

# 70 Silver

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**S**ilver is one of the five noble metals. It has brilliant white colour, malleability and resistance to atmospheric oxidation. Hence, it is in use since last 6,000 years. Apart from its monetary and decorative uses, its highest known electrical conductivity amongst all metals has found application in modern age; viz, for printed electric circuits, coating for electronic conductors and in alloys of gold and copper for electrical contacts. Its chloride and iodide are light-sensitive and hence used in photographic material. These two modern uses are responsible for contributing its supply as scrap.

In India, there are no native silver deposits except the small and unique Bharak deposit of silver in Rajasthan. It occurs generally with lead, zinc, copper and gold ores and is extracted as a by-product from electrolysis or chemical methods.

Silver is recovered as a co-product as well as a by-product in the country. Silver was recovered in the past as a co-product in gold refining at KGF Complex and Hutti Gold Mines in Karnataka, as a by-product in smelting and refining of lead, zinc and copper concentrates at Chanderiya and Debari smelters in Rajasthan, Tundoo and Moubandar (Ghatsila) smelters in Jharkhand and at Visakhapatnam smelter in Andhra Pradesh. The present production of silver comes from Ghatsila copper smelter of HCL, Chanderiya lead-zinc smelter of HZL and from gold refinery of HGML. In addition, Hindalco extracts silver as by-product during smelting of imported copper concentrates, at Dahej in Gujarat.

The installed capacity for recovery of silver at various plants are: HCL - 9.9 tpy; HZL - 132 tpy and Hindalco - 150 tpy. HZL is planning to set up a silver plant at Pantnagar, Uttarakhand, for which the company has initiated the process for appointment of vendors/contractors.

The capacity of the proposed plant is not available. Besides, Sterlite Industries (India) Ltd is in the process of obtaining world class technology for recovery of minor metals from imported copper concentrates and smelter by-products at its Tuticorin smelter, Tamil Nadu.

## RESOURCES

As per the UNFC system, the total resources of silver ore in the country as on 1.4.2005, were estimated at about 244.63 million tonnes. Out of these, 115.91 million tonnes were placed under reserves category and 128.72 million tonnes under the remaining resources category.

The total resources of silver in the country as on 1.4.2005 in terms of metal were estimated at 10,212.62 tonnes, comprising 6,058.33 tonnes under reserves and 4,154.29 tonnes under the remaining resources.

By States, Rajasthan accounted for about 84% resources and Jharkhand 10%. Karnataka, Uttarakhand, Andhra Pradesh, Orissa, Meghalaya, Sikkim, Tamil Nadu and Maharashtra together shared 6% resources (Table - 1).

## PRODUCTION

In 2007-08, the production of silver at 80,684 kg increased by 51% as compared to the previous year mainly because of higher recovery of silver at Chanderiya. The production of silver from gold refining was 281 kg in 2007-08 as against 268 kg in 2006-07. One undertaking each from private sector and public sector reported production of silver in 2007-08 (Tables - 2 to 4).

In addition, Hindalco recovered 48,362 kg and 53,938 kg silver from imported copper concentrates in 2006-07 and 2007-08, respectively.

**Table – 1 : Reserves/Resources of Silver as on 1.4.2005  
(By Grades/States)**

Grade/State	Reserves				Remaining resources						Total resources (A+B)		
	Proved		Total		Feasibility Pre-feasibility		Measured		Indicated			Inferred	Total (B)
	STD111	Probable	STD121	STD122	STD211	STD222	STD331	STD332	STD333	Total (A+B)			
<b>All India : Total</b>	<b>55752053</b>	<b>1707043</b>	<b>115912738</b>	<b>3375000</b>	<b>11864000</b>	<b>1900000</b>	<b>34370000</b>	<b>77211729</b>	<b>128720729</b>	<b>244633467</b>			
Ore	2283.19	58453642	6058.33	270	878.18	161.6	958.24	1886.27	4154.29	10212.62			
Metal		133.81											
<b>By States</b>													
<b>Andhra Pradesh</b>													
Ore	686250	105000	791250	-	-	-	-	90000	90000	881250			
Metal	5.19	0.79	5.98	-	-	-	-	1.08	1.08	7.06			
<b>Jharkhand</b>													
Ore	-	-	-	-	-	-	-	23840000	23840000	23840000			
Metal	-	-	-	-	-	-	-	5.22	5.22	5.22			
<b>Karnataka</b>													
Ore	7208303	69462	7277765	-	-	-	-	314150	314150	7591915			
Metal	2.67	0.48	3.15	-	-	-	-	2.92	2.92	6.07			
<b>Maharashtra</b>													
Ore	-	-	-	-	-	-	-	235000	235000	235000			
Metal	-	-	-	-	-	-	-	0.23	0.23	0.23			
<b>Meghalaya</b>													
Ore	-	-	-	-	-	-	-	880000	880000	880000			
Metal	-	-	-	-	-	-	-	19.8	19.8	19.8			
<b>Orissa</b>													
Ore	960500	119000	1079500	-	-	-	-	670000	670000	1749500			
Metal	27.43	3.4	30.83	-	-	-	-	34.17	34.17	65			
<b>Rajasthan</b>													
Ore	46897000	58096400	106264600	3375000	11864000	-	31370000	51452579	98061579	204326179			
Metal	2247.9	3636.62	6003.08	270	878.18	-	917.98	1802.17	3868.33	9871.41			
<b>Sikkim</b>													
Ore	-	63780	499623	-	-	300000	-	150000	450000	949623			
Metal	-	0.04	15.29	-	-	27.6	-	13.8	41.4	56.69			
<b>Tamil Nadu</b>													
Ore	-	-	-	-	-	-	330000	460000	790000	790000			
Metal	-	-	-	-	-	-	15.87	26.68	42.55	42.55			
<b>Uttarakhand</b>													
Ore	-	-	-	-	-	1600000	1790000	-	3390000	3390000			
Metal	-	-	-	-	-	134	4.59	-	138.59	138.59			

## SILVER

**Table – 2 : Principal Producer of Silver, 2007-08**

Name & address of producer	Location of mine	
	State	District
M/s Hindustan Zinc Ltd, Yashad Bhavan Udaipur – 313 001.	Rajasthan	Chittorgarh

**Table – 3 : Production of Silver\* 2005-06 to 2007-08  
(By States)**

(Quantity in kg; value in Rs. '000)

State	2005-06		2006-07		2007-08 (p)	
	Qty	Value	Qty	Value	Qty	Value
<b>India</b>	<b>27961</b>	<b>228123</b>	<b>53271</b>	<b>419262</b>	<b>80684</b>	<b>1521158</b>
Jharkhand	3383	41518	1708	28444	-	-
Karnataka	317	3797	268	4310	281	5398
Rajasthan	24261	182808	51295	386508	80403	1515760

\* According to location of final processing / extraction plant.

**Table – 4 : Production of Silver\* 2006-07 and 2007-08  
(By Sector/States/Districts)**

(Qty in kg; value in Rs. '000)

State/District	2006-07		2007-08(p)	
	Quantity	Value	Quantity	Value
<b>India</b>	<b>53271</b>	<b>419262</b>	<b>80684</b>	<b>1521158</b>
Public sector	1976	32754	281	5398
Private sector	51295	386508	80403	1515760
<b>Jharkhand</b>	<b>1708</b>	<b>28444</b>	-	-
Singhbhum (East)	1708	28444	-	-
<b>Karnataka</b>	<b>268</b>	<b>4310</b>	<b>281</b>	<b>5398</b>
Raichur	268	4310	281	5398
<b>Rajasthan</b>	<b>51295</b>	<b>386508</b>	<b>80403</b>	<b>1515760</b>
Chittorgarh	51295	386508	80403	1515760

\* Silver is a by-product:

(i) In Singhbhum East (Jharkhand), it is recovered at smelter of HCL at Ghatsila from copper slime.

(ii) In Karnataka, it is recovered at Raichur while refining of gold at Hutti and Uti gold mines.

(iii) In Rajasthan, it is recovered at Chanderiya lead-zinc smelter of HZL.

## WORLD REVIEW

The total reserve base of silver is estimated at 570,000 tonnes. Poland, China, USA, Mexico, Australia and Peru were the main countries having resources (Table-5). Major part of the reserves and resources is associated with base metals, such as copper, lead and zinc.

Peru, Mexico, China, Australia, Chile, Canada, Poland and USA were the main producers of silver. The global primary as well as by-product mine output increased marginally at 20,988 tonnes in 2007 from 20,413 tonnes in the previous year. World mine production is given in Table-6.

**Table – 5 : World Resources of Silver\***  
(By Principal Countries)

(In tonnes of metal content)

Country	Reserve base
<b>World : Total</b>	<b>570000</b>
Australia	37000
Canada	35000
China	120000
Mexico	40000
Peru	37000
Poland	140000
USA	80000
Other countries	80000

*Source : Mineral Commodity Summaries, 2008.*

\* Includes silver recoverable from base metal ores.

**Table – 6 : World Mine Production of Silver**  
(By Principal Countries)

(In tonnes of metal content)

Country	2005	2006	2007
<b>World : Total</b>	<b>20758</b>	<b>20413</b>	<b>20988</b>
Australia	2417	1727	1880
Canada	1124	995	862
Chile	1400	1607	1936
China	2500	2600 <sup>e</sup>	2700 <sup>e</sup>
Kazakhstan*	812	796	708
Mexico	2894	3028	3135
Peru	3193	3471	3493
Poland	1262	1265	1244
Russia*	1350	1250	1200
USA	1226	1140	1170
Other countries	2580	2534	2660

\* Smelted and/or refinery production.

*Source : World Mineral Production, 2003-2007.*

### Australia

A steep decline over previous year was seen in the country's silver production which reached at 1,727 tonnes mainly from Cannington mines. Contribution also was reported from Xstrata's Mount Isa mine. The production increased to 1,880 tonnes in 2007.

### China

China maintained its third position in output of silver with a production of 2,700 tonnes in 2007, despite some mine closures in Hebei Province.

### Mexico

Mexican silver production registered a slight growth of 4.6% and reached to 3,028 tonnes in 2006. Pan American Silver's La Colorada mine registered an increase over the previous year. Fresnillo, Tizapa and Sabinas were other mines which showed increase in production. The production further increased to 3,135 tonnes in 2007 with an increase of 3.5%.

### Peru

For the fourth consecutive year, Peru dominated Mexico to become the largest producer of silver in the world by registering a production of 3,471 tonnes in 2006 and 3,493 tonnes in 2007. The major players contributing to this increase included Minera Antamina, Minera El Brocal and Minas Buenaventura.

### USA

Production declined in 2006 to reach 19 years low of 1,140 tonnes. Slight increase by 30 tonnes was registered in 2007. Production increased at Hecla's Lucky Friday mine due to development of a new 5900 level.

## SILVER

**FOREIGN TRADE****Exports**

In 2007-08, exports of silver ores and conc. were 25 tonnes valued at Rs. 1.89 lakh to Rep. of Korea and USA. Exports of silver decreased to 23 tonnes in 2007-08 from 66 tonnes in the previous year. Exports were mainly to USA, UAE, Iran and Switzerland. Besides, 351 kg of silver-clad base metals valued at Rs. 31.96 lakh were also exported during 2007-08 (Tables - 7 to 9).

**Imports**

Imports of silver in 2007-08 increased to 2,690 tonnes from 834 tonnes in the preceding year. Imports were mainly from UK (27%), China (25%), Mexico and USA (8% each) and Hong Kong (7%). Imports of silver-clad base metals decreased to 17 kg in 2007-08 from 459 kg in the previous year (Tables - 10 and 11).

**Table – 7 : Exports of Silver Ores & Conc.  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>10000</b>	<b>53999</b>	<b>25</b>	<b>189</b>
Belgium	10000	53999	-	-
Korea	-	-	24	139
USA	-	-	1	50

**Table – 8 : Exports of Silver  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>66</b>	<b>814177</b>	<b>23</b>	<b>466489</b>
USA	2	42867	10	164520
UAE	++	6604	4	98162
Iran	1	9736	4	79569
Switzerland	-	-	3	78855
Macedonia	++	4301	1	10651
UK	61	720557	++	4825
Sweden	1	9145	1	4701
Australia	++	154	++	4358
Japan	1	8451	++	218
Italy	++	4088	++	13
Other countries	++	8274	++	20617

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**Table – 9 : Exports of Silver-clad Base Metals  
(By Countries)**

Country	2006-07		2007-08	
	Qty (kg)	Value (Rs. '000)	Qty (kg)	Value (Rs. '000)
<b>All Countries</b>	<b>91</b>	<b>888</b>	<b>351</b>	<b>3196</b>
Hong Kong	-	-	200	1598
Chinese Taipei/ Taiwan	-	-	72	790
USA	15	98	20	666
Spain	-	-	59	142
Belgium	30	590	-	-
South Africa	46	200	-	-

**Table – 10 : Imports of Silver  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>834</b>	<b>9686596</b>	<b>2690</b>	<b>46358875</b>
UK	111	1953175	725	12539003
China	208	3777102	679	12073593
Mexico	-	-	224	3563981
USA	174	142165	207	3411392
Hong Kong	21	358438	177	3203590
Russia	25	436581	115	2021270
Poland	-	-	120	2009314
UAE	42	735985	89	1591055
Australia	48	752003	73	1336682
Switzerland	43	727401	73	1235317
Other countries	162	803746	208	3373678

**Table – 11 : Imports of Silver-clad Base Metals  
(By Countries)**

Country	2006-07		2007-08	
	Qty (kg)	Value (Rs. '000)	Qty (kg)	Value (Rs. '000)
<b>All Countries</b>	<b>459</b>	<b>3117</b>	<b>17</b>	<b>541</b>
Germany	8	168	7	510
Hong Kong	1	4	-	-
Italy	259	1673	10	31
Thailand	9	93	-	-
USA	182	1179	-	-