Indian Minerals Yearbook 2016

(Part- II : Metals & Alloys)

55th Edition

LEAD & ZINC

(FINAL RELEASE)

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

Indira Bhavan, Civil Lines,
NAGPUR – 440 001

PHONE/FAX NO. (0712) 2565471
PBX : (0712) 2562649, 2560544, 2560648
E-MAIL : cme@ibm.gov.in
Website: www.ibm.gov.in

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10 Lead & Zinc

Lead is a soft, heavy, toxic and highly malleable metal. It is bluish white when freshly cut, but tarnishes to dull grey when exposed. Both lead & zinc are found to occur together in ore along with other metals like silver and cadmium. Zinc is a silvery blue-grey metal with a relatively low melting and boiling point.

World wide largest single use of lead today is in the manufacture of lead-acid storage batteries about 74%, while the single largest use for zinc is in the Galvanising Industry about 50%.

With capacity additions undertaken by HZL, the country enjoys self-sufficiency in respect of zinc. In contrast, there is short supply of lead vis-a-vis the demand in the country.

The ever increasing demand for lead especially from Lead Acid Battery Sector is met by the thriving market of lead scrap recycling. Government of India has enacted Battery Management and Handling Rule (BMHR), 2002, which will further increase the availability of scrap from the Organised Sector. It is estimated that more than 50% of refined lead produced worldwide is from recycled material. Producing lead through this route requires 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.

HZL is the only producer of primary lead and primary zinc in 2015-16 due to shutdown of the operation of Edyar Zinc Limited (EZL). Edayar Zinc Limited (Formerly Binani Zinc Limited) produced zinc from imported concentrates. During the year 2015-16, EZL did not operate its plant and the company has referred board for BIFR and the case is pending for determination of its sickness.

RESERVES/ RESOURCES

The total reserves/ resources of lead and zinc ore as on 1.4.2015 as per NMI data based on UNFC system have been estimated at 749.46 million tonnes. Of these, 106.12 million tonnes (14.16%) fall under 'reserves' category while balance 643.34 million tonnes (85.84%) are classified as 'remaining resources'.

The reserves/ resources of ore containing + 10% Pb & Zn were estimated at 124.23 million tonnes (16.57%), ore containing 5 to 10% Pb & Zn were 329.88 million tonnes (44%) and ore containing less than 5% Pb & Zn were 295.35 million tonnes (39.41%).

The total metal content in reserves/ resources of lead is 13 million tonnes and that of zinc is 36.36 million tonnes and for lead & zinc metal is 0.14 million tonnes. In terms of reserves, 2.48 million tonnes of lead metal and 9.99 million tonnes of zinc metal have been estimated. Rajasthan is endowed with the largest reserves/ resources of lead-zinc ore amounting to 670.34 million tonnes (89.44%), followed by Andhra Pradesh 22.69 million tonnes (3.03%), Madhya Pradesh 14.84 million tonnes (1.98%), Bihar 11.43 million tonnes (1.52%) and Maharashtra 9.27 million tonnes (1.24%). 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 2015-16 in the Guntur and Prakasam district of Andhra Pradesh, Goalpara district of Assam, Bhandara district of Maharashtra, Chhindwara district of Madhya Pradesh, Alwar district of Rajasthan and Mahendragarh district of Haryana. MECL carried out exploration in Betul district of Madhya Pradesh. HZL also carried out exploration in Rajsamand, Bhilwara, Ajmer and Udaipur districts of Rajasthan in their leasehold areas. The details of exploration activities are furnished in Table-2.

Table – 1 : Reserves/Resources of Lead & Zinc Ore as on 1.4.2015
(By Grades/States)

(In '000 tonnes)

Grade/State	Reserves				Remaining resources								Total resources (A+B)
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
		STD121	STD122			STD221	STD222						
All India													
Ore	**31662**	**68687**	**5767**	**106116**	**5564**	**17411**	**31297**	**37055**	**192083**	**355403**	**4530**	**643343**	**749459**
Lead metal	624.56	1666.02	191.76	2482.34	119.31	521.74	780.56	690.65	2171.43	6237.67	-	10521.36	13003.7
Zinc metal	2871.75	6728.14	399.63	9999.52	364.08	940.26	1362.05	1941.94	7931.06	13722.2	101.65	26363.24	36362.76
Lead & Zinc metal	-	-	-	-	-	-	-	-	-	120.76	22.37	143.13	143.13
By Grades													
Ore with (+)10% Pb & Zn	17597	36790	-	54387	155	148	81	-	24850	44605	-	69839	124226
Ore with 5-10 % Pb & Zn	14065	31897	5767	51729	5280	17146	31216	32449	29335	162730	-	278156	329885
Ore with (-)5% Pb & Zn	-	-	-	-	129	117	-	4606	137898	148068	4530	295348	295348
Lead metal	624.56	1666.02	191.76	2482.34	119.31	521.74	780.56	690.65	2171.43	6237.67	-	10521.36	13003.7
Zinc metal	2871.75	6728.14	399.63	9999.52	364.08	940.26	1362.05	1941.94	7931.06	13722.2	101.65	26363.24	36362.76
Lead & Zinc metal	-	-	-	-	-	-	-	-	-	120.76	22.37	143.13	143.13
By States													
Andhra Pradesh													
Ore	-	-	-	-	-	-	-	1000	4159	17530	-	22689	22689
Lead metal	-	-	-	-	-	-	-	28.70	119.53	688.65	-	836.88	836.88
Zinc metal	-	-	-	-	-	-	-	12.40	43.57	7.19	-	63.16	63.16
Bihar													
Ore	-	-	-	-	-	-	-	-	435	11000	-	11435	11435
Lead metal	-	-	-	-	-	-	-	-	-	24	-	24	24
Zinc metal	-	-	-	-	-	-	-	-	14.75	24.00	-	38.75	38.75
Gujarat													
Ore	-	-	-	-	2470	3010	1380	129	-	200	-	7189	7189
Lead metal	-	-	-	-	74.1	90.3	41.4	3.9	-	-	-	209.70	209.70
Zinc metal	-	-	-	-	123.5	150.5	69	1.1	-	-	-	344.10	344.10
Lead & Zinc metal	-	-	-	-	-	-	-	-	-	0.9	-	0.90	0.90
Madhya Pradesh													
Ore	-	-	-	-	129	117	-	1510	4006	5930	3150	14841	14841
Lead metal	-	-	-	-	-	-	-	26.12	5.13	5.04	-	36.29	36.29
Zinc metal	-	-	-	-	5.2	4.71	-	114.76	41.93	186.02	101.12	453.74	453.74
Maharashtra													
Ore	-	-	-	-	-	-	-	1967	6305	1000	-	9272	9272
Zinc metal	-	-	-	-	-	-	-	133.56	428.11	28	-	589.67	589.67

(Contd.)

Table - 1 (Concld.) (In 000' tonnes)

Grade/State	Reserves				Remaining resources								Total resources (A+B)
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
		STD121	STD122			STD221	STD222						
Meghalaya													
Ore	-	-	-	-	-	-	-	-	880	-	-	880	880
Lead metal	-	-	-	-	-	-	-	-	16.50	-	-	16.50	16.50
Zinc metal	-	-	-	-	-	-	-	-	14.00	-	-	14.00	14.00
Odisha													
Ore	-	-	-	-	-	961	119	-	-	670	-	1750	1750
Lead metal	-	-	-	-	-	34.32	4.25	-	-	38.39	-	76.96	76.96
Rajasthan													
Ore	31662	68687	5767	106116	2965	12888	29734	28779	170547	317929	1380	564221	670338
Lead metal	624.56	1666.02	191.76	2482.34	45.21	390.22	733.23	490.82	1860.47	5462.09	-	8982.04	11464.38
Zinc metal	2871.75	6728.14	399.63	9999.52	235.38	772.17	1289.91	1514.15	7145.53	13435.31	0.53	24392.98	34392.5
Lead & Zinc metal	-	-	-	-	-	-	-	-	-	119.86	22.37	142.23	142.23
Sikkim													
Ore	-	-	-	-	-	436	64	300	-	150	-	950	950
Lead metal	-	-	-	-	-	6.9	1.68	-	-	-	-	8.58	8.58
Zinc metal	-	-	-	-	-	12.88	3.14	3	-	1.05	-	20.07	20.07
Tamil Nadu													
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
Uttarakhand													
Ore	-	-	-	-	-	-	-	3170	1790	660	-	5620	5620
Lead metal	-	-	-	-	-	-	-	138.85	34.25	9.50	-	182.60	182.60
Zinc metal	-	-	-	-	-	-	-	151.21	87.99	27.63	-	266.83	266.83
West Bengal													
Ore	-	-	-	-	-	-	-	-	3371	335	-	3706	3706
Lead metal	-	-	-	-	-	-	-	-	130.07	10.00	-	140.07	140.07
Zinc metal	-	-	-	-	-	-	-	-	130.42	13.00	-	143.42	143.42

Figures rounded off.

Table – 2 : Details of Exploration Activities for Lead & Zinc 2015-16

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Andhra Pradesh							
Guntur	West of Karempudi to east of Khandrika area of Agnigundala	1:12500	115	-	-	53 PTS 152 BRS 12 PS 10 PCS	A G-4 stage investigation was carried out.The Agnigundala mineral belt lies within the Agnigundala minor basin and is located in the northern part of the Nallamalai Fold Belt (NFB). The minor basin has a strike length of 50 km and mostly hosts the rocks of Cumbum Formation having a general trend of lithounits varying from ENE-WSW in the north to NE-SW in the south. The argillaceous-dominated Cumbum Formation is represented by shale, phyllite, slate, dolomite in association with chert bands and quartzite. Shale/ phyllite is the lowermost lithounit exposed in the area. The cherty dolomite contains mineralisation in the form of galena which occurs as disseminations, stringers and veinlets. The mineralisation is patchy and observed to be concentrated within the cherty dolomite but near to its contact with the grey dolomite/impure dolomite or phyllite. Many old workings and pits are observed within the cherty dolomite dug along dip, a few are as deep as 50 m. Analytical results of gold in samples analysed are <25 ppb, and basemetal results are still awaited.
Prakasam	Mallapuram block of Markapur basemetal	1:1000	1	12	1623	183 core samples (BRS-101 PS-26 PCS-17 ORM-20)	A G-2 stage investigation was carried out.There are mainly three types of rocks exposed in this block. Phyllite, magnetite-bearing quartzite, dolomite and quartz vein. Mineralised zone is mainly concentrated within the dolomite band that occurs west of magnetite-quartzite (marker bed). Flaky galena is often noticed in silicified dolomite dump at old working present in northern part of the area.

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Table-2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							Quartz veins intruding dolomite are seen oriented parallel to and across the bedding plane, which also contains galena. Gossanised calcareous phyllite bands (length 700 m x width 5 m) are noticed in the southern strike extension of the above mentioned mineralised dolomite bands, which are mainly noticed in the central and southwestern part. The average thickness of the gossan zone is 5 m and has maximum thickness 33 m along 1200 m old geophysical line. Borehole APMP12, which was drilled to intersect this geophysical anomaly zone, shows specks of pyrite and chalcopyrite, discontinuously, both along bedding and fracture plane from a depth of 50-80 m. Borehole APMP11 also intersected this mineralised zone (discontinuously from 58-74 m along run) and shows similar features.
Assam							
Goalpara	Phophonga hills	-	2	4	401.3	-	G-3 stage investigation has been carried out. Mineralisation in the form of small stringers, veins and veinlets, fracture-filling and as dissemination, is associated with shear zone. It is found in the retrogressed part of the high-grade rocks of upper amphibolites/ granulite grade. The zone is also closely related with granite gneiss. The mineralisation is controlled by structures and metamorphism. Dissemination in sillimanite-biotite gneiss is also noticed; however, it is not significant. Continuous and massive type of mineralisation is not seen in the zone.

(Contd.)

Table - 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							Exposed strike extension is 120 m; however, drilling of boreholes indicates extension of the mineralisation for more than 400 m. Mineralisation occurs as small stringers, lenses, veins and fracture-filling in a zone ranging in thickness from 2.7 m to 45.8 m. Since the analytical data have not been received, grade is not known.
Haryana							
Mahendragarh	NW of Islampur	-	-	5	1038	32	G-3 stage exploration was carried out. Presence of pyrite, pyrrhotite and chalcopyrite in the calcareous quartz-biotite schist was noticed. The sulphide mineralisation occurs in the form of disseminations nd specks along the foliation and fracture planes of calcareous quartz-biotite schist. Based on geophysical anomalies, a total of 1,038 m was drilled in five first-level boreholes (IBH-1 to IBH-5) to intersect the mineralised host rocks. The analytical results of 32 channel and pit samples show 2 ppm to 129 ppm Cu, 10 ppm to 146 ppm Pb and 11 ppm to 159 ppm Zn. The analytical results of 246 core samples show Au values <50 ppb.
Madhya Pradesh							
Chhindwara	Chhindboh Chhipanala, Kohat, etc.	1:12500	100	-	-	6 soil sam-ples	G-4 stage investigation for identification & assessment of basemetal mineralisation of potential of hydrothermal alteration zones was taken up. Alteration zone of 600 m x 300 m (approx) trending E-W, dipping northerly was noticed within altered rhyolite 1 km NE of village Chhindboh. It shows very good development of anthophyllite-garnet-muscovite with surface indications of magnetite and sphalerite. In this location development of garnets of varying sizes ranging from few millimetres to 5 centimetres has

(Contd.)

Table - 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Chhindwara (contd.)	Chhindboh	-	-	-	-	-	been observed. Samples collected were submitted to chemical laboratory in Bhopal.
	Kohat	1:12,500	100	-	-	138 Soil samples	Alteration zone of 400 m x 250 m (approx) trending E-W dipping northerly was noticed within altered rhyolite 300 m south of village Kohat. It shows development of muscovite-garnet-sillimanite with specs of sphalerite. samples collected have been submitted to chemical laboratory in Bhopal. Zn anomaly of 1000 ppm of length 200 m and width 100 m have been established.
	Chipanala	-	-	-	-	84 Soil samples	Alteration zone of 300 m x 200 m (approx) trending E-W dipping northerly was noticed within altered rhyolite around 500 m NW of village Chipanala. It is composed of garnet, antho-phyllite, muscovite with few specs of sphalerite and magnetite. Another zone of 150 m x 150 m (approx) trending E-W was also noticed around 500 m NE of village Chipanala with enrichment of tremolites. Development of garnets within it is less compared to the NW band. Based on integration of geochemical and geological data received so far, a zinc anomaly of 300 ppm of length 100 m and width 60 m has been established.
	Pradhanghogri	-	-	-	-	92 Soil samples	Alteration zone of 400 m x 250 m (approx) trending E-W dipping northerly was noticed west of village Pradhanghogri with development of garnet, biotite, feldspar and translucent quartz.

(Contd.)

Table - 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Chhindwara (contd.)	Mehlari	-	-	-	-	92 soil samples	Aleration zone of 400 m x 250 m (approx) trending E-W dipping southerly was noticed SW of village Mehlari with development of garnet, amphiboles and biotite with specs of magnetite and sphalerite.
	Burena	-	-	-	-	232 soil samples	Alteration zone of 650 m x 450 m (approx) trending E-W was noticed 2 km south of village Burena with development of tremolite-anthophyllite (+cummingotonite)-garnet-muscovite-sericite. Development of garnet-muscovite-sericite schist, crystals of garnet of varying sizes (ranging from few millimetres to centimetres) were observed.
	Nimbukhera	-	-	-	-	-	Alteration zone of 100 m x 50 m (approx) trending E-W was observed 1 km north of village Nimbukhera. Garnet-muscovite-sericite schist, crystals of garnet of varying sizes (ranging from few millimetres to centimetres) were noticed.
Maharashtra							
Bhandara	Silejhari	1:2000	1	-	-	150 soil samples	G-4 investigation has been carried out to ascertain zinc & associated mineralisation. Pitting & trenching of 50 cu m along with collection of pitting-trenching samples (PTS) and bed rock samples (BRS) have been carried out for chemical analysis. The lithologies of the

(Contd.)

Table - 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Bhandara (Contd.)							study area belong to Gaikhuri and Dhabetekri Formation of Sakoli Group and basement Amgaon Gneiss. Disseminations of sulphide minerals, which include mainly pyrite, chalcopyrite, covellite, sphalerite, etc. are observed in chert bands and metabasalt west of Silejhari and northeast of Jhari areas. Bedrock samples from different locations of investigated area reveal that the Zn values vary from 10 ppm to 0.12% with average value of 381 ppm, Pb values vary from 10 ppm to 0.23% with average value of 383 ppm and Cu values vary from 10 ppm to 345 ppm with average value of 102 ppm. Further exploration work is not recommended because of very low concentration of Zn and Pb. The investigation is completed.
Rajasthan							
Alwar	Angari Block Thanagazi tehsil	1:2000	1.5	-	-	213 trench sam ples 66 BRS	G-4 stage investigation has been carried out. On the basis of surface indications i.e., presence of old workings, malachite stains and fresh sulphides, two mineralised zones have been delineated. The two zones are present in the west-central part of the block; one in banded dolomitic marble and the other is in tremolite-bearing banded dolomitic marble with quartz and carbonate veins. Within the banded dolomitic marble pyrrhotite and arsenopyrite are present as disseminations and along foliation planes. Highly gossanised rock of tremolite-bearing dolomitic marble is observed in two dug wells further north of the Angari block. Stromatolitic structures are identified in dolomitic marble at two places, one in the eastern part and the other in the western part of Angari block. Samples of

(Contd.)

Table - 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
	Angari block (Contd.)						stromatolitic dolomitic marble were powdered and tested for phosphate with Shapiro solution, which gave yellow precipitate indicating presence of phosphate. Bedrock samples from west-central part of the area contain up to 0.17% Cu. Samples collected from the northern part of the block analysed 450 ppm Zn. The analytical results of samples from ferruginised brecciated zone at the eastern side of the block shows 0.24% Zn, 800 ppm Cu and 600 ppm Ni.
MECL							
Madhya Pradesh							
Betul	Muariya block	1:2000	1	07	1659.7	305	Objective of the exploration was to generate additional sub-surface data of the ore bodies along sections, geometry of the ore bodies as well as their down dip persistency. To augment ore reserves/resources at greater depth by drilling few deeper boreholes along the plunge direction of the ore bodies. To fill up data gap along strike to reduce the interval about 50 m over the promising area for enhancing the confidence level of grade & reserves/resource estimation. To upgrade the earlier estimation of the ore reserves/resources by including additional data thus generated. The area represents the Bimodal Volcano-sedimentary sequence composed of Meta basalt and metarhyolites. Impersistent bands of meta-sediments within the meta-rhyolites play host to the multimetal sulphide mineralisation. Northern band is found out to be associated with sulphide mineralisation while on the other hand the southern one is devoid of any mineralisation. The

(Contd.)

Table - 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							sulphide mineralisation occurs in the form of sphalerite, chalcopyrite & galena which may be massive, vein & veinlets and disseminated nature. At some place fracture filling was also noticed. It is dominantly a zinc deposit with Pb & Cu as associated metals. In addition to this Cd & Ag concentration to a significant amount (129.79 g/t & 43.63 g/t respectively) were also noticed which makes the deposit economically important. Out of seven lensoidal lodes identified, the main lode & its splits are found to have most significant strike & depth continuity. The total reserves/ resources were estimated at 1.061 million tonnes with 6% Zn, 1.43% Pb and 0.62% Cu under 332 category.
HZL(Vedanta)							
All mines & sites	-	-	-	-	1,85120	-	Objective of exploration was to delineate the shape of ore body & grade tonnage estimation. The brownfield drilling added gross reserves & resources of 25.3 million tonnes during the year, augmenting the overall reserves & resources to 389.9 million tonnes as on 31st March, 2016. This contains 27.46 million tonnes of zinc metal, 8.67 million tonnes of lead metal and grading 7.0% zinc, 2.2% lead and 80.3 g/t silver.

As on 31.03.2016, there are 13 mining leases of lead & zinc ore in the country. Among 13 leases, 10 in Rajasthan state, two in Madhya Pradesh and one in Andhra Pradesh. In Rajasthan, 9 leases are held by HZL and one lease is held by RSMML at Deri in Sirohi district. In Madhya Pradesh twoat leases are held by Ind Agro Synergy Ltd (Nagpur)Dehari in Betul district. In Andhra Pradesh one lease is held by P.L. Narasimha Reddy in Cuddapah district.

PRODUCTION & STOCKS

Lead & Zinc Ores and Concentrates

The entire output of lead & zinc ore and concentrates in both the years was reported by mines owned by Hindustan Zinc Ltd, a private sector company (Tables-8 & 9). The production of lead and zinc ore 10.45 million tonnes in 2015-16 increased by 12% as compared to that in the previous year (Tables-3 & 4). The metal content of lead and zinc in the ore produced in 2015-16 works out to 1,95,692 tonnes and 8,20,636 tonnes respectively as against the corresponding figures of 1,60,960 tonnes and 8,65,640 tonnes in the previous year.

During the year 2015-16, under review 10.66 million tonnes of lead & zinc ore was treated as against 9.13 million tonnes in 2014-15 (Table-5).

The production of lead concentrates in 2015-16 at 2,61,858 tonnes increased by about 32% as compared to the previous year. Entire production of lead concentrates was reported from Rajasthan (Tables - 6 & 7).

The production of zinc concentrates decreased marginally from 14,89,374 tonnes in 2014-15 to 14,73,812 tonnes in 2015-16. The entire production of zinc concentrates was reported from Rajasthan.

Grade Analysis

All India average metal content of ore treated during 2015-16 worked out to be 9.72% (1.86% Pb and 7.86% Zn) as against 10.98% (1.73% Pb and 9.25% Zn) in 2014-15. The metal content of ore treated at Rampura Agucha mine in Bhilwara district Rajasthan was the highest at 12.78% (1.73% Pb and 11.05% Zn). The lead concentrates produced during 2015-16 were of grade 54.88% Pb as against 56.34% Pb in 2014-15. Metal content of zinc concentrates produced worked out to 50.26% Zn in 2015-16 as against 51.51% Zn in the previous year.

Stock

Mine-head closing stocks of lead concentrates in 2015-16 were 10,375 tonnes as against 11,805 tonnes in 2014-15. The entire quantity of the stocks at the end of the year was held in Rajasthan (Table-10).

Mine-head closing stocks of zinc concentrates in 2015-16 were 29,529 tonnes as against 55,262 tonnes in 2014-15. The entire quantity of the stocks was held in Rajasthan (Table-11).

Employment

The average daily labour employed in lead and zinc mines during the year under review was 6,916 as against 7,222 in 2014-15.

Lead and Zinc Metals

The production of primary lead during 2015-16 increased to 1,45,257 tonnes from 1,27,142 tonnes in the previous year. The entire output of primary lead was from Chanderiya and Dariba smelters of Hindustan Zinc Ltd.

The production of zinc ingot metal at 7,58,944 tonnes in 2015-16 increased by 4% as compared to that in the previous year. Hindustan Zinc Ltd, contributed 100 % of the total output. (Tables - 12 to 15).

Table - 3 : Producers of Lead & Zinc Ore, Concentrates & Metals, 2015-16

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

Table – 4 : Production of Lead and Zinc Ore, 2014-15 and 2015-16 (By State)

(In tonnes)

State	2014-15			2015-16 (P)		
	Ore Produced	Metal content		Ore Produced	Metal content	
		Lead (Pb)	Zinc (Zn)		Lead (Pb)	Zinc (Zn)
India/	**9362659**	**160960**	**865640**	**10453037**	**195692**	**820636**
Rajasthan	9362659	160960	865640	10453037	195692	820636

Table – 5 : Lead and Zinc Ore treated, 2014-15 and 2015-16 (By State)

(In tonnes)

State	2014-15			2015-16 (P)		
	Ore Treated	Metal content		Ore Treated	Metal content	
		Pb	Zn		Pb	Zn
India/	**9128706**	**157832**	**844795**	**10657035**	**197813**	**838148**
Rajasthan	9128706	157832	844795	10657035	197813	838148

Table – 6 : Production of Lead Concentrates, 2013-14 to 2015-16 (By State)

(Quantity in tonnes; Value in ₹'000)

State	2013-14		2014-15		2015-16 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India/	**194426**	**4372536**	**197668**	**5640013**	**261858**	**7885168**
Rajasthan	194426	4372536	197668	5640013	261858	7885168

Table – 7 : Production of Lead Concentrates, 2014-15 and 2015-16 (By Sector/State/Districts)

(Quantity in tonnes; Value in ₹'000)

State/District	2014-15				2015-16 (P)			
	No. of mines	Production			No. of mines	Production		
		Quantity	Pb%	Value		Quantity	Pb%	Value
India/	**8**	**197668**	**56.34**	**5640013**	**8**	**261858**	**54.88**	**7885168**
Private Sector	**8**	197668	56.34	5640013	8	261858	54.88	7885168
Rajasthan	**8**	**197668**	**56.34**	**5640013**	**8**	**261858**	**54.88**	**7885168**
Ajmer*	1	-	-	-	1	-	-	-
Bhilwara	1	98693	59.46	2259500	1	109631	57.62	2814278
Rajsamand	2	71435	50.97	2115513	2	108197	51.39	3130270
Udaipur	4	27540	59.10	1265000	4	44030	56.62	1940620

***:** *Reported production of lead and zinc ore only and processing is done along with ore produced from Rampura Agucha mine at Bhilwara.*

Table – 8 : Production of Zinc Concentrates, 2013-14 to 2015-16 (By State)

(Quantity in tonnes; Value in ₹'000)

State	2013-14		2014-15		2015-16 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India/	**1490662**	**27389284**	**1489374**	**31572181**	**1473812**	**34943111**
Rajasthan	1490662	27389284	1489374	31572181	1473812	34943111

Table – 9 : Production of Zinc Concentrates, 2014-15 & 2015-16 (By Sector/State/Districts)

(Quantity in tonnes; Value in ₹'000)

State/District	2014-15				2015-16 (P)			
	No. of mines	Production			No. of mines	Production		
		Quantity	Zn%	Value		Quantity	Zn%	Value
India/	@	**1489374**	**51.51**	**31572181**	@	**1473812**	**50.26**	**34943111**
Private Sector	@	1489374	51.51	31572181	@	1473812	50.26	34943111
Rajasthan	@	**1489374**	**51.51**	**31572181**	@	**1473812**	**50.26**	**34943111**
Bhilwara	@	1279420	51.31	24395200	@	1179362	49.87	25317206
Rajsamand	@	163308	50.96	5056281	@	235491	50.67	7021246
Udaipur	@	46646	58.79	2120700	@	58959	56.44	2604659

@ *Associated mines with lead concentrates.*

Table – 10 : Mine-head Closing Stocks of Lead Concentrates, 2014-15 & 2015-16 (By State)

(In tonnes)

States	2014-15	2015-16 (P)
India/	**11805**	**10375**
Rajasthan	11805	10375

Table – 11 : Mine-head Closing Stocks of Zinc Concentrates, 2014-15 & 2015-16 (By State)

(In tonnes)

States	2014-15	2015-16 (P)
India	**55262**	**29529**
Rajasthan	55262	29529

Table – 12 : Production of Lead Metal, 2013-14 to 2015-16

(Quantity in tonnes; Value in ₹'000)

Year	Lead Primary	
	Quantity	Value
2013-14	122595	18662521
2014-15	127142	18759110
2015-16 (P)	145257	20363511

Table – 13 : Production of Zinc Metal, 2013-14 to 2015-16

(Quantity in tonnes; Value in ₹'000)

Year	Zinc Ingots	
	Quantity	Value
2013-14	766530	109946139
2014-15	732792	119987141
2015-16 (P)	758944	108928344

Table – 14 : Production of Lead (Primary), 2014-15 and 2015-16 (By State/Plant)

(Quantity in tonnes; Value in ₹'000)

State	Plant	2014-15		2015-16 (P)	
		Quantity	Value	Quantity	Value
India/		**127142**	**18759110**	**145257**	**20363511**
Rajasthan	HZL Chanderiya/ Dariba				

Table – 15 : Production of Zinc (Ingots), 2014-15 and 2015-16 (By States/Plants)

(Quantity in tonnes; Value in ₹'000)

State	Plant	2014-15		2015-16 (P)	
		Quantity	Value	Quantity	Value
India		**732792**	**119987141**	**758944**	**108928344**
Rajasthan	HZL Chanderiya/ Debari/Dariba				

MINING & MILLING

HZL is the only integrated lead and zinc producer in the country. Its operation can be classified into mining and smelting. At present, HZL's eight mines and all mining operations are located in Rajasthan. Eight mines are Rampura-Agucha mine (Bhilwara district), Kayad mine (Ajmer district), Rajpura-Dariba mine, Sindesar-Khurd mine (both in Rajsamand district) and Zawar group of mines (4 mines in Udaipur district), Rajasthan. Rampura-Agucha is the combination of opencast mine and underground mine of lead and zinc, with an annual production capacity of 6.15 million tonnes of lead zinc ore. Sindesar-Khurd mine is the highly mechanised and largest ore producing underground mine with annual production capacity of 3.0 million tonnes. The other six mines viz, Rajpura-Dariba, Zawar group of mines (Mochia, Ballaria, Zawarmala and Baroi) and Kayad mine are underground mines with an annual production capacity of 0.9 million tonnes, 1.2 million tonnes and 1.0 million tonne of lead & zinc ore, respectively (Table-16).

Table – 16 : Ore Production Capacity of HZL Mines

Mine	Ore	Capacity (million tpy)
Total		**12.25**
Zawar Mines, Distt Udaipur, Rajasthan.	Zinc-lead	1.20
Rajpura-Dariba, Distt Rajsamand, Rajasthan.	Zinc-lead	0.90
Sindesar-Khurd Mine, Distt Rajsamand, Rajasthan.	Zinc-lead	3.00
Rampura-Agucha, Distt Bhilwara, Rajasthan.	Zinc-lead	6.15
Kayad Distt Ajmer Rajasthan.	Zinc-lead	1.00

Source : *HZL Annual Report 2015-16*

Zawar group of mines is a cluster of four underground mines viz. Mochia, Balaria, Zawarmala and Baroi mines and one beneficiation plant for all mines. Zawar group of mines are one of the oldest mine and are located about 40 km south of Udaipur. Lead-Zinc ore of the mines is divided into stope blocks which are drilled and blasted using sub-level open stoping mining method. Loading and transportation is done using combination of LHDs, LPDTs, LOCO and shaft hoisting to surface. The ore is further crushed and then undergoes a flotation process to produce concentrate. In 2015-16, the Zawar group of mines produced 1.35 million tonnes ore at 2.8% Zn and 2.1% Pb feed grade.

The Rajpura-Dariba mine of HZL is an undergound mine commissioned in 1983.It is located 75 kilometers north-east of Udaipur, Rajasthan. Mining is carried out by using the Vertical Crater Retreat method and Blast hole stopping method. Mined out stopes are backfilled with cement tailings. Rajpura-Dariba Mine production capacity is being enhanced from 0.8 to 1.2 million tonnes by developing new mining blocks and multi level mining in existing blocks at faster rate. The proposed enhancement in ore production capacity is to be achieved by developing the blocks in 180-100 mRL block (North lode, 1850N-2550N), 11-100 mRL block (North lode, 1850 N-2550N), 212-285 mRL block (North lode, 1900N – 2550N), 13 to -87 mRL block (East lode 350N-750N), 200 to 300 mRL block (East lode 600N-750N), -119 to -257 mRL block (Main lode, 1825N – 1662N), -200 to – 400 mRL block (East lode / E-10 675 N-1600N). The current mining block – south lode (180-100 mRL) will be depleted by 2017-18. In the year 2015-16, the mine produced 0.67 million tonnes ore as compared to 0.57 million tonnes ore in previous year at average feed grade of 5.1% Zn and 1.2% Pb.

Rampura-Agucha mine is located 230 km north of Udaipur in Bhilwara district, Rajasthan and it was commissioned in 1991. It is high zinc-lead reserve grades averaging 15.8%. The production of ore carried out from both surface mining and underground mining. Commercial stoping commenced during the year 2016 at underground. The mine is gradually transitioning from surface mining to underground mining and further depending on the ultimate depth of open pit up to 420 meters , the ore will be produced from surface mining operation till 2020. The underground mine project includes a production shaft of 950 meters depth, two declines from surface, two ventilation shafts and a paste fill plant. The underground mine achieved 12.1 km of mine development during the year. In the year 2015-16, the mine produced 4.71 million tonnes of ore which is 45% of total ore production of HZL as against 58% last year at 12% Zn and 1.9% Pb feed grade.

Sindesar-Khurd mine is located at 6 km NNE of Rajpura-Dariba mine and 82 km north east of Udaipur. It is an underground mine, commissioned in 2006. It produces high silver content ore at 182 gm/tonne. The mine has undergone several phases of expansion to reach a production capacity of 3.0 million tonnes. It is the largest underground mine in India in respect of production capacity. The mine consists of multiple standalone deposits, or auxiliary lenses, which gives three standalone production centres at present. The production is carried out from the mainlode which has an annual capacity of 2.3 million tonnes & SKA2 auxiliary lens which has an annual capacity of 0.7 million tonnes. Main shaft sinking has been completed up to the ultimate depth of 1,052 meters along with significant off shaft development. An additional beneficiation plant of 1.5 million tonnes ore treating capacity is being established to meet the capacity of the mine. In the year 2015-16, the mine produced 2.9 million tonnes ore as compared to 1.9 million tonnes ore in the previous year at average feed grade of 3.9% Zn and 2.2% Pb.

Kayad mine is newly developed underground mine near Ajmer, Rajasthan. It is commissioned in 2014 having small but high grade deposit. Kayad mine has access to the mine through decline for ore and waste transportation. Longitudinal Long Hole Open Stoping method is used for the steeper and thinner portion of ore body and Transverse Long Hole Open Stoping method for flatly dipping and thick portion of ore body. Mining is being carried out by using 10/17 tonnes LHDs and 30/50 tonnes LPDTs. The production capacity of the mine has increased up to one million tonnes

Table – 17 : Company-wise Capacity and Production of Primary Lead and Zinc

(In tonnes)

Company	Lead capacity tpy	Production		Zinc capacity tpy	Production	
		2014-15	2015-16 (P)		2014-15	2015-16 (P)
Hindustan Zinc Ltd	185000	127142	145257	823000	732792	758944
Edayar Zinc Ltd	-	-	-	38000		-
Total	**185000**	**127142**	**145257**	**861000**	**732792**	**758944**

this year. In the year 2016, the mine produced 0.76 million tonnes ore which is double of previous year 2014-15 production at average feed grade of 8.9% Zn and 1.1% Pb. The ore from Kayad mine is treated at Rampura Agucha's beneficiation plant.

SMELTING

Primary lead was produced entirely by HZL which operated smelter at Chanderiya and Dariba having capacity of 85,000 tpy and 1,00,000 tpy of lead metal, respectively. Thus, the smelting capacity for lead (primary) in the country presently is 1,85,000 tpy. Company wise smelting capacity of lead and zinc smelters is furnished in Table - 17.

HZL and Edyar Zinc limited are the primary producer of Zinc. The smelting capacity of HZL for zinc is distributed between three smelters at Debari (88,000 tpy), Chanderiya (5,25,000 tpy) and Dariba (2,10,000 tpy). Edyar Zinc Ltd's plant at Binanipuram (Aluva), Kerala with capacity of 38,000 tpy. Thus, the smelting capacity for zinc in the country is 8,61,000 tpy. EZL produced zinc from imported concentrates but due to the company declared as sick unit, it did not operate its plant. Besides lead & zinc capacities, HZL has capacities to produce 518 tpy of silver. India's largest manufacturer of sulphuric acid which is by product of its smelting operations . In 2016 HZL produced 1.34 million tonnes of sulphuric acid. In addition to this it is understood that HZL also produces Cadmium metal at Debari Zinc Smelter.

The Registrar of Companies has issued a fresh certificate to change in name from "Binani Zinc Limited" to "Edayar Zinc Limited" with effect from 6th October 2015. Edayar Zinc Ltd (EZL) has been incurring huge fixed costs due to shutdown of the plant from April 2014 onwards, except for a brief period of 59 days when the plant operated. In the year 2015, the Edyar Zinc Limited did not operate its plant for determination of its sickness by reference made to Board for Industrial and Financial Reconstruction (BIFR) in terms of section 15 of the sick Industrial Companies (Special Provisions) Act, 1985 (SICA), under review, the matter pending before BIFR for ascertaining the sickness of the company could not see much progress due to intermittent sitting of BIFR.

Chanderia Lead-zinc smelting complex is located 110 km North of Udaipur in Chittorgarh district, Rajasthan. It was commissioned in 1991 with an initial production capacity of 70,000 tonnes per annum. Chanderia Lead-zinc smelting complex comprises of one lead-zinc pyrometallurgical smelter having production capacity of 1,05,000 tonnes zinc and 35,000 tonnes lead, one Ausmelt lead smelter having production capacity of 50,000 tonnes and two Hydro metallurgical zinc smelters namely Hydro-I & Hydro-II having production capacity of 2,10,000 tonnes zinc each. It employs Roast Leach Electro-Wining technology in its Hydro metallurgical smelters, Imperial Smelting process in lead-zinc smelter and Top submerged Lance Technology (Designed by M/s Ausmelt Ltd, Australia) coupled with Cansolv Technology for its lead smelter. In the year 2015-16, Chanderia Lead-Zinc smelter produced 4,88,470 tonnes of zinc and 51,219 tonnes of lead as compared to 4,64,724 tonnes of zinc and 40,763 tonnes of lead in previous year.

Zinc Smelter Debari was commissioned in the year 1968 with an initial production capacity of 18,000 tonnes per annum of zinc and now it reached to 88,000 tonnes per annum of zinc. It is located 13 km north of Udaipur, Rajasthan. Zinc smelter Debari employs Roast leach Electro-Winning Technology at its Hydro metallurgical zinc smelter. The plant has three roasting facilities, leaching and purification section, electrolysis, melting and casting sections. It produced surplus calcine, an intermediate product, which is supplied to the rest of the Hydro metallurgical zinc smelter. In the year 2015-16, zinc smelter Debari produced 66,764 tonnes of zinc as compared to 69,385 tonnes of zinc in the previous year.

Dariba smelting complex is located 75 km north-east of Udaipur near to Rajpura-Dariba Mine and 7 km from Sindesar Khurd mine in Rajsamand district, Rajasthan. The zinc smelter at Dariba was commissioned in march 2010 and has a capacity of 210,000 tonnes per annum while lead smelter was commissioned in July, 2011 with a capacity of 1,00,000 tonnes lead per annum. Dariba smelting complex employs Roast Leach Electro-winning technology at its hydro metallurgical zinc smelter. The plant has two roasting facilities, a leaching and purification section and a cell house. The lead smelter employs SKS bottom blowing technology. The plant consist of SKS furnace – bottom blowing, blast furnace, electric arc furnace & fuming furnace and elecro-refining. Fuming furnace is also installed to produce zinc-oxide from blast furnace slag. In the year 2015-16, the smelter produced 2,03, 704 tonnes of zinc and 1,00,357 tonnes of lead metal as compared to 1,99,694 tonnes of zinc and 94,135 tonnes of lead metal in the previous year.

HZL also have one more zinc smelter situated at Visakhapatnam, Andhra Pradesh. It was commissioned in the year 1978. The production capacity of the smelter is 56,000 tonnes per annum of zinc. The plant operation has been under suspension since February 2012 due to management decision of HZL.

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 1,000 kg and PW Jumbo weighing 600 kg. Lead is available as HZL Grade containing 99.99% Pb (min.) in the form of slab weighing 24 kg.

POLLUTION CONTROL & ENVIRONMENTAL MANAGEMENT EFFORTS

The standard for Emission or Discharge of Environment Pollutant from lead & zinc smelting is prescribed in Schedule-I of the Environment (Protection) Rules, 1986. The standards for Particulate Matter Emission in concentrator for lead & zinc smelter is 150 mg per normal cubic metre and the standard for emission of oxides of sulphur in smelter & convertor is that off-gases must be utilized for sulphuric acid manufacture. The limit of sulphur dioxide emission from stock shall not exceed 4 kg per tonne of concentrated (one hundred percent acid produced).

At underground mines, the tailings generated after beneficiation is utilised to backfill the underground mined stopes and the remaining tailings is stored in tailing dam at various mines location. During the the process of recovery of metal at smelters waste are generated. The waste contains toxic element i.e. waste water effluent sludge, smelter slag leach residues, suspended particulate matter (SPM), SO_2, NO_x and toxic metal fumes which are harmful at low exposure generated during the production of lead & zinc metal.

In the year 2016, HZL invested ₹'42 crore in research for new and innovative ways of protecting the environment and to bring efficiency savings. Smelting and mining operations of HZL are working on zero discharge principle and company is committed for efficient utilization of waste generated at its mines and smelter. HZL successfully implemented 20 million litre per day sewage treatment plant at Udaipur to deal with the water scarcity problem at smelters. In the lead & zinc smelters, SO_x & other toxic gases are also generated during metal production.

The storage battery scrap is the main source of secondary lead production. Many of the secondary lead producing units have operated in the unorganized sector and they create major pollution by emission of lead vapour and SO_X. The small scale units generally do not control process parameters such as smelting temperature, charge to fuel ratio, leakages in the body, etc. As per the National Ambient Air Quality standards, the permissible concentration of lead in ambient air is 0.50 µg/m^3 while the permissible limit for SO_x is 50 µg/m^3.

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 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 reduction of fresh water consumption. The sewage treatment plants at Debari and Chanderiya smelters were operated continuously and the recovered water was 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 footprint emissions.

HZL has entered into a charter on 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 is one of the highest recycled metal. Lead is very easy to recycle. It can be re-melted any number of times, and provided enough processes to remove impurities are performed, the final product (termed secondary lead) is indistinguishable from primary lead produced from ore. The amount of lead recycled is 50% of total lead production worldwide. The figure is higher in Western Europe at 60% and in USA at 70%. Used lead acid battery is one of the largest sources of secondary lead production globally including India. A standard lead acid battery for starting, lighting and ignition of vehicles has the following average composition by weight : Lead metal : 34%; Lead oxide paste : 39%, Electrolyte (free sulphuric acid): 11-12% others (ebonite, PVC, paper etc): 8-10%, polypropylene 5-6%. Lead Battery Industry in India is currently estimated at ₹ 40,000 crore with 60% automotive and 40% industrial. The data from CPCB in respect of recycling unit is not readily available. However, there are 448 lead recyclers plant with production capacity of 16,97,958 tonnes of secondary lead in the country.

Lead when used as metal in batteries, cable sheathing and sheathing for containing radiation is fully recyclable and it does not lose its properties. There is indeed a thriving industry that recycles lead in the country. However, due to the health risk involved in lead recycling the Central Pollution Control Board issues licences to the lead-reprocessors to ensure adherence of stringent environmental norms.

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.

Zinc

The largest consumer of zinc is the Galvanising Industry. The zinc once used for galvanising as well as for brass making is not recoverable. Hence, the quantum of zinc recycling is comparatively small as compared to lead recycling. The secondary zinc was recovered from pure zinc scrap in the form of sheet cutting, zinc roofings, old zinc anodes and alloys containing zinc as a major constituent.

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 & compounds (9%), rolled and extruded products (8%), alloys (3%), cable sheathing (2%) and the balance 4% is consumed by other industries. The production of lead acid batteries by the units in the organised sector in 2015-16 was 849.57 lakh valued at ₹' 1281.91 crore. The apparent consumption of lead during the year 2014-15 and 2015-16 was calculated on the basis of production of lead (primary) and imports & exports of refined lead (unwrought). The apparent consumption thus arrived at was 1,88,336 tonnes in 2014-15 and 1,89,842 tonnes in 2015-16 (Table-18). In addition to this, it is understood that large quantities of recycled lead were also consumed in certain other industries.

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

(In tonnes)

Item	2014-15	2015-16 (P)
Total Production Lead (Primary)	127142	145257
Total Imports*	114773	108521
Total Exports*	53579	63936
Apparent Consumption (Primary)	188336	189842

** DGCI & S, Kolkata.*

Zinc

Owing to its corrosion resistance in varied 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 during the year 2014-15 and 2015-16 was calculated on the basis of production of zinc, import & export of zinc (not alloyed). The apparent consumption, thus arrived at was 5,90,141 tonnes in 2014-15 and 6,34,888 tonnes in 2015-16 (Table-19). The data on trade of zinc (not-alloyed) was taken from DGCI&S. In addition to this, some quantities of recycled zinc are also consumed in certain other industries.

Table – 19 : Apparent Consumption of Zinc (Based on Production of Zinc (Ingots) and Imports & Exports of Zinc (not alloyed)

(In tonnes)

Item	2014-15	2015-16 (P)
Total Production Zinc	732792	758944
Total Imports*	82133	108058
Total Exports*	224784	232114
Apparent Consumption	590141	634888

**DGCI&S, Kolkata.*

SUBSTITUTES & TECHNICAL POSSIBILITIES

Lead

Battery replacements include batteries of nickel-zinc, zinc lithium chloride, sulphide or nickel lithium hydride. 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 applications.

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 shots 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-knocking agent was phased out 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 anti-oxidant 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 being developed and are bound to 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 vehicles have created shortage in the 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 were estimated at 88 million tonnes in terms of lead content. Australia possesses 39.77% of the world's reserves followed by China (19.32%), Russia (7.27%), Peru (7.16%) , Mexico (6.36%) and USA (5.68%), etc. (Table- 20).

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

(In '000 tonnes of lead content)

Country	Reserves
World: Total (rounded)	**88000**
Australia	35000
Bolivia	1600
China	17000
India*	2200
Iran	540
Ireland	600
Kazakhstan	2000
Macedonia	600
Mexico	5600
Peru	6300
Poland	1600
Russia	6400
South Africa	300
Sweden	1100
USA	5000
Turkey	860
Other countries	1500

Source: *Mineral Commodity Summaries, 2017.*
** As per NMI total reserves of lead metal contents are 2482.34 thousand tonnes as on 1.4.2015.*
As per NMI data base based on UNFC System.

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

(In '000 tonnes of zinc content)

Country	Reserves
World: Total (rounded)	**220000**
Australia	63000
Bolivia	4000
Canada	5700
China	40000
India*	10000
Ireland	1100
Kazakhstan	11000
Mexico	17000
Peru	25000
Sweden	3000
USA	11000
Other countries	32000

Source: *Mineral Commodity Summaries, 2017.*
** As per NMI total reserves of zinc metal contents are 9999.52 thousand tonnes as on 1.4.2015.*
As per NMI data base based on UNFC System the total reserves/resources of zinc metal..

Zinc

The world's reserves of zinc were estimated at 220 million tonnes. Australia accounts for 28.64% of world's zinc reserves, followed by China (18.18%), Peru (11.36%), Mexico (7.73%), USA and Kazakhstan (5% each) (Table-21).

PRODUCTION

Lead

World mine production of lead ore was about 5.0 million tonnes in terms of lead content in the year 2015 which is 5.83% less than previous year. China is the leading producing country with 2.3 million tonnes (46%) followed by Australia (13%), USA (7.69%), Peru (6.3%), Mexico (5%), Russia (3.9%), India (2.9%), etc. (Table-22).

Zinc

World mine production of zinc ore was 13.2 million tonnes in terms of zinc content in the year 2015. China is at top position with 4.75 million tonnes thus contributed 35.9% followed by Australia (13%), Peru (10.75%), USA (6.2%), India (5.7%), Mexico (5.1%), Kazakhstan (2.9%) and Canada (2%), etc. (Table- 23).

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

(In '000 tonnes of metal content)

Country	2013	2014	2015
World: Total	**5320**	**5314**	**5004**
Argentina[e]	23	29	26
Australia	711	728	653
Bolivia	82	76	75
China	2697	2609	2300[e]
India*	110	112	148
Iran	42	36	41
Ireland	43	41	31
Kazakhstan	41	38	41
Korea Dem. P.R.[e]	59	53	47
Macedonia	43	44	38
Mexico	253	250	254
Morocco	31	28	32
Peru	266	277	316
Poland	79	83	60[e]
Russia	165	196	196
South Africa	42	29	35
Sweden	60	71	79
Tajikistan	17	28	31
Turkey	77	62	76
USA	340	379	385[e]
Other countries	140	147	140

Source: *World Mineral Production, 2011-2015.*

* *India's production of primary lead in 2013-14, 2014-15 and 2015-16 was 1,22,595 tonnes, 1,27,142 tonnes and 1,45,257 tonnes respectively.*

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

(In '000 tonnes of metal content)

Country	2013	2014	2015
World: Total	**13607**	**13676**	**13227**
Australia	1525	1555	1600
Bolivia	407	449	442
Canada	427	352	277
China	5188	5118	4750
India*	770	769	761
Ireland	327	283	236
Kazakhstan	417	386	384
Mexico	643	660	677
Peru	1351	1315	1422
USA	784	832	825
Other countries	1769	1957	1853

Source: *World Mineral Production, 2011-2015.*

* *India's production of primary zinc in 2013-14, 2014-15 and 2015-16 was 7,66,530 tonnes, 7,32,792 tonnes and 7, 58,944 tonnes respectively.*

Lead

World refined lead production (includes secondary production) was 10.04 million tonnes in which secondary lead production was 5.97 million tonnes in the year 2015. Secondary lead production represented about 59.5% of total refined lead production worldwide in 2015 compared with 55% in 2014. The global production of refined lead in the year 2015 decreased by 8.2% than previous year. China is the largest producer of refined lead with 3.85 million tonnes in the year 2015 and contributed 38.4% of world refined lead production followed by USA (10.9%), Korea Rep. of (6.8%), India (4.4%), Germany (3.8%), United Kingdom (3.5%), Mexico (3%), Canada (2.6%), Japan (2.3%), Australia (2.2%) and Italy (2.1%).

World consumption of refined lead was 10.05 million tonnes in the year 2015 (including secondary lead) which is 8.5% less than the previous year. China is the largest refined lead consuming country with 3.82 million tonnes consumption during the year 2015 which was 38% of world refined lead consumption followed by USA (15.8%), Korea, Rep.of (6%), India (4.8%), Germany (3.5%), and Italy (2.3%). International Lead & Zinc Study Group (ILZSG) anticipates that global demand for refined metal will rise to 11.39 million tonnes in 2017. This will be primarily a consequence of higher output in China and India

with smaller increase forecast in Belgium and the USA where Aqua metals recently commisioned new used lead-acid battery recycling plants in Nevada.

Australia

In 2015, lead mine production in Australia decreased by about 10% as a result of reduced production at Ivernia Inc.'s (Canada) Paroo Station Mine (85,000-t/yr production capacity) in Western Australia. In January 2015, the mine was placed on care-and-maintenance status owing to market conditions, primarily due to the decline in lead prices. In 2014, the mine produced 80,900 tonnes of lead in concentrates.

Canada

Trevali Mining Corp. announced the commissioning of the mill at its Caribou Zinc Mine in northern New Brunswick following the start of underground mining operations earlier in the year. The company expected that the mill could process 3,000 t/d of ore and produce about 14,000 t/y of lead in concentrate at full capacity

China

In 2015, China continued to be the leading global producer and consumer of lead and the leading producer of lead-acid batteries, although declines were reported for each compared with those in 2014. Refined lead production in 2015 decreased by 7% to 4.40 million tonnes from 4.74 million tonnes in 2014, the second consecutive annual decrease. The decline in primary refined lead production was attributed to less available production capacity in 2015 following plant shutdowns for maintenance or environmental reasons. The decline in secondary production was partially attributed to the reduction of a value-added tax rebate to 30% from 50% in July 2015 that increased the tax burden on secondary lead producers and resulted in some producers cutting back production during the second half of 2015. Lead in concentrate production in 2015 was about 2.40 millon tonnes, a 17% decrease from the 2.90 million tonnes produced in 2014 and an 18% decrease from production in 2013. The decrease in mine production was attributed to price-induced production cutbacks and an increase in environmental regulations for mines by Provincial government.

According to the ILZSG, consumption of lead in China decreased by 6% to 4.41 million tonnes in 2015 from 4.71 million tonnes in 2014. The decline in domestic lead consumption was attributed to a slowdown in sales of electric bikes in 2015, as was the case in 2014, which accounted for about 30% of annual lead consumption.

Zinc

World refined zinc production was 13.98 million tonnes in the year 2015 and is 3.14% more than the previous year. The production mainly increased in China, India, Korea Rep. of, and Canada.

China is the largest producer of refined zinc with 6.15 million tonnes in the year 2015 which contributed 44% of world refined zinc production followed by Korea Rep. of (7%), India (5.8%), Canada (4.8%), Japan (4%), Spain (3.8%), Australia (3.4%), Peru (2.4%) and Kazakhstan (2.3%).

The world consumption of refined zinc was 13.87 million tonnes in the year 2015 which is 0.64% more than the previous year. China is the largest refined zinc consuming country with 6.48 million tonnes in the year 2015 which accounted for 46.7% of world followed by USA (6.7%), Korea, Rep. of (4.6%), India (4.4%), Japan (3.5%), Germany (3.4%).

ILZSG forecasts that world refined zinc metal production is expected to increase by 6.7% to 13.7 million tonnes in 2017, and the consumption of refined zinc metal is expected to increase by 2.6% to 14.30 million tonnes in 2017. Demand is forecast to continue to growing demand in China and India, to remain stable in Japan South Korea and to fall in Thailand.

Australia

In August, MMG Ltd completed mining activities at the Century Mine and continued to process about 700,000 t of stockpiled ore during the final months of 2015. Century operated for 16 years, and at full production, was one of the leading global zinc-producing mines. In 2015, the mine produced 393,000 t of zinc in concentrate, 16% less than that in 2014.

Canada

Zinc mine production in Canada was 277,000 t in 2015, 21% less than that in 2014. Production decreased in 2015 owing mostly to the closure of Yukon Zinc Corp.'s Wolverine Mine, lower zinc in concentrate output at Glencore's Matagami mill, and the temporary suspension of operations at Nyrstar's Myra Falls Mine. In January, Yukon Zinc announced that it planned to put the Wolverine Mine on care-and-maintenance status as a result of low zinc prices and high operating costs. Wolverine had been operating at 75% of capacity since 2013, producing 84,000 t of zinc concentrate (gross weight) in 2014. Nyrstar suspended operations at Myra Falls in order to improve mine conditions, and the company initially planned to restart the mine in the latter half of 2016. However, Nyrstar decided to defer development work at Myra Falls for at least an additional year due to the zinc price decline in the second half of 2015. Myra Falls produced 9,000 t of zinc in 2015 compared with 26,700 t in 2014.

China

Zinc mine production in China decreased by 13% in 2015 from that of 2014 to 4.3 million tonnes and took place predominantly in the Inner Mongolia Autonomous Region and Hunan & Yunnan Provinces, where combined production accounted for more than one-half of China's zinc in concentrate production in 2015. According to Beijing Antaike Information Development Co., Ltd. (Antaike), stricter environmental regulations caused many small mines to close during the year, whereas other mines stopped production as a result of high smelter treatment charges and low zinc prices in the second half of the year. As a result of the decrease in mine production, China's net imports of zinc in concentrate increased considerably (by 37%) in 2015 to about 1.5 million tonnes. About 70% of China's zinc concentrate imports (gross weight) were sourced from Australia and Peru.

Zinc metal production rose by 5% in 2015 from that of 2014 to 6.1 million tonnes. Zinc smelters in China were reported to have operated at higher production rates in 2015 than in 2014 due to an increase in domestic smelter treatment charges during the year. Hunan, Shaanxi, and Yunnan were the three leading zinc-metal-producing Provinces in China and accounted for about one-half of the country's zinc metal production in 2015. Domestic smelter production capacity in China increased by at least 200,000 t/yr in 2015; Anhui Tongguan Non-Ferrous Metal Chizhou Co. Ltd and Western Mining Co. Ltd each added 100,000 t/yr of zinc metal production capacity at their smelters in Chizhou, Anhui Province, and Xining, Qinghai Province, respectively.

China's zinc consumption increased at a slower rate in 2015 from that of 2014, coinciding with a decreasing growth rate in the country's automotive, construction, and industrial sectors. ILZSG reported a slight year-on-year increase in zinc consumption in 2015 compared with an 8% increase in 2014.

Ireland

Zinc mine production in Ireland decreased by 16% in 2015 from that of 2014 to 236,000 t of contained zinc mostly as a result of the closure of Vedanta's Lisheen Mine. Mining activities at Lisheen concluded in November, and concentrate production stopped in December. Lisheen began

operating in 1999 and typically produced about 300,000 t/yr of zinc concentrate.

Namibia

Zinc mine and metal production decreased notably in Namibia in 2015 owing mostly to a decline in production at Vedanta's Skorpion complex in the southern Namib Desert. Mined zinc oxide ore at Skorpion was treated onsite at an SX–EW refinery with the capacity to produce 150,000 t/yr of SHG zinc. Vedanta reported that zinc metal production at Skorpion was 82,000 t in the fiscal year ending March 31, 2016, 20% less than production in the previous fiscal year as a result of lower ore grades at the mine, planned maintenance at the refinery, and a slower than anticipated rampup after maintenance work was completed. The company anticipated that the mine would close in the fiscal year ending March 31, 2017, and considered increasing the depth of the deposit to potentially extend the mine life to the fiscal year ending March 31, 2019. In November 2014, Vedanta announced that it had approved investment for the Gamsberg-Skorpion Integrated Zinc Project. The project included developing the Gamsberg zinc deposit in South Africa into an open pit mine and reconfiguring the Skorpion refinery to allow it to treat zinc sulfide concentrates, including those generated by Gamsberg. At the end of the fiscal year ending March 31, 2016, Vedanta was in the process of finalizing a feasibility study for the refinery conversion.

Peru

Zinc mine production in Peru increased by 8% in 2015 from that of 2014 mostly as a result of increased production at the Antamina copper-zinc mine. Zinc production increased by 11% at Antamina in 2015 to 235,000 t due to increased mill throughput and share of copper-zinc ore processed as opposed to copper ore. From 2017 through 2019, zinc production at Antamina was projected to increase significantly as mining was expected to take place in an area of higher zinc grades resulting in an increased proportion of copper-zinc ore mined. Copper and zinc production at Antamina can vary significantly from year to year due to the geology of the deposit. The Colquijirca Mine reached its full processing capacity of 18,000 t/d in December, resulting in zinc production increasing to 53,300 t in 2015 from 10,100 t in 2014. El Brocal completed a mill capacity expansion project at Colquijirca in 2014 that included building a second processing plant with a capacity of 11,000 t/d for the treatment of lead-zinc ore and increasing the capacity of the original concentrator, allocated for the treatment of copper ore from the adjacent Marcapunta Mine, to 7,000 t/d from 5,000 t/d .

South Africa

In November 2014, Vedanta approved capital expenditure for the Gamsberg-Skorpion Integrated Zinc Project, which included the development of the Gamsberg zinc deposit. According to the company, Gamsberg was one of the largest undeveloped zinc-bearing ore bodies globally and, once developed, would partially replace the zinc production lost from the closure of the company's Lisheen zinc mine in Ireland. Located in the Northern Cape Province near Vedanta's Black Mountain zinc mine, the deposit would be developed into an open pit mine that was expected to produce 250,000 t/yr of zinc in concentrate during a 13-year mine life with potential for further expansion. Vedanta began development work at Gamsberg. Mill construction and prestripping activities were expected to take 2 years to complete, and production was projected to begin in 2018 with the mine reaching full capacity in 9 to 12 months.

FOREIGN TRADE

Lead

Exports

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

and others.

Exports of lead ores and concentrates decreased drastically from 509 tonnes in 2014-15 to negligible quantity in 2015-16. Exports of lead and alloys including scrap increased to 89,389 tonnes during 2015-16 as compared to 76,289 in the preceding year. Export of lead and alloys increased to 89,379 tonnes in 2015-16 as compared 76,173 tonnes in the previous year. Export of refined lead, unwrought also increased to 63,936 tonnes in 2015-16 as compared to 53,579 tonnes in 2014-15. In 2015-16, USA with 29% followed by Rep. of Korea (18%) and Vietnam (17%) were the major export destinations for refined lead unwrought (Tables- 24 to 30).

Imports

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

Imports of lead ores & concentrates decreased drastically to 5,334 tonnes in 2015-16 as compared to 39,441 tonnes in 2014-15. Imports were mainly from UAE (32%), Turkey (30%) and Qatar (11%). Total imports of lead & alloys and scrap during 2015-16 were 2,68,607 tonnes as compared to 2,95,474 tonnes during 2014-15. Out of which imports of lead and alloys & scrap during 2015-16 were 2,09,883 & 58,724 tonnes, respectively compared to 2,34,743 & 60,731 tonnes respectively in 2014-15.

Imports comprised mainly of lead and alloys and the rest was scrap (22%). The major suppliers during 2015-16 were Korea, Rep. of & Australia 19% each,UAE (11%), UK & USA (6% each). (Tables- 31 to 38).

Zinc

Exports

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

Exports of zinc ores & concentrates increased to 558 tonnes in 2015-16 as compared to 41 tonnes in the previous year. China is the solely importer of zinc ores & concentrates drastically by13 times country.

Exports of zinc & alloys and scrap during 2015-16 were 2,57,634 tonnes as against 2,46,395 tonnes in the preceding year. Almost entire exports during 2015-16 were of zinc & alloys while those of scraps were nominal. Malaysia (20%), Korea, Rep. of (17%), Singapore (12%), Chinese Taipei/Taiwan (10%), UAE (6%) were the main export destinations for zinc alloys & scrap. Export of zinc (scrap) were at 44 tonnes in 2015-16 as compared to 130 tonnes in the preceding year (Tables-39 to 42).

Imports

Imports of zinc in the country are in the form of zinc ores & concentrates, zinc & alloys including scrap, zinc or spelter and zinc & alloys in the forms of bars, rods, plates, mazak, etc. Imports of zinc ores & concentrates decreased drastically to 385 tonnes in 2015-16 from 35,696 tonnes in the preceding year. Imports were mainly from USA (51%), Ethiopia (26%) and UAE (23%). Imports of zinc and alloys during 2015-16 were 1,68,359 tonnes as compared to 1,66,519 tonnes in 2014-15. Imports of zinc (scrap) were 58,944 tonnes during 2015-16 as compared to 83,663 tonnes during the previous year. Imports of zinc or spelter were at 1,37,761 tonnes during 2015-16 as compared to 1,19,998 tonnes during the previous year. The major suppliers of zinc & alloys during 2015-16 were Korea, Rep. of (51%), UAE (14%), Australia (8%) and Spain (6%) etc. (Tables- 43 to 48).

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

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**509**	**22298**	**++**	**216**
Sri Lanka	6	136	++	215
China	501	21913	-	-
Maldives	2	246	-	-
UK	++	3	-	-
Other countries	-	-	++	1

Table – 25 : Exports of Lead and Alloys (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**76173**	**10599712**	**89379**	**11882683**
Korea, Rep. of	23628	3278157	24916	3190569
USA	10318	1414442	18952	2328650
Vietnam, Soc. Rep.	2762	356790	11140	1450705
UAE	1287	248609	3170	589652
Chinese Taipei/Taiwan	3714	506857	4427	584365
Thailand	2428	323464	3195	420636
Japan	2102	346296	2653	371590
Malaysia	852	135907	1695	294918
Indonesia	1274	162007	2276	290602
Korea, Dem. Rep of	4158	543843	2071	290074
Other countries	23650	3283340	14884	2070922

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

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**76289**	**10617034**	**89389**	**11883144**
Korea, Rep. of	23726	3293347	24916	3190569
USA	10318	1414442	18952	2328650
Vietnam Soc Rep	2762	356790	11140	1450705
UAE	1287	248609	3170	589655
Chinese Taipei/ Taiwan	3714	506857	4427	584365
Thailand	2428	323464	3195	420636
Japan	2102	346296	2653	371590
Malaysia	852	135907	1695	294918
Indonesia	1274	162007	2276	290602
Korea, Dem.Rep.of	4158	543843	2071	290074
Other countries	23668	3285472	14894	2071380

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

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**116**	**17322**	**10**	**461**
Oman	-	-	10	457
UAE	-	-	++	3
Australia	-	-	++	1
Korea, Rep. of	98	15190	-	-
UK	18	2132	-	-

Table – 28 : Exports of Refined Lead, Unwrought (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**53579**	**7177212**	**63936**	**8055807**
USA	10235	1396103	18836	2309273
Vietnam, Soc. Rep.	2727	351812	11119	1447649
Korea, Rep. of	13507	1814668	11554	1437601
Chinese Taipei/ Taiwan	3714	506857	4426	584081
Thailand	2182	288699	3010	394302
Japan	1222	162978	2209	272204
Brazil	195	25368	1901	240030
Turkey	--	--	1895	236367
Korea, Dem. Rep. of	3928	512664	1682	204960
Indonesia	914	110761	1246	156319
Other countries	14955	2007302	6058	773021

Table – 29 : Exports of Lead & Alloys Unwrought, NES (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**10574**	**1705155**	**19013**	**2883698**
Korea, Rep. of	4454	684676	10880	1412535
UAE	740	150449	1126	300489
Malaysia	167	32702	812	178352
Saudi Arabia	646	89686	1277	159901
Iran	52	15735	737	140287
Indonesia	262	38036	906	118887
Sri Lanka	1234	183349	693	99496
Japan	796	170896	424	96732
Bulgaria	-	-	598	80345
Korea Dem. Rep of	101	13550	273	70108
Other countries	2122	326076	1287	226566

Table – 30 : Exports of Lead (Scrap) (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**116**	**17322**	**10**	**461**
Oman	-	-	10	457
UAE	-	-	++	3
Australia	-	-	++	1
Korea, Rep. of	98	15190	-	-
UK	18	2132	-	-

Table – 31 : Imports of Lead Ores & Conc. (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**39441**	**3846804**	**5334**	**264662**
Turkey	7581	872874	1597	91167
UAE	2068	117736	1707	67126
Qatar	-	-	607	34105
Saudi Arabia	185	8764	503	24102
Yemen Republic	416	18633	331	16668
Morocco	84	5550	127	8778
Sudan	43	2398	198	8586
Singapore	-	-	75	5737
Jordan	-	-	80	3856
Ivory Coast/Cote-D Ivoire	26	949	50	2074
Other countries	29038	2819900	59	2463

Table – 32 : Imports of Lead and Alloys Including Scrap : Total (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**295474**	**38467363**	**268607**	**32144471**
Korea, Rep. of	46262	6656944	51787	6870748
Australia	52273	6954497	49841	6301454
UAE	39352	4934296	30475	3134784
UK	21033	2644130	16256	1900189
USA	15812	1891617	16606	1813734
Malaysia	10929	1430601	13391	1576100
Vietnam Soc Rep	7424	960455	10031	1195801
Bangladesh	9185	1191550	8949	1072698
Lao Pd Rp	2191	274875	7563	884282
Saudi Arabia	15115	1913173	6254	713121
Other countries	75898	9615225	57454	6681560

Table – 33 : Imports of Lead & Alloys (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**234743**	**31599899**	**209883**	**26265199**
Korea, Rep. of	46262	6656944	51787	6870748
Australia	49825	6681793	48115	6110039
UAE	31809	4222388	17425	2093616
Malaysia	10854	1421349	12675	1511107
Vietnam, Soc. Rep.	7424	960455	10031	1195801
Bangladesh	9185	1191550	8949	1072698
Lao, Pd. Rep.	2191	274875	7563	884282
UK	4845	682180	7184	876515
Saudi Arabia	15095	1910751	6132	703391
Russia	4038	519917	5982	697077
Other countries	53215	7077697	34040	4249925

Table – 34 : Imports of Lead (Scrap) (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**60731**	**6867464**	**58724**	**5879272**
USA	14449	1706394	16260	1762760
UAE	7543	711908	13050	1041168
UK	16188	1961950	9072	1023674
Netherlands	2160	245452	3028	329153
Spain	1322	157494	1868	207201
Germany	2290	259020	1952	206393
Australia	2448	272704	1726	191415
Nigeria	738	74168	1253	96044
Kuwait	953	115827	922	91684
Malaysia	75	9252	716	64993
Other countries	12565	1353295	8877	864787

Table – 35 : Imports of Lead: Pig Lead (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**9516**	**1256598**	**5243**	**617931**
UAE	3732	493103	2558	304952
Saudi Arabia	356	47493	723	80550
Ghana	103	12514	306	36449
France	274	34769	224	27044
Brazil	-	-	201	26265
Italy	-	-	177	21481
Malaysia	45	5583	177	20517
Australia	-	-	140	16411
Nigeria	686	90876	127	14071
Cameroon	-	-	98	11816
Other countries	4320	572260	512	58375

Table – 36 : Imports of Lead Unrefined NES (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**34682**	**4422506**	**33988**	**4057969**
Bangladesh	7896	1021379	8909	1067651
Vietnam, Soc. Rep.	3925	506427	7650	910725
Malaysia	2967	383645	4074	483696
UAE	6371	814199	3172	382837
Russia	218	28547	1517	172123
Lao, Pd. Rep.	609	79453	1429	169192
Nigeria	565	70273	976	115256
Saudi Arabia	3080	387165	941	103667
Australia	--	--	548	76681
Ghana	749	92176	548	61768
Other countries	8302	1039242	4224	514373

Table – 37 : Imports of Refined Lead Unwrought (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**114773**	**15566390**	**108521**	**13596144**
Australia	43493	5796065	42390	5365656
Korea, Rep. of	31312	4366440	36023	4609201
UK	4212	588008	6601	795339
UAE	9243	1276111	5163	615396
Russia	3456	445379	4157	487126
Indonesia	240	30977	3394	425255
Malaysia	4616	601904	3356	406783
France	947	127045	1265	157391
Uzbekistan	330	39465	1107	124238
Nigeria	292	37154	819	101229
Other countries	16632	2257842	4246	508530

Table – 38 : Imports of Lead (By Items)

Item	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Items	**238450**	**31338681**	**295474**	**38467363**
Lead & Alloys:	179617	24735385	234743	31599899
Antimonial Lead	3169	441263	4959	695252
Lead & Alloys: Worked (Bars, Rods, Plates, etc)	445	145956	397	170037
Lead & Alloys: Uwrought Nes	65799	9052583	70416	9489116
Lead Unrefined, Nes	7605	996384	34682	4422506
Lead: Pig Lead	4636	590081	9516	1256598
Refined Lead, Unwrought	97963	13509118	114773	15566390
Lead (Scrap)	58833	6603296	60731	6867464

Table – 39 : Exports of Zinc Ores & Concentrates (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**41**	**744**	**558**	**11345**
China	40	722	558	11337
Australia	++	3	++	8
Nepal	1	12	-	-
Kazakhstan	++	5	-	-
Ireland	++	2	-	-

Table – 40 : Exports of Zinc & Alloys Including Scrap : Total (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**246395**	**37553145**	**257634**	**34345671**
Malaysia	16155	2520784	50446	6196724
Korea, Rep. of	33386	5014312	42561	5695185
Singapore	2458	355384	32025	4265357
Chinese Taipei/ Taiwan	23564	3703163	26337	3756779
UAE	19720	3096508	14796	2089629
Nepal	12625	1834209	13687	1856487
China	61245	9004014	9356	1261203
Indonesia	12215	1890851	8992	1176553
Thailand	7972	1213919	7121	978179
Bangladesh	829	121147	7233	876003
Other countries	56226	8798854	45080	6193572

Table – 41 : Exports of Zinc & Alloys (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**246265**	**37526431**	**257590**	**34339940**
Malaysia	16155	2520777	50446	6196724
Korea, Rep. of	33386	5014312	42561	5695185
Singapore	2403	348855	32003	4262587
Chinese Taipei/ Taiwan	23564	3703163	26337	3756779
UAE	19645	3076342	14776	2087147
Nepal	12625	1834203	13687	1856487
China	61245	9004014	9356	1261203
Indonesia	12215	1890851	8992	1176553
Thailand	7972	1213919	7121	978179
Bangladesh	829	121142	7233	876003
Other countries	56226	8798853	45078	6193093

Table – 42: Exports of Zinc (Scrap) (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**130**	**26714**	**44**	**5731**
Singapore	55	6529	22	2770
UAE	75	20166	20	2482
USA	-	-	2	387
UK	-	-	++	66
France	-	-	++	22
Canada	-	-	++	3
Malaysia	++	7	-	-
Nepal	++	6	-	-
Bangladesh	++	5	-	-
Other countries	++	1	++	1

Table – 43 : Imports of Zinc Ores & Conc. (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**35696**	**1693837**	**385**	**18722**
USA	51	4593	198	7507
Ethiopia	151	8939	100	5831
UAE	23	1360	87	5384
Turkey	17645	816117	-	-
Australia	9752	518957	-	-
Saudi Arabia	8006	340046	-	-
Argentina	49	2625	-	-
Canada	19	1200	-	-
Other countries	-	-	-	-

Table – 44 : Imports of Zinc and Alloys Including Scrap (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**250182**	**34291939**	**227303**	**30128365**
Korea, Rep. of	60713	9104765	88053	12262031
UAE	19985	2680542	29826	3655031
Australia	17060	2567974	14653	2082969
Spain	12563	1743592	10548	1 503733
USA	13784	1737320	10419	1211820
Malaysia	6448	848222	9226	1196250
Belgium	16505	2278259	5649	726239
Kazakhstan	14443	2050442	4436	642330
Saudi Arabia	5697	660687	5395	589111
China	4255	903790	1368	539651
Other countries	78729	9716346	47730	5719200

Table – 45 : Imports of Zinc & Alloys (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**166519**	**24899842**	**168359**	**23734743**
Korea, Rep. of	57832	8781039	85973	12042095
UAE	1461	2060086	24302	3069266
Australia	15436	2373792	13945	2004568
Spain	11116	1579589	9710	1409923
Malaysia	2900	464253	6000	862017
Kazakhstan	14443	2050442	4436	642330
China	4255	903790	1367	539561
Belgium	12993	1871623	3923	532669
Peru	2702	387403	3021	417606
Netherlands	952	145043	2568	368172
Other Countries	29280	4282782	13114	1846536

Table – 46 : Imports of Zinc or Spelter (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**119998**	**17549908**	**137761**	**8888382**
Korea, Rep. of	39487	5953348	70591	9820499
UAE	13927	1957304	23054	2923902
Australia	6396	974098	10292	1473803
Spain	6244	886658	9664	1404248
Kazakhstan	14443	2050442	4436	642330
Malaysia	902	128346	3872	513384
Peru	2652	379315	3021	417606
Netherlands	952	144867	2497	353606
Belgium	10882	1577439	2386	307835
Singapore	571	74907	1467	189817
Other countries	23542	3423184	6481	841352

Table – 47 : Imports of Zinc (Scrap) (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**83663**	**9392097**	**58944**	**6393622**
USA	10900	1283901	9462	1055239
UAE	5375	620456	5524	585765
Saudi Arabia	5409	624604	5071	552717
Italy	3821	445739	4084	447569
Mexico	4951	573694	3450	391363
Malaysia	3548	383969	3226	334233
Thailand	4061	445631	2395	250576
Korea, Rep. of	2881	323726	2080	219936
Belgium	3512	406636	1726	193570
UK	2097	239338	1727	186224
Other countries	37108	4044403	20199	2176430

Table – 48 : Imports of Zinc
(By Items)

Item	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Items	**250182**	**34291939**	**227303**	**30128365**
Zinc & alloys	166519	24899842	168359	23734743
Mazak	14752	2235837	15371	2207388
Zinc & alloys: worked (bars, rods, plates, etc.)	8607	1362109	5518	911700
Zinc & alloys, NES	23162	3751988	9709	1727273
Zinc or spelter	119998	17549908	137761	18888382
Zinc (Scrap)	83663	9392097	58944	6393622

FUTURE OUTLOOK

HZL has ambitious plans to expand in mining extraction & production of zinc, depending on the country's need while in lead, the reycling sector is likely to emerge as the major sector in future.

As every major national plans sees continuous rise in the power generation capacity of the country, the demand for galvanised transmission tower also increases by about 4-5% along with increasing necessity of errection of mobile towers, higher investment in the infrastructure, Railways will also lead to increase the use of galvanised steel. Over the past decade, zinc consumption in India has trebled, the CAGR from 2001 to 2009 being 10%. CARE Research predicts zinc demand to grow at the rate of 8 to 9% in the current decade (2010-20). The domestic demand is expected to reach 09 lakh tonnes by 2020. Lead metal will remain in demand for the electric vehicles in view of pressure on petrol fuel driven automobiles. Increased volume of transportation prompted by higher industralisation is going to keep lead in demand. Government entrust in Automobile Industries to produce battery running vehicles. All the automobile sector was recommended by Government to encourage the investment in battery vehicles. So there is huge demand in future and it is expected to be 6 lakh tonnes by 2020.