
Haryana	1110	1442	12764	15316	Off colour
Jammu & Kashmir	-	-	202351	202351	Off colour & Unclassified
Maharashtra	-	-	28720	28720	Off colour & Unclassified
Rajasthan	2184	109475	451467	563126	White colour Off colour Unclassified & Not known
Sikkim	-	-	1191	1191	Off colour & Unclassified
Uttar Pradesh	-	-	3000	3000	Unclassified

- Note : (i) The reserves in Bihar, Madhya Pradesh and few districts in Gujrat, Maharashtra and Rajasthan have not been estimated.
- (ii) The reserves estimates are based on available data. Data are purely tentative and the coverage partial.
- (iii) Figures rounded off.

## **DEMAND & SUPPLY :**

There is no authentic data to exactly quantify the internal consumption of marble. However the apparent consumption may be estimated on the basis of available production and exports. Being a minor mineral authentic figures on production of marble are not available with Bureau (IBM). It may be presumed that other than about 70,000 tonnes of dressed and other type of marbles which are being exported annually, the remaining quantity is being consumed internally. There is a developing market for polished marble slabs in our country due to the fact that they are now increasingly being used in construction of residential and commercial buildings, hotels, hospitals etc..

Production of marble is reported from Rajasthan, Gujrat, Uttar Pradesh, Andhra Pradesh, Madhya Pradesh, Jammu & Kashmir and Haryana. Rajasthan account for more than 90% of the total production of marble in the country. In Rajasthan, marble is largely obtained from the quarries of Makrana area in Nagaur district and from a number of quarries in Banswara, Dungarpur, Udaipur, Rajasamand, Ajmer, Sirohi, Jaipur, Alwar, Sikar and Bundi districts. In Gujrat, marble production comes from Ambaji area in Banaskantha district and from Vadodara district. Other States like Madhya Pradesh, Andhra Pradesh, Uttar Pradesh etc. contribute in small quantities . In 1996-97, production of marble from the country was 35.7 lakh tonnes of which Rajasthan accounted 93% and Gujrat 6%. Rajasthan has almost 90-100 gangsaws to swan marble blocks, both imported and indigenous. There are large number of automatic tiling and polishing plants, around 250 cutting units and two agglomerated marble units. Marble processing unit are also in operation in Gujrat and Haryana.

## **TRADE :**

### **EXPORTS :**

Marble is one of the important commodity from the mineral sector which is being exported from the country traditionally. India is endowed with some of the best and larger marble deposits and one of the important producers of quality marble. Export of marble has maintained a steady growth and during the last five years. It has increased from 47,569 tonnes valued at Rs. 37 crores in 1992-93 to 74,694 tonnes valued at Rs.130 crores in 1997-98. The major destination for marble export are Italy, USA, UAE, Singapore, Saudi Arabia, Korea Rep. Of , Indonesia, and Hong Kong. Italy is major importer of Indian marble of both dressed and undressed and accounts for about 50% of exports quantitatively. Trends in exports of marble is furnished below :

Category/Year	Quantity : Tonnes Value : Rs.'000					
	Dressed		Others		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
1992-93	32403	336005	15166	36505	47569	372510
1993-94	36306	460442	24254	86104	60560	546456
1994-95	60518	869107	12734	50899	73252	920006
1995-96	50171	799672	9141	100253	59312	899925
1996-97	54876	959521	11963	120628	66839	1080149

### IMPORTS :

With the availability of quality marble resources in the country itself, scope for imports of marble into India seems to be limited. However in the liberalised economic scenario a sharp increase in marble imports has also been recorded during the last few years. The total imports of marble which was only 6,092 tonnes valued at Rs.3.6 crores in 1992-93 has increased to 46,291 tonnes valued at Rs.39.42 crores in 1996-97. The imports however, declined to 23,136 tonnes valued at Rs. 20 crores during 1997-98. Italy and Iran are the major suppliers while Greece, Spain etc. contributed small quantities. Category-wise imports of marble is given below :

Category/Year	Quantity : Tonnes Value : Rs.'000					
	Dressed		Others		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
1992-93	2929	19939	3163	16845	6092	36784
1993-94	752	7057	11280	49858	12032	56915
1994-95	1882	30141	17582	76619	19464	106670
1995-96	7114	48024	25019	139441	32133	187465
1996-97	16546	87718	29745	306455	46291	394171

### WORLD SCENARIO :

As production of marble is clubbed with other dimension stones in most of the countries of the world, the separate statistics on production of marble is not available except for few countries. The total production of dimension stone including marble was 19.80 million tonnes in 1981, 25 million tonnes in 1988 and increased to 36.35 million tonnes in 1994. As per the Handbook of World Trade Statistics, United Nations the total world exports of marble & travertine which was 1.30 million tonnes in 1992 has increased to 15.8 million tonnes in 1996. Italy, Spain, Austria, Portugal, Turkey, Greece, Croatia, Belgium-Luxembourg, France, China, India are the major exporting countries. Similarly world imports of marble and travertine was

around 1.4 million tonnes between 1992 and 1996. Italy, Taiwan, Switzerland, Spain, China, Netherlands, Indonesia, Tunisia, Jordan, Japan, Egypt, etc. are the leading importing countries.

In Europe Italy, Spain, Greece and Portugal are important countries as far as processing of marble is concerned. Italy is the leading exporters/importers/processor of marble in the world. The traditional Italian material, including primarily Carrara White, are still dominant and recently grown in importance.

### EXPORT PROSPECTS :

Indian marble has a good world-wide market. It is therefore necessary to assess marble resources in the high potential areas of Rajasthan. It may be seen that in comparison to total domestic production of marble around 36 lakh tonnes our exports are quite meager. It is imperative to explore new markets as our marble exports is mainly confined to Italy, USA, Gulf and Far East region. European and North American countries may be given more stress for exports. It is reported that Indian green marble products are very much in demand in China as no other country in Asia except India has these products. At present China is in the midst of construction activity and therefore Indian stone industrialists should make use of these opportunities to push up the sales. It may be noticed that marble is being used on large scale in the domestic construction too, hence strategy to export value added processed marble may yield positive results. It is expected that marble exports will grow with increasing mechanisation of quarrying and processing operations.

**(c) SLATE**

Slates are characterised by the presence of closed set planes or cleavages along which they can be easily split into thin sheets. Those with good and even cleavages are valued most and are used as roofing slates and school slates. The usual colours of slates are black, dark gray, greenish grey and purplish grey. Slates are of varying degrees of hardness, the harder one being some times used for flooring.

**RESOURCES :**

The slate deposits in India are found in Rajasthan, Haryana, Himachal Pradesh and Andhra Pradesh. Slate occurrence in Rajasthan are reported in parts of Ajmer, Alwar, Bharatpur, Bundi, Pali, Sawai Madhopur, Tonk and Udaipur districts. Slates of good quality also occur in district of Rewari and Mahendragarh in Haryana, Chamba, Kangra, Mandi, Simla, and Kullu districts in Himachal Pradesh. In Andhra Pradesh, slate occurs near and around Markapur, Remedicherla-Bollapalli R.F of Vinukonda areas in Prakasam and Guntur district respectively.

Systematic assessment of resources of slate in the country has not so far been made. In Haryana, M/s. Haryana Minerals Limited, a State public-sector unit, has estimated reserves of 10.5 Million Cubic Meter. in its leaseholds. Information on reserves in other states is however, not available.

**DEMAND & SUPPLY :**

Production of slate is reported from Andhra Pradesh, Haryana, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh and Rajasthan. During 1996-97, Madhya Pradesh reported about 14.8 lakh tonnes (97% ) of slate (Farshee Patthar) production mainly from Mandasaur district followed by Himachal Pradesh, Haryana, Andhra Pradesh and Rajasthan. State-wise production of slates during 1994-95 to 1996-97 is given below:

State	Unit : Tonnes		
	1994-95	1995-96	1996-97
Andhra Pradesh*	11689	11689	11689
Haryana*	12675	12675	12675
Himachal Pradesh	79712	14850	16900
Jammu & Kashmir	370	555	324
Madhya Pradesh	1529171	1480429	1483926
Rajasthan	8730	6350	10450

Source : State Governments.

\* estimated

Demand survey for slate has not been conducted in the country. In India, it is mainly used for making school slates and for roofing and flooring purposes in rural areas in and around the places where it is mined. About 70,000 tonnes of slates have been exported during 1996-97. There is a good number of slate edge cutting plants in and around slate producing areas and pieces are cut as per domestic and export demands.

### TRADE :

### EXPORTS :

India exports slate under worked and other categories, however, second category (others) dominates the Indian exports. Export of slate has maintained a steady growth and it has increased from 38962 tonnes valued at Rs.20 crores in 1992-93 to 69755 tonnes valued at Rs.53.53 crores in 1996-97. During the year 1995-96 exports of slate registered a substantial increase with 97,245 tonnes valued at Rs.45 crores. The exports however, declined to 66045 tonnes valued at Rs. 56.6 crores during 1997-98. From the analysis of export statistics it is evident that quantum of exports of worked slate has remained static around 5-7 thousand tonnes whereas it fetches more value than other categories. USA, Singapore, Malaysia, Australia, Belgium, Canada, Italy are the major importing countries of Indian slates. Category-wise exports of slate during last five years is given below :

Category/Year	Quantity : Tonnes Value : Rs.'000					
	Worked		Others		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
1992-93	7702	57543	31260	143180	38962	200723
1993-94	4537	45303	34303	187451	38840	232754
1994-95	5428	59597	45056	258367	50484	317964
1995-96	7322	89509	89923	359901	97245	449410
1996-97	7378	109518	62377	425800	69755	535318

### IMPORTS :

India's domestic supply of slate is sufficient to meet the domestic requirements. Indian imports of slate comprising of worked and other categories is merger . USA, UK, Germany are the supplier countries to India. During 1997-98 the imports were 3 thousand tonnes valued at about Rs. 6 lakh.

### WORLD SCENARIO :

Nearly every country in the world produces dimension stone and the production of slate is also clubbed together. In European countries, Italy and Spain are major producers of slate. In Italy, the production of slate is concentrated near Lavangne and Triora. Spain is a leading producer of roofing slate. Slate production is also reported from USA. World trade statistics in slate is not available.

### EXPORT PROSPECTS :

Though systematic reserve estimation of slate resources in the country has not been done so far, however, it is believed to be quite large. There is urgent need to prepare a data base on slate resources in the country with its quality. As export of worked slate realises more value it may be endeavor to enhance more and more export of these category which is almost static. From the analysis of trade export, it is evident that USA, Singapore, Malaysia, Australia, are the major importers of Indian slate. In 1996-97, USA accounted for 44% of total quantum of slate exports. Some other countries like Belgium, Canada, Netherlands, Italy, Indonesia, Bangladesh are also importing Indian slates. However, quantum is less and erratic. With aggressive marketing schemes the exports may be increased in these traditional markets as well as some new areas may also be explored. It seems that there may not be any problem in supply of slate to domestic and export markets for a long period.



#### (d) OTHER BUILDING AND MONUMENTAL STONES

Apart from main natural stones like granite, marble and slate, a number of other building stones like sandstone, quartzite, limestone (building) are also being exploited and used in the country. At the same time substantial quantities are also exported from the country.

#### RESOURCES :

No systematic attempt has been made to assess the resources position of other building stones like sandstone, quartzite, limestone (building) in the country. However, as per the geological distribution, it may be considered that country is endowed with large resources of these stones.

Rajasthan is one of the important State where a variety of stones are found. The main sandstone deposits in Rajasthan are located in Bundi, Kota, Jhalawar, Bhilwara, Sawai Madhopur, Baran, Dholpur, Bharatpur Jodhpur, Bikaner, Churu and Nagaur districts. The colours are red, pink, white, brown, and blue. However the hardness of sand stone varies from district to district. Sand stones of Chittorgarh, Jodhpur, Karauli and Dholpur are famous for their different colours.

In Gujrat, Himatnager sand stone is well established and occurs in Himatnager, Dhrangadhra, Songadh and Anjar area mostly in north Gujrat, Saurashtra and Kachchh district. Due to its attractive red, pink and white colour and equigranular size they are preferred for building construction.

Vindhyan sand stone are being quarried on large scale in parts of Uttar Pradesh and Madhya Pradesh for local uses. Quartzite deposits suitable for building purpose are reported from Kheda, Panchmahal, Banaskantha, Vadodara, and Sabarkantha districts in Gujrat, Jaipur district in Rajasthan and Faridabad, Gurgaon, Rewari, Mahendragarh and Bhiwani districts in Haryana. Deposits also occur in West Bengal, Madhya Pradesh, Karnataka and Tamil Nadu.

Limestone deposits to be used as building stone are located in Rajasthan, Karnataka and Andhra Pradesh. 'Kota Stone' from Kota and Chittorgarh district in Rajasthan, 'Shahabad stone' from Bijapur, Gulbarga and Belgaum districts in Karnataka and 'Kaddapah stone' from Cuddapah, Kurnool, Anantpur and Guntur districts in Andhra Pradesh are the popular varieties of limestone used by building sector.

#### DEMAND & SUPPLY :

These stones are placed under minor minerals, hence production statistics of these stones are not available. It is also noticed that these stones are quarried for local use all over the country. Rajasthan is the major producer of sandstone and limestone (building) and other building stone. Jodhpur sandstone is being quarried for making dressed boulders for a stone

masonry work. Karauli and Dholpur sand stones are obtained in the forms of slabs, tiles etc. Rajasthan reported 41 lakh tonnes of sandstone production during 1995-96. Sandstone are also quarried from North Gujrat and various districts of Madhya Pradesh and Uttar Pradesh.

Popular limestone known as 'Kota stone' in Rajasthan, 'Shahabad stone' in Karnataka and 'Cuddapah Stone' in Andhra Pradesh are mined on large scale. These stones are quarried in various thickness for manufacture of tiles for flooring. In 1995-96, Rajasthan reported 1.76 lakh tonnes of limestone (building) production. Quartzite are used for building purposes and as paving stone and road metal in various States.

A major portion of the production of these stones are used in the domestic building construction, however, building and monumental stones have emerged as one of the main export oriented area from mining sector. Although, they are still quarried in conventional way, techniques are also being adopted to reduce generation of waste. A large number of edge cutting plants, polishing plants for these stones are in operation in various States

#### TRADE :

#### EXPORTS :

Exports of building and monumental stones other than granite, marble and slate has registered a substantial jump. During the last five years it has increased from 84060 tonnes valued at Rs.17.3 crores in 1992-93 to 23.47 lakh tonnes valued at Rs. 74 crores in 1997-98. However, it may be analysed that main importer is Bangladesh and which accounted for 88% and 45% of the total quantity and value of exports respectively in 1996-97. Other importing countries are USA, Italy, Korea Rep. of, UAE and Belgium etc.

#### IMPORTS :

In comparison to total exports of building and monumental stones, the total imports of these commodities are very limited to few hundred tonnes only. The major supplying countries are Italy, Germany, UK, & USA. Trend in exports and imports of building and monumental stones other than granite, marble and slate from India during 1993-94 to 1997-98 is furnished below.

Quantity : Tonnes  
Value : Rs. '000

YEAR	EXPORT		IMPORT	
	Quantity	Value	Quantity	Value
1993-94	172991	255193	224	3887
1994-95	307635	424544	649	7695
1995-96	624863	598966	801	11398
1996-97	888324	1201271	383	11393
1997-98	2347003	737088	825	30494

## **WORLD SCENARIO :**

Since every country is almost self-sufficient in stone and quantity produced so voluminous, it is rather difficult to systematically estimate the quantum of production in each country. In most of the countries, mining is done mostly on small scale, simply to meet local requirements since the transportation cost make it uneconomic for long haulage. Processing of stone is done in an organised way mostly in small and medium scale basis.

## **EXPORT PROSPECTS :**

It may be seen that building and monumental stones sector is growing rapidly. With the economic growth and prosperity a lot of developments have also been made in the building construction works and a major chunk of natural stones produced are being utilised indigenously. At the same time our export of building stones have also made a formidable jump which is a positive sign for mineral industry. It is also recorded that major share of these stones is exported to Bangladesh. Italy & USA are the other importers of Indian stones. It seems that exports of this sector may be expanded in other areas as India can offer a wide range of building stones with varieties of pleasing colours and textures . Now processing machinery including sawing, polishing and final dressing in various sizes is manufactured in the country. Building stone sector may take advantages of these developments in the production of value added stone products which realises more export value.

**(ix) PRECIOUS AND SEMIPRECIOUS STONES**

Diamond, ruby sapphire and emerald are major precious stones. Semi precious stones includes agate, amethyst, chrysoberyl, rosy quartz, topaz, aquamarine, gem garnet, moonstone, sunstone, spinal, red corundum, green beryl, heliodor, iolite, tourmaline, staurolite, alexandrite, cats eyes and zircon.

**(a) DIAMOND**

India has been recognised as a major source of gemstone deposits since ages and has also made spectacular progress in the lapidary industry. In recent years, India has emerged as an international center for many varieties of precious and semi-precious gemstones, however among these diamond has been placed on the top. Diamond cutting and polishing industry in India is providing employment to a large number of persons along with substantial export earnings.

**RESOURCES :**

Occurrence of diamond are reported from many parts of the country, however at present production of diamond is confined to Panna district in Madhya Pradesh. The occurrences of diamond have been located in Anantapur, Kurnool, Krishna, Mehbobnager and Guntur districts of Andhra Pradesh, Panna, Chattarpur & Raipur district of Madhya Pradesh, Gadchiroli district of Maharashtra, Bolangir, Phulbani and Sambalpur districts of Orissa and Chittorgarh, Jhalawar and Kota districts of Rajasthan. Assessment of diamond reserves in the country has been carried out in respect of Panna diamond belt and in Krishna, Kurnool districts of Andhra Pradesh. The total recoverable reserves of diamond in the country as on 1.4.1995 are placed at 0.98 million carats of which 0.85 million carats are placed under proved category and the remaining under possible category as given below .

Grade/ States	Unit : '000 Carats			
	Proved	Probable	Possible	Total
<b>All India : All GradeTotal</b>	<b>851</b>	<b>-</b>	<b>130</b>	<b>981</b>
<b>Grades:</b>				
Gem	385	-	-	385
Industrial	466	-	-	466
Unclassified	-	-	130	130
<b>States:</b>				
Andhra Pradesh	5	-	-	5
Madhya Pradesh	846	-	130	976

Note : Figures rounded off.

**DEMAND & SUPPLY :**

In the Panna diamond field Majhgaon mine operated by M/s. National Mineral Development Corporation Ltd. (NMDC Ltd.) is the only diamond producing mine in the country. Besides, NMDC's workings, diamond is also recovered by private operators on a permit system basis in the Panna diamond field. Due to efforts of M/s. NMDC Ltd. the production of diamond which was around 20,000 carats earlier has shown an ascending trend. Diamond production from Panna field has increased from 19,222 carats in 1993-94 to 34,579 carats in 1998-99. Production trends in diamond in India is given below.

						Unit : Carats
1993-94	1994-95	1995-96	1997-98	1996-97	1997-98	1998-99(p)
19222	25518	29931	31018	31836	31018	34579

p : Provisional

In comparison to the demand of diamond for exports and domestic market, the domestic production is very meager and almost the entire demand is met through import. India has a thriving business of cutting and polishing of gem diamonds. Rough diamonds are imported for this purpose. Well established diamond cutting and polishing industries exist at Navsari, Surat, Bhavnagar, Porbandar in Gujrat, Mumbai in Maharashtra, Jaipur in Rajasthan and Coimbatore in Tamil Nadu. It is reported that this industry gives employment to about 8 lakh artisans besides sizeable employment to related activities.

**TRADE :****EXPORTS :**

The Indian export of cut and polished diamonds is entirely based on imported rough diamonds. Indian craftsman are expert in cutting and polishing of rough diamonds, particularly in smaller sizes, which are difficult to be handled by machines. This gives an upper hand to India in export of value added diamonds. Exports of diamonds from India has registered a steady growth since many years. During the last five years exports of diamond has increased to Rs.16,015 crores in 1997-98 from Rs.7,785 crores in 1992-93. This may be attributed due to economic recession in the world economy. India exported diamonds mainly to USA, Hong Kong, Belgium, Japan, Thailand, Israel, Singapore, Switzerland etc.

**IMPORTS :**

As stated earlier, India imports rough diamonds in big quantities, specially of small sizes, for cutting and polishing. The major supplying countries are Belgium, UK, Israel, Hong Kong, USA, etc. The total value of imports of rough diamond in India has increased from Rs. 6893 crores in 1992-93 to Rs. 12,087crores in 1997-98.

The data on Indian trade in diamond is given below :

	Value : Rs. Crores				
	1993-94	1994-95	1995-96	1996-97	1997-98
Exports	11208	12357	15374	14299	16015
Imports	8102	4960	6874	10183	12087

**WORLD SCENARIO :**

Global market of gemstones is divided in (i) diamonds and (ii) coloured gemstones. Most diamond supplies are controlled by a few major mining companies; prices are supported by managing the quantity and quality of gems relative to demand, a function performed by Central Selling Organization (CSO) of De Beers . De Beers Consolidated Mines Ltd., in South Africa is a significant force affecting gem diamond price worldwide because it mines about one-half the diamonds produced each year worldwide and controls three-fourth of global raw diamond supply through CSO which has marketing agreements with other diamond producers.

World diamond output in 1997 totaled 110 million carats with an estimated value of approx. \$ 7 billion. Most production was concentrated in a few regions- Africa, Angola, Botswana, Namibia, South Africa and Asia (Northeastern Siberia and Yakuta in Russia); Australia; and South America(Brazil, Guyana and Venezuela). Most of these countries are major exporters of rough diamonds. A number of countries like UK; Belgium-Luxembourg, Germany, France, Canada, USA, Hong Kong, India, Israel, Japan, Malaysia, Singapore, Thailand etc. are importing rough and cut diamonds for their domestic market as well as for exports after value addition.

Sales of rough diamonds by the CSO in 1997 reached \$ 4.6 billion, 4% less than the record sales of 1996. The sales loss reflected reduced demand in Asian markets following the decline of several national economies in the region. In the recent past De Beers has taken several steps like signing of a new contractual agreement that returned Russia to the CSO after two years; reduction in supply of diamonds by CSO to stabilise and support price; to increase output from its mines by De Beers in order to compete more vigorously against producers outside the CSO; and plan to explore new markets, particularly in China, Middle East and South America. Canada's first diamond mine is expected to be completed in 1997 and it has to start diamond production in 1998 with 4.5 million carats/year capacity(about 5% of world production). This mine may bring a greater measure of competition to global markets.

### EXPORT PROSPECTS :

Bulk of the small diamonds produced in the world are being imported by India for processing. At present due to economic recession in the world economy, particularly in the Far-East Asian countries, the export of cut and polished diamonds is not increasing as per expectations but with its performance it is established that India will continue to lead in the world diamond market with the expertise developed in cutting and polishing.

As indigenous resources of diamond are not comfortable , it seems that India will continue to depend on imported rough diamonds in the coming years.

**(b) EMERALD**

Emerald is a transparent, pale green to sea-green variety of beryl. It occurs sporadically in nature. The green colour is due to the minute content of chromium. The emerald belt of Rajasthan stretches for about 200 km from Bhubani near Ajmer to Gumgudha near Udaipur. Emerald is also reported to occur in Andhra Pradesh, Bihar, Jammu & Kashmir, Karnataka, Orissa and Tamil Nadu. Occurrences of emerald along with other gem stones had been identified by the GSI over a tract extending from Bir Maharajpura to Panagarh in Kalahandi district of Orissa. The recoverable reserves of emerald have not been estimated so far.

**PRODUCTION :**

As per the available information with Bureau , production of emerald has not been reported since 1983.

**DOMESTIC DEMAND:**

The raw uncut emerald is imported and a major part of it is re-exported after cutting & polishing. India has emerged as the only country to process small gemstones and cut and polished gemstones find their use in making of jewellery which are in turn exported . There is no production of emerald from 1983 onward, the entire emerald cutting & polishing industry depend upon the imported raw emerald.

**TRADE****EXPORTS :**

As indigenous supply of emeralds in the country is negligible, Indian exports of processed emerald is totally dependent on imported raw emeralds. With the expertise developed by Indian artisans in gemstones processing, the processed Indian emeralds are well appreciated in the International markets. Exports value of emerald from the country has almost registered an ascending trends except with some in-between fluctuations. The main destinations for Indian emerald are USA; Hong Kong, Thailand, Japan, France, Belgium, Switzerland, Germany, Italy etc.



**IMPORTS :**

To meet the internal as well as export demands of emerald, India has to import, the entire quantum of raw emeralds from the other countries. Emeralds are mainly imported from USA, Thailand, Switzerland, Hong Kong, Brazil, Germany, Belgium, Kenya and Zambia. The total value of Indian trade of emerald with its percentage shares in the total exports during 1995-96 to 1997-98 are furnished below:

	Exports			Imports		
	1995-96	1996-97	1997-98	1995-96	1996-97	1997-98
Value (Rs'000)	2546473	1429266	1789328	667891	22738	916920
%Share in total mineral Trade	1.28	0.75	0.87	0.28	0.01	0.26

**WORLD SCENARIO :**

As other coloured gemstones, the production of emerald consists of small, low-cost nature and widely distributed in many countries. Occurrences of gem quality beryl/emerald are reported from Afghanistan, Australia, Brazil, Myanmar, Colombia, Kenya, Madagascar, Sri Lanka and Zambia. These countries are also the main source of other coloured gemstones in the world.

**EXPORT PROSPECTS :**

There is no estimated recoverable reserve of emerald in the country. The occurrence of emerald has been reported in Andhra Pradesh, Bihar, Jammu & Kashmir, Karnataka, Orissa & Tamil Nadu. The entire emerald requirement for cutting & polishing industry is met through imported rough emeralds. The Indian cutting and polishing skills can be utilised for earning higher foreign exchange. So there is wide scope to develop more cutting and polishing industry based on imported emeralds. It may also be highlighted that Indian lapidary artisans have advantages of high recovery by using manual methods. The disadvantages are lack of perfect calibration and polish. Due to improper shape and non-calibration, many times these gemstones are found to be unsuitable for use in jewelry. It is felt that our lapidary technique should be modified in order to suit the requirements of the overseas markets.

It may be envisaged that with adoption of the latest processing techniques and recovery of world economy particularly in Far-East Region, markets for Indian emeralds will improve.

**(c) OTHER PRECIOUS & SEMI-PRECIOUS STONES****CORUNDUM, RUBY & SAPPHIRE****RESOURCES :**

A number of occurrences of precious and semi-precious stones are reported in many States of the country. However, due to its sporadic nature, any systematic assessment of these resources have not been done so far. Ruby and Sapphire are reported from Andhra Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Orissa & Tamil Nadu. Sapphire deposits were worked in Poddar area of J & K.

Due to concerted efforts of exploration agencies like GSI, Orissa Mining Corporation Limited, and DGM Orissa, a total of 28 gem bearing tracts have so far been identified in different districts of Orissa which contain precious stone like diamond, ruby, sapphire alongwith a large number of other stones. Occurrences of alexandrite are also reported from the South-eastern part of Madhya Pradesh in Raipur district with diamond. There is need to establish commercially viable deposits of other precious and semi-precious stones in the known areas through exploration. The recoverable reserves of corundum/ sapphire as on 1-4-1995 is given below :

<b>Precious/ Semi-precious stone</b>	<b>Proved</b>	<b>Probable</b>	<b>Possible</b>	<b>Total</b>
<b>Ruby (In Kg.)</b>				
<b>All India Total</b>	<b>79.45</b>	<b>220.0</b>	<b>170.0</b>	<b>469.45</b>
Orissa	79.45	220.0	170.0	469.45
<b>Corundum (In Tonnes)</b>				
<b>All India Total</b>	<b>793</b>	<b>673</b>	<b>26871</b>	<b>28337</b>
Andhra Pradesh	-	6	1087	1093
Karnataka	768	667	13859	15294
Madhya Pradesh	25	-	-	25
Rajasthan	-	-	11925	11925

**PRODUCTION :**

Due to small irregular and sporadic occurrences of precious & semi-precious stones it is rather difficult to exploit these resources in a scientific manner. Mining of these stones is being done in a small way and it may also be assumed that production is also not reported properly. Among the other precious and semi-precious stones production of corundum ,ruby and agate are reported under MCDR returns as given below.

Precious/ Semi-precious stone	Unit	1995-96	1996-97	1997-98	1998-99(p)
Corundum	kg.	1416	3758	914	950
Ruby	kg.	215	168	399	-
Agate	tonnes	542	400	234	154

p : Provisional

**DEMAND :**

The principal use of corundum is in the abrasive such as grinding wheels, papers and clothes mortar and wire drawing and grinding powder. Due to its high melting point it is used in special refractories. The reported consumption of corundum during 1993-94(p) in organised sector was 100 tonnes, 50 tonnes and 100 tonnes in abrasives, foundry and industries respectively. However, ruby and agate are being processed by lapidary units for further use in jewelry. Production/purchase of other stones like gem garnet, zircon, iolite, cat's eye, chrysoberyl, alexandrite are also reported from Orissa.

**TRADE :****EXPORTS :**

With its expertise and skill in cutting and polishing of gemstones India has established as one of the leading exporting country for cut and polished gemstone. The value of exports of other gemstone has registered a substantial increase in the recent past and it was at Rs. 437 crores in 1997-98 . The total value of other gemstones and its percentage share in total export during the last three years is as under. Besides India also exports ,cut & uncut varieties of felspar, garnet etc.

	1994-95	1995-96	1996-97	1997-98
Total Value (In Rs.'000)	2167499	2452181	3460873	4376104

% Share in total value	1.37	1.24	1.83	2.12
------------------------	------	------	------	------

### **IMPORTS :**

As stated India is one of the leading exporter of processed precious and semi-precious stones in the world market. However its total trade in precious stone is based on imported rough stones. The internal production of precious and semi-precious stones are very meager which hardly meets a fraction of trade demand. With the increasing demand by indigenous lapidary units, the total value of imports of other precious and semi-precious stones is showing ascending trend and it has increased from Rs. 99 crores in 1994-95 to Rs. 188 crores in 1997-98. The trend in imports during 1994-95 to 1996-97 is given below :

	(Value in Rs.'000)			
	1994-95	1995-96	1996-97	1997-98
<b>Total</b>	<b>988,362</b>	<b>1,155,976</b>	<b>1,864,744</b>	<b>1,884,260</b>
Uncut	862,917	1,050,747	1,715,378	1,793,301
Cut	125,445	105,229	149,366	90,959

During 1996-97 India has imported raw, uncut precious and semi-precious stones mainly from USA , Thailand, Hong Kong, Kenya, Switzerland, UAE, Zambia, Brazil, Germany and UK and cut stones from Hong Kong, Thailand and USA.

### **WORLD SCENARIO**

In comparison to diamond, the other gemstones are primarily produced at relatively small, low-cost operation with few dominant producers in the world. The main countries with important gemstones deposits other than diamond are Afghanistan (beryl, ruby and tourmaline), Australia (beryl, opal and Sapphire), Brazil (Agate, amethyst, beryl, ruby, sapphire, topaz and tourmaline), Maynmar (beryl, Jade, ruby, sapphire and topaz), Colombia (beryl, emerald and sapphire), Kenya (beryl, garnet and sapphire), Madagascar (beryl, rosy quartz, sapphire and tourmaline), Mexico (agate, opal and topaz), Tanzania (garnet, ruby, sapphire and tourmaline), Sri Lanka (beryl, ruby, sapphire and topaz), and Zambia (amethyst and beryl).

It is estimated that annual world production of cut natural gemstones other than diamond and pearl exceeds \$ 2 billion/year. Most coloured gemstones mining consists of small, low-cost and widely dispersed operations in remote regions of developing countries.

### EXPORT PROSPECTS :

The requirement of precious & semi-precious stone for cutting & polishing industry is mostly met through import. In India , production of precious & semi-precious stones are limited. The entire production of precious & semi-precious stone are sent to cutting & polishing industry. The major markets for precious and semi-precious stones during 1996-97 were USA, Hong-Kong, Germany, Thailand, Japan, Switzerland, France, Italy, Saudi Arabia, Australia, United Kingdom & Israel. It may be noted that the processed Indian gemstones are well received in the world markets and our exports of these commodities are increasing with appreciable rate.

In the recent past, due to economic crisis in Far East Asian Countries, market of gemstones including diamond adversely affected. However, it may be envisaged that demand for other gemstone, will continue to rise as diamonds become more expensive and markets may adopt the most suitable alternative of gemstones.

**(x) FELSPAR**

Felspar is the most abundant rock-forming mineral in the nature and comprises a group of minerals consisting of mixture of aluminium silicate of potassium, sodium and calcium. They are the important mineral raw materials required in the manufacture of glass and ceramic products.

**RESOURCES :**

The recoverable reserves of felspar in India as on 1.4.1995 are placed at 31.29 million tones. Being one of the commonest rock forming mineral in nature, it is quite widespread in occurrence. Reserves of felspar are distributed in Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. Apart from these States, Felspar is also reported to occur in Gujarat and Haryana. Mica pegmatites of Rajasthan, Andhra Pradesh and Bihar are important sources of felspar in the country. The state-wise and grade-wise reserves of felspar as on 1.4.95 are as follows :

States/Grade	( in '000 Tonnes)			
	Proved	Probable	Possible	Total
<b>All India/All Grades Total</b>	<b>4468</b>	<b>6299</b>	<b>20518</b>	<b>31285</b>
<b>By Grades</b>				
Glass	43	696	100	839
Pottery/Ceramics	3030	2593	10396	16019
Others	9	-	10	19
Unclassified	950	1553	5808	8311
Not known	436	1457	4204	6097
<b>By States</b>				
Andhra Pradesh	399	641	476	1517
Bihar	123	439	4590	5152
Haryana	22	13	13	48
Karnataka	28	100	60	188
Madhya Pradesh	-	-	18	18
Maharashtra	-	707	1	708
Meghalaya	-	-	39	39
Rajasthan	3654	3508	13455	20617
Tamil Nadu	61	211	1765	2038
Uttar Pradesh	-	-	100	100
West Bengal	180	680	-	860

Note : Figure rounded off

**DOMESTIC DEMAND :**

Felspar is mainly used in the manufacture of glass, pottery, ceramics, vitrified enamels, special electrical porcelain, wind plates and opalescent glass as well as glassware. In ceramic industry, felspar is used both in the body and as glaze for chinaware. It is also used as a binding agent in the manufacture of abrasives. During the last few years internal demand of felspar was static around 90 thousand tonnes/year. The Working Group On Mineral Development for IXth Five Year Plan has envisaged following domestic demand for felspar :

(In Tonnes)				
1997-98	1998-99	1999-2000	2000-2001	2001-2002
117116	125314	134086	143472	153515

**PRODUCTION :**

Production of felspar is reported from Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu. Production of felspar has maintained an ascending trend and during the last five years it has increased from 87,155 tonnes in 1993-94 to 106,811 tonnes in 1998-99. During the year 1996-97 felspar production was highest at 101,697 tonnes. Rajasthan and Andhra Pradesh continued to be leading producers of felspar and accounted for 56% and 31% respectively. Production trend in felspar is as under :

(In Tonnes)					
1993-94	1994-95	1995-96	1996-97	1997-98	1998-99(p)
87155	92219	106896	101697	94651	106811

p : Provisional

**TRADE :****EXPORTS :**

Felspar is one of the important industrial mineral which has registered a substantial growth in its export. During the last five years, the exports of felspar has increased from 26,355 tonnes valued at Rs.3.6 crores in 1992-93 to 94,717 tonnes valued at Rs.17.1 crores in 1996-97. It however declined to 77,644 tonnes valued at Rs. 15.62 crores during 1997-98. Traditional markets for Indian felspar are Malaysia, Singapore, Indonesia, Thailand, Chinese Taipei,

Philippines, Bangladesh and some Middle-East countries. Exports of felspar from India is given below :

1993-94		1994-95		1995-96		1996-97		1997-98 (P)	
Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
29448	49396	49307	79915	84622	141055	94717	171024	77644	156208

### IMPORTS :

India is self-sufficient in felspar and imports of this commodity is negligible and of intermittent nature. During the last five years from 1992-93 to 1996-97 country has imported only 12 tonnes of felspar from UK in 1996-97.

### WORLD SCENARIO :

Identified and hypothetical world resources of felspar are more than adequate to meet anticipated demand. As per the latest available statistics world production of felspar has increased from 6.8 million tonnes in 1992 to 9.7 million tonnes in 1996 registering about 43% growth. A large number of countries are reporting production of felspar in modest to substantial quantities. The important among them are Italy, Yugoslavia, USA, Japan, Thailand, France, Spain, Korea Rep. of, Brazil etc. World trade in felspar ranged between 1.7 to 2.5 million tonnes during 1992 to 1996. The major exporting countries are Turkey, China, Thailand, Hong Kong, India, Germany, France and main importing countries are Taiwan, Italy, Spain, Hong Kong, Belgium-Luxembourg, Germany, Indonesia, Netherlands.

### EXPORT PROSPECTS :

It may be analysed that internal consumption of felspar is not reporting any quantum jump, however its exports, which was almost between 25-30 thousand per year till 1992-93 has increased to around one lakh tonnes/year. It indicates that Indian felspar is well received in the international markets. It may also be seen that our export is restricted in the neighboring countries, Far-East and Middle-East regions. So far country could not develop permanent market for exporting felspar in sizeable quantity. The country has adequate resources of felspar and is in a position to meet the export requirement apart from catering to the increasing domestic demand. However, it is imperative to monitor regular availability of quality felspar to the domestic industries.



**(XI) GARNET**

The total recoverable reserves of garnet are placed at 51.71 million tonnes. However the reserves of abrasive grade garnet are placed at 5,479 thousand tonnes distributed in the states of Andhra Pradesh (11,744 tonnes), Bihar (72,000 tonnes), Kerala (121,000 tonnes) and Rajasthan (5,112,000 tonnes). Although the reserves of abrasive grade occur in Ganjam district of Orissa but break-up of abrasive grade is not available.

Grade /State	Unit : '000 Tonnes			
	Proved	Probable	Possible	Total
<b>All India All Grade Total</b>	<b>104</b>	<b>9734</b>	<b>41878</b>	<b>51716</b>
<b>By Grades</b>				
Gem	++	1	2	3
Abrasive	89	93	5297	5479
Others	-	-	27	27
Unclassified	-	-	19	19
Not known	15	9640	36533	46188
<b>By States</b>				
Andhra Pradesh	-	7920	3824	11744
Bihar	38	17	17	72
Kerala	37	112	47	196
Madhya Pradesh	-	-	1	1
Orissa	-	-	13899	13899
Rajasthan	14	34	5097	5145
Tamil Nadu	15	1650	18993	20658

Note : Figures rounded off

**PRODUCTION :**

The all India garnet (abrasive) production during 1994-95 to 1998-99 is given below :

1994-95	1995-96	1996-97	1997-98	(In tonens)
				1998-99(p)
66,110	62,314	42,296	72,004	130,150

p : Provisional

### **DOMESTIC DEMAND :**

The most important industrial use of garnet is in the manufacture of coated abrasive like paper, cloth and discs for grinding and finishing glass, wood hard rubber, plastic, leather metal etc. In powder form it is used for marking lapping and buffing compounds. Finely ground garnet is also used in nonskid floor, paints, sparking plug, clearing and plate glass grinding. Garnet is washed, crushed and roasted before use as an abrasive. The domestic consumption of garnet (abrasive) during 1993-94 to 1996-97 is estimated at the rate of 100 tonnes per year.

### **EXPORTS :**

The quantitative details of the exports of garnet (abrasive) from India is not available. However, the total value of garnet (abrasive) exported from the country during 1996-97 was at Rs.7.85 crores and increased to Rs. 9.48 crores in 1997-98.

### **WORLD SCENARIO**

The world resource of garnet are large and occur in a wide variety of rocks, particularly gneisses and schists. Significant resources of garnet are concentrated in United States, Russia Turkey, Australia ,China and India. The estimated world production of garnet (Abrasive/Industrial) was 160,000 tonnes in 1996-97. The major producers of garnet during 1997 were USA(73,000 tonnes), Australia(40,000 tonnes) and China & India( 15,000 tonnes each).

### **EXPORT PROSPECTS :**

The all India recoverable reserves of garnet are placed at 51.71 million tonnes as on 1.4.1995. The internal consumption is very nominal i.e. at a rate of 100 tonnes per year during 1993-94 to 1996-97. In such a situation the garnet export can be further increased with concerted efforts.

**(xii) ILMENITE & RUTILE****RESOURCES :**

The ilmenite and rutile form ingredients of beach sand deposits found right from Ratangiri coast in the west to Orissa coast in the east. These minerals are mainly concentrated in three well defined zone.

- (i) A stretch of 22 km. between Meendakara and Kayamkulam, Quilon district, Kerala.
- (ii) A stretch of 6 km from mouth of Valliyar river to Colachal in Manavalakurichi and little beyond in Kanyakumari district, Tamil Nadu.
- (iii) Chhatrapur coast stretching for 18 km over 26 sq. km. area in Ganjam district, Orissa.

The, first zone contains the highest concentration of heavy minerals. The heavy minerals content of first and second deposit are reported to be varying between 65 to 85% and 50 to 70% respectively. The beach sands of Chhatrapur coast contains only 18 to 23% of heavy minerals, comprising on an average 9.4% ilmenite, 0.4% rutile, 3.10% Sillimanite, 6.8% Garnet, 0.33% zircon, 0.29% Monazite and 0.76% other minerals. The total recoverable reserve of ilmenite and rutile as on 1.4.1995 are placed 94 million tonnes and 6.0 million tonnes respectively. The recoverable reserve of ilmenite and rutile as on 1-4-1995 are given below :

		(Unit : '000 tonnes)			
Grades/States		Proved	Probable	Possible	Total
<b>All India</b>	Ilmenite	15734	55094	19319	90147
	Rutile	1658	3900	910	6468
<b>Andhra Pradesh</b>	Ilmenite	-	13553	8150	21703
	Rutile	-	712	294	1006
<b>Bihar</b>	Ilmenite	-	-	670	670
	Rutile	-	-	10	10
<b>Kerala</b>	Ilmenite	8674	16565	8226	33465
	Rutile	420	1399	411	2230
<b>Maharashtra</b>	Ilmenite	2918	485	-	3403

Table contd..

**Table concluded**

Grades/States		Proved	Probable	Possible	Total
Orissa	Ilmenite	2786	6643	-	9429
	Rutile	1175	286	-	1461
Tamil Nadu	Ilmenite	1356	17848	395	19599
	Rutile	63	1503	22	1588
West Bengal	Ilmenite	-	-	1878	1878
	Rutile	-	-	173	173

Note : Figures rounded off

**PRODUCTION :**

Kerala, Orissa and Tamil Nadu are the major producers of ilmenite and rutile. The all India production of ilmenite and rutile for the year 1994-95 to 1998-99 is given in table below:

Minerals	( in Tonnes)				
	1994-95	1995-96	1996-97	1997-98	1998-99(p)
Ilmenite	297,444	298,369	231,513	332,727	377,907
Rutile	13,438	12,963	9,305	14,365	16,039

p : Provisional

**DOMESTIC DEMAND :**

The reported domestic consumption of ilmenite was 91,200 tones in 1993-94 which excluded defense requirements. Ilmenite in bulk was consumed for manufacturing pigment by sulphate route and for producing synthetic rutile in that order. A small quantity was consumed for producing Ferro-alloys, titanium dioxide pigment and electrode. The domestic consumption of rutile according to Indian Rare Earths Limited is reported annually at about 12,000 tones. Almost entire quantity is consumed in coating of welding electrodes. The other consuming industries are titanium dioxide, white pigment ceramics and titanium metal sponge.

**TRADE :****EXPORTS :**

The exports of ilmenite and rutile showed mixed trend. Export of ilmenite increased to 207,812 tonnes in 1995-96 from 177,674 tonnes in 1994-95 and declined to 42,961 tonnes in 1996-97 and again rose to 109,312 tonnes valued at Rs. 37 crores during 1997-98. Similarly the export of rutile increased to 11240 tonnes in 1995-96 from 3603 tonnes in 1994-95 and declined to 7399 tonnes in 1996-97 and again picked up to 8,955 tonnes valued at Rs. 6.5 crores in 1997-98. The export trend of ilmenite and rutile from 1994-95 to 1996-97 is shown below:

Mineral	(In tonnes)			
	1994-95	1995-96	1996-97	1997-98
Ilmenite	177,674	207,812	42,961	109,312
Rutile	3,603	11,240	7,399	8,955

During 1996-97 Ilmenite was mainly exported to Japan, (11,595 tonnes), Netherlands (18,341 tonnes), Malaysia (12,705 tonnes) and other countries (320 tonnes) whereas, Rutile was mainly exported to Japan (6,759 tonnes) and Malaysia (640 tonnes) in 1996-97.

**IMPORTS:**

Ilmenite is not being imported whereas, small quantity of rutile is imported by India. The imports of rutile at 1571 tonnes in 1994-95 have increased slightly 4,783 tonnes in 1996-97 and further to 6,339 tonnes in 1997-98. During 1996-97 rutile was mainly imported from Australia (2,952 tonnes), South Africa (567 tonnes), Ukraine (394 tonnes), Sri Lanka (281 tonnes) and about 589 tonnes from UAE, Russia & Italy.

**WORLD SCENARIO :**

The world resources of rutile are placed at 170,000 thousand tonnes. The major resources are owned by Brazil(85,000 thousand tonnes), Australia (43,000 thousand tonnes), Italy ( 8,800 thousand tonnes), South Africa (8,300 thousand tonnes), India (7,700 thousand tonnes), Sri Lanka ( 4,800 thousand tonnes), Sierra Leone( 3,100 thousand tonnes ) and Ukraine( 2,500 thousand tonnes). The estimated world production of rutile during 1997 was 414000 tonnes. The major producer were Australia(190,000), South Africa ( 108,000 tonnes), Ukraine(95,000 tonnes) and India ( 13,000 tonnes).

The world resources of ilmenite are placed at 440,000 thousand tonnes. The major reserve are found in Australia (80,000 thousand tonnes), South Africa ( 63,000 thousand tonnes), USA (59,000 thousand tonnes), Norway (40,000 thousand tonnes), China (41,000 thousand tonnes), India (38,000 thousand tonnes), Canada (36,000 thousand tonnes) and remaining quantities in other countries. The estimated world production of ilmenite during 1997 was 3,500 thousand tonnes. The major producers are Australia (1,190,000 tonnes) , South Africa (850,000 tonnes), Canada (720,000 tonnes), Norway (225,000 tonnes), India (162,000 tonnes) and Ukraine (53,000 tonnes).

### **EXPORT PROSPECTS :**

The total recoverable reserve of ilmenite and rutile as on 1.4.1995 are 94 million tonnes and 6.0 million tonnes respectively. The production of ilmenite and rutile during 1997-98 was 332,727 tonnes and 14,365 tonnes respectively. Our internal consumption of ilmenite and rutile is on an average is 91,000 tonnes and 12,000 tonnes. So keeping all these thing in view the export of ilmenite can be further increased in near future. But in case of rutile judicious export policy has to be adopted because of limited reserves of only 6.0 million tonnes.

**(xiii) QUARTZ/SILICA SAND****RESOURCES :**

Resource position of quartz/silica sand is quite extensive. The total recoverable reserve of quartz/silica sand are placed at 2402.2 million tonnes.. The grade-wise reserves of quartz & silica sand as on 1.4.1995 is given below :

State/Grade	(In '000 tonnes)			
	Proved	Probable	Possible	Total
<b>All India/ All Grade Total</b>	<b>323381</b>	<b>602994</b>	<b>1475806</b>	<b>2402181</b>
<b>By Grades</b>				
Glass	120143	111849	167624	399616
Ferro-silicon	11021	95634	38322	144977
Sodium silicate	8930	18	48	8996
Ceramic & pottery	4979	69197	75936	150112
Foundry & molding	36729	113641	193319	343689
Abrasive	765	2369	21170	24304
Others	19067	37231	712260	768558
Unclassified	92477	39983	79228	211688
Not known	29269	133072	187899	350240
<b>By States</b>				
Andhra Pradesh	17138	27543	28288	72969
Assam	-	-	1611	1611
Bihar	882	6064	129483	136429
Goa	18	1680	15324	17022
Gujrat	12433	10287	21829	44549
Haryana	213826	268874	1040635	1523335
Himachal Pradesh	300	-	1750	2050
Jammu & kashmir	-	-	2177	2177
Karnataka	10275	7981	19787	38043
Kerala	8954	31393	70493	110840
Madhya Pradesh	172	3106	1730	5008
Maharashtra	10202	31704	33585	75491
Meghalaya	-	124	5586	5710
Orissa	804	57203	2126	60133
Punjab	-	2295	1239	3534
Rajasthan	12900	50014	67590	130504
Tamil Nadu	10516	74757	5905	91178
Tripura	11	115	74	200
Uttar Pradesh	24712	28953	26444	80109
West Bengal	238	901	149	1288

Note : Figures rounded off.

**PRODUCTION :**

Andhra Pradesh (82,000 tonnes), Bihar (12,000 tonnes), Karnataka (25,000 tonnes), Rajasthan (46,000 tonnes) and Tamil Nadu (12,000 tonnes) were the principal producer of quartz during 1997-98, while Andhra Pradesh (135,000 tonnes), Bihar (98,000 tonnes), Gujrat (118,000 tonnes), Haryana (337,000 tonnes), Karnataka (114,000 tonnes), Kerala (121,000 tonnes), Maharashtra (131,000 tonnes), Rajasthan (135,000 tonnes) and Uttar Pradesh (70,000 tonnes) were the principal producer states of silica sand. The all India production of quartz and silica sand during 1994-95 to 1998-99 is given below :

Mineral	(In tonnes)				
	1994-95	1995-96	1996-97	1997-98	1998-99(p)
Quartz	172003	139283	178378	183555	217106
Silica Sand	1428664	1146418	1540321	1260233	1314316

p : provisional

**DOMESTIC DEMAND :**

Glass, ceramics and foundry are major consuming industries of quartz and silica sand. The internal consumption of quartz and silica sand during 1993-94 to 1996-97 are given below :

(In tonnes)			
1993-94	1994-95	1995-96	1996-97
1154700	1171183	1162000	1305700

**TRADE :****EXPORTS :**

Silica sand is mainly exported to Japan, UAE, Malaysia, Chinese Tai-pei, USA, Singapore, Maldives and other countries. During 1997-98, the exports of quartz were 16224 tonnes valued at Rs. 5.2 crores and that of silica sand at 25356 tonnes valued at Rs. 1108 crores.



**IMPORTS :**

Small quantities of quartz (natural) and silica sand are also imported. Quartz (natural) is mainly imported from Italy, Belgium, and Germany where as silica sand is mainly imported from USA, Belgium and Germany.

The details of export and import of quartz and silica sand during 1995-96 to 1997-98 is given below :

Mineral	(In tonnes)					
	1995-96		1996-97		1997-98	
	Export	Import	Export	Import	Export	Import
Quartz (natural)	72327	27	42172	15	16224	51
Silica sand	25756	391	36137	258	25356	240

**WORLD SCENARIO :**

Sand and gravel resources of the world are sizeable. However, because of their geographical distribution, environmental restrictions and quality requirements for some industries, extraction of these resources become sometime uneconomic. Quartz rich sand and sandstone, the main source of industrial silica sand occur throughout the world. The world production of quartz is not available separately, but the world production of sand and gravel (industrial) during 1996 was at 120 million tonnes. The major producers were USA (28.3 million tonnes), Netherlands (24 million tonnes), Germany (6.8 million tonnes), Austria (6.7 million tonnes), France (6.8 million tonnes).

**EXPORT PROSPECTS :**

The total recoverable reserves of quartz and silica sand is around 2402 million tonnes. The production of quartz and silica sand during 1998-99 was 217100 tonnes and 1314316 tonnes respectively. Exports during 1997-98 of quartz was at 16224 tonnes and of silica sand at 25356 tonnes. There are very good prospects of increasing the exports of quartz and silica sand to the neighboring countries.

**(xiv) TALC-STEATITE**

Talc is a hydrous magnesium silicate. Talc, Steatite and soapstone are the three terms used in trade for the same material. Talc is a soft, non-abrasive, inert mineral that can be ground to a white bright micronised powder that acts as a filler in paper, insecticide, textiles, fertilizers, ceramics, rubber, cosmetics, paints, asbestos cements, plastics, pharmaceuticals, adhesives etc. Pure talc after calcining called "Lava" is finding more use in the manufacture of low loss ceramics material for radio, radar, television and related instruments. In ceramics, talc's high fusion point, fluxing action, higher thermal conductivity and its low shrinkage property are helpful in the manufacture of wall tiles, sanitaryware, porcelain etc. In roofing products such as tar paper, asphalt shingles and roll proofing, talc acts as a fire retardant and increases weather resistance.

Massive steatite when cut into panels is used for switch boards and acid proof table tops in laboratory, laundry and kitchen sinks in tubs and tanks as well as in linings for furnaces. Soapstone is aesthetically pleasing and used in sculpturing. Due to its high melting point (1630<sup>0C</sup>) soapstone can also be used in refractories and fire places. The all-India recoverable reserves of talc-steatite are placed at 213 million tonnes. Rajasthan accounts for about 80% of the total reserves. The grade-wise and state-wise reserves position is given below :

	('000 tonnes)			
Grade/ State	Proved	Probable	Possible	Total
<b>All India All Grade Total</b>	<b>71283</b>	<b>41862</b>	<b>100559</b>	<b>213704</b>
<b>By Grades</b>				
Paper & textile	1386	2399	7719	11504
Cosmetics	6223	4252	5274	15749
Insecticide	2509	2483	6058	11050
Ceramics	-	-	34	34
Others	1325	2776	1847	5948
Unclassified	3351	9220	44757	57328
Not known	56489	20732	34871	112092
<b>By States</b>				
Andhra Pradesh	598	934	2014	3546
Bihar	12	49	228	289
Gujrat	-	-	7	7
Karnataka	380	471	771	1622
Kerala	-	-	8131	8131
Mudhya Pradesh	358	1990	3869	6217
Maharashtra	-	1026	5494	6520
Orissa	-	52	65	117
Rajasthan	66517	31353	72470	170340
Sikkim	-	60	-	60
Tamil Nadu	210	1435	264	1909
Uttar Pradesh	3208	4492	7246	14946

Note : Figures rounded off.

**DOMESTIC DEMAND :**

The domestic demand for talc-steatite is about 3 lakh tonnes per annum. About 41% consumption is in paper industry, followed by cosmetic, soap & detergent (38%), insecticide (15%) and the remaining 6% is shared by ceramic, fertilizer, paint rubber, textile etc.

**PRODUCTION :**

Rajasthan is the major producer of the talc-steatite. During 1998-99 the provisional production of steatite was 456187 tonnes and came mainly from Rajasthan (85%), Andhra Pradesh (9%), Uttar Pradesh (4%) and Madhya Pradesh (2%). Small quantities are reported from Orissa, Bihar, Tamil Nadu etc.. The state-wise production of steatite for the period 1996-97 to 1998-99 is given below.

State	(In Tonnes)		
	1996-97	1997-98	1998-99(p)
All India Total	531224	474957	456187
Andhra Pradesh	32347	35441	40423
Bihar	2185	1090	863
Gujrat	34	114	59
Karnataka	624	235	250
Madhya Pradesh	12081	10883	7648
Orissa	3316	1204	1117
Rajasthan	455626	401643	388176
Tamil Nadu	1584	216	106
Uttar Pradesh	23427	24131	17545

p : provisional

**TRADE :****EXPORTS :**

The exports of talc to other countries are allowed freely without any restrictions. Exports of talc in various forms like blocks, lumps or powdered are done. In the world market, talc free from grit, having high whiteness and high degree of soapy feeling are very much in demand. Indian talc minerals are comparable with the best qualities available in other countries. Indian talc is considered to be the second best in the world next to "Italian talc". India is one of the chief sources of sawn shaped talc and the "Lava" grade talc from Rajasthan and Andhra Pradesh. The country has surplus reserves of talc minerals and sizeable surplus of domestic production for catering to any increased export demand. The exports from India were mainly to Kenya, Bangla

Desh, Saudi Arabia, UAE, Ghana, UK, Austria, Sri Lanka, Indonesia, Malaysia, Nigeria, Japan, South Africa, Australia, Netherlands etc. The export statistics for the period 1990-91 to 1997-98 is given below :

Year	Quantity	Quantity : Tonnes
		Value : Rs.'000
1990-91	14402	25363
1991-92	15307	41171
1992-93	16553	53129
1993-94	13027	57905
1994-95	27783	97878
1995-96	30413	128303
1996-97	99200	135996
1997-98	27360	118404

Exports from India in the world trade are comparatively insignificant and there exists a vast scope to increase our exports.

### **IMPORTS :**

India's imports of talc steatite varied between 124 tonnes and 151 tonnes during 1994-95 to 1997-98. Only special grades are being imported.

### **WORLD SCENARIO :**

The current world production capacity of talc minerals is around 8 million tonnes per annum. China (2.4 million tonnes) is the principal producer during 1996. The other important producer are Finland, France, USA, Brazil, India, Japan, Korea Rep. Of and Australia. The major exporters of talc during 1996 were Austria (146,000 tonnes), USA (199,000 tonnes), China (1023,000 tonnes), Korea Rep. Of (226,000 tonnes) and India (99,000 tonnes). The principal importers of talc are Japan, Korea, Germany, Taiwan, UK, Belgium-Luxembourg, Mexico, Netherlands, USA, Indonesia, Thailand etc.

### **EXPORT PROSPECTS :**

The world market conditions for talc minerals are steadily growing. In Europe talc is an important Paper filler and even coater. In North America, large quantities are used for pitch control, Western and Eastern Europe and African countries offer immense scope for the exports of India talc. Though Japan is the largest importer of talc in the world, no exports of significance from India have been made to this country. China People Rep. has now emerged as one of the important exporters of high purity talc. Therefore, concerted efforts are necessary to capture the above market by adopting modern pulverising techniques for Indian talc to compete in the world market and thus increase the exports.

**(XV) WOLLASTONITE**

Wollastonite is metasilicate of calcium ( $\text{CaSiO}_3$ ) and it theoretically contains 48.3% CaO and 51.7%  $\text{SiO}_2$ . It occurs as aggregates of blended or needle like crystals. India is the third largest producer of Wollastonite in the world after USA and China. It is a comparatively new mineral on the India Mineral Scene. It is white in colour having a transparent to semi-transparent appearance. Its hardness is 4.5 to 5.0 and specific gravity ranges from 2.8 to 2.9. It has many uses including its utility as an environmentally safe replacement for short mill fiber glass. Wollastonite is chiefly used as a filler in the ceramic industry especially in the manufacture of floor and wall tiles.

**RESOURCES :**

Major deposits of Wollastonite are found in Sirohi and Dungarpur districts of Rajasthan. Besides a deposit in Godha area, Baraskantha district, Gujrat and two small deposits in Dharampuri and Tirunelveli districts, Tamil Nadu are recorded. The total recoverable reserves of Wollastonite are placed at 6294 thousand tonnes. The grade-wise and state-wise reserves of wollastonite as on 1.4.1995 are as follows :

Grade/State	('000 tonnes)			
	Proved	Probable	Possible	Total
All India All Grade Total	1519	2769	2007	6295
<b>By Grades</b>				
Marketable Grade	1519	1743	473	3735
Unclassified	-	750	1534	2284
Not known	-	276	++	276
<b>By States</b>				
Gujrat	-	-	1493	1493
Rajasthan	1519	2769	511	4799
Tamil Nadu	-	-	3	3

Note : Figures rounded off.

**PRODUCTION :**

The production of Wollastonite during 1995-96 to 1998-99 has remained stable at about 95 thousand tonnes. The entire output was reported from private sector mines located in Rajasthan.

**DOMESTIC DEMAND :**

Bulk of the demand for wollastonite in the country is in the ceramic industry for the manufacture of floor and wall tiles. Negligible quantities are used in asbestos cement products, paint, insecticides and welding rod industries. Domestic demand of Wollastonite in the organised sector has varied between 27,000 and 45,000 tonnes during 1992-93 to 1996-97.

**TRADE :****EXPORTS :**

Exports of wollastonite from the country are allowed freely without any restrictions. The country started exporting wollastonite from 1978-79 onwards. Limited number of countries produce and export wollastonite in the world and India is one of them. Hence, there are bright prospect of obtaining a greater share in world exports. The trend in exports during the period 1991-92 to 1997-98 is given below :

<b>Year</b>	<b>Quantity ( tonnes)</b>	<b>Value (Rs.'000)</b>
1991-92	19384	92881
1992-93	11704	64601
1993-94	14761	95766
1994-95	9880	66225
1995-96	6743	48009
1996-97	11582	80020
1997-98	16977	111893

Exports of wollastonite ranged between 352 tonnes in 1978-79 and 19,384 tonnes in 1991-92 which was the peak level recorded so far. During 1994-95 India exported about 9,800 tonnes of wollastonite value at Rs.6.6 crore, whereas, during 1997-98 country exported 16,977 tonnes of wollastonite valued at Rupees 11 crore. Hong Kong is the major country to import wollastonite for India. India being self sufficient in the production of wollastonite there have not been any imports of wollastonite.

**WORLD SCENARIO :**

Major producers of wollastonite are USA, China, India, Finland and Mexico. The reported total world production capacity is placed at 4 lakh tonnes. The USA continue to be the top producer accounting for 40% of the total world production.

**EXPORT PROSPECTS :**

The largest market for wollastonite in the world is in ceramic followed by asbestos substitution, metallurgy and paints. Wollastonite is marketed under two grades viz. high aspect ratio wollastonite and powdered (rolled) wollastonite. As a reinforcement material, wollastonite use is growing as a substitute for short fiber asbestos and also in plastic industry. The greatest growth of markets for plastics are in locomotive application in which plastics help reduce the weight of vehicles.

There is an increasing demand for wollastonite in the international market especially in the plastics, ceramics and construction industries due to with the increasing health legislation hindering the use of asbestos in various reinforcement application. As such there exists a growing large market for high acicular wollastonite as an asbestos substitute. There are good prospects of obtaining a greater share of world exports in the traditional importing countries like Japan, Germany, Hong Kong, Netherlands, UK, USA, Australia etc. Besides, concerted efforts need to be made to capture new markets in Italy, Spain, Taiwan and Portugal.

### III

#### METALS AND ALLOYS

The metal industry is of crucial importance for any modern Industrial nation. In fact the strength and prosperity of a country can be measured from the amount of metals & alloys consumed by a country and its per capita consumption. The domestic metal industry is favorably placed as regards the production capacity of iron & steel, aluminium, ferro- alloys etc. (Annexure - III). Although the present per capita consumption of various metals in India is one of the lowest in the world the future outlook of metals industry in India is bright and of great economic importance considering individual domestic demand levels. Considering the increasing domestic demand and limited indigenous resources the metal imports are inevitable almost in respect of all metals. However, Iron and Steel and Aluminium & its alloys are the two chief metals India can produce in surplus for exports. Certain metals after imports can further be exported in alloys form as value added products to earn foreign exchange and to compensate the import bill to some extent.

#### EXPORTS :

India's export trade in metals & alloys increased to Rs. 5354 crores during 1997-98, from the level of Rs. 2755 crores during 1994-95. Iron & steel accounted for 68% of the total value of export of metals & alloys during 1997-98. Aluminium and scrap and ferroalloys contributed 15% and 8% respectively during the same period. The other metals & alloys of significance are tin & alloys, silicon, zinc & alloys, lead & alloys and scrap etc. (Annexure - VIII & IX).

#### IMPORTS :

The value of imports of metals and alloys is placed at Rs. 22,820 crores during 1997-98. It has increased from Rs. 8,565 crores in 1994-95. Gold (non-monetary & monetary (45.19%), Iron & steel (27.30%), Copper & alloys (incl. brass & bronze(10.33%), Silver (6.99%), aluminium scrap (3.75%), zinc and alloys (2.07%), nickel & alloys (1.52%) and ferroalloys (1.16%) account for 98.84% of the total imports of metals & alloys. (Annexure - X).



**DOMESTIC DEMAND/SUPPLY :**

The estimated demand/supply for various metals during 1998-99 and at the end of the IXth five year plan is placed below :

Metals	(In Tonnes)			
	Estimated Supply		Estimated Demand	
	1998-99	2001-2002	1998-99	2001-2002
Aluminium	660000	780000	700000	800000
Zinc	161000	161000	240000	254000
Lead	78500	78500	95000	114000
Tungsten	44	44	6450	8125
Cadmium	259	259	NA	454
Silver	355	35.5	NA	750
Tin	NA	NA	5960	6800
Nickel	NA	NA	28700	32600
Blister Copper(000T)	50	NA	NA	487
Finished Steel	NA	32000	25225	32680

N.A. : Not available

Looking at the above table, it may be observed that the gap between the production level and demand level in respect of all metals is ever increasing hardly leaving any scope for major exports of these metals. However considering the vast resources position of raw materials required for iron and steel industry and aluminium, these two commodities and its alloys can be very well exported in value added form and finished form. However, so far as the metal like antimony, arsenic, bismuth, mercury etc. are concerned, we have to depend wholly on imports.

**ALUMINIUM :**

In many ways the past years were disappointing for aluminium. The total consumption (primary & secondary/recycled) in the established market economy countries is estimated to have dropped slightly for the first time in last 14 years during 1996. However, world aluminium production in 1997 is estimated to have reached 16.1 million tonnes while consumption could have raised by 4.6% to 18.7 million tonnes. The Western world consumption of aluminium by 2005 is estimated to be 22,170 thousand tonnes as against its estimated production of 20,493 thousand tonnes. The East block exports during the period is expected to be 11,397 thousand tonnes still leaving deficit of 284,000 tonnes. Looking at this deficit and India's expected enhanced capacity of aluminium production at 829,000 tonnes from present level of 630,000 tonnes. India should explore the West European market.

India's exports of aluminium & alloys during 1997-98 are placed at 121 thousand tonnes valued at Rs. 750 crores. The exports have increased from 62,631 tonnes valued at Rs. 427 crores in 1995-96. During 1996-97 amongst the various items exported, the share of unwrought aluminium & alloys (like ingots etc.) was 86,172 tonnes whereas in case of worked aluminium alloys, the tonnage was 20,931 tonnes.

During 1996-97, the principal markets for Indian aluminium were Singapore (30,086 tonnes), Chinese Taipei (12,713 tonnes), Bangladesh (9064 tonnes), Indonesia (10,683 tonnes), UAE (7,596 tonnes), Hong Kong (8405 tonnes), USA (5489 tonnes), Korea Rep. of (5768 tonnes), Thailand (2939 tonnes) & Nepal (2496 tonnes) and accounted for about 89% of the total exports. Looking at the world exports of about 10 million tonnes, there is tremendous scope for increasing India's share in world exports.

### IRON AND STEEL :

Indian Iron and Steel exports since 1994-95 to 1997-98 indicates rising trend from a level of 1241 thousand tonnes to 2232 thousand tonnes. World scenario shows that there is recession in the developed countries, however, many countries in Asia, the newly developing economies witnessed accelerated Industrial activity, resulting in more demand for steel. Since in these countries, production was less than demand, the gap was met by imports. As the emerging economies in Asia expand, the demand for steel will increase calling for more production. However, export-import front the phenomenon of anti-dumping duty might deflect trade flow from one region to another but in long run it cannot stop the export-import activity. So trade in steel will have better opportunity when there is intra-regional trade and inter-regional trade.

India's imports of Iron and Steel were valued at Rs. 6232 crores in 1997-98 as against the exports value at Rs. 3644 crores during the same period. During 1996-97 imports were mainly from Germany, Japan, UK, USA, France, Russia, Belgium, Italy, Spain, Netherlands, Korea Rep. of, Brazil, UAE, Ukraine, South Africa, Argentina, Switzerland, Singapore, China, Iran, Sweden, Australia, Canada, Mexico etc. which indicates our business tie up almost with all important countries.

The total World production of iron and steel during 1996 was placed at 758 million tonnes. The leading world producers of raw steel during 1996 were USA (94.7 million Tonnes), Brazil (25.7 million Tonnes), China (100 million Tonnes), European Union (147 million Tonnes), Japan (98.8 million Tonnes), Korea Rep. of (38.9 million Tonnes), Russia (49.2 million Tonnes), Ukraine (22.3 million Tonnes), and Other countries (181 million Tonnes).

It is felt that we must focus our exports in specialty steel in the Asian countries in particular and to all other countries from whom we import iron and steel. The country needs to exert more to reduce our imports bills in respect of iron and steel giving boost to Indian capacities and manufacture of all kinds of specialty steel which we are importing at present inducting the technology abroad. Control area of the scrap imports need also to be checked keeping in view & making such suitable policies, making use of indigenous availability of scrap or other raw material available amply in our country. SAIL should make all required efforts to make qualitative steel to meet our indigenous demand and for gaining exports market. The future of Indian iron and steel industry appears bright.

## LEAD & ALLOYS

The imports of lead & alloys have increased from 22,048 tonnes valued at Rs. 57 crores in 1995-96 to 47,940 tonnes valued at Rs. 125 crores in 1997-98: Australia (10,828 tonnes), Korea Rep. of ( 4,632 tonnes), Belgium (4,645 tonnes), USA (3,726 tonnes), Saudi Arabia (2,755 tonnes) and China Peoples Rep. of (2,616 tonnes) were the principal suppliers during 1996-97 and constituted 86.38% of total Indian imports of lead and alloys. The present production is insufficient to meet the domestic demand and as such the country may have to resort to imports of this commodity.

## NICKEL & ALLOYS

During 1997-98 the imports of nickel and alloys were 12,497 tonnes valued at Rs. 341 crores as against 12,290 tonnes valued at Rs.341 crores in 1995-96. Russia (3,748 tonnes) Canada (2,481 tonnes) UK (837 tonnes) Australia ( 345 tonnes) and Netherlands (335 tonnes) were the major suppliers during 1997-98 and formed a share of 80% of total Indian imports of nickel alloys. With domestic production at almost a negligible level , the country will continue to meet its requirements of nickel from imported source.

## FERRO -ALLOYS:

In the recent years China has emerged as a major force in the world Ferro alloy markets and has become the second largest world exporter of Ferro-alloys after South Africa. There are three important trends which characterise the Ferro-alloys industries

- i) Down-stream development into more refined and sophisticated products.
- ii) Strong link between producers and consumers both local and foreign in order to provide more secure markets for producers.
- iii) Capacity to switch production from one alloy to another according to market demand.

Indian Ferro-alloys imports were placed at 52,905 tonnes valued at Rs 310 crores during 1995-96as against 59,079 tonnes worth Rs 265 crores in 1997-98. At the other hand the total exports of ferro -alloys during 1995-96 and 1997- 98 were 222,516 and 240,879 tonnes valued at Rs 483 crores and 428 crores respectively.

There appears to be lot of fluctuations in the export market of variety of Ferro alloys. India exports Ferro chrome, Ferro manganese, Ferro molybdenum, Ferro niobium, Ferro vanadium, Ferro silicon, Ferro titanium, Ferro silico chrome, Ferro silico magnesium, Ferro silico manganese and other ferro alloys category. Comparison of statistics for the years 1995-96 to 1996-97, it is observed that Indian exports in terms of quantity has gone down in respect of Ferro chrome, Ferro manganese, Ferro molybdenum, Ferro vanadium, Ferro titanium, Ferro

silico magnesium, & Ferro silico manganese whereas it shows substantial increase in respect of Ferro silico chrome & Ferro silicon. Therefore export market for Ferro silico chrome & Ferro silicon should be further expanded.

Although there is a stiff international competition in metal markets and mainly India being import oriented in most of the metals and alloys specific policies for each metals should be of prime importance. The development of steel industry in China and Korea makes good market for Indian manganese alloys. As a result of delicensing of industry following economic liberalisation no administrative sanction are required for setting up of new Ferro alloy units as well as expansion of existing units. Dumping of imported Ferro alloys in the domestic market at cheaper rate may be sometimes the problems of present alloying industry. Ferro-alloys industry is highly power intensive. Power consumption is about 35-75% of the cost of production depending upon the ferro-alloys produced and the power availability at cheaper rates, power shortage cuts etc. are some of the reasons for non realisation of higher capacity utilisation and full export potential of its products. Disruption of power supply to ferro- alloy furnace leads to multifarious problems both from technological and economic consideration. The import duties on many metallurgical items have been reduced substantially in tune with the international rates following economic liberalisation.

### OTHER METALS & ALLOYS

India exports variety of metals & alloys including value added products. Comparing the quantum of export in 1996-97 when compared with the data for the year 1995-96 it is observed there is a quantum jump in the export of platinum, Tin & alloys, Tungsten & alloys, Zinc & alloys etc. However we have to keep watch on such strategic metals & alloys which are being exported..

## IV

### SUMMARY & CONCLUSIONS

India is wholly or largely self-sufficient in about 27 minerals. It produces as many as 67 minerals 4 fuel minerals, 11 metallic and 52 non-metallic minerals. India's mineral sector is gaining grounds with economic liberalization. In the foregoing chapters a comprehensive account of India's resource position, production, demand and trade prospects has been presented and summarised below:

#### Iron Ore :

With the total 13,460 million tonnes of recoverable reserves about 73 million tonnes/year production and about 30 million tonnes/year exports. India is self-sufficient in this commodity and is able to sustain domestic and exports demands for longer period. The only aspect which appears to be taken in the consideration that exports of high grade iron ore to be made judiciously without hampering the interest of domestic steel industry.

#### Manganese Ore :

India is one of the leading producer and supplier of manganese ore in the world market. The present recoverable reserves of manganese ore are placed at 167 million tonnes, annual production is 1.6 million tonnes and exports is placed at 3.10 lakh tonnes/year. There are ceiling limits for the exports of raw and medium grades manganese ores, however, probably due to poor demand, the exports of these grade, never reached the ceiling limits. It seems that to boost the exports of manganese ore, high grade material may also be taken into consideration, with a appropriate ceiling.

#### Chromite :

The total recoverable reserves of chromite in the country are placed at about 86 million tonnes and production is 1.5 million tonnes. After meeting the domestic requirements, India exports chromite to various countries and during 1996-97 it was placed at 5.7 lakh tonnes. In the light of total recoverable reserves and production trend, it is better to continue the current policy of chromite exports with ceilings.

**Alumina :**

Among the export earning mineral commodities, alumina has made important place in the last few years. At present country is exporting around 5 lakh tonnes of alumina per annum. With the huge recoverable reserve of bauxite in the country at about 2,500 million tonnes and scarcity of electric power, it is rather appreciable to pursue the exports of alumina from the country.

**Barytes :**

India is one of the prominent producer and exporter of barytes in the world. The total recoverable reserves of barytes in the country are placed at 87 million tonnes and per annum production is about 5 lakh tonnes. India exports barytes in both lumps and powder forms. As export demand of barytes fluctuate with activities of oil and gas wells drilling, it is concluded that the country may increase its share in the international trade of barytes with better quality and concerted efforts.

**Bentonite :**

Country is endowed with substantial reserves of this mineral commodity and the total recoverable reserves of bentonite are placed at 365 million tonnes. The total exports of bentonite have shown an ascending trends and increased to 1.74 lakh tonnes in 1996-97. As the present domestic demand of bentonite is estimated at 1.54 lakh tonnes, it may be envisaged that India can meet any quantum of domestic as well as exports demands of bentonite in the country in future.

**Mica :**

India is one of the traditional exporters of mica, particularly sheet mica. However, due to development of synthetic substitutes, the demand of mica has declined world -over. The present production of mica (crude) is rather limited about 2000 tonnes/year, however its exports is around 30,000 tonnes/year. It may be analysed that there is need to evaluate the mica resources in the country, and markets to be developed through systematic efforts with varied mica based products.

**Granite :**

With varied types of textures and colours, Indian granites are well accepted in the International Markets. Value-wise granite ranks third in the list of mineral commodities being exported from the country. Although systematic estimation of granite resources in the country have not been done so far, it appears to be quite large. It may be envisaged that with proper leasing policy and value addition export of this mineral may be enhanced many-folds.

**Marble :**

Occurrences of marble are widely distributed in India and the total recoverable reserves are estimated at 825 million tonnes. The present annual domestic production and exports of marble are placed at about 35.7 lakh tonnes and 70,000 tonnes, respectively. It shows that the domestic requirements of marble is sizeable and concerted efforts are needed to increase its exports.

**Slate :**

Any systematic reserve estimation of slate resources has not been carried out, however, it is believed to be quite large. It may also be analysed that our exports of slate is limited to around 70,000 tonnes. Our exports are erratic and market confined to few countries like USA, Singapore, Malaysia and Australia. Systematic evaluation of slate resources and value addition are imperative in order to enhance its exports.

**Other building and monumental stones :**

Besides granite, marble and slate, India is also an important producer and exporter of other stones like sandstone, quartzite, limestone (building) etc. Occurrences of these stones are widely distributed in the country. In the last five years exports of these stones has increased from 84,060 tonnes valued at Rs. 17 crores in 1992-93 to 23.5 lakh tonnes valued at Rs. 73 crores in 1997-98. Potentiality of this sector has to be exploited with the adoption of the latest technology in mining , cutting and polishing.

**Diamond :**

Although meager in indigenous reserves, India has emerged as a major center in the world for cutting and polishing of diamond and its exports in value added form. The export turnover from the cut and polished diamonds accounts for more than 75% of the value of the total mineral exports. With the application of sophisticated exploration techniques, the resource position of diamond may be enhanced and one of the thriving industry of diamond processing may be supported with domestic diamond production.

**Emerald :**

In absence of any commercially exploitable deposits, our entire demand of emerald met through imports. Processed Indian emeralds are well accepted in the international markets and export of emerald was at Rs. 179 crores in 1997-98. It may be concluded that our exports of emerald continue to be based on imported material in the coming future.

### Other precious and Semi-precious stones :

Other than diamond, emerald a number of precious and semi-precious stones like ruby, sapphire, agate, amethyst, garnet, beryl, alexandrite etc. are also produced and processed in India. However, major requirements of these stones are met through imports. The value of these stones is registering an ascending trend from Rs. 271 crores in 1994-95 to Rs. 438 crores in 1997-98. There is urgent need to evaluate known resources of precious and semi-precious stones in the country, particularly in Orissa & Madhya Pradesh.

### Felspar :

The total recoverable reserves of felspar in the country are placed at 31.29 million tonnes and current production is around one lakh tonnes. Demands of Indian felspar in the foreign markets has increased substantially and it has doubled to 94717 tonnes in 1996-97 from 49,307 tonnes in 1994-95. It however, declined to 77644 tonnes during 1997-98. It seems rather better to monitor the exports of felspar regularly, so the availability of quality material to the domestic industries may be maintained.

### Garnet :

With the estimated recoverable reserves of about 52 million tonnes and domestic production of around 60-70 thousand tonnes/year, exports of garnet may be increased further.

### Ilmenite & Rutile :

The total recoverable reserves of ilmenite and rutile in the country are placed at 94 million tonnes and 6 million tonnes respectively. Production of ilmenite is around 4 lakh tonnes and of rutile is around 16 thousand tonnes per annum, however exports of these commodities are erratic. With substantial reserves, it appears that exports of these commodities particularly ilmenite may be enhanced.

### Quartz & Silica sand :

Resources of quartz and silica sand are quite extensive in the country. With the current total production around 1.5 million tonnes/year and exports of quartz and silica sand at around 16 thousand tonnes and 25 thousand tonnes respectively, it may be envisaged that concerted efforts may yield positive results in exports enhancement.



### Talc/Steatite :

India is endowed with substantial resources of talc/steatite and it is estimated at about 214 million tonnes as on 1.4.95. The present production and consumption of this mineral commodity are at around 5 lakh tonnes and 3 lakh tonnes/year, respectively. India has exported talc/steatite in various form like blocks, lumps or powder and it has registered a substantial increase during the past few years. With six times jump from 16,553 tonnes in 1992-93 to 99,200 tonnes in 1996-97. Although the exports declined to 27,360 tonnes during 1997-98, there are prospects to enhance.

### Wollastonite :

India is one among the few countries, those are producing wollastonite in the world. Our wollastonite production is around 95 thousand tonnes/year, however, export quantities have ranged between 7 thousand to 17 thousand tonnes during the last five years. As domestic consumption varies between 27 thousand tonnes to 45 thousand tonnes, there is scope to increase the quantum of exports of wollastonite from India. There is also need to increase reserve base of wollastonite in the country by extensive exploration in the known areas.

### Metals And Alloys :

In the metal and alloys sector, considering the increasing domestic demand and limited indigenous resources, the imports of these commodities seems to be inevitable. Among these, iron & steel and aluminium are the two chief metals can be produce sulphur for exports from India. Indian exports of metals & alloys has increased to Rs. 5,355 crores in 1997-98 from Rs. 2755 crores in 1994-95. During 1997-98, Iron & Steel , aluminium & scrap and ferroalloys accounted for 68%, 15% and 8% respectively of total value of export of metals and alloys. Similarly, during the corresponding period imports value of metals & alloys has also increased to Rs. 22,820 crores from 8,566 crores. Iron & Steel. copper & alloys, gold, silver, aluminium scrap, zinc and alloys, nickel & alloys and ferroalloys accounted for 98.84% of the total value of imports of metals & alloys.

It may be concluded that as indigenous resources and production of metals like copper, lead and zinc, nickel etc. are not sufficient to meet the domestic requirements, the country has to depend upon imported materials in the near future. In the era of liberalization, domestic consumers have access to quality materials at comparable prices from the foreign markets, hence indigenous produces have to face a stiff competition.

\*\*\*

**ANNEXURE - I****RECOVERABLE RESERVES OF IMPORTANT MINERALS IN INDIA  
(As on 1.4.1995)**

Unit : '000 Tonnes

Mineral	Reserves	Mineral	Reserves
<b>Metallic Minerals:</b>			
Antimony : Ore	2000	Ruby (Kg)	469
Metal	10	Diamond (Carats)	981515
Bauxite	2462431	Diaspore	1433
Chromite	86229	Diatomite	2008
Copper : Ore	416810	Dolomite	4386852
Metal	4374	Felspar	31286
Gold : Ore	17788	Fire Clay	518133
Metal (Tonnes)	68	Fluorite	2951
Iron Ore (Million Tonnes)	13460	Fullers Earth	228339
Lead-Zinc : Ore	179132	Garnet	51716
Lead Metal	2319	Granite ('000M <sup>3</sup> )	1027421
Zinc Metal	10078	Graphite	4580
Molybdenum : Ore	8037	Gypsum	237601
MoS <sub>2</sub> (Tonnes)	2826	Ilmenite	90147
Manganese Ore	167309	Kaolin/Chinaclay	1042464
Silver : Ore	158796	Ballclay	37527
Metal (Tonnes)	4875	Kyanite	2817
Tin : Ore	28907	Sillimanite	51620
Metal (Tonnes)	3272	Limestone	75678890
Tungsten : Ore	38111	Magnesite	245141
WO <sub>3</sub> content	87	Marble	824625
Vanadium : Ore	11527	Mica	60
Metal	64	Ochre	27364
		Pyrophyllite	9860
		Pyrites	98000
<b>Non-metallic minerals</b>			
Apatite	13644	Quartz & Silica Sand	2402180
Asbestos	9383	Quartzite	305077
Borax	47204	Rock Salt	3550
Barytes	87062	Rock Phosphate	145374
Bentonite	365489	Rutile	6487
Calcite	11873	Talc/Steatite/Soapstone	213704
Corundum	28	Vermiculite	223
		Wollastonite	6295
		Zircon	1699

## ANNEXURE - II

**MINERAL PRODUCTION IN INDIA**  
(Excluding atomic Minerals & Minor Minerals)

Mineral	Unit	1994-95	1995-96	1996-97	1997-98	1998-99(p)
<b>Fuel Minerals</b>						
Coal	'000 T	257770	273415	286080	296656	293565
Lignite	'000 T	19256	22144	22540	23052	23009
Natural Gas(Utilised)	M.c.m	17339	20916	21262	19703	19522
Petroleum (Crude)	'000 T	32239	34517	32900	33772	32893
<b>Metallic Minerals</b>						
Bauxite	Tonne	4912737	5564775	6076217	6112131	6451901
Chromite	Tonne	1132398	1699534	1455849	1515286	1403957
Copper Ore	Tonne	4766821	4736870	3895528	4499716	4253409
Gold	Kg.	2373	2036	2710	2636	2463
Iron Ore	'000 T	64507	67418	68161	75723	70683
Lead Conc.	Tonne	52724	61583	60271	60881	63856
Manganese Ore	Tonne	1680975	1836705	1870783	1641963	1525805
Silver	Kg.	45911	35531	39689	53925	55363
Tin Conc.	Kg.	59226	54991	31184	35143	35851
Tungsten Conc.	Kg.	5721	6451	3826	0	-
Zinc Conc.	Tonne	268813	289072	276992	292524	349934
<b>Non Metallic Minerals</b>						
Agate	Tonne	602	542	400	239	154
Apatite	Tonne	11066	10777	9147	7150	14031
Asbestos	Tonne	28326	23844	27180	25537	19926
Ball clay	Tonne	421462	507681	492207	464201	383913
Barytes	Tonne	530714	442733	381832	453073	659318
Calcareous sand	Tonne	196272	312652	107968	32008	14066
Calcite	Tonne	63270	74705	37254	51023	57629
Chalk	Tonne	154028	147293	123336	115141	115321
Clay(others)	Tonne	63165	75117	69304	93855	68441
Corundum	Kg.	7782	1416	3758	945	950
Corundum (Ruby)	Kg.	109	215	168	400	-
Diamond	Carat	25518	29931	31836	30994	34579
Diaspore	Tonne	11126	10287	14874	6956	10776
Dolomite	Tonne	3419193	3717541	3468622	3062880	2907736
Dunite	Tonne	69966	171491	158808	193777	230210
Emerald	Kg.	-	-	-	-	-
Felsite	Tonne	1021	1183	1209	1481	651
Felspar	Tonne	92219	106896	101697	112238	106811
Fire clay	Tonne	426792	452817	406695	450219	361398

Table contd.

Table concluded

Mineral	Unit	1994-95	1995-96	1996-97	1997-98	1998-99(p)
Fluorite (Conc.)	Tonne	24788	22944	19926	11338	48
Fluorite (Graded)	Tonne	4584	4099	5135	5519	3918
Fuch.Quartzite	Tonne	797	17	1	0	195
Garnet (Gem)	Kg.	378	602	654	742	889
Garnet (Abrasive)	Tonne	66110	62314	42296	76946	130150
Graphite (ROM)	Tonne	103053	136263	117761	111518	131822
Gypsum	Tonne	1646385	2195111	2209937	2195423	2326876
Jasper	Tonne	4559	4780	5059	6118	5592
Kaolin	Tonne	732233	831098	775283	790802	708503
Kynatie	Tonne	4564	8944	6996	6068	5861
Laterite	Tonne	426112	677173	661843	592584	582406
lime kankar	Tonne	256587	307050	330154	378844	253793
Limeshell	Tonne	87223	105973	80015	82294	81767
Limestone	'000 T	93207	96832	102723	110441	109835
Magnesite	Tonne	334487	345077	377510	373520	350755
Mica(Crude)	Tonne	1988	1832	1954	1697	1492
Mica (Waste & Scrap)	Tonne	1465	1240	1109	907	889
Ochre	Tonne	252973	346683	322383	357895	357766
Perlite	Tonne	274	452	310	80	207
Phosphorite	Tonne	1096651	1308551	1340836	1219425	1609159
Pyrites	Tonne	118000	141000	143602	125474	88738
Pyrophilite	Tonne	95866	144050	141655	102875	86561
Quartz	Tonne	172003	139283	178378	209133	217106
Quartzite	Tonne	94878	116085	111110	58714	47425
Salt (Rock)	Tonne	2874	1827	2700	2801	2608
Sand ( Others)	Tonne	1523923	1723559	1642881	2060426	2254745
Shale	Tonne	192295	302959	467283	614198	794306
Silica Sand	Tonne	1428664	1146418	1540321	1451156	1314316
Sillimanite	Tonne	9982	9086	8528	12458	12070
Slate	Tonne	6190	9696	7826	10655	9026
Steatite	Tonne	408754	540570	531224	474957	456187
Sulphur	Tonne	19050	19826	8820	12852	12143
Vermiculite	Tonne	1475	1798	4064	4699	4035
Wollastonite	Tonne	68920	96017	97330	97742	94642

(p) : Provisional

ANNEXURE -IIICAPACITY AND PRODUCTION OF DIFFERENT MINERAL BASED PRODUCTS  
DURING 1995-96 TO 1996-97

Mineral based product	Unit	Installed capacity	Production	
			1995-96	1996-97
<b>Ferrous Metals</b>				
Pig iron	'000 t.	21,050	18,749	19,558
Steel ingot(crude steel)	"	17,915	22,536*	23,689*
Sponge iron	"	5,400	2,680	4,189
<b>Ferro -alloys</b>				
Ferro-chrome	Tonne	130,000	190,561	90,412
Ferro-manganese	"	342,550	186,503	175,002
Ferro-silicon	"	122,000	71,089	65,191
Charge-chrome	"	208,000	102,038	112,599
<b>Non-ferrous Metals</b>				
Aluminium	"	610,000	534,230	520,688
Copper(Electrolytic wirebar)	"	N.A.	24,196	17,639
Lead(Primary)	"	89,000	27,843	27,874
Zinc(Ingot)	"	179,000	142,078	140,422
<b>Dry Cell Batteries</b>	Million Nos.	5,872	1,442	1,566
<b>Cement</b>	Million t.	97.25	69.55	76.2
<b>Asbestos Cement</b>	'000 tonnes	834	776	855
<b>Sheet &amp; Accessories</b>				
<b>Ceramics</b>				
Glazed tiles	'000 tonnes	713	500	575
Sanitarywares	"	101	66	68
Croc keryware	"	42.5	17	18.5
<b>Glass &amp; Glasswares</b>				
Sheet glass	Million Sq.m	65	50	65
Laboratory glasswares including tubes	tonne	27,200	19,000	20,000
Glass wool	"	6,000	3,000	3,200
<b>Fertilizers</b>				
Nitrogenous	'000 tonnes	9,443	9,480	8,764
Phosphatic(P <sub>2</sub> O <sub>5</sub> content)	"	2,558	3,276	2,803
<b>Chemicals</b>				
Sulphuric acid	'000 tonnes	6,000	4,402	4,988
Caustic soda	"	1,528.2	1,357	1,456
Calcium carbide	"	150	95	91
Soda ash	"	1,654.6	1,464	1,488
Petroleum refinery products	Million t.	60.55	55.32	59.00

Source :

1. Data received from MMS Division
2. Statistical Abstract India, 1997, Volume I, CSO, Ministry of Planning & Programme Implementation.

\* Includes production from EAF unit and Induction furnace Units.

ANNEXURE -IVEXPORTS OF ORES AND MINERALS DURING 1995-96 TO 1997-98  
(By Principal Minerals)

Ore/Mineral	Quantity in Tonnes Value in Rs.'000					
	1995-96		1996-97		1997-98	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>All Minerals</b>	<b>198198555</b>		<b>189561724</b>		<b>206428438</b>	
Abrasive (natural)	35470	148399	30247	172568	46709	239108
Alumina	447988	3256765	560615	3748203	427184	3245221
Antimony ores & conc.	20	2305	1	4	0	0
Arsenic sulphide (natural)	63	438	0	450	0	0
Asbestos	14	600	275	2185	282	1345
Ball clay	1891	6166	1405	4058	3519	4493
Barytes	424840	397801	140023	172113	24373	44474
Bauxite	149968	46264	103925	50431	86876	31395
Bentonite	147856	187961	174118	282194	183212	326857
Borax	311	6144	290	5132	714	16000
Bulding & monu - mental Stones NES	624863	598966	888324	1201271	2347003	737088
Calcite	310	1009	215	1270	243	1681
Chalk	93	564	99	575	191	994
Chromite	347705	1608413	565825	2254073	438948	1489951
Coal	651000	963269	478000	826562	540000	884351
Coke	14371	26500	7935	32269	5458	13790
Copper ores & conc	3476	68613	14	3778	0	0
Corundum(natural)	90	1139	51	481	330	1026
Cryolite (artificial)	765	18470	718	26605	400	14736
Diamond (mostlycut)	*	153744345	*	142986587	*	160150933
Dolomite	74	392	3036	8107	6679	14823
Earth clay	40	56	249	1107	459	2797
Earth colours	658	2328	1151	5629	669	3500
Emerald (Cut & uncut)	*	2546473	*	1429266	*	1789328
Felspar (natural)	84622	141055	94717	171024	77644	156208
Felspar (cut & uncut)	*	114697	*	83437	*	106773
Fireclay	459	1551	399	1132	7369	4845
Flint	50128	22610	1278	1371	1766	1157
Fluorspar	20	141	188	741	101	1045
Fullers earth	76	322	163	1127	403	2105

Table contd.

Table concluded

Ore/Mineral	1995-96		1996-97		1997-98	
	Quantity	Value	Quantity	Value	Quantity	Value
Garnet (natural)	2734	9240	1913	6255	6661	23029
Garnet (cut & uncut)	*	25469	*	78946	*	94782
Granite	1277160	10827128	1172474	11388103	708160	9577430
Gypsum & plaster	43770	28959	67104	64275	20197	20834
Ilmenite	207812	724445	42961	218242	109312	370714
Iron Ore (000' T)	31719	17210269	27627	17064413	29496	17696584
Kaolin	6241	18386	10469	31665	10139	30941
Kieselgurh	0	0	0	0	3	128
Lead ores & conc.	104	2227	368	8268	17	242
Limestone	199855	39993	46640	73066	231693	78337
Magnesite	866	5847	2227	16566	615	6702
Manganese ore	236529	297218	309846	480825	259194	429973
Marble	59312	899925	66839	1080149	74694	1301096
Mica	33776	472166	29360	468220	47892	625911
Nickel ores & conc.	0	0	3	1063	20	5348
Precious & semi-precious stones NES	*	2452181	*	3460873	*	4376104
Quartz (natural)	72327	139096	42172	100115	16224	52013
Red oxide	1473	26710	1375	6541	1083	19005
Rock phosphate	145	564	221	1395	153	6129
Rutile	11240	162471	7399	170814	8955	65088
Salts (other than common salt)	57759	41983	19037	25249	35822	39900
Sand, excl. metal bearing	32523	45653	26478	36888	18364	52718
Silica sand	25756	72416	36137	106648	25356	118327
Sillimanite	1260	6657	794	5709	525	3913
Slate	97245	449410	69755	535318	66045	565871
Steatite	30413	128303	99200	135996	27360	118404
Sulphur	1711	15581	1581	17239	1604	45242
Tripoli earth	0	0	10	55	9	36
Vanadium ores & others	0	9	15	1487	68	6485
Vermiculite	482	1681	737	2506	350	1528
Wollastonite	6743	48009	11582	80020	16977	111893
Zinc ores & conc.	140	985	31239	299880	92364	918166
Other Minerals		48476		64794	-	44602

\* Quantity figures not given due to partial coverage, value figures, however, have full coverage.

ANNEXURE -V

**VALUE OF EXPORTS OF ORES AND MINERALS DURING 1995-96 TO 1997-98**  
(By Principal Minerals)

Mineral	1995-96		1996-97		1997-98	
	Value (Rs.'000)	% Share in total value	Value (Rs.'000)	% Share in total value	Value (Rs.'000)	% Share in total value
All Minerals	198198555	100	189561724	100	206428438	100
Diamond (mostly cut)	153744345	77.57	142986587	75.43	160150933	77.58
Iron ore	17210269	8.68	17064413	9.00	17696584	8.51
Granite	10827128	5.46	11388103	6.01	9577430	4.64
Precious & semi- precious stones NES	2452181	1.24	3460873	1.83	4376104	2.12
Alumina	3256765	1.64	3748203	1.98	3245221	1.57
Emerald (uncut & cut)	2546473	1.28	1429266	0.75	1789328	0.87
Chromite	1608413	0.81	2254073	1.19	1489951	0.72
Marble	899925	0.45	1080149	0.57	1301096	0.63
Zinc ores & conc.	985	0.00	299880	0.16	918166	0.44
Coal	963269	0.49	826562	0.44	884351	0.43
Building & monu- mental stones NES	598966	0.30	1201271	0.63	737088	0.36
Mica	472166	0.24	468220	0.25	625911	0.30
Slate	449410	0.23	535318	0.28	565871	0.27
Manganese ore	297218	0.15	480825	0.25	429973	0.21
Ilmenite	724445	0.37	218242	0.12	370714	0.18
Bentonite	187961	0.09	282194	0.15	326857	0.16
Natural Gas	-	-	-	-	273161	0.13
Abrasives natural	148399	0.07	172568	0.09	239108	0.12
Felspar (natural)	141055	0.07	171024	0.09	156208	0.08
Steatite	128303	0.06	135096	0.07	118404	0.06
Silica sand	72416	0.04	106648	0.06	118327	0.06
Other minerals	1420454	0.72	1171289	0.62	925759	0.45



## ANNEXURE -VI

**IMPORTS OF ORES AND MINERALS DURING 1995-96 TO 1997-98**  
(By Principal Minerals)

Ore/Mineral	Quantity in Tonnes Value in Rs.'000					
	1995-96		1996-97		1997-98	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>All Minerals</b>		<b>236599488</b>		<b>342862904</b>	-	<b>346548106</b>
Abrasives (natural)	1195	24148	2071	35705	1469	18387
Alabaster	60	600	63	1440	168	1104
Alumina	11527	283566	9920	264796	13849	389461
Andalusite	1060	9266	1540	6704	1352	14347
Antimony ores & conc.	81	6398	57	3230	60	4386
Asbestos	81924	1449740	77498	1459672	61474	1210747
Ball clay	3397	29522	2883	26249	8596	44885
Barytes	23	336	62	782	21	273
Bauxite	71590	255574	27177	135123	32245	163862
Bentonite	168	7745	83	7211	252	14998
Borax	38031	453832	22667	317782	31794	393457
Bulding & monu -mental stones NES	801	11398	383	11393	825	30494
Calcite	3	32	17	425	0	0
Chalk	22	70	0	0	21	156
Chromite	7271	30680	820	7882	174*	22329
Coal ('000 tonnes)	12513	26908502	3175	31055709	6439	37085742
Coke	1177493	4049839	1237320	4259742	2275274	7212442
Copper ores & conc.	19384	661646	60096	1321021	87934	1587830
Cryolite & chiolite	1384	26778	815	20036	393	8894
Diamond (uncut)	*	68739278	*	101834375	*	120873284
Dolomite	2651	5317	202	1147	319	2166
Earth clay	0	0	25	243	40	489
Earth colours	84	667	105	1177	18	199
Emerald (cut & uncut)	*	667891	*	22738	*	916920
Felspar (natural)	0	0	12	160	0	0
Fireclay	20	225	4	82	0	0
Flint	103	1012	0	0	60	352
Fluorspar	53627	251358	54666	281221	39135	191530
Fullers earth	17	274	128	2272	420	6781
Garnet (cut & uncut)	*	208	*	566	*	2303
Granite	588	8863	1037	6658	913	11418
Graphite (natural)	774	18437	823	35938	1081	34861
Ilmenite	0	0	0	0	20	507
Gypsum & plaster	23185	23999	10146	29393	16254	39487
Iron Ore (000' T)	879	1446357	853	1252915	372	770067

Table Contd.

Table concluded

Ore/Mineral	1995-96		1996-97		1997-98	
	Quantity	Value	Quantity	Value	Quantity	Value
Kaolin	424	6354	1429	18438	3104	36098
Kyanite	0	0	1	30	0	0
Kisielgurh	600	7567	505	6650	1682	21549
Lead ores & conc.	14625	189333	52428	715026	40288	486939
Limestone	964436	549286	1030581	694645	1186240	790443
Magnesite	117974	1365693	66954	815911	57188	733200
Manganese dioxide electrolytic	509	26639	818	40968	1346	73767
Manganese ore	3689	37482	2760	28881	5065	59721
Marble	32133	187465	46291	394171	23136	201920
Mica	214	87734	442	71717	346	94224
Natural gas (mcm)	0	0	0	0	2	32
Nickel ores & conc.	1983	483209	1418	362898	2015	458523
Ores & conc. of cobalt	13	7952	252	37645	606	86279
Persian red	0	57	1	365	1	413
Petroleum crude ('000t)	27357	115397458	33710	185546700	34399	158251000
Precious & semi-precious stones NES	*	1155976	*	1864744	*	1884260
Quartz/Quartzite (natural)	27	512	15	522	51	572
Red oxide	15	1010	59	4528	62	8309
Rock phosphate	2443753	5242811	2038153	4773519	2667811	6611986
Rutile	1866	48340	4783	163201	6339	171285
Salts (other than common salt)	20654	17957	22051	24068	1236	2008
Sand, excl. metal bearing	1745	38832	903	7206	1432	34634
Silica sand	391	6060	258	5850	240	3954
Slate	2	64	0	200	3	584
Steatite	151	3199	131	3933	111	2686
Sulphur	1543194	4844622	1543503	3247206	1617847	3533066
Tin ore & conc.	1441	159075	2478	298658	5016	270523
Tripoli earth	56	855	85	1350	96	1568
Tungsten ore & conc.	481	73160	315	45952	440	35048
Vanadium ores & others	6290	767459	7791	574511	11545	859307
Vermiculite	146	681	45	314	1	27
Zinc ores & conc.	39516	398836	42661	560920	51776	513306
Other minerals		99995		128276		264716

\* Quantity figures not given due to partial coverage value figures, however, have full coverage.

ANNEXURE -VIIVALUE OF IMPORTS OF ORES AND MINERALS DURING 1995-96 TO 1997-98  
(By Principal Minerals)

Mineral	1995-96		1996-97		1997-98	
	Value (Rs.'000)	% Share in total value	Value (Rs.'000)	% Share in total value	Value (Rs.'000)	% Share in total value
<b>All Minerals</b>	<b>236599488</b>	<b>100</b>	<b>342862904</b>	<b>100</b>	<b>346548106</b>	<b>100</b>
Petroleum crude	115397458	48.77	185546700	54.12	158251000	45.66
Diamond (uncut)	68739278	29.05	101834375	29.70	120873234	34.88
Coal	26908502	11.37	31055709	9.06	37085742	10.70
Coke	4049839	1.71	4259742	1.24	7212442	2.08
Rock phosphate	5242811	2.22	4773519	1.39	6611986	1.91
Sulphur	4844622	2.05	3247206	0.95	3533066	1.02
Precious & semi-precious stones NES	1155976	0.49	1864744	0.54	1884260	0.54
Copper ores & conc.	661646	0.28	1321021	0.39	1587830	0.46
Asbestos	1449740	0.61	1459672	0.43	1210747	0.35
Emerald (uncut & cut)	667891	0.28	22738	0.01	916920	0.26
Vanadium ores & others	767459	0.32	574511	0.17	859307	0.25
Limestone	549286	0.23	694645	0.20	790443	0.23
Iron Ore	146357	0.61	1252915	0.37	770067	0.22
Magnestie	1365693	0.58	815911	0.24	733200	0.21
Zinc ore & conc.	398836	0.17	560920	0.16	513306	0.15
Lead ore & conc.	189333	0.08	715026	0.21	486939	0.14
Nickel ore & conc.	483209	0.20	362898	0.11	458523	0.13
Borax	453832	0.19	317782	0.09	393457	0.11
Alumina	283566	0.12	264796	0.08	389461	0.11
Tin ores & conc.	153025	0.07	298658	0.09	270523	0.08
Marble	187465	0.08	394171	0.11	201920	0.06
Fluorspar	251358	0.11	281221	0.08	191530	0.06
Other minerals	849757	0.36	1107559	0.32	1322153	0.38

ANNEXURE - VIIIEXPORTS OF METALS AND ALLOYS DURING 1995-96 TO 1997-98

Ore/Mineral	Quantity in Tonnes Value in Rs.'000					
	1995-96		1996-97		1997-98	
	Qty.	Value	Qty.	Value	Qty.	Value
All Metals		35820315		43665345		53549721
Aluminium alloys & scrap	62631	4270065	107212	6490818	121448	7949205
Antimony alloys & scrap	140	3648	0	18	0	0
Copper & alloys (incl. Brass & bronze)	6325	840638	5355	788385	6337	898413
Cadmium & scrap	0	0	2	208	1	50
Cobalt alloys & scrap	69	10237	31	6883	26	20555
Ferro alloys	222516	4832608	182345	3405787	240879	4276179
Gold non-monitory & monitory (Kg.)	0	0	0	0	1	276
Iron & steel	1459336	22912963	1952535	29604759	2232068	36439412
Lead & alloys & scrap	3742	109149	3660	116865	2297	68157
Magnesium & scrap	4	703	2	1183	1	73
Manganese & alloys NES	0	0	299	8052	40	1270
Manganese electrolytic	0	0	0	0	10	549
Mercury	3	847	0	0	0	0
Molybdenum & scrap	3	6113	0	1978	1	1815
Nickel & alloys (incl. scrap)	228	28207	306	88640	1680	88754
Pig & cast iron incl. spiegeliesen	511849	2567487	345481	2099592	501478	2849386
Platinum (Kg.)	386	22115	451	55300	3667	54948
Selenium	1	401	0	0	0	0
Silicon	611	22730	5992	349622	3894	187519
Silver (Kg.)	780	4761	1253	5958	5160	41962
Tantalum & scrap	0	0	0	0	0	23
Tellurium	0	0	0	0	10	107
Tin & alloys (incl. scrap)	976	98863	8448	405720	8650	335922
Tungsten alloys & scrap	46	72921	173	66772	82740	78815
Zinc & alloys incl. Scrap	175	12935	11603	161804	11906	254596
Non-ferrous base metals scrap	155	2924	227	7001	156	1753

ANNEXURE -IXVALUE OF EXPORTS OF METALS AND ALLOYS DURING 1995-96 TO 1997-98  
(By Principal Metals)

Mineral	1995-96		1996-97		1997-98	
	Value (Rs.'000)	% Share in total value	Value (Rs.'000)	% Share in total value	Value (Rs.'000)	% Share in total value
All Metals	35820315	100	43665345	100	53549721	100
Iron & steel	22912963	63.97	29604759	67.80	36439412	68.05
Aluminium & scrap	4270065	11.92	6490818	14.86	7949205	14.84
Ferro alloys	4832608	13.49	3405767	7.80	4276179	7.99
Pig & cast iron incl. spiegeliesen	2567487	7.17	2099592	4.81	2849386	5.32
Copper & alloys (incl. brass & bronze	840638	2.35	788385	1.81	898413	1.68
Tin & alloys (incl. scrap)	98863	0.28	405720	0.93	335922	0.63
Zinc & alloys incl. scrap	12935	0.04	161804	0.37	254596	0.48
Silicon	22730	0.06	349622	0.80	187519	0.35
Nickel & alloys (incl. scrap	28207	0.08	88640	0.20	88754	0.17
Tungsten alloys & scrap	72921	0.20	66772	0.15	78815	0.15
Lead & alloys & scrap	109149	0.30	116865	0.27	68157	0.13
Platinum	22115	0.06	55300	0.13	54948	0.10
Other metals	29634	0.08	31281	0.07	68415	0.13

ANNEXURE - XIMPORTS OF METALS AND ALLOYS DURING 1995-96 TO 1997-98Quantity in Tonnes  
Value in Rs.'000

Ore/Mineral	1995-96		1996-97		1997-98	
	Qty.	Value	Qty.	Value	Qty.	Value
<b>All Metals</b>		<b>110469910</b>		<b>147335284</b>		<b>228204671</b>
Aluminium alloys & scrap	124991	8353699	179712	10855042	109001	7411906
Antimony alloys & scrap	742	90736	1269	115596	1018	74453
Boron	13	6995	7	3036	15	5201
Copper & alloys (incl. Brass & bronze)	248945	20682266	359769	26283816	330551	23623307
Cadmium & scrap	376	23279	1038	65667	1651	58073
Chromium & scrap	189	47090	120	32254	142	40651
Cobalt & scrap	214	522443	276	646269	276	514423
Ferro alloys	52905	3103052	58310	2457303	59079	2653226
Gold non-monitory & monitory (Kg.)	0	0	52425	24453632	265457	103123570
Iron & steel	3986282	56899845	4099322	60501785	4037417	62318045
Lead & alloys & scrap	62929	854686	43461	1218931	64286	1512362
Magnesium & scrap	1777	250737	1729	187745	1809	208479
Manganese & alloys NES	724	37317	772	41131	650	33698
Manganese electrolytic	468	22758	456	24747	485	22565
Mercury	428	49225	254	31527	268	43945
Molybdenum & scrap	41	57517	34	49151	60	82378
Nickel & alloys (incl. scrap)	12550	3425421	10677	2758792	14341	3460651
Pig & cast iron incl. spiegeliesen	29811	226849	17809	176550	9570	244575
Platinum (Kg.)	297	85751	467	58160	2376	214967
Selenium	65	20935	93	25696	86	26558
Silicon	10951	335858	15195	632562	13822	572201
Silver (Kg.)	1900650	11105464	1889504	11188524	2667015	15957224
Tantalum & scrap	1	3902	0	1699	0	4221
Tellurium	0	940	1	1071	2	762
Tin & alloys (incl. scrap)	4815	622790	7808	1187973	4256	955976
Tungsten alloys & scrap (kg)	99902	114706	40709	79644	63549	113931
Zinc & alloys incl. Scrap	63020	2203633	101219	3623664	120781	4728400
Non -ferous base metals scrap	68669	1322016	30580	633317	6849	198923

## ANNEXURE- XI

**VALUE OF IMPORTS OF METALS & ALLOYS, 1995-96 TO 1997-98  
(BY PRINCIPAL METALS)**

Metals	1995-96		1996-97		1997-98	
	Value (Rs,000)	% share in total value	Value (Rs.000)	% share in total value	Value (Rs.000)	% share in total Value
All metals	110469910	100	147335284	100	228204671	100
Gold, non-monetary & monetary	-	-	24453632	16.60	103123570	45.19
Iron & Steel	56899845	51.51	60501785	41.06	62318045	27.31
Copper & Alloys (incl. brass & bronze).	20682266	18.72	26283816	17.84	23623307	10.35
Silver	11105464	10.05	11188524	7.59	15957224	6.99
Aluminum & Scrap	8353699	7.56	10855042	7.37	7411906	3.25
Zinc & Alloys (Incl. scrap	2203633	1.99	3623664	2.46	4728400	2.07
Nickel & Alloys (Incl. Scrap	3425421	3.10	2758792	1.87	3460651	1.52
Ferro-alloys	3103052	2.81	2457303	1.67	2653226	1.16
Lead and alloys & scrap	854686	0.77	1218931	0.83	1512362	0.66
Tin and alloys (incl. scrap	622790	0.56	1187973	0.81	955976	0.42
Silicon	335858	0.30	632562	0.43	572201	0.25
Cobalt & scrap	522443	0.47	646269	0.44	514423	0.23
Pig & cast iron incl. spiegelisen	226849	0.21	176550	0.12	244575	0.11
Platinum	85751	0.08	58160	0.04	214967	0.09
Other metals	788000	0.71	705929	0.48	913838	0.40