

# 52 Lead & Zinc

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**L**ead is a soft, heavy, toxic and highly malleable metal. It is bluish white when freshly cut, but tarnishes to dull grey when exposed. It is usually found in ore with zinc. Zinc is a silvery blue-grey metal with a relatively low melting and boiling point.

The largest single use of lead today is in the manufacture of lead acid storage batteries while the single largest use for the zinc is in galvanizing industry.

With the expansion in capacities by HZL the country enjoys self-sufficiency in respect of zinc. Production of zinc is more than its consumption. However, there appears to be shortage of lead in the country as the primary production of lead is limited only to one producer namely HZL and the production of lead is less than the domestic requirement.

There is a thriving market of lead scrap recycling to meet the ever increasing demand from lead acid battery sector. Government of India has enacted Battery Management and Handling Rule (BMHR) 2002 which will further increase the availability of scrap from organised sector. It is estimated that worldwide more than 50% of refined lead produced is from recycled material. Producing lead through this route required around one third of the energy needed to extract it from its ores. Recovery of secondary zinc and lead is economically more attractive because of certain advantages. Besides lower energy consumption it also entails low capital cost, less environmental hazards and high metal contents. However, in this review emphasis is given on the primary lead and zinc scenario.

HZL is the only producer of primary lead in the country as well as the only integrated producer of primary zinc from its mines situated in Rajasthan. Other producer of zinc namely Binani Zinc Ltd (BZL) produces zinc from imported concentrates. Indian Lead Ltd (ILL) is yet to start production. During the year 2009-10 there was an increase in production of lead and zinc ore by 6%, lead concentrate by about 2%, zinc concentrate by 4%, primary lead by about 7% and zinc ingot by 6% over the previous year.

## RESOURCES

The total resources of lead and zinc ores as on 1.4.2005, as per UNFC system, are estimated at 522.58 million tonnes. Of these, 125.75 million tonnes (24%) fall under 'reserves' while balance 396.83 million tonnes (76%) are classified as 'remaining resources'. The resources of ore containing +10% Pb & Zn were estimated at 86.82 million tonnes, ore containing 5 to 10% Pb & Zn were 144.68 million tonnes and ore containing less than 5% Pb & Zn were 291.08 million tonnes.

The total metal content in resources is 7.21 million tonnes lead and 24.26 million tonnes zinc. Besides, 118.45 thousand tonnes lead+zinc metal resources are available. In terms of reserves, 2.59 million tonnes of lead metal and 11.09 million tonnes of zinc metal are estimated. Rajasthan is endowed with the largest resources of lead-zinc ore amounting to 468.51 million tonnes (90%), followed by Bihar 11.43 million tonnes (2%), Maharashtra 9.272 million tonnes (2%), Madhya Pradesh 6.920 million tonnes (1%) and Andhra Pradesh 6.620 million tonnes (1%). Resources are also established in Gujarat, Meghalaya, Odisha, Sikkim, Tamil Nadu, Uttarakhand and West Bengal (Table-1).

## EXPLORATION & DEVELOPMENT

GSI carried out exploration for lead and zinc during 2009-10 in the districts of Bhilwara, Jhunjhunu and Sirohi in Rajasthan, besides Baramulla and Reasi districts of Jammu & Kashmir and Gadchiroli district of Maharashtra.

MECL conducted exploration for lead and zinc in the Ajmer and Chittorgarh districts, Rajasthan.

DMG, Rajasthan carried out exploration in Ajmer, Bhilwara, Pali and Rajasmand districts for basemetals. DGM, Nagaland carried out exploration for basemetals in Phek district, DGM Madhya Pradesh carried out exploration in Jabalpur and Katni districts. The details of exploratory activities are given in Table-2.

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**Table – 1 : Reserves/Resources of Lead & Zinc Ore as on 1.4.2005  
(By Grades/States)**

(In '000 tonnes)

Grade/State	Reserves				Remaining resources						Total resources (A+B)	
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility STD222	Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334		Total (B)
		STD121	STD122									
<b>All India : Total</b>												
Ore	62860	6574	56320	125754	3375	13572	12193	161985	202361	3340	396826	522580
Lead metal	1262.98	130.21	1197.36	2590.55	85.39	306.35	244.37	1601.86	2378.73	-	4616.70	7207.25
Zinc metal	5503.16	282.11	5307.62	11092.89	269.32	631.45	535.06	5271.77	6357.54	101.65	13166.79	24259.68
Lead & zinc metal	-	-	-	-	-	-	-	-	118.45	-	118.45	118.45
<b>By Grades</b>												
Ore with (+)10% Pb & Zn	22623	-	32839	55462	-	-	-	11100	20259	-	31359	86821
Ore with 5-10 % Pb & Zn	40237	6574	23481	70292	3375	13572	7587	13713	36138	-	74385	144677
Ore with (-)5% Pb & Zn	-	-	-	-	-	-	4606	137172	145964	3340	291082	291082
Lead metal	1262.98	130.21	1197.36	2590.55	85.39	306.35	244.37	1601.86	2378.73	-	4616.70	7207.25
Zinc metal	5503.16	282.11	5307.62	11092.89	269.32	631.45	535.06	5271.77	6357.54	101.65	13166.79	24259.68
Lead & zinc metal	-	-	-	-	-	-	-	-	118.45	-	118.45	118.45
<b>By States</b>												
<b>Andhra Pradesh</b>												
Ore	686	-	105	791	-	-	1000	4159	670	-	5829	6620
Lead metal	25.9	-	3.96	29.86	-	-	28.7	119.53	21.74	-	169.97	199.83
Zinc metal	-	-	-	-	-	-	12.4	43.57	7.19	-	63.16	63.16
<b>Bihar</b>												
Ore	-	-	-	-	-	-	-	435	11000	-	11435	11435
Lead metal	-	-	-	-	-	-	-	-	24	-	24	24
Zinc metal	-	-	-	-	-	-	-	14.75	24	-	38.75	38.75
<b>Gujarat</b>												
Ore	-	4955	845	5800	-	-	129	-	200	-	329	6129
Lead metal	-	104.37	17.81	122.18	-	-	3.9	-	-	-	3.9	126.08
Zinc metal	-	224.04	39.37	263.41	-	-	1.1	-	-	-	1.1	264.51
Lead & zinc metals	-	-	-	-	-	-	-	-	0.9	-	0.9	0.9
<b>Madhya Pradesh</b>												
Ore	-	-	-	-	-	-	1510	-	2260	3150	6920	6920
Lead metal	-	-	-	-	-	-	26.12	-	-	-	26.12	26.12
Zinc metal	-	-	-	-	-	-	114.76	-	123.45	101.12	339.33	339.33

(Contd.)

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Table - 1 (Concltd.)

Grade/State	Reserves				Remaining resources							Total resources (A+B)
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility STD222	Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
		STD121	STD122									
<b>Maharashtra</b>												
Ore	-	-	-	-	-	-	1967	6305	1000	-	9272	9272
Zinc metal	-	-	-	-	-	-	133.56	428.11	28	-	589.67	589.67
<b>Meghalaya</b>												
Ore	-	-	-	-	-	-	-	880	-	-	880	880
Lead metal	-	-	-	-	-	-	-	16.5	-	-	16.5	16.5
Zinc metal	-	-	-	-	-	-	-	14	-	-	14	14
<b>Odisha</b>												
Ore	961	-	119	1080	-	-	-	-	670	-	670	1750
Lead metal	34.32	-	4.25	38.57	-	-	-	-	38.39	-	38.39	76.96
<b>Rajasthan</b>												
Ore	61213	1183	55187	117583	3375	12172	3917	145855	185416	190	350925	468508
Lead metal	1202.76	18.94	1169.66	2391.36	85.39	283.25	44.54	1319.13	2275.1	-	4007.41	6398.77
Zinc metal	5503.16	45.19	5265.11	10813.46	269.32	562.57	107.27	4597.05	6133.22	0.53	11669.96	22483.42
Lead & zinc metals	-	-	-	-	-	-	-	-	117.55	-	117.55	117.55
<b>Sikkim</b>												
Ore	-	436	64	500	-	-	300	-	150	-	450	950
Lead metal	-	6.9	1.68	8.58	-	-	-	-	-	-	-	8.58
Zinc metal	-	12.88	3.14	16.02	-	-	3	-	1.05	-	4.05	20.07
<b>Tamil Nadu</b>												
Ore	-	-	-	-	-	-	200	590	-	-	790	790
Lead metal	-	-	-	-	-	-	2.26	5.48	-	-	7.74	7.74
Zinc metal	-	-	-	-	-	-	11.76	24.76	-	-	36.52	36.52
<b>Uttarakhand</b>												
Ore	-	-	-	-	-	1400	3170	390	660	-	5620	5620
Lead metal	-	-	-	-	-	23.1	138.85	11.15	9.5	-	182.60	182.60
Zinc metal	-	-	-	-	-	68.88	151.21	19.11	27.63	-	266.83	266.83
<b>West Bengal</b>												
Ore	-	-	-	-	-	-	-	3371	335	-	3706	3706
Lead metal	-	-	-	-	-	-	-	130.07	10	-	140.07	140.07
Zinc metal	-	-	-	-	-	-	-	130.42	13	-	143.42	143.42

Figures rounded off.

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Table – 2 : Details of Exploration for Lead &amp; Zinc, 2009-10

Agency/ State/District	Location	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Metres		
<b>GSI</b>							
<b>Himachal Pradesh</b>							
Solan	Modipur-Narag area	-	-	-	-	-	Two boreholes completed, Borehole (MNS-1) intersected five mineralised zones. 1) 2.10m x.1.47% (Pb+Zn) 2) 1.80m x.3.85% (Pb+Zn) 3) 2.10m x.1.03% (Pb+Zn) 4) 2.10m x.0.74% (Pb+Zn) 5) 1.90m x.0.50% (Pb+Zn) Analytical results of borehole MNS-2 are awaited and borehole MNS-3 is under progress.
Sirmaur	Ambota area	-	-	-	-	-	Three Pb-Zn lenses identified. Value of Zn in first lens varies from 0.1% to 4.08% and Pb 125 ppm to 0.83%. Values of Zn vary from 500 ppm to 1.22% and those of Pb vary from 100 ppm to 1.7% in second lens. Zn value for third lens is 1.70%.
<b>Jammu &amp; Kashmir</b>							
Baramulla	Buniyar area	-	-	-	-	-	A collaborative programme with DGM, Jammu & Kashmir. One selected grab sample from the richest zone of ore has analysed 20% Pb and 17% Zn with traces of copper (Cu).
Reasi	Bakkal-Sersandhu-Khairikot area	-	-	-	-	-	Surface indications of mineralisation have been noted in the form of minor disseminations of pyrite in quartzite and ferruginisation at places. Five old workings have also been recorded in the area. Analytical results of the surface bedrock samples are awaited.
<b>Maharashtra</b>							
Gadchiroli	Ghanpur-Mudohli	-	-	-	-	-	Surface analytical results of 10 samples of this area indicated Cu values from 20 ppm to 1.9% Pb varies from 10 ppm to 30 ppm. Zn varies from 10 ppm to 75 ppm Co varies from <10 ppm to 20 ppm. Ni varies from <10 ppm to 100 ppm and Cr varies from 10 ppm to 0.1%. First borehole was under progress.

(Contd.)

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Table-2 (Contd.)

Agency/ State/District	Location	Mapping		Drilling		Sampling (No.)	Remarks	
		Scale	Area (sq km)	No. of boreholes	Metres			
<b>Rajasthan</b>								
Bhilwara	Rampuriya & Gadariya Khera villages	1:5000	–	–	–	331	The area indicates a linear zone of AEM anomaly with significant magnetic signature, ferruginisation and is in strike continuity of favourable host rocks having mineralisation on either end of the area. Detailed Mapping, geochemical sampling in grid pattern (100m x 50m) and trenching was carried out to expose BIF and ferruginised bands. Analytical results of 57 out of 331 numbers of pedo-geochemical samples show Pb between 10 ppm and 460 ppm and Zn between 20 ppm and 1100 ppm.	
Jhunjhunu	Dhanota area						The analytical results of 45 nos. grid geochemical samples indicate Cu ranging from 14 ppm to 6700 ppm. Co < 25 ppm to 730 ppm, Zn 8 ppm to 47 ppm, Pb < 50 ppm to 95 ppm, Au content in two samples indicated 0.5 ppm and 0.12 ppm. A wide and persistent gossan zone trending in NE-SW direction dipping steeply towards NW can be traced for a distance of 700 m with width varying up to 240m. Extensive old workings and huge slag dumps are present within gossan zone. The first borehole (DNBH-1) was under progress. Disseminations and clusters of coarse crystals of pyrite along with minor pyrrhotite, smears and occasional stringers of chalcopyrite have been noticed along the borehole cores, but the borehole was yet to intersect the expected zone of mineralisation.	
Sirohi	Danva Block					01	–	Two deeper boreholes (DAN-1 & DAN-2) were planned to intersect the mineralisation delineated in shallow borehole (60m vertical depth) at 300m vertical depth. But the borehole DAN-1 did not intersect massive sulphide mineralised zone at desired depth.

(Contd.)

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Table-2 (Concl.)

Agency/ State/District	Location	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Metres		
<b>DGM, Madhya Pradesh</b>							
Katni	Badwara, Jabalpur Steenbabad and Bagirubad areas	-	-	47	-	-	About 273 sq km area has been reconnoitered.
<b>DGM, Nagaland</b>							
Phek	Meluri	-	-	-	-	150	Core logging and sampling were carried out.
<b>DMG, Rajasthan</b>							
Ajmer	N/v Nayagaon, Jiwana, Chainpura etc.	1:50,000 1:10,000 1:2,000	100 1	15	-	-	Gossan zone was located at the contact of limestone and quartzite in about 1 km x 5-70 m area.
Bhilwara	N/v Thadia	1:2,000	1	-	10	-	An area extending for a strike length of 1150 m with width 30 to 40 m is indicative of base metal occurrences.
Pali	N/v Jadan Kharadi, etc.	1:50,000 1:10,000 1:2,000	100 10 2	-	-	-	-
Rajsamand	N/v Sunar Kui	1:2,000	1	38	2	329	Indication of basemetal mineralisation is revealed along a thin ferruginous sheared, gossan zone within dolomite exposed for more than 1500 m strike length near Sunar Kui village.
<b>MECL Rajasthan</b>							
Ajmer	Bajata North Block (Phase-I)	-	-	5	859	166	1.241 million tonnes of resources with 0.70% Cu, 0.35% Pb and 0.56% Zn (at 0.50% Cu cut-off) were estimated.
Ajmer	Ganeshpura	1:1,000	0.55	5	1067	220	0.973 million tonnes of resources with 1.33% Pb and 1.44% Zn (2.77% Total Metal Content) at 2.00 Total Metal Content (TMC) cut-off.
Chittorgarh	Rewara Block	1:1,000	1	8	2300	298	2.65 million tonnes of resources with 3.42% Pb, 0.66% Zn and 0.38% Cu (4.4% TMC) at 2% TMC.

HZL also conducted exploratory operations in Zawar Mala Group of mines in Udaipur district and also in Rampura-Agucha mines, Bhilwara district in Rajasthan. In its Rampura Agucha mine, it has proved the continuity of the ore body up to a depth of 1065 metres by drilling 6 boreholes with a total meterage of 5096.15 metres.

Based on exploratory boreholes and DATAMINE model 118 million tonnes of reserves have been estimated with 1.90% Pb and 14.23% Zn (as on 1.4.2009). The reserves falling within ultimate pit depth of 372 m are 48.7 million tonnes and remaining will be excavated by underground mining.

In Zawar Group of mines, underground mapping in 1:200 scale was carried out covering an area of 2997 metres, 409 boreholes were drilled with a total meterage of 18363 metres, 16254 samples were collected. Exploratory mining was carried out for 400 metres.

Surface mapping in Mochia (Sonaria, Ruparia area) was carried out on 1:5000 scale covering an area of 8 sq. km and geophysical mapping was carried out for 18 line kilometres. Surface drilling by sinking 16 boreholes covering 16021 metres was carried out in Balaria mine. A total of 1382 samples were collected in Mochia and Balaria areas.

In Rajpura Dariba mines, underground mapping on 1:200 scale was carried out covering 877 metres, 47 boreholes were drilled with a total drilling of 21,502 metres and 3,096 samples were collected. Total 42.20 million tonnes of reserves were estimated with 2.00% Pb and 7.70% Zn.

In addition to this, Pebble Creek Mining Ltd (PCML) of Canada continued exploration in its Askot project in Uttarakhand. PCML owns 100% of the Askot project through a subsidiary Adi Gold Mining Private Ltd. The Askot project is a poly metallic deposit containing gold, silver, copper, lead and zinc. SRK Consulting estimated a compatible resource of 2 million tonnes containing 2.6% Cu, 5.7% Zn, 3.7% Pb, 0.5 g/t Au and 37 g/t Ag.

## PRODUCTION AND STOCKS

### Lead & Zinc Ores and Concentrates

The production of lead and zinc ore at 7.10 million tonnes in 2009-10 increased by about 6% as compared to that in the previous year.

The metal content of lead and zinc in the ore produced in 2009-10 worked out to 129,752 tonnes and 745,969 tonnes, respectively as against 128,732 tonnes and 919,139 tonnes, respectively, in the previous year. During the year under review, 7.09 million tonnes of lead & zinc ore was treated as against 6.64 million tonnes in 2008-09.

The production of lead concentrates in 2009-10 at 136,095 tonnes increased by about 2% as compared to the previous year. Among the states, Rajasthan continued to be the only producer of lead concentrates accounting for the entire production.

The production of zinc concentrates increased from 1,224,077 tonnes in 2008-09 by 4% to 1,277,080 tonnes in 2009-10. The entire production of zinc concentrates was reported from Rajasthan. The entire output of lead and zinc ores and concentrates in both the years was reported by mines owned by Hindustan Zinc Ltd, a private sector unit.

### Grade Analysis

All-India average metal content of ore treated in 2009-10 worked out to 12.36% (1.82% Pb and 10.54% Zn) as against 12.65% (1.91% Pb and 10.74% Zn) in 2008-09. The metal content of ore treated from Rampura-Agucha mine in Bhilwara district of Rajasthan was the highest at 14.71% (1.80% Pb and 12.91% Zn). The lead concentrates produced in Rajasthan in 2009-10 was of grade 61.82% Pb as against 61.34% Pb in 2008-09. Metal content of zinc concentrates produced in Rajasthan worked out to 52.85% Zn in 2009-10 as against 52.90% Zn in the previous year (Tables - 3 to 9).

### Stocks

Mine-head stocks of lead concentrates at the end of the year were 21,977 tonnes as against 12,021 tonnes at the beginning of the year. The entire stocks at the end of the year were held in Rajasthan (Table-10).

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Mine-head stocks of zinc concentrates at the end of year were 41,897 tonnes as against 169,871 tonnes at the beginning of the year. The entire stocks were held in Rajasthan (Table-11).

**Employment**

The average daily labour employed in lead and zinc mines during the year under review was 4,249 as against 4,157 in 2008-09.

**Table – 3 : Producer of Lead & Zinc Ore, Concentrates and Metals, 2009-10**

Name and address of the producer	Location	
	State	District
Hindustan Zinc Ltd Yashad Bhavan, Udaipur – 313 004, Rajasthan.	Rajasthan	Bhilwara, Rajsamand Udaipur

**Lead and Zinc Metals**

The production of primary lead during 2009-10 increased to 64,319 tonnes from 60,323 tonnes in the previous year. The entire output of primary lead was contributed by HZL from Chanderiya smelter. Nil production of secondary lead was reported in both years (Table-12).

The production of zinc ingot metal at 613,964 tonnes in 2009-10 increased by 6% as compared to that in the previous year (Table-13). HZL contributed 94% of the total output. Remaining production was from Binani Industries Ltd. The entire production was reported from private sector (Tables - 14 & 15).

Annual average prices of lead and zinc metals are furnished in General Review on 'Prices'.

**Table – 4 : Production of Lead and Zinc Ore, 2008-09 & 2009-10 (By State)**

(In tonnes)

State	2008-09			2009-10(P)		
	Ore produced	Metal content		Ore produced	Metal content	
		Lead	Zinc		Lead	Zinc
<b>India/</b>						
Rajasthan	6680698	128732	719139	7101972	129752	745969

**Table – 5 : Lead and Zinc Ore Treated, 2008-09 and 2009-10 (By State)**

(In tonnes)

State	2008-09			2009-10(P)		
	Ore treated	Metal content		Ore treated	Metal content	
		Lead	Zinc		Lead	Zinc
<b>India</b>						
Rajasthan	6642209	126678	713570	7087129	129094	746986

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**Table – 6 : Production of Lead Concentrates,2007-08 to 2009-10  
(By State)**

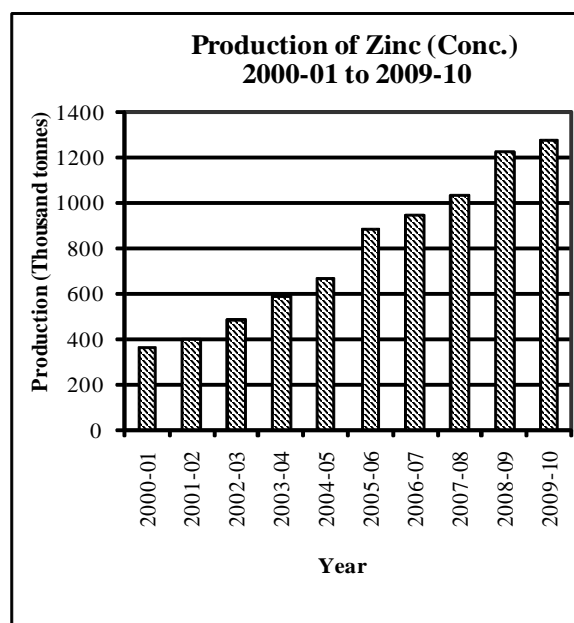
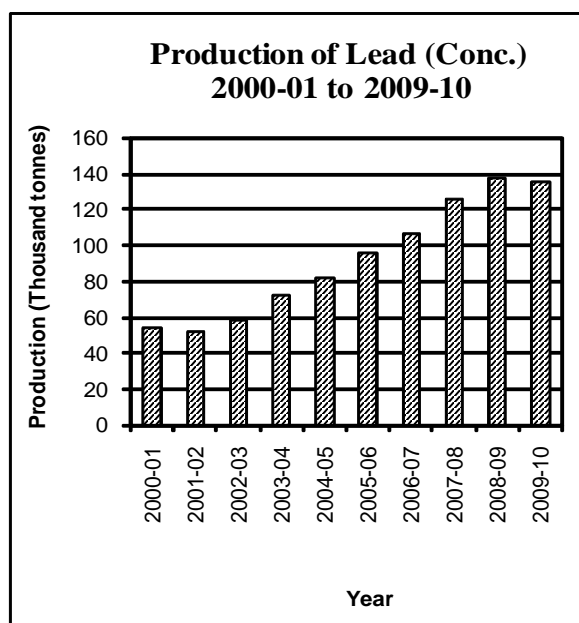
(Quantity in tonnes; value in Rs. '000)

State	2007-08		2008-09		2009-10(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>						
Rajasthan	125755	1443876	133768	1362744	136095	1743405

**Table – 7 : Production of Lead Concentrates, 2008-09 & 2009-10  
(By Sector/State/Districts)**

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

State/District	2008-09				2009-10(P)			
	No. of Mines	Production			No. of Mines	Production		
		Quantity	Pb%	Value		Quantity	Pb%	Value
<b>India</b>	<b>7</b>	<b>133768</b>	<b>61.34</b>	<b>1362744</b>	<b>7</b>	<b>136095</b>	<b>61.82</b>	<b>1743405</b>
Private Sector	7	133768	61.34	1362744	7	136095	61.82	1743405
<b>Rajasthan</b>	<b>7</b>	<b>133768</b>	<b>61.34</b>	<b>1362744</b>	<b>7</b>	<b>136095</b>	<b>61.82</b>	<b>1743405</b>
Bhilwara	1	92151	61.80	625169	1	89205	61.80	815316
Rajsamand	2	17745	52.03	261963	2	23001	54.68	350423
Udaipur	4	23872	66.54	475612	4	23889	68.92	577666



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**Table – 8 : Production of Zinc Concentrates, 2007-08 to 2009-10  
(By State)**

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

State	2007-08		2008-09		2009-10 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India/Rajasthan</b>	1035828	9394204	1224077	9466647	1277080	12908514

**Table – 9 : Production of Zinc Concentrates, 2008-09 & 2009-10  
(By Sector/State/Districts)**

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

State/District	No. of Mines	2008-09			No. of Mines	2009-10 (P)		
		Production				Production		
		Quantity	Zn%	Value		Quantity	Zn%	Value
<b>India/Private sector</b>	@	1224077	52.90	9466647	@	1277080	52.85	12908514
<b>Rajasthan</b>	@	1224077	52.90	9466647	@	1277080	52.85	12908514
Bhilwara	@	1114048	53.12	7557907	@	1155849	53.03	10564215
Rajsamand	@	59671	47.40	905437	@	72072	47.94	1162416
Udaipur	@	50358	54.43	1003303	@	49159	56.05	1181883

@ Associated mines with lead concentrates.

**Table – 10 : Mine-head Stocks of Lead Concentrates, 2009-10  
(By State)**

(In tonnes)

States	Stocks at the	
	Beginning of the year	End of the year
<b>India</b>	<b>12021</b>	<b>21977</b>
Rajasthan	12021	21977

**Table – 12 : Production of Lead Metal, 2007-08 to 2009-10**

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

Year	Lead Primary	
	Quantity	Value
2007-08	58246	7566718
2008-09	60323	5418563
2009-10 (P)	64319	7260867

**Table – 11 : Mine-head Stocks of Zinc Concentrates, 2009-10  
(By State)**

(In tonnes)

States	Stocks at the	
	Beginning of the year	End of the year
<b>India</b>	<b>169871</b>	<b>41897</b>
Rajasthan	169871	41897

**Table – 13 : Production of Zinc Metal, 2007-08 to 2009-10**

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

Year	Zinc Ingots	
	Quantity	Value
2007-08	457075	62236418
2008-09	579091	47090795
2009-10 (P)	613964	67484136

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**Table – 14 : Production of Lead (Primary), 2008-09 and 2009-10  
(By State\Plant)**

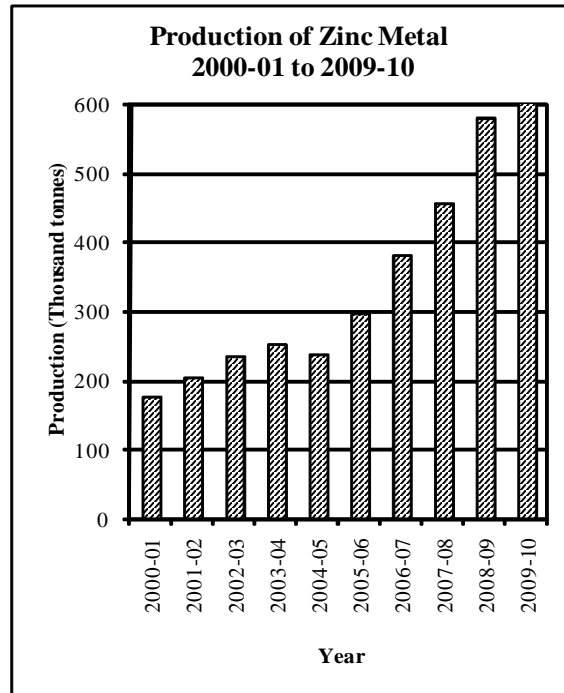
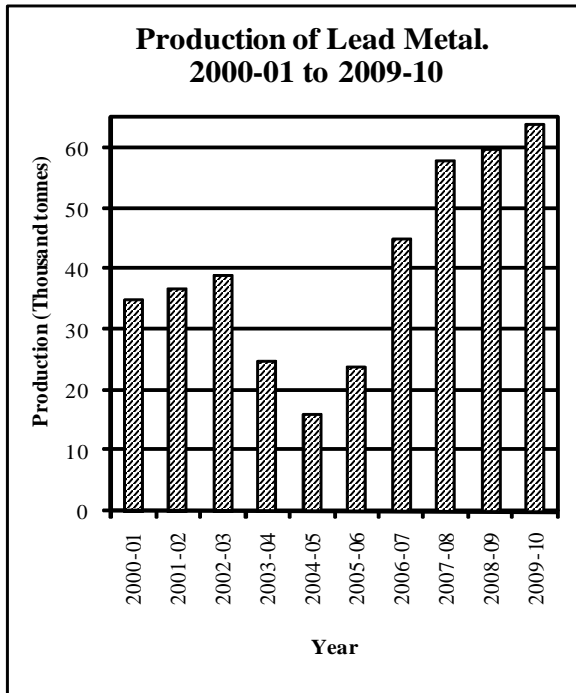
(Quantity in tonnes; value in Rs '000)

State	Plant	2008-09		2009-10 (P)	
		Quantity	Value	Quantity	Value
<b>India</b>		<b>60323</b>	<b>5418563</b>	<b>64319</b>	<b>7260867</b>
Rajasthan	HZL Chanderia	60323	5418563	64319	7260867

**Table – 15 : Production of Zinc (Ingots), 2008-09 and 2009-10  
(By States\Plants)**

(Quantity in tonnes; value in Rs '000)

State	Plant	2008-09		2009-10 (P)	
		Quantity	Value	Quantity	Value
<b>India/</b>		<b>579091</b>	<b>47090795</b>	<b>613964</b>	<b>67484136</b>
Rajasthan	HZL Chanderia/ Debari	551723	44806395	578412	63881436
Kerala	Binani Zinc	27368	2284400	35552	3602700



## MINING & MILLING

HZL is the only integrated lead and zinc producer in the country. Its operation can be classified into mining and smelting. It has seven mining operations and three smelting operations. All except one operation are located in Rajasthan. One smelting operation is located in Visakhapatnam, Andhra Pradesh. The company's mining operations are located in Rampura-Agucha (Bhilwara district), Rajpura-Dariba, Sindesar-Khurd (both in Rajsamand district) and Zawar (Udaipur district), Rajasthan. Rampura-Agucha is the largest opencast mine for zinc and lead, with a capacity of 6.15 million tpy lead zinc ore after a recent expansion. It is also one of the lowest cost zinc mines in the world, and has a 5S certification and a four star rating from the British Safety Council. The other three mines viz, Sindesar-Khurd, Rajpura-Dariba, and Zawar are underground mines with an annual capacity of 1.5 million tonnes, 0.9 million tonnes and 1.2 million tonnes of lead & zinc ore capacity respectively. The average grade of Rampura-Agucha mine is zinc 14.28% and Pb 1.96%, Sindesar-Khurd (Zn 4.93%, Pb 2.78%), Rajpura-Dariba mine (Zn 6.80%, Pb 1.77%) and Zawar mines (Zn 3.66% and Pb 2.03%). Sargipalli mine in Sundergarh district of Odisha, having a capacity of 500 tpd lead ore has not reported production for the last few years (Table-16).

**Table – 16 : Ore Production Capacity of HZL Mines**

Mine	Ore	Capacity* (million tpy)
<b>Total</b>		<b>9.75</b>
Zawar Mines Dist. Udaipur, Rajasthan.	Zinc-Lead	1.20
Rajpura-Dariba, Dist. Rajsamand, Rajasthan.	Zinc-Lead	0.90
Sindesar-Khurd Mine, Dist. Rajsamand, Rajasthan.	Zinc-Lead	1.50
Rampura-Agucha, Dist. Bhilwara, Rajasthan.	Zinc-Lead	6.15
Sargipalli, Dist. Sundergarh Odisha.	Lead	Closed

\* Source : HZL Annual Report 2011

All the mines of Zawar Group are mechanised. The Group has underground mining complex consisting of four underground mines namely Mochia, Balaria, Zawarmala and Baroi and one concentrator for all mines. The mining lease renewal of Zawar mines is currently pending requiring directions from the Hon'ble Supreme Court.

The Rajpura-Dariba mine of HZL is an underground mine with on-site concentrator and two vertical access shafts. Mining is done through vertical crater retreat and blast hole stoping. Ore is crushed underground before hoisting and stock piling for secondary and tertiary crushing.

Sindesar-Khurd mine, located near Rajpura-Dariba is an underground mine having access through a decline and service incline. Mining is done through Blast Hole Stopping method using 17 t LHD (Load Haul Dump) and 50 t Low Profile Dump Trucks(LPDT). Ore produced is hauled up to surface stock pile and crushed and then transported to RDM concentrator for secondary crushing.

Rampura-Agucha mine is the single largest open cast lead zinc mine in the entire world. Rampura-Agucha underground mine development and associated infrastructure development work continued in conformity with the outcomes of the feasibility studies done by internationally reputed consultants planned underground mining is beyond the ultimate open pit depth of 372 metres from the surface. The process for carrying out detailed engineering work for shaft sinking (900 metres depth) has also begun. The Shotcreting machine (for the first time in the Indian mining industry), 17 tonnes loaders, 30 tonnes LPDT (Low Profile Dump Trucks), twin boom jumbo drill machines and other support equipment will be utilized for mining. Good mineralogy leads to higher recovery and overall low production cost. On-site concentrator produces lead and zinc concentrates. Output per man-shift (O.M.S.) is 65.37 in 2009-10 as compared to 65 unit generally not regin 2008-09. In-stream analyser and computerised process control system were installed at Mochia and Dariba beneficiation plants. This system, already is in operation at Balaria plant, improved operational efficiency, such as higher grade concentrate, reduction in consumption of reagents and higher metal recovery.

HZL plans possible hiving off the Sargipalli mine in Odisha as it has become economically unviable. Agnigundala (Bandalmottu) in Guntur district of Andhra Pradesh had a capacity of 240 tpd lead ore. Mining and allied operations at Bandalmottu lead mine were discontinued in 2002. Mining lease was surrendered and the site was abandoned in 2004.

## INDUSTRY

The smelting capacity for lead (primary) in the country was 85,000 tpy and for zinc (primary) 917,000 tpy in 2009-10.

Primary lead was produced entirely by HZL which operated smelter at Chanderiya having an aggregate capacity of 85,000 tpy lead metal. The Vizag lead smelter having 22,000 tpy metal capacity was closed down on 24.1.2001 while Tundoo lead smelter was closed from May 2003 for economic reasons. For producing secondary lead, Indian Lead Ltd (ILL), a private sector company, has two units, one at Kolkata and other at Thane (Maharashtra), each having 12,000 tpy capacity. Both the units are based on imported concentrates/scrap. However, no production was reported by ILL. It is reported that Pondy Oxides & Chemicals also uses lead scrap along with concentrates as feedstock at its

17,000 tpy smelter and subsidiary company has capacity to refine metal to the tune of 12000 tpy.

The smelting capacity of HZL for zinc is distributed between HZL smelters at Debari 88,000 tpy, Visakhapatnam 56,000 tpy and Chanderiya 525,000 tpy. HZL Dariba Smelting Complex-Hydrozinc Smelter has capacity of 210, 000 tpy. BZL's plant at Binanipuram (Alwaye), Kerala having a capacity of 38,000 tpy produces zinc from imported concentrates. Besides lead & zinc capacities, HZL has capacities to produce 162 thousand tonnes of silver, 740 tonnes of cadmium and 1.34 million tonnes of sulphuric acid.

BZL does not have captive mines. The company produces zinc by procuring zinc concentrates from abroad/indigenously at its plant at Alwaye (Kerala). Companywise smelting capacity of lead and zinc smelters is furnished in Table - 17.

**Table – 17 : Companywise Capacity and Production of Primary Lead and Zinc**

(In tonnes)

Company	Lead capacity tpy	Production		Zinc capacity tpy	Production	
		2008-09	2009-10		2008-09	2009-10
Hindustan Zinc Ltd	85000	60323	64319	879000	551723	578412
Binani Zinc Ltd	-	-	-	38000	27368	35552
<b>Total</b>	<b>85000</b>	<b>60323</b>	<b>64319</b>	<b>917000</b>	<b>579091</b>	<b>613964</b>

The Chanderiya zinc smelter complex has three zinc smelters, namely, lead zinc smelter using Imperial Smelting Technology, UK, Hydrometallurgical zinc smelter, Hydro-I (100% EOU) and Hydro-II using Roast Leach Electrowinning Technology with conversion process and lead smelter using TSL Technology from Ausmelt, Australia and Cansol Technology for sulphur recovery. The total Pb-Zn metal production capacity is 6.1 lakh tpy and the silver production capacity is 168 tpy.

The Debari zinc smelter and Vizag zinc smelter are hydrometallurgical zinc smelters using Roast Leach Electrowinning Technology with conversion process. The product range of HZL constitutes two grades, namely, Special High Grade (SHG) zinc containing 99.995% Zn (min.) and Prime Western (PW) containing 98.65% Zn (min.). Both these products are available in the form of slabs weighing 25 kg, SHG Jumbo weighing 1000 kg and PW Jumbo weighing 600 kg. Lead is available as HZL Grade containing 99.99% Pb (min) in the form of slab weighing 25 kg.

HZL accelerated the pace of ramp-up at silver-rich Sindesar Khurd mine with the commissioning of 1.50 million tpy concentrator. During 2011, HZL successfully commissioned 160 MW (80X2) CPP at Dariba. It also commissioned 48 MW of the total 150 MW expansion in Wind Power. Commissioning of the 100 thousand tpy lead smelter at Dariba is expected to be completed in early 2012 to reach the stated objective of over 1 million tonnes of metal production capacity.

## POLLUTION CONTROL & ENVIRONMENTAL MANAGEMENT EFFORTS

In order to regulate the reuse/reprocessing of recyclable waste in an environmentally sound manner, the Government had decided, with effect from 31 December 1999, to auction old/used lead-acid batteries and other non-ferrous metal waste to users only who were enlisted with Ministry of Environment & Forest (MoEF) as 'actual users' and were having facilities for environmentally sound management of waste processing.

## LEAD & ZINC

Most of the mine overburden generated is utilised for secondary construction work including raising of tailing dam heights and mine backfilling. The slag generated from Pyro operations of Chanderiya is gainfully utilised for cement manufacturing. Likewise, fly ash is used in cement production, brick manufacturing and other secondary constructions.

The hazardous wastes generated are being disposed in the secured landfills in environment-friendly manner, designed with state-of-the-art technologies and approved by statutory bodies. Extensive R&D has been undertaken for gainful utilisation of Jarosite (a waste from Hydro operations), in road construction and cement manufacturing. Premier research institutes and industries including National Council for Cement and Building Materials (NCCBM) and Cement industries and Tiles industries, have been associated for the same. HZL has obtained positive results and are hopeful on alternative gainful utilisation of Jarosite.

All the units of HZL have achieved certification by International Occupational Health and Safety Management System OHSAS 18001, ISO 9001 and ISO 14001. Debari and Vizag smelters have obtained SA 8000 certificate for the social accountability. In view of severe scarcity of water in Rajasthan, zero discharge of desliming hydrocyclones was introduced in the tailing circuit to increase the recovery of water from the tailings. This has resulted in reducing the fresh water consumption. The sewage treatment plants at Debari and Chanderiya smelters were operated continuously and the effluents were reutilised in the smelter and for plantation in the colony. Over the years, the company has been voluntarily filing carbon disclosure project (CDP) responses as a proactive step towards reporting carbon foot-printing.

HZL has entered into a charter for Corporate Responsibility for Environmental Protection (CREP) with MoEF, Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) for achieving a quantum jump in its environmental performance in the coming years.

## RECYCLING OF LEAD & ZINC

### Lead

Lead when used as metal in batteries, cable sheathing and sheathing for containing radiation is fully recyclable without losing its properties.

Therefore, there is a thriving industry of lead recycling in the country. However, due to the health risk involved in lead recycling the Central Pollution Control Board authorises and gives licences to the lead-reprocessors with stringent environmental checks.

Government of India has enacted Battery Management and Handling Rules (BMHR) 2002 to organise the recycling of lead acid batteries and to make available raw material to the lead reproducers. As on 13.5.2010, there were 316 lead waste reproducers in the country with their combined battery intake capacity of 1,097,876 tpy. In the recently published Market Survey on Lead & Zinc by IBM, the secondary lead productions have been estimated at 72,000 tonnes in 2009-10.

### Zinc

Largest consumer of zinc is galvanising industry, the zinc once used for galvanising as well for brass making is not recoverable, hence, the quantum of zinc recycling is comparatively small as compared to lead recycling. There were 170 units of zinc recycling with combined capacity of 402,463 tpy and 132 units of zinc with other metal recycling having a combined capacity of 517,515 tpy in the country as on 13.5.2010.

There is an estimated production of 60,888 tonnes of secondary zinc in 2009-10.

## CONSUMPTION

Consumption of lead and zinc in various industries is not available readily, however, it is known that lead and zinc are consumed in the form of metals as well as in the form of compounds and oxides.

### Lead

The battery industry consumes about 74% of lead followed by pigments and compounds 9%, rolled and extruded products 8%, alloys 3%, Cable Sheathing 2% and rest 4% is consumed by other industries.

The apparent consumption of lead during the years 2008-09 and 2009-10 was computed on the basis of production of lead (primary), imports and exports of lead (scrap), pig lead and refined lead (unwrought) and unrefined lead NES. The apparent consumption thus arrived at was 194,408 tonnes in 2008-09 and 201,394 tonnes in 2009-10 (Table-18).

**Table – 18 : Apparent Consumption of Lead  
(Based on Production of Lead (Primary),  
Imports and Exports)**

(In tonnes)		
Item	2008-09	2009-10(P)
(i) Total production Lead (primary)	60323	64319
(ii) Total imports *	141299	164587
(iii) Total exports *	7214	27512
(iv) Apparent consumption	194408	201394

\* Lead (scrap), pig lead and refined lead (unwrought), unrefined lead NES.

## Zinc

Owing to its corrosion resistance in varying types of environment, zinc is used for protecting steel by way of galvanising. The galvanising industry alone consumes about 57% of zinc, followed by coatings 16%, die-casting alloys 14%, oxides & chemicals 7% and extruded products 6%. The apparent consumption of zinc in various industries during 2008-09 and 2009-10 was computed on the basis of production of zinc, imports and exports of zinc, zinc spelter, and zinc scrap. The apparent consumption thus arrived at was 392,878 tonnes in 2008-09 and 561,056 tonnes in 2009-10 (Table-19).

**Table - 19 : Apparent Consumption of Zinc  
(Based on Production of Zinc,  
Imports and Exports)**

(In tonnes)		
Item	2008-09	2009-10 (P)
(i) Total production Zinc	579091	613964
(ii) Total Imports *	70012	103545
(iii) Total exports *	256225	156453
(iv) Apparent consumption	392878	561056

\* Zinc, zinc spelter and zinc scrap.

## SUBSTITUTES & TECHNICAL POSSIBILITIES Lead

Battery replacements include batteries of nickel-zinc, zinc lithium chloride, sulphide or nickel lithiumhydride. The large-scale commercial use of any of these four possible substitutes was so far precluded by cost and operating problems. Polyethylene and other materials work as substitute in some cable and operating problems.

In construction applications, in place of galvanised sheets, copper and aluminium are alternatives. In corrosive chemical environment, stainless steel, titanium, plastics and cements are substitutes. Tin, glass, plastics and aluminium are alternatives in tubes and containers, iron & steel or bismuth in shot for ammunition, and tin in solder. In electronic industry, there has been a move towards lead-free solders with varying compositions of tin, bismuth, silver and copper.

Environmental concerns for lead are limiting the uses, particularly in gasoline, where its use as an anti-knock additive is rapidly being phased out, a process hastened by the introduction of catalytic converters. Storage batteries for industrial load levelling, mains power management and electric vehicles have growing markets. The continued search for weight reduction is reducing the amount of lead per battery, and battery lives are being extended. Possible new developments include the use of lead as an antioxidant in asphalt, as a shielding material, in nuclear waste, in protection of buildings against radon gases and as a sound buffer. Environmental legislation will inhibit the growth of new uses and possibly eliminate lead from many existing uses. The Organisation for Economic Cooperation & Development (OECD) is actively examining possible restrictions on uses of lead. New techniques to recover lead from concentrates and from scrap are developing and will become more important in future. Recycling of lead and zinc through environmentally safe processes needs to be encouraged as the growing use of lead and zinc in railway electrification as well as in road transport and agriculture sectors has created shortage in country.

## Zinc

Aluminium, magnesium and plastic compete in some die-casting applications. Ceramic and plastic coatings, electroplated cadmium & aluminium and special steel compete in some galvanising applications. Aluminium, magnesium and titanium can replace zinc in chemicals and pigments. Zirconium is an alternative in ceramic and enamel applications. New alloys, e.g. superplastic alloys of zinc and aluminium could be developed. Many elements are substitutes for zinc in chemical, electronic and pigment uses.

## WORLD REVIEW

### RESERVES

#### Lead

The world's reserves of lead are estimated at 79 million tonnes. Australia leads with 29% world reserve of lead, followed by China (15%), USA (10%), Peru (8%), and Mexico (6%) (Table - 20).

#### Zinc

The world's reserves are estimated at 200 million tonnes. China accounts for 17% of world's zinc reserves, followed by Australia (11%), Peru (10%), Kazakhstan (9%), Mexico and USA (7% each), India (5%) and Canada (4%) (Table - 21).

## PRODUCTION

#### Lead

The world mine production of lead increased to 3.9 million tonnes in 2009 as compared to 3.8 million tonnes in 2008. China was the leading producer accounting for about 41% of world production, followed by Australia (15%), USA (10%), Peru (8%) and Mexico (4%) (Table-22).

#### Zinc

The world mine production of zinc decreased to 11.4 million tonnes in 2009 from 11.8 million tonnes in 2008. China (27%), Peru (13%) and Australia (11%) were the leading producers followed by Canada and India (6% each) and Mexico (4%) (Table - 23).

## WORLD PRICES

Prices of lead and zinc are furnished in the General Review on 'Prices'.

**Table – 20 : World Reserves of Lead  
(By Principal Countries)**

(In '000 tonnes of lead content)

Country	Reserves
<b>World: Total (rounded)</b>	<b>79000</b>
Australia	23000
Bolivia	1400
Canada	700
China	12000
India	2600
Ireland	500
Mexico	4700
Peru	6000
Poland	3500
Russia	900
South Africa	300
Sweden	1300
USA	7700
Other countries	14000

Source: Mineral Commodity Summaries, 2010.

**Table – 21 : World Reserves of Zinc  
(By Principal Countries)**

(In '000 tonnes of zinc content)

Country	Reserves
<b>World: Total (rounded)</b>	<b>200000</b>
Australia	21000
Canada	8000
China	33000
India	10000
Ireland	2000
Kazakhstan	17000
Mexico	14000
Peru	19000
USA	14000
Other countries	62000

Source: Mineral Commodity Summaries, 2010.

**Table - 22 : World Mine Production of Lead  
(By Principal Countries)**

(In '000 tonnes of metal content)

Country	2007	2008	2009
<b>World : Total</b>	<b>3700</b>	<b>3800</b>	<b>3900</b>
Australia	641	650	566
Canada	75	100	69
China	1402	1403	1610
India*	78	83	84
Irish Republic	57	50	50
Kazakhstan	40	39	39
Mexico	137	141	144
Morocco	42	33	34
Poland	61	67	55
Peru	329	345	302
South Africa	42	46	49
Sweden	63	63	69
USA	444	410	406
Other countries	289	370	423

Source: World Mineral Production, 2005-2009.

\* India's production of primary lead in 2007-08, 2008-09 and 2009-10 was 58.2 thousand tonnes, 60.3 thousand tonnes and 64.3 thousand tonnes, respectively.

**Table – 23 : World Mine Production of Zinc  
(By Principal Countries)**

(In '000 tonnes of metal content )

Country	2007	2008	2009
<b>World : Total</b>	<b>11100</b>	<b>11800</b>	<b>11400</b>
Australia	1514	1519	1290
Canada	630	750	699
China	3048	3186	3092
India*	551	652	677
Irish Rep.	401	398	386
Kazakhstan	386	387	419
Mexico	452	454	490
Peru	1444	1603	1509
USA	803	778	736
Other countries	1871	2073	2102

*Source: World Mineral Production, 2005-2009.  
India's production of primary zinc in 2007-08, 2008-09 and 2009-10 was 457.0 thousand tonnes and 579.0 thousand tonnes, and 613.9 thousand tonnes respectively.*

### Australia

Xstrata plc (Zug, Switzerland) intended to convert the existing underground zinc-lead mine to an open pit operation in order to extend the life of the mine by about 25 years. The proposed development allowed Xstrata to mine identified reported reserves of 43 Mt of ore containing 11.9% zinc, 5.2% lead, and 53 grams per metric tonnes silver. Production capacity of zinc-lead-silver bulk concentrates at McArthur River was reported to be about 320,000 tpy in 2008. Lead in concentrate production in 2009 was 37,100 tonnes slight increase from that in 2008.

Magellan Metals Pty. Ltd [a wholly owned subsidiary of Ivernica Inc., (Toronto)] primary source of the lead produced at Magellan is a near-surface cerussite (lead carbonate) deposit. When operating at full capacity, the mine was capable of producing about 85,000 tpy of lead concentrate .

### Belgium

In Belgium, Umicore s.a. (Brussels) announced that it had decided to close the lead sheet operation at its Overpelt facility, which had been operating in a declining market for some time. The European construction industry, which consumed lead sheet products for roofing, experienced a slowdown in activity that began in the fourth quarter of 2008.

### Bolivia

Atlas Precious Metals Inc. was expecting to bring its primary lead-silver smelter in Karachipampa onstream in early 2010. Atlas was planning to begin

production at the smelter upon receiving an environmental permit that would allow for the installation of a 500,000-tpy sulfuric acid plant. When operating at full production, the plant would produce about 21,000 tpy of primary refined lead, 196 tpy of silver, and 30,000 tpy of recovered byproducts such as bismuth crystals, indium, and zinc oxide.

### Canada

In 2009, lead concentrates were produced at two mines located in British Columbia and New Brunswick. There was a 31% decrease in mine production in 2009 compared with that of 2008 owing to the closure of several mines that had reopened when metal prices were elevated in 2006 and 2007. Primary refined lead metal was produced from domestic and imported concentrates at two smelters located in New Brunswick and British Columbia. Secondary lead metal was produced from recycled lead (primarily lead-acid batteries) at four sites in Quebec, Ontario, and British Columbia.

Xstrata's underground zinc-lead mine near Bathurst, New Brunswick was the leading producer of lead in concentrate in Canada. The mine had production capacity to process 3.60 million tonnes of ore containing copper, lead, silver, and zinc on an annual basis. In 2009, Brunswick Mine produced 66,000 tonnes of lead in concentrate, down by 6% from the 70,000 tonnes produced in 2008. The operating status of the Brunswick mine was expected to change during the next 2 years owing to depletion of mineral resources at the site. However, Xstrata was focusing efforts on extending the life of the mine to year end 2012.

Teck announced that in 2009 refined lead production at its metallurgical complex at Trail was 72,600 tonnes, a 15% decrease from that of 2008 owing to operational issues in the dressing plant, where the lead is purified.

### China

China continued to be the leading global producer and consumer of lead in 2009. Consumption of lead in China has increased by an average of 20% per year from 1999 to 2009 and was estimated to be about 3.86 million tonnes in 2009.

Lead in concentrate production in 2009 was 1.60 million tonnes, a 7% increase from the 1.50 million tonnes produced in 2008. Mine ore production increased sharply in the fourth quarter of 2009 from that early in the year, as mining companies attempted to meet their annual production goals. Guangxi, Henan, Hunan, and Sichuan Provinces had the greatest production increases in 2009 compared with production in 2008.

Government's emphasis is on phasing out smaller nonferrous metal-producing facilities and major producers to continue with plans to increase and modernise lead refining capacity in China. In June, Luoyang Yongning Gold and Lead Smelting Co., Ltd commissioned a new 80,000-tpy primary lead smelter. Yuguang Gold and Lead Co. Ltd. planned to commission a new 80,000-tpy lead smelter after the completion of trial production that began in October 2009. In July, Jianxi Copper launched construction of new smelters that were to have the capacity to produce 100,000 tpy of lead and zinc by year end 2011. In total, at least 11 lead-smelting projects were under construction and had the potential to add about 600,000 tpy of refined lead capacity by year-end. Secondary production has become an increasingly significant part of the lead metal supply in China owing to the growing quantities of used lead-acid batteries generated by the automobile and e-bike markets. In 2009, secondary lead production accounted for 35% of total refined lead production in China.

### **Guatemala**

Acumuladores Iberia S.A. (Guatemala City) secured a licence from the Guatemalan Government to import used lead-acid batteries. Acumuladores Iberia operated a lead recycling plant in Guatemala City that processed about 120,000 used lead-acid batteries per year from domestic sources. With this new import licence, the company would have the capacity to recycle as many as 1.2 million batteries per year. This increased capacity was expected to be significant for the entire Central American region, which had previously been heavily reliant on secondary plants in Mexico for lead-acid battery recycling and refined lead.

### **Ireland**

Lundin Mining Corp. (Toronto) permanently ceased operational mining and milling at its Galmoy zinc-lead-silver mine in south-central Ireland owing to the decline in zinc prices.

### **Italy**

Glencore International AG (Baar, Switzerland) placed the lead production line at its Porto Vesme metallurgical complex (Sardinia) on temporary care-and-maintenance status. Porto Vesme is an integrated zinc and lead smelting operation that can smelt both primary and secondary materials. Production capacity at the facility was reported to be 120,000 tpy refined zinc and 80,000 tpy refined lead.

### **Mexico**

Goldcorp Inc. (Vancouver, British Columbia, Canada) announced that the first lead and zinc in concentrates were produced at its Penasquito gold-silver-lead-zinc project in the northeast corner of the State of Zacatecas. Penasquito consists of two open pit mines, Penasco and Chile Colorado, which produce oxide and sulphide ore. By year-end 2009, Goldcorp estimated that Penasquito would have a mine life of 22 years and produce an estimated average of 204,000 tpy of zinc in concentrates and 90,700 tpy of lead in concentrates.

JCI began construction on a new secondary lead smelter in Villa de Garcia, near Monterrey, in northeastern Mexico that would be more than double its secondary refined lead output in Mexico. The facility was expected to initially have the capacity to produce 132,000 tpy of refined lead and eventually could be expanded to 170,000 tpy of refined lead. The plant was to process about 13 million used lead-acid batteries per year. Refined lead production capacity at JCI's existing secondary smelter in Cienega de Flores would be unchanged at 120,000 tpy.

### **Peru**

Lead mine production in 2009 was 302,000 tonnes a 12% decline from the 345,000 tonnes of lead produced in 2008. Peru has been one of the leading global producers of lead concentrates for more than a decade. Several major mines scaled back lead production in 2009 and one lead-producing mine suspended operations in the spring. Volcan Compania Minera S.A.A., a leading lead producer in Peru, reportedly slowed production considerably at its open pit and underground lead mine in Cerro de Pasco in early 2009 owing to declining lead and zinc price. The company also postponed plans to expand its mining operations.

Glencore temporarily suspended operations at its Iscaycruz zinc-lead operations in the Central Andes owing to declining global prices for lead and zinc. Iscaycruz consisted of an open pit and underground mine that had the capacity to produce 50,000 tpy of lead in concentrate and employed about 2,000 workers.

Doe Run Peru halted operations at its La Oroya metallurgical complex, 140 km east of Lima owing to environmental and financial problems that kept it from obtaining copper, lead, and zinc concentrates to process. La Oroya had the capacity to produce 120,000 tpy of refined primary lead.

## Romania

Mytilineos Holding S.A. (Athens, Greece) temporarily suspended production at its zinc-lead metallurgical facility in Copsa Mica owing to adverse international market conditions for metals and a lack of raw materials for the production of zinc after the world's only bulk concentrate mine (McArthur River in Australia) suspended operations. The plant was operated by Sometra S.A., a subsidiary in which Mytilineos owned a 93% interest.

## Russia

Highland Gold Mining Ltd (HGM), (St. Helier, United Kingdom), commissioned the Novoshirokinskoye Mine in early October. Novoshirokinskoye, in Eastern Siberia, primarily produced lead and zinc concentrates with an expected capacity of about 20,000 to 28,000 tpy of lead concentrate when operating at full production. HGM planned to test various processing technologies during the remaining portion of 2009 and ramp-up production beginning in January 2010.

## Zambia

Central Recycling Ltd, a Zambian-registered company, announced that it planned to produce lead metal ingot and lead oxide from used lead-acid batteries at a new lead recycling plant that was under construction in Kabwe. The company expected that it would produce about 2,400 tpy of lead ingot for export, and its lead oxide production capacity would depend on the availability of feedstock. Construction of the plant was expected to last until November, and production was to begin by year-end 2009.

## FOREIGN TRADE

### Lead

#### *Exports*

Exports of lead from the country are in the form of ore and concentrates, lead alloys and scrap, lead waste and scrap, lead unrefined, refined lead unwrought, pig lead, lead and alloys worked and in many other forms.

Exports of lead ores and concentrate decreased drastically to 36,476 tonnes in 2009-10 as compared to 81,095 tonnes in the previous year. China was the single largest importer accounting for almost the entire quantity. Exports of lead and alloys & scrap increased to 53,779 tonnes during 2009-10 as compared to 12,566 tonnes in the preceding year. Almost entire exports were of lead & alloys while those of scrap

were nominal. Rep. of Korea, accounting for 34% of exports and Indonesia for 23% were the major destinations in 2009-10 (Tables - 24 to 27).

#### *Imports*

Imports of lead in India are in the form of lead ores and concentrates, lead and alloys including scrap, lead and alloys unwrought, pig lead, antimonial lead, worked lead and alloys (bars, rods, plates, etc).

Imports of lead ores & concentrates increased to 6,944 tonnes in 2009-10 as compared to 5,184 tonnes in 2008-09. Imports were mainly from Nigeria (48%), Ivory Coast (16%), and Morocco (12%). Imports of lead and alloys & scrap during 2009-10 were 253,275 tonnes compared to 209,455 tonnes in 2008-09. Imports mainly comprised lead and alloys and the rest was scrap. Australia (18%), UK (17%), Germany (10%), UAE (8%) & Belgium (6%) were the major suppliers during 2009-10 (Tables - 28 to 32).

### Zinc

#### *Exports*

Exports of zinc from the country are in the form of ores and concentrates, zinc & alloys including scrap, zinc spelter, zinc and alloys in the forms of bars, rods and plates.

Exports of zinc ores and concentrates increased sharply to 191,960 tonnes in 2009-10 as compared to 88,387 tonnes in the previous year. China was the major importer and accounted for almost entire quantity. Exports of zinc and alloys & scrap during 2009-10 were 175,767 tonnes as against 209,434 tonnes in the preceding year. Almost entire exports during 2009-10 were of zinc & alloys. Rep. of Korea (15%), Malaysia & Chinese Taipei/Taiwan (14% each) and China (11%) were the main destinations (Tables 33 to 36).

#### *Imports*

Imports of zinc in the country are in the form of zinc ores and concentrates, zinc and alloys including scrap, zinc spelter, zinc and alloys in the forms of bars, rods, plates, mazak, etc. Imports of zinc ores and concentrates decreased to 59,875 tonnes in 2009-10 from 78,201 tonnes in the preceding year. Imports were mainly from Australia (61%) and Peru (22%). Imports of zinc and alloys & scrap during 2009-10 were 153,920 tonnes compared to 94,694 tonnes in 2008-09. Kazakhstan (18%), Australia (15%) and Iran (13%) were the major suppliers (Tables - 37 to 40).

## LEAD &amp; ZINC

**Table – 24 : Exports of Lead Ores & Concentrates  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>81095</b>	<b>5649354</b>	<b>36476</b>	<b>2434582</b>
China	81079	5649203	36450	2434324
UAE	-	-	2	126
South Africa	++	4	20	119
Sri Lanka	16	141	4	13
Spain	++	6	-	-

**Table – 25 : Exports of Lead and Alloys  
Including Scrap : Total  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>12566</b>	<b>1302253</b>	<b>53779</b>	<b>5469186</b>
Korea , Rep. of	++	35	18002	1950868
Indonesia	5075	479679	12131	1217194
Chinese Taipei/ Taiwan	++	15	7162	538315
Malaysia	244	22370	3251	378655
Sri Lanka	878	89505	1867	175585
Singapore	38	4989	1434	173398
Thailand	89	8883	1647	165782
Saudi Arabia	2283	220796	1289	128413
China	128	16829	898	99428
Tanzania	8	748	555	84489
Other countries	3823	458404	5543	557059

**Table –26 : Exports of Lead & Alloys  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>12471</b>	<b>1296644</b>	<b>53658</b>	<b>5458634</b>
Korea , Rep. of	++	35	18002	1950868
Indonesia	5075	479679	12131	1217194
Chinese Taipei/ Taiwan	-	15	7162	538315
Malaysia	244	22370	3251	378655
Sri Lanka	878	89505	1867	175585
Singapore	38	4989	1434	173398
Thailand	89	8883	1647	165782
Saudi Arabia	2283	220724	1289	128413
China	128	16829	818	90935
Tanzania	8	748	555	84489
Other countries	3728	452867	5502	555000

**Table – 27 : Exports of Lead & Waste & Scrap  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>95</b>	<b>5609</b>	<b>121</b>	<b>10552</b>
China	-	-	80	8493
UAE	c	26	1596	-
Kenya	-	-	13	237
Egypt	-	-	2	110
USA	4	326	++	106
Japan	80	3683	-	-
Bhutan	2	684	-	-
Saudi Arabia	++	72	-	-
UK	5	495	-	-
Ukraine	4	348	-	-
Other countries	++	1	++	10

**Table – 28 : Imports of Lead Ores & Conc.  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>5184</b>	<b>193822</b>	<b>6944</b>	<b>223284</b>
Nigeria	2038	83700	3346	108909
Morocco	1061	48475	864	38961
Ivory Coast	1317	37617	1122	28973
USA	-	-	173	6106
Zambia	-	-	106	5544
Greece	212	7170	153	5427
Ghana	101	4520	171	4853
Germany	-	-	185	4692
Indonesia	101	3395	-	-
Pakistan	160	3609	-	-
Other countries	194	5336	824	19819

**Table – 29 : Imports of Lead and Alloys  
Including Scrap : Total  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>209455</b>	<b>18878086</b>	<b>253275</b>	<b>21984498</b>
Australia	51802	4613044	44962	4219882
UK	22535	1813740	43394	3640570
Germany	10900	846500	26368	2635111
UAE	13461	1350801	22754	1936427
Korea, Rep. of	17233	1643114	19390	1875236
Belgium	8090	578176	14922	1333071
Nigeria	5786	533086	6076	437508
Iran	6098	614434	5545	437206
China	8630	854642	723	64726
Kazakhstan	12321	1197195	-	-
Other countries	52599	4833354	69141	5404761

## LEAD &amp; ZINC

**Table – 30 : Imports of Lead & Alloys  
( By Countries )**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>183610</b>	<b>16713024</b>	<b>212890</b>	<b>18788265</b>
Australia	50657	4517656	44641	4192471
Germany	10251	791816	25667	2583210
Korea, Rep. of	17233	1643114	19390	1875236
UAE	12022	1233464	20713	1774140
Belgium	8015	573029	14576	1307433
UK	5718	397008	13848	1226301
Nigeria	5710	526927	6076	437508
Iran	6098	614434	5545	437206
China	8630	854642	723	64726
Kazakhstan	12302	1194899	-	-
Other countries	46974	4366035	61711	4890034

**Table – 31 : Imports of Lead (Scrap)  
( By Countries )**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>25845</b>	<b>2165062</b>	<b>40385</b>	<b>3196233</b>
UK	16817	1416732	29546	2414269
UAE	1439	117337	2041	162287
USA	1732	133989	1286	77991
Kuwait	505	45521	697	54179
Netherlands	355	31558	818	53751
Germany	649	54684	701	51901
Georgia	234	24464	464	36226
Australia	1145	95388	321	27411
Romania	250	22369	340	24131
Saudi Arabia	740	69372	85	5527
Other countries	1979	153648	4086	288560

**Table – 32 : Imports of Lead  
(By Items)**

Item	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Items</b>	<b>209455</b>	<b>18878086</b>	<b>253275</b>	<b>21984498</b>
Lead & alloys:				
unwrought	182637	16553263	210532	18408052
Pig lead	3393	304800	1695	116783
Unrefined lead, NES	8808	826513	12307	883317
Refined lead, unwrought	103253	9224593	110200	10203561
Antimonial lead	414	36835	2895	229225
Lead & alloys unwrought, NES	66769	6160522	83435	6975166
Lead & alloys: worked (bars, rods, plates, etc.)	973	159761	2358	380213
Lead scrap	25845	2165062	40385	3196233

**Table – 33 : Exports of Zinc Ores & Concentrates  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>88387</b>	<b>2389172</b>	<b>191960</b>	<b>6167984</b>
China	87500	2379130	171800	5564052
Spain	-	-	10100	352013
Thailand	-	-	10	234
Guyana	-	-	++	2
Australia	2	6	-	-
UAE	885	10036	-	-
UK	++	++	-	-
USA	++	++	-	-
Unspecified	-	-	10050	251682
Other countries	-	-	++	1

**Table – 34 : Imports of Zinc and Alloys  
Including Scrap : Total  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>94694</b>	<b>7977278</b>	<b>153920</b>	<b>13463420</b>
Kazakhstan	17839	1549992	27547	2747413
Australia	9366	769585	22342	1972752
Iran	13950	1107882	19417	1742787
Korea, Rep. of	9563	951812	10706	1133267
UAE	5973	434131	10717	948134
Canada	92	7397	4709	435320
Uzbekistan	11467	946834	5320	423576
Germany	1160	129383	4913	355256
Japan	1889	164313	3808	330437
Russia	4979	434066	2027	174442
Other countries	18416	1481883	42414	3200036

**Table – 35 : Exports of Zinc & Alloys Including  
Scrap : Total  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>209434</b>	<b>18428890</b>	<b>175767</b>	<b>19140301</b>
Korea, Rep. of	16049	1521471	26935	3012382
Malaysia	41382	3672581	24831	2986432
Chinese Taipei/ Taiwan	7892	651487	24073	2559572
China	10397	894688	18602	1795499
Bangladesh	1005	74754	10121	1146024
Nigeria	10068	873599	9743	1004143
UAE	10085	874666	8874	987184
Indonesia	8035	707775	8645	963131
Nepal	6781	506126	8375	844693
Singapore	29004	2410548	583	55062
Other countries	68736	6235741	34985	3786179

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**Table – 36 : Exports of Zinc (Scrap)  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>60</b>	<b>5454</b>	<b>21</b>	<b>6051</b>
Nepal	++	50	9	5448
UAE	25	1833	10	290
Austria	-	-	1	234
USA	8	736	1	78
Ethiopia	2	164	-	-
France	25	2671	-	-
Other countries	-	-	++	1

**Table – 37 : Imports of Zinc Ores & Conc.  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>78201</b>	<b>2217983</b>	<b>59857</b>	<b>1911107</b>
Australia	28865	763460	36395	1162123
Peru	36280	1106508	12920	453081
Turkey	-	-	4975	136822
Bulgaria	-	-	2632	70893
Poland	-	-	1872	54941
Congo	-	-	466	23888
Nigeria	27	784	169	3084
Ethiopia	-	-	199	2860
Belgium	7985	207066	-	-
Ireland	5044	140165	-	-
Other countries	-	-	229	3415

**Table – 38 : Imports of Zinc & Alloys  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>80129</b>	<b>7018812</b>	<b>126684</b>	<b>11698545</b>
Kazakhstan	17839	1549992	27547	2747413
Australia	8958	741469	21809	1938361
Iran	13950	1107882	19417	1742787
Korea, Rep.of	9484	945462	10663	1131278
UAE	3508	266244	8268	771443
Canada	2	575	4583	426456
Uzbekistan	11467	946834	5320	423576
Japan	1889	164313	3808	330437
China	962	103477	3737	259815
Russia	4979	434066	2008	172735
Other countries	7091	758498	19524	1754244

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**Table – 39 : Imports of Zinc (Scrap)  
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>14565</b>	<b>958466</b>	<b>27236</b>	<b>1764875</b>
Germany	539	28182	3669	232221
UAE	2465	167887	2449	176691
USA	1231	91476	2626	167541
UK	1190	81098	2241	158821
Belgium	488	31450	1498	95293
Saudi Arabia	1332	90084	1096	79270
Netherlands	124	9385	1198	78144
Malaysia	337	21495	1156	69773
Italy	683	41927	1020	59477
Thailand	488	29851	833	45908
Other countries	5688	365631	9450	601736

**Table – 40 : Imports of Zinc  
(By Items)**

Item	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Items</b>	<b>94694</b>	<b>7977278</b>	<b>153920</b>	<b>13463420</b>
Zinc & alloys	80129	7018812	126684	11698545
Zinc or spelter	64628	5446112	103474	9530567
Mazak	4728	426054	3621	419923
Zinc & alloys, NES	5779	613864	8932	753013
Zinc & alloys: worked (bars, rods, plates, etc.)	4994	532782	10657	995042
Zinc scrap	14565	958466	27236	1764875

## **FUTURE OUTLOOK**

The demand of zinc is riding the steel industry growth, mainly driven by the production of galvanised sheets. Similarly, with the growth in the automotive, information & communication technology and infrastructure sectors, the demand for lead is poised to increase and sustain in future. It is expected that down-stream industry development, improvement in standard of living and consumer awareness is set to further increase the demand of zinc and lead in the forthcoming years.

It is also recommended that in order to develop the Indian zinc-lead industry certain factors such as market development and development of newer

applications; infrastructure development; focus on safe and eco-friendly recycling; creating capacities with focus on global cost competitiveness and value addition; and focussed R&D efforts for recovery of minor/trace metals and development of cost effective new applications, etc. require specific attention.

As per the market survey carried out by IBM, the domestic demand of lead by 2015-16 was estimated to be 375,000 tonnes against an estimated production of 369,000 tonnes whereas domestic demand for zinc was estimated at 993,000 tonnes against an estimated production of 1,631,000 tonnes.