

LEAD & ZINC



Indian Minerals Yearbook 2019

(Part- II :Metals and Alloys)

58th Edition

LEAD & ZINC

(ADVANCE RELEASE)

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

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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.

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

Zinc is the fourth most widely used metal across the globe, trailing only steel, aluminium and copper. The country has the 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 56% 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 2018-19 due to shutdown of the operation of Edayar Zinc Limited (EZL). EZL is in the process of arriving at a settlement with the banks. The banks have taken over physical possession of the secured assets of EZL on 23rd July 2019. The

consortium of banks led by Punjab National Bank have taken physical possession of the mortgaged assets and has conducted auctions for sale of the mortgaged properties.

RESERVES/ RESOURCES

The total reserves/resources of lead and zinc ore as on 1.4.2015 as per NMI data base 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

The Exploration & Development details, if any, are shown in the review on Exploration & Development in "General Reviews".

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**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		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%	17597	36790	-	54387	155	148	81	-	24850	44605	-	69839	124226
Ore with 5-10 %	14065	31897	5767	51729	5280	17146	31216	32449	29335	162730	-	278156	329885
Ore with (-)5%	-	-	-	-	129	117	-	4606	137898	148068	4530	295348	295348
Pb & Zn	624.56	1666.02	191.76	2482.34	119.31	521.74	780.56	690.65	2171.43	6237.67	-	10521.36	13003.7
Lead 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
Zinc metal	-	-	-	-	-	-	-	-	-	120.76	22.37	143.13	143.13
Lead & Zinc metal	-	-	-	-	-	-	-	-	-	-	-	-	-
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.)

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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	12888	29734	28779	170547	317929	1380	564221	670338	
Lead metal	624.56	1666.02	191.76	2482.34	390.22	733.23	490.82	1860.47	5462.09	-	8982.04	11464.38	
Zinc metal	2871.75	6728.14	399.63	9999.52	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

PRODUCTION & STOCKS

Lead & Zinc Ores and Concentrates

The entire output of lead & zinc ore and concentrates in 2017-18 and 2018-19 was reported by mines owned by Hindustan Zinc Ltd, a Private Sector company.

The production of lead and zinc ore at 13.75 million tonnes in 2018-19 increased by 9% as compared to that in the previous year. The metal content of lead and zinc in the ore produced in 2018-19 works out to 2,65,651 tonnes and 8,10,805 tonnes respectively as against the corresponding figures 2,28,733 & 8,34,689 tonnes in the preceding year (Tables-2 & 3).

During the year 2018-19, 14.19 million tonnes of lead & zinc ore was treated as against 12.92 million tonnes in 2017-18 (Table-4).

The production of lead concentrates in 2018-19 at 3,58,370 tonnes increased by 17% as compared to the previous year. Entire production of lead concentrates was reported from Rajasthan (Tables-5 & 6).

The production of zinc concentrates decreased to 14,57,171 tonnes in 2018-19 from 15,39,657 tonnes in 2017-18. The entire production of zinc concentrates was reported from Rajasthan (Tables - 7 & 8).

Grade Analysis

All India average metal content of ore treated during 2018-19 worked out to be 7.74% (1.89% Pb and 5.85% Zn) as against 8.40% (1.78% Pb and 6.62% Zn) in 2017-18. The metal content of ore treated at Rampura Agucha mine in Bhilwara district Rajasthan was the highest at 11.60% (1.49% Pb & 10.11% Zn). The lead concentrates produced during 2018-19 was of grade 57.78% Pb as against 56.73% Pb in 2017-18. Metal content of zinc

concentrates produced in Rajasthan worked out to 50% Zn in 2018-19 as against 50.18% Zn in the previous year.

Stock

Mine-head closing stocks of lead concentrates in 2018-19 were 6,684 tonnes as against 34,259 tonnes in 2017-18. The entire quantity of the stocks at the end of the year was held in Rajasthan (Table-9).

Mine-head closing stocks of zinc concentrates in 2018-19 were 23,272 tonnes as against 27,052 tonnes in 2017-18. The entire quantity of the stocks was held in Rajasthan (Table-10).

Employment

The average daily labour employed in lead and zinc mines during the year 2018-19 under review was 10,551 as against 8,056 in 2017-18.

Lead and Zinc Metals

The production of primary lead during 2018-19 increased by 17.58% to 1,97,839 tonnes from 1,68,245 tonnes during 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 6,96,283 tonnes in 2018-19 decreased by 12% from 7,91,461 tonnes in the previous year. Hindustan Zinc Ltd, contributed 100% of the total output. (Tables - 11 to 14).

Table - 2 : Producers of Lead & Zinc Ore, Concentrates & Metals, 2018-19

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

Table - 3 : Production of Lead and Zinc Ore, 2017-18 and 2018-19 (By State)

State	2017-18		2018-19 (P)			
	Ore Produced	Metal content		Ore Produced	Metal content	
		Lead (Pb)	Zinc (Zn)		Lead (Pb)	Zinc (Zn)
India	12613866	228733	834689	13752297	265651	810805
Rajasthan	12613866	228733	834689	13752297	265651	810805

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**Table – 4 : Lead and Zinc Ore Treated, 2017-18 and 2018-19
(By State)**

(In tonnes)

State	2017-18			2018-19 (P)		
	Ore Treated	Metal content		Ore Treated	Metal content	
		Lead (Pb)	Zinc (Zn)		Lead (Pb)	Zinc (Zn)
India	12919068	229337	855664	14194918	268977	829930
Rajasthan	12919068	229337	855664	14194918	268977	829930

**Table – 5 : Production of Lead Concentrates, 2016-17 to 2018-19
(By State)**

(Quantity in tonnes; Value in ₹'000)

State	2016-17		2017-18		2018-19 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	268047	9669267	306397	11429414	358370	16316814
Rajasthan	268047	9669267	306397	11429414	358370	16316814

**Table – 6 : Production of Lead Concentrates, 2017-18 and 2018-19
(By Sector/State/Districts)**

(Quantity in tonnes; Value in ₹'000)

State/District	2017-18				2018-19 (P)			
	No. of mines	Production			No. of mines	Production		
		Quantity	Pb%	Value		Quantity	Pb%	Value
India	8	306397	56.73	11429414	8	358370	57.78	16316814
Private Sector	8	306397	56.73	11429414	8	358370	57.78	16316814
Rajasthan	8	306397	56.73	11429414	8	358370	57.78	16316814
Ajmer	1*	-	-	-	1	-	-	-
Bhilwara	1	91421	57.41	2920824	1	77612	57.92	2963123
Rajsamand	2	164327	55.39	5901583	2	210299	55.83	8542830
Udaipur	4	50649	59.87	2607007	4	70459	63.44	4810861

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

**Table – 7 : Production of Zinc Concentrates, 2016-17 to 2018-19
(By State)**

(Quantity in tonnes; Value in ₹'000)

State	2016-17		2017-18		2018-19 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	1484244	43385599	1539657	49798274	1457171	56083774
Rajasthan	1484244	43385599	1539657	49798274	1457171	56083774

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**Table – 8 : Production of Zinc Concentrates, 2017-18 & 2018-19
(By Sector/State/Districts)**

(Quantity in tonnes; Value in ₹'000)

State/District	No. of mines	2017-18			No. of mines	2018-19 (P)		
		Production				Production		
		Quantity	Zn%	Value		Quantity	Zn%	Value
India	@	1539657	50.18	49798274	@	1457171	50.00	56083774
Private Sector	@	1539657	50.18	49798274	@	1457171	50.00	56083774
Rajasthan	@	1539657	50.18	49798274	@	1457171	50.00	56083774
Bhilwara	@	1064141	50.11	32475626	@	910223	50.04	32528451
Rajsamand	@	402884	49.57	13616706	@	442085	49.36	16908683
Udaipur	@	72632	54.53	3705942	@	104863	52.31	6646640

@ Associated mines with lead concentrates

**Table – 9 : Mine-head Closing Stocks
of Lead Concentrates,
2017-18 & 2018-19
(By State)**

(In tonnes)

State	2017-18	2018-19 (P)
India	34259	6684
Rajasthan	34259	6684

**Table – 11 : Production of Lead Metal,
2016-17 to 2018-19**

(Quantity in tonnes; Value in ₹'000)

Year	Lead Primary	
	Quantity	Value
2016-17	142231	23270410
2017-18	168245	28487471
2018-19 (P)	197839	33814419

**Table – 10 : Mine-head Closing Stocks
of Zinc Concentrates,
2017-18 & 2018-19
(By State)**

(In tonnes)

State	2017-18	2018-19 (P)
India	27052	23272
Rajasthan	27052	23272

**Table – 12 : Production of Zinc Metal,
2016-17 to 2018-19**

(Quantity in tonnes; Value in ₹'000)

Year	Zinc Ingots	
	Quantity	Value
2016-17	672010	128211275
2017-18	791461	169157981
2018-19 (P)	696283	113894301

**Table – 13 : Production of Lead (Primary), 2017-18 and 2018-19
(By State/Plant)**

(Quantity in tonnes; Value in ₹'000)

State	Plant	2017-18		2018-19 (P)	
		Quantity	Value	Quantity	Value
India		168245	28487471	197839	33814419
Rajasthan	HZL Chanderiya/ Dariba	168245	28487471	197839	33814419

**Table – 14 : Production of Zinc (Ingots), 2017-18 and 2018-19
(By States/Plants)**

(Quantity in tonnes; Value in ₹'000)

State	Plant	2017-18		2018-19 (P)	
		Quantity	Value	Quantity	Value
India		791461	169157981	696283	153894301
Rajasthan	HZL Chanderiya/ Debari/Dariba	791461	169157981	696283	153894301

MINING & MILLING

HZL is the only integrated lead and zinc metal producer in the country. Its operations 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. All the mines of HZL having underground mining operations. Rampura- Agucha mine was completely turned to underground mine with an annual production capacity of 5 million tonnes of lead & zinc ore. Sindesar-Khurd mine is highly mechanised and the largest ore producing underground mine with annual production capacity of 6 million tonnes. The other six mines viz, Rajpura-Dariba, Zawar group of mines (Mochia, Balaria, Zawarmala and Baroi) and Kayad mine are underground mines with an annual production capacity of 1.08 million tonnes, 4.0 million tonnes and 1.2 million tonnes of lead & zinc ore respectively (Table-15).

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 commissioned in the year 1966. Zawar group of mines, one of the oldest mines is 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 are 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 2018-19, the Zawar group of mines produced 2.86 million tonnes ore at 2.36% Zn and 1.97% Pb feed grade. During the year 2018-19, mine

**Table – 15 : Ore Production Capacity of
HZL Mines**

Mine	Ore	Capacity (million tpy)
Total		17.28
Zawar Mines, Distt Udaipur, Rajasthan.	Zinc-lead	4.00
Rajpura-Dariba, Distt Rajsamand, Rajasthan.	Zinc-lead	1.08
Sindesar-Khurd Mine, Distt Rajsamand, Rajasthan.	Zinc-lead	6.00
Rampura-Agucha, Distt Bhilwara, Rajasthan.	Zinc-lead	5.00
Kayad Distt Ajmer Rajasthan.	Zinc-lead	1.20

Source : HZL Annual Report 2018-19

development at Zawar mines was ramped up to 35 km with production commencing via the large declines at Mochia and Baroi using 60 MT LPDTs. Sub-level open-stoping method is used for extraction of ore at the mines.

The Rajpura-Dariba mine of HZL is an underground mine commissioned in 1983. It is located at 75 kilometers north-east of Udaipur, Rajasthan. Mining is carried out by using Blast-hole stoping method with hydraulic filling. Mined out stopes are backfilled with cement tailings. During the year 2018-19, Rajpura-Dariba Mine produced 1.08 million tonnes ore at 5% Zn and 1.2% Pb feed-grade. Presently, the mine is accessed via decline and main

shaft. As RDM orebody also allows for multiple production centres, the mine is poised to produce at the capacity of 2 million tonnes per annum of ore in future with new level of mechanisation & automation. Mine has achieved highest truck filling hours and exploration drilling resulting in its readiness for expansion.

Rampura-Agucha mine is located at 230 km north of Udaipur in Bhilwara district, Rajasthan and it was commissioned in 1991. It has high zinc-lead reserve grades averaging 15.4%. In 2018-19, the production of ore was carried out by underground mining. Until 2017-18 the production of ore from the mine was by surface mining and the mine has been fully transformed into an underground mine. Two ventilation shafts (North and South) each with diameter of 7.5 m and 450 m depth are in operation. The main hoisting shaft of 7.5 m diameter has been sunk and furnished to its final depth of 950 m and winders, skip loading & surface conveyors have been installed, while off-shaft development activities to commission underground crushing and conveying system are under progress. Paste-Fill plant has been established in the mine area. Underhand stoping method has been adopted which will use mine tailings to fill stopes after ore extraction.

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. The average reserve grade of Sindesar-Khurd Mine is 7% with its silver-rich lead-zinc deposit. The mine lies on the same geological belt as the Rajpura-Dariba mine. During the year 2018-19, Sindesar-Khurd mine produced 5.3 million tonnes ore at 3.75% Zn and 2.4% Pb grade. It produces high silver content ore at 128 g/tonne. During the year 2018-19, an underground shaft having capacity of 3.75 million tonnes was commissioned with skip & waste hoisting system. 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 main lens which has an annual capacity of 3.5 million tonnes & two auxiliary lens SKA2 and SKA6, are functioning at 2.5 million tonnes capacity per annum. In 2018-19, the mine received environment clearance to produce 6.0 million tonnes of ore and 6.5 million tonnes of ore

beneficiation. Two existing beneficiation plants at the mine are operating at 4.7 million tonnes per annum, while in the year 2018-19, third beneficiation plant of 1.5 million tonnes per annum was commissioned. Thus, the total beneficiation capacity is 6.2 million tonnes per annum.

Kayad mine is a newly developed underground mine near Ajmer, Rajasthan. It was commissioned in 2014 having small but high-grade ore at 6.3% Pb & Zn ore deposit. In Kayad mine, 21 tonnes capacity of LHD and 65 tonnes capacity of LPDT are used to produce 1.2 million tonnes of ore per annum. The mine has access through a single decline from surface portal to the top of the orebody and split in two declines 75 meters below surface.

Longitudinal Long-hole Open stoping method is used for the steeper and thinner portion of ore body and Transverse Long-hole Open Stopping method for flatty dipping and thick portion of the ore body. In the year 2018-19, the Kayad mine produced 1.2 million tonnes ore as same as in the previous year at average feed grade of 8.2 % 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 tonnes and 1,20,000 tonnes per annum of lead metal, respectively. Thus, the smelting capacity for lead (primary) in the country presently is 2,05,000 tonnes per annum. Company-wise smelting capacity of lead and zinc smelters is furnished in Table-16.

The smelting capacity of HZL for zinc is distributed between three smelters at Debari (88,000 tonnes), Chanderiya (5,58,000 tonnes) and Dariba (2,34,000 tonnes). Edayar Zinc Ltd's plant at Binanipuram (Aluva), Kerala has capacity of 38,000 tonnes per annum. Thus, the smelting capacity for zinc in the country is 9,18,000 tonnes per annum. EZL produced zinc from imported concentrates but since the Company has been declared as sick unit, it did not operate its plant. Besides lead & zinc capacities, HZL has capacities to produce 800 tonnes per annum of silver. HZL is India's largest manufacturer of sulphuric acid which is by-product

Table – 16 : Company-wise Capacity and Production of Primary Lead and Zinc

(In tonnes)

Company	Lead capacity tpy	Production		Zinc capacity tpy	Production	
		2017-18	2018-19 (P)		2017-18	2018-19 (P)
Hindustan Zinc Ltd	205000	168245	197839	880000	791461	696283
Edayar Zinc Ltd	-	-	-	38000	-	-
Total	205000	168245	197839	918000	791461	696283

of its smelting operations. In 2018-19, HZL produced 1.28 million tonnes of sulphuric acid, as compared to 1.40 million tonnes in the previous year.

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. EZL did not operate its plant during 2018-19 as negotiation for One Time Settlement with its secured lenders are under process. The banks have taken over physical possession of the secured assets of EZL on 23rd July 2019.

The consortium banks led by Punjab National Bank have taken physical possession of the mortgaged assets and has conducted auctions for sale of the mortgaged properties. The Company has settled/ arrived at settlement with more than 65% of creditors.

Chanderiya Lead-zinc smelting complex is located at 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. Chanderiya Lead-zinc smelting complex comprises one lead-zinc pyrometallurgical smelter having production capacity of 1,05,000 tonnes zinc and 85,000 tonnes lead, one Ausmelt lead smelter having production capacity of 50,000 tonnes and Hydro-metallurgical zinc smelters having production capacity of 4,53,000 tonnes zinc. It employs Roast-Leach Electro-winning 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 2018-19, Chanderiya Lead-Zinc smelter produced 4,24,803 tonnes of zinc and 85,916 tonnes of lead as compared to 4,97,049 tonnes of zinc and 72,450 tonnes of lead in the previous year.

Zinc fuming is a process that recovers valuable metals from zinc residue and will help in higher recovery of zinc, lead and silver. At the Hydro plant, Hydro-2 cell house was upgraded from 192 kA to 200 kA for enhancing zinc output.

Zinc Smelter Debari was commissioned in the year 1968 with an initial production capacity of 18,000 tonnes per annum of zinc. The present capacity has now it reached 88,000 tonnes per annum of zinc. It is located at 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 & 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 2018-19, Zinc Smelter Debari produced 67,968 tonnes of zinc as compared to 76,979 tonnes of zinc in the previous year.

Dariba smelting complex is located at 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 2,34,000 tonnes per annum while lead smelter was commissioned in July, 2011 and has a capacity of 1,20,000 tonnes 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 & purification section and a cell house. The lead smelter employs SKS bottom blowing technology. The plant consists of SKS furnace– bottom blowing, blast furnace, electric arc furnace & fuming furnace and electro-refining. Fuming furnace is also installed to produce zinc oxide from blast furnace slag. In the year 2018-19, the smelter produced 2,03,512 tonnes of zinc and

1,11,922 tonnes of lead metal as compared to 2,17,433 tonnes of zinc and 95,797 tonnes of lead metal in the previous year. Dariba Smelting Complex lead plant steam was utilised in Dariba Smelting Complex Captive Power Plant (CPP) for reducing the auxiliary steam consumption. In 2018-19, Dariba Smelting Complex produced 4,77,217 tonnes of sulphuric acid as compared to that of 5,12,945 tonnes in the previous year.

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. In October 2016, a new zinc alloy value-added product, HZDA or Hindustan Zinc Die-cast Alloy was added to the Company's portfolio from Chanderiya Lead-Zinc Smelter.

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 utilised for sulphuric acid manufacture. The limit of sulphur dioxide emission from stock shall not exceed 4 kg per tonne of concentrate (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 process of recovery of metal at smelters, waste is generated. The waste contains toxic element, i.e., waste water effluent sludge, smelter slag leach residues, suspended particulate matter (SPM), SO₂, NO_x and toxic metal fumes which are harmful at low exposure generated during the production of lead & zinc metal.

Smelting and mining operations of HZL are working on zero discharge principle and the Company is committed for efficient utilisation of waste generated at its mines and smelter. The Company has adopted Fumer technology to reduce jarosite generation, which is known to be successful in few Chinese and Korean Zinc Plants.

During the year 2018-19, the environment expenses of HZL was ₹69 crore. Hindustan Zinc Limited runs a 25 MLD STP in Udaipur for treating municipal sewage. The enhancement of capacity of STP to 45 MLD and establishment of another STP of 15 MLD capacity is in progress. This STP is a unique PPP initiative of the Company and is counted among the best functioning STPs in the country.

HZL is using internal waste for paste filling of stopes in mines. Remote operations and autonomous fleet in mines keep people away from risk. Some other initiatives in pipeline include ventilation on demand in mines to reduce energy consumption and use of advance flotation & ore retreatment technology to increase ore-to-metal ratio which is aimed at reducing waste and increasing output.

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 foot print 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.

Many of the secondary lead producing units have operated in the unorganised 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/m³ while the permissible limit for SO_x is 50 µg/m³.

RECYCLING OF LEAD & ZINC

Lead

The storage battery scrap is the main source of secondary lead production. Lead is one of the highest recycled metals. 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 about 75% of the total lead production in India. More than 80% of lead consumed in the country goes for manufacturing of lead batteries.

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. In 2010, the Ministry of Environment and Forest also issued amendments making battery dealers and importers of new lead batteries to register with the respective state regulatory bodies and to file periodic returns every six months on collection of used lead batteries. In September, 2010, Central Pollution Control Board also shifted the registration scheme for lead recycling, as a decentralisation move to the state regulatory boards. In 2010, 355 eco-friendly lead recycling units had registered with CPCB for processing used lead batteries which is now more than 550 units in India.

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 to environmental norms.

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 80% of lead and remaining 20% is consumed in pigments & compounds, rolled & extruded products, alloys, cable sheathing and other industries.

The apparent consumption of lead during the year 2017-18 and 2018-19 was calculated on the basis of production of lead (primary) and imports & exports of refined lead (unwrought). The apparent consumption thus arrived at was 1,78,300 tonnes in 2018-19 and 1,63,435 tonnes in 2017-18 (Table-17). In addition to this, it is understood that large quantities of recycled lead were also consumed in certain other industries.

Table – 17 : Apparent Consumption of Lead (Based on Production of Lead (Primary), and Imports & Exports of Refined Lead, Unwrought)

(In tonnes)

Item	2017-18	2018-19
Total Production Lead (Primary)	168245	197839
Total Imports*	119919	118075
Total Exports*	124729	137614
Apparent Consumption (Primary)	163435	178300

* 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 2017-18 and 2018-19 was calculated on the basis of production of zinc, import & export of zinc (not alloyed). The apparent consumption, thus arrived at was 6,50,755 tonnes in 2017-18 and 6,22,188 tonnes in 2018-19 (Table-18). The data on trade of zinc (not-alloyed) was taken from DGCI&S (HS Code 79011100). In addition to this, some quantities of recycled zinc are also consumed in certain other industries.

Table – 18 : Apparent Consumption of Zinc (Based on Production of Zinc (Ingots) and Imports & Exports of Zinc (not alloyed)

Item	(In tonnes)	
	2017-18	2018-19
Total Production Zinc	791461	696283
Total Imports*	117322	111013
Total Exports*	258028	185108
Apparent Consumption	650755	622188

*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 of these metals 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

Lead

The world's reserves of lead were estimated at 90 million tonnes in terms of lead content. Australia possesses 40% of the world's reserves followed by China (20%), Russia & Peru (7% each), Mexico & USA (6% each), etc. (Table- 19).

Zinc

The world's reserves of zinc were estimated at 250 million tonnes of zinc content. Australia accounts for 27% of world's zinc reserves, followed by China (18%), Russia & Mexico (9% each), Peru (8%), Kazakhstan (5%), USA (4%), etc. (Table-20).

**Table – 19 : World Reserves of Lead
(By Principal Countries)**

(In '000 tonnes of lead content)

Country	Reserves
World: Total (rounded off)	90000
Australia ^(a)	36000
Bolivia	1600
China	18000
India*	2500
Kazakhstan	2000
Mexico	5600
Peru	6300
Russia	6400
Sweden	1100
Turkey	860
USA	5000
Other countries	5000

Source: USGS, Mineral Commodity Summaries, 2020.
(a) For Australia, Joint Ore Reserve Committee-compliant reserves were about 12 million tonnes
* India's total reserve/ resources of lead & zinc as per National Mineral Inventory based on UNFC as on 01.04.2015 are 749.46 million tonnes.

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

(In '000 tonnes of zinc content)

Country	Reserves
World: Total (rounded off)	250000
Australia ^(a)	68000
Bolivia	4800
Canada	2200
China	44000
India*	7500
Kazakhstan	12000
Mexico	22000
Peru	19000
Russia	22000
Sweden	3600
USA	11000
Other countries	34000

Source: USGS, Mineral Commodity Summaries, 2020.
(a) For Australia, Joint Ore Reserve Committee-compliant reserves were about 25 million tonnes
* India's total reserves/ resources of lead & zinc as per National Mineral Inventory based on UNFC as on 01.04.2015 are 749.46 million tonnes

PRODUCTION**Lead**

World mine production of lead in terms of metal content was about 4.8 million tonnes in the year 2018 which is almost same as that of the previous year. China is foremost amongst producing countries with about 2.28 million tonnes (48%) followed by Australia (9%), Peru (6%), USA & Mexico (5% each), Russia & India (4% each), etc. (Table-21).

Zinc

World mine production of zinc ore was at 13.30 million tonnes in terms of zinc content in the year 2018. China is at top position with 4.1 million tonnes (31%) followed by Peru (11%), Australia (8%), USA (6%), India & Mexico (5% each), Bolivia (4%), etc. (Table- 22).

**Table – 21 : World Mine Production of Lead
(By Principal Countries)**

(In '000 tonnes of metal content)

Country	2016	2017	2018
World Total (rounded off)	4800	4800	4800
China	2337	2300	2280
Australia	441	393	432
Peru	314	307	289
USA	346	310	260 ^e
Mexico	242	243	231
Russia	217	210	215
India* ^(c)	151	173	198
Bolivia	90	113	112
Kazakhstan	70	111	86
Poland	63	74	70
Sweden	76	71	65
Morocco	30	38	50 ^e
Iran	47	48	48
Tajikistan ^(e)	47	51	44
North Macedonia	31	40	43
South Africa	39	48	35
Argentina	30	30	31
Turkey	29	30 ^e	30 ^e
Cuba	0	1 ^e	25
Bulgaria ^(d)	22	23	24
Other countries	188	235	200

Source: BGS, World Mineral Production, 2014-18
* India's production of primary lead in 2016-17, 2017-18 and 2018-19 was 142 thousand tonnes, 168 thousand tonnes and 198 thousand tonnes respectively
(c) Year ended 31st March following that stated
(d) Metal content of ore (e) Estimate

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

(In '000 tonnes of metal content)

Country	2016	2017	2018
World Total (rounded off)	13800	13700	13300
China	4710	4300 ^e	4100
Peru	1337	1473	1475
Australia	885	852	1112
USA	805	774	790 ^e
India ^{*(b)}	756	784	723 ^e
Mexico	662	671	662
Bolivia	489	527	520
Kazakhstan	357	345	345
Russia	248	292	315
Canada	301	347	294
Sweden	258	251	238
Other countries	1696	1688	1871

Source : BGS, World Mineral Production, 2014-18

* India's production of primary zinc in 2016-17, 2017-18 and 2018-19 was 672 thousand tonnes, 791 thousand tonnes and 696 thousand tonnes respectively.

(b) Year ended 31st March following that stated

Lead

As per the report of Lead & Zinc Study Group (ILZSG), February 2020, world refined lead production (includes secondary production) was 11.79 million tonnes in which secondary lead production was 7.37 million tonnes in the year 2018. Secondary lead production represented about 62.5% of total refined lead production worldwide in 2018 which is 56% in 2017. The global production of refined lead in the year 2018 increased by 21% than previous year. China is the largest producer of refined lead with 4.91 million tonnes in the year 2018 and contributed 42 % of world refined lead production followed by European countries (17%), USA (10%), Republic of Korea (7%), India (5%), etc.

World consumption of refined lead was 11.87 million tonnes in the year 2018 (including secondary lead) which is 1.2% more than the previous year. China is the largest refined lead consuming country with 4.9 million tonnes consumption during the year 2018 which was 42% of world refined lead consumption followed by European countries (17%), USA (14%), Republic of Korea & India (5% each), etc. International Lead & Zinc Study Group (ILZSG) forecasted the global demand for refined metal to fall by 0.5% at 11.81 million tonnes in 2019 and again rise by 0.8% at 11.90 million tonnes in 2020.

A generalised view of the development in various countries along with the country-wise description sourced from latest available publication of Minerals Yearbook of 'USGS', 2015 is furnished as below.

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 million 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

As per Lead & Zinc Study Group (ILZSG), world refined zinc production was 13.17 million tonnes in the year 2018 which decreased by 2.4% from that of the previous year.

China was the largest producer of refined zinc with 5.67 million tonnes in the year 2018 which contributed 43% of world refined zinc production followed by Republic of Korea (7%), India (6%), European countries (5%), Canada (5%), Japan & Australia (4% each), etc.

The world consumption of refined zinc was 13.69 million tonnes in the year 2018 which is 2% less than the previous year. China was the largest refined zinc consuming country with 6.52 million tonnes in 2018 which accounted for 48% of world consumption followed by European countries (18%), USA (6%), India (5%) and Republic of Korea (4%), etc.

ILZSG forecasts that world demand for refined zinc metal is expected to decrease by 0.1% at 13.67 million tonnes in 2019 and again rise by 0.9% at 13.80 million tonnes in 2020.

To give a generalised view of the development in various countries, the country-wise description sourced from latest available publication of Minerals Yearbook of 'USGS', 2017 is furnished below.

Australia

Zinc mine production in Australia decreased by 5% in 2017 as compared with that of 2016 mainly as result of several mine closures. Three mines opened in Australia in 2017 and therefore it is expected that production would in 2018. During the second quarter of 2017, Auctus Minerals Pty. Ltd, restarted the 20,000 tonnes per annum Mungana zinc mine in Northern Queensland. In September, 2017, Red River Resources Ltd restarted production at 21,000 tonnes per year from Thalang zinc-copper-lead mine in Queensland. The mine was placed on care-and-main-

tenance status in 2012 and reopened after the processing plant was refurbished. Minerals and Metals Group opened Dugald River zinc mine in Northern Queensland and commercial production was expected to commence in 2018 at 1,70,000 tonnes per year.

Canada

Zinc mine production in Canada was 3,44,000 tonnes in 2017, 7% more than that in 2016. Production increased in 2017 owing mostly to an increase in zinc production at Trevali Mining Corp.'s Caribou Mine. In October 2017, Coeur Mining Inc. acquired the Silvertip silver-zinc-lead mine in British Columbia and production was expected to commence in the first quarter of 2018. Zinc smelter production in Canada was 6,08,000 tonnes in 2017, 12% less than that in 2016. Smelter production decreased mainly as a result of the 9-month strike at Noranda Income Fund's zinc refinery in Salaberry-de-Valleyfield, Quebec. The strike was initiated by workers union on February 12, 2017 and ended after unionized workers voted in favour of a new collective bargaining agreement on November 25, 2017. During the strike, the facility operated at a partial production level, although the reduced rate was not disclosed.

China

Zinc mine production in China decreased by 8% in 2017 from that of 2016 to 4.4 million tonnes. According to Beijing Antaika Information Development Co. Ltd, decreased production was attributed to the closure of mines owing to increased environmental protection measures, lower than expected production from new mines and a decrease in ore grades. As a result of the decrease in mine production, China's net imports of zinc in concentrate increased by 22% in 2017 to about 2.4 million tonnes. About 60% of China's zinc concentrate imports (gross weight) were sourced from Australia, Peru and Russia.

Zinc metal production in China decreased slightly in 2017 from that of 2016 to 6.14 million tonnes. Despite the slight production decrease, two smelters of 1,00,000 tonnes per year capacity opened in China, i.e., Hualian Zinc and Indium Co.'s Hualian zinc smelter in Yunnan Province and Huili Lead and Zinc Co.'s Huili zinc smelter in Sichuan Province. Antaika

attributed the decrease in zinc smelter production to refinery maintenance, a shortage of zinc concentrates and stricter environmental regulations.

China's net imports of refined zinc increased by 67% in 2017 to about 0.66 million tonnes. Increased imports were attributed to the tight domestic supply. About 66% of China's refined zinc imports were sourced from Australia, Kazakhstan and Spain.

China's zinc consumption increased in 2017 from that of 2016. ILZSG reported a 4% increase in zinc consumption in 2017 as against 9% increase in 2016.

Cuba

In 2017, construction was completed on the Castellanos lead and zinc mine near Santa Lucia, Pinar del Rio. This was the first new mining project in Cuba in more than 20 years. The mine, operated by Empresa Minera del Caribe, was expected to commence commercial production during the first half of 2018. Trafigura reported that the mine was expected to ramp up through out the year and produce 1,00,000 tonnes of zinc concentrate when it reached full capacity.

Peru

Zinc mine production in Peru increased by 10% in 2017 from that of 2016 as a result of increased production at the Antamina copper-zinc mine and the opening of two mines. Zinc production nearly doubled at Antamina in 2017 to 3,72,100 tonnes primarily as a result of increased processing of copper-zinc ores and significantly higher zinc grades and recoveries. Copper and zinc production at Antamina can vary significantly from year to year owing to the geology of the deposit and the proportion of copper to copper-zinc ore produced.

In 2017, a new mine and a capacity expansion opened in Peru. In January, Compania de Minas Buenaventura S.A.A. commissioned the 10,000 tonnes per year Tambomayo Mine near Chilcaymarca, Arequipa. In May 2017, Shougang Group Co. Ltd added 30,000 tonnes per year of capacity by reprocessing the tailings at the Marcona Mine near San Juan de Marcona. The Company also planned to produce copper and iron.

Thailand

Zinc mine production ceased in Thailand in 2017 after closure of Padaeng Industry Public Co. Ltd.'s

Mae Sod Mine in 2016. The mine closed owing to the depletion of reserves and ceased operations by the end of 2017. In 2017, zinc metal production decreased by 73% from that of 2016. Padaeng Industry's smelter in Tak Province processed the remaining zinc concentrate from Mae Sod in 2017 and operations at the plant ceased in the second quarter of 2017. The refinery had a production capacity of 1,05,000 tonnes per year.

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 were 37 tonnes in 2018-19 as compared to negligible in 2017-18.

Exports of lead and alloys including scrap increased to 1,76,846 tonnes during 2018-19 as compared to 1,59,543 tonnes in the preceding year. Export of lead and alloys also increased by 11% to 1,76,783 tonnes in 2018-19 as compared to 1,59,531 tonnes in the previous year. Export of refined lead, unwrought also increased by 10% to 1,37,614 tonnes in 2018-19 as compared to 1,24,729 tonnes in the previous year. Republic of Korea with 40% followed by Vietnam (13%) and Thailand (11%) were the major export destinations for refined lead, unwrought (Tables- 23 to 29).

Imports

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

Imports of lead ores & concentrates decreased drastically by 32% to 1,499 tonnes in 2018-19 as compared to 2,220 tonnes in 2017-18. Imports were mainly from UAE (45%), Tanzania (23%), Canada (8%) and Nigeria (6%). The total imports of lead & alloys including scrap during 2018-19 was at 3,60,252 tonnes as compared to 3,51,645 tonnes during 2017-18, out

of which imports of lead and alloys during 2018-19 were 2,52,586 tonnes as compared to 2,53,350 tonnes in 2017-18.

Imports comprised mainly of lead and alloys and the rest was scrap (30%). The major suppliers during 2018-19 were Republic of Korea (21%), Australia (13%), UAE (9%), UK & USA (8% each) and Vietnam (6%) (Tables- 30 to 36).

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 drastically by 72% to 2,079 tonnes in 2018-19 as against 1,206 tonnes in the previous year. China is the main export destination of zinc ores & concentrates and accounted for 88% of all the export of zinc ores & concentrates followed by Cuba (12%).

Exports of zinc & alloys and scrap during 2018-19 were 1,95,900 tonnes as against 2,86,978 tonnes in the preceding year. Almost entire exports during 2018-19 were of zinc & alloys while

those of scraps were nominal. Republic of Korea (22%), Taiwan (13%), China & Nepal (9% each), and UAE (8%) were the main export destinations for zinc alloys & scrap. Exports of zinc (scrap) were only at 119 tonnes in 2018-19 as compared to 216 tonnes in the preceding year (Tables- 37 to 40).

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 during 2018-19 were 1,422 tonnes as against nil import during the previous year. Imports were mainly from Ethiopia (76%) and UAE (24%). Imports of zinc & alloys during 2018-19 were at 1,84,253 tonnes as compared to 1,91,603 tonnes in 2017-18. Imports of zinc (scrap) were 93,837 tonnes during 2018-19 as compared to 81,171 tonnes in 2017-18. Imports of zinc or spelter were at 1,44,267 tonnes in 2018-19 as compared to 1,56,012 tonnes during the previous year. The major suppliers of zinc & alloys including scrap during 2018-19 were Republic of Korea (42%), UAE (10%), USA (6%), Australia (5%) and Japan (4%) (Tables- 41 to 45).

**Table – 23 : Exports of Lead and Alloys
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	159531	25570820	176783	28192397
Korea, Rep. of	44664	7119499	70009	11080144
Vietnam	11765	1957571	21289	3425059
Thailand	8801	1369995	18197	2848504
Turkey	306	47833	11246	1760729
UAE	8006	1306687	9559	1526982
Taiwan	9548	1571596	9042	1437967
Bangladesh	13700	2167879	7290	1216479
China	239	62905	6540	985820
USA	44043	6856286	6168	970025
Indonesia	2585	428623	4290	681725
Other countries	15875	2681947	13152	2258963

Figures rounded off

LEAD & ZINC

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

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	++	52	37	2007
Belgium	-	-	35	1686
Bangladesh	-	-	2	150
Sri Lanka	-	-	++	134
South Africa	++	23	++	37
Australia	++	12	-	-
USA	++	17	-	-

*Figures rounded off***Table – 25 : Exports of Lead & Alloys Including scrap
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	159544	25572183	176846	28199782
Korea, Rep. of	44664	7119499	70009	11080144
Vietnam	11765	1957571	21289	3425059
Thailand	8801	1369995	18197	2848504
Turkey	306	47833	11246	1760729
UAE	8016	1307717	9596	1530361
Chinese Taipei/Taiwan	9548	1571596	9042	1437967
Bangladesh	13700	2167879	7290	1216479
China	239	62905	6540	985820
USA	44043	6856286	6186	972996
Indonesia	2585	428623	4290	681725
Other countries	15877	2682278	13161	2259998

*Figures rounded off***Table – 26 : Exports of Lead and Waste & Scrap
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	13	1363	62	7385
UAE	11	1031	36	3378
USA	-	-	18	2971
Nepal	2	217	4	589
Ghana	-	-	4	413
Ethiopia	-	-	++	33
Mozambique	-	-	++	++
Uganda	++	80	-	-
Yemen Republic	++	34	-	-
Kenya	++	1	-	-

Figures rounded off

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**Table – 27 : Exports of Refined Lead Unwrought
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	124729	19653387	137614	21562902
Korea, Rep. of	31850	5001337	55136	8618237
Vietnam	9843	1639068	18532	2958785
Thailand	7097	1078655	14638	2239118
Turkey	49	8643	11244	1760225
Taiwan	9544	1570829	9039	1437342
Bangladesh	10521	1657297	6537	1084326
China	-	-	6537	984877
USA	43998	6841549	5895	914993
UAE	3079	474747	4084	631298
Philippines	5292	836516	2199	345752
Other countries	3456	544745	3773	587948

*Figures rounded off***Table – 28 : Exports of Lead & Alloys Unwrought, NES
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	20655	3581918	26394	4478738
Korea, Rep. of	9831	1639325	12397	2054497
Thailand	1586	268985	3330	566407
UAE	2096	389835	2552	417156
Indonesia	1181	202451	2364	383458
Oman	2050	382587	2021	359083
Vietnam	427	75362	1231	210911
Saudi Arabia	557	86113	815	144237
Japan	635	109696	453	82111
Philippines	-	-	201	41142
Nepal	265	45050	244	39041
Other countries	2028	382515	785	180696

*Figures rounded off***Table – 29 : Exports of Lead (Pig Lead)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	545	93030	-	-
Belgium	503	84968	-	-
Japan	41	7782	-	-
Nepal	2	266	-	-
Ghana	++	14	-	-

Figures rounded off

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**Table – 30 : Imports of Lead Ores & Conc.
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	2220	149369	1499	85468
UAE	315	34419	669	41127
Tanzania	-	-	350	13882
Canada	-	-	114	7694
Nigeria	25	1321	95	7442
Morocco	150	12490	72	6928
Kuwait	-	-	98	3889
Ghana	-	-	51	2270
Somalia	-	-	50	2236
Saudi Arabia	312	21517	-	-
Turkey	334	19708	-	-
Other countries	1084	59914	-	-

*Figures rounded off***Table – 31 : Imports of Lead and Alloys Including Scrap : Total
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	351645	52503762	360252	54754911
Korea, Rep. of	62193	10584499	76209	12881476
Australia	47895	7780335	47627	7764397
UAE	30870	4310530	31044	4632718
UK	24058	3445106	29996	4279513
USA	23774	3408961	28054	4219985
Vietnam	30680	4683430	20546	3254845
Malaysia	24818	3826480	14477	2232251
Tanzania	3348	440803	8009	1207371
Singapore	271	37504	7858	1206618
Nigeria	4449	605159	7528	1062632
Other countries	99289	13380955	88904	12013105

Figures rounded off

LEAD & ZINC

**Table – 32 : Imports of Lead & Alloys
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	253350	40639656	252586	40998155
Korea, Rep. of	62193	10584499	75996	12857476
Australia	44999	7379221	43819	7218879
UAE	22121	3428945	25415	4012331
Vietnam	30680	4683430	20546	3254845
Malaysia	23937	3726404	13594	2111911
Tanzania	2180	330509	7156	1109489
Singapore	109	15743	6850	1069828
Sri Lanka	5116	791880	6396	1004351
Nigeria	3383	504100	6224	932483
UK	4915	766281	3581	613637
Other countries	53717	8428644	43009	6812925

*Figures rounded off***Table – 33 : Imports of Lead & Waste & Scrap
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	98296	11864104	107668	13756756
USA	23369	3329435	25153	3789067
UK	19143	2678825	26415	3665876
UAE	8749	881585	5629	620387
Australia	2895	401114	3808	545518
Kuwait	6619	623860	3474	378083
Canada	868	115046	2207	300983
Libya	1913	166412	3112	284091
Cote'D' Ivoire	1733	142754	2754	266145
Germany	1942	274615	1730	237034
Netherlands	2044	280049	1643	229032
Other countries	29021	2970409	31743	3440540

Figures rounded off

LEAD & ZINC

**Table – 34 : Imports of Lead : Pig Lead
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	5827	903644	5496	862573
UAE	3601	555647	4223	656881
Nigeria	482	76865	303	49946
Georgia	-	-	214	33636
Jordan	350	55444	200	32339
Sri Lanka	300	45888	150	24765
Hong Kong	-	-	130	20618
South Africa	64	11973	129	20592
UK	-	-	76	11991
Chile	-	-	51	9081
Canada	-	-	20	2724
Other countries	1030	157827	-	-

*Figures rounded off***Table – 36 : Imports of Refined Lead Unwrought
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	119919	19414429	118075	19209830
Korea, Rep. of	46101	7597705	56174	9204775
Australia	38073	6235946	33780	5543498
UAE	4580	706901	5277	824013
UK	3979	626474	3026	520354
Malaysia	9588	1501117	3219	499729
Singapore	65	9391	3012	469734
Sri Lanka	800	130693	2800	453507
Nepal	1060	150594	2281	342317
Tanzania	642	105031	1468	242540
Switzerland	-	-	1259	209838
Other countries	15031	2350577	5779	899525

*Figures rounded off***Table – 35 : Imports of Lead Unrefined, NES
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	46846	7169219	43514	6730099
UAE	6644	1009502	6526	1025018
Malaysia	4240	637834	6305	977548
Vietnam	7262	1111762	6341	965397
Bangladesh	11816	1925398	3396	557998
Singapore	-	-	3008	469131
Nigeria	2127	310250	2634	393217
Tanzania	52	8369	2014	325307
Sri Lanka	2150	330572	1550	237732
Lebanon	852	126988	1236	188462
Zambia	361	55695	1171	177385
Other countries	11342	1652849	9333	1412904

*Figures rounded off***Table – 37 : Exports of Zinc Ores &
Concentrates
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1206	31460	2079	71170
China	1206	31457	1838	47816
Cuba	-	-	240	23318
Canada	++	2	1	18
Ghana	-	-	++	10
Australia	-	-	++	5
Japan	-	-	++	2
Germany	++	1	-	-

Figures rounded off

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**Table – 38 : Exports of Zinc & Alloys Including Scrap : Total
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	286978	61679965	195900	41899908
Korea, Rep. of	48030	10441309	43349	9116309
Taiwan	17732	3655423	25716	5430998
China	85433	18614786	17635	3819016
UAE	14677	3101598	16586	3645841
Nepal	13116	2757024	17134	3505608
Thailand	6516	1447224	13518	2867271
Indonesia	7533	1589593	9509	1993054
Bangladesh	7476	1637162	6409	1364592
Malaysia	36960	7802485	6204	1356527
Saudi Arabia	6374	1309799	6164	1303938
Other countries	43131	9323562	33676	7496754

*Figures rounded off***Table – 39 : Exports of Zinc & Alloys
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	286763	61654613	195780	41882289
Korea, Rep. of	48030	10441309	43339	9115170
Taiwan	17732	3655423	25716	5430998
China	85433	18614786	17635	3819016
UAE	14591	3092831	16532	3638989
Nepal	13115	2756813	17134	3505532
Thailand	6516	1447224	13518	2867271
Indonesia	7533	1589593	9463	1984899
Bangladesh	7476	1637162	6409	1364592
Malaysia	36960	7802485	6204	1356527
Saudi Arabia	6374	1309799	6164	1303904
Other countries	43002	9307189	33666	7495391

Figures rounded off

**Table – 40 : Exports of Zinc (Scrap)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	216	25352	119	17620
Indonesia	-	-	46	8155
UAE	86	8767	53	6852
Korea, Rep. of	-	-	10	1140
Singapore	103	13347	9	895
Australia	-	-	1	415
Nepal	1	211	++	76
Congo Dem. Rep. of	-	-	++	37
Saudi Arabia	-	-	++	34
Kuwait	-	-	++	17
USA	1	215	++	++
Other countries	25	2812	++	++

*Figures rounded off***Table – 41 : Imports of Zinc Ores & Conc.
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	-	-	1422	38776
Ethiopia	-	-	1078	28534
UAE	-	-	344	10204
Nigeria	-	-	++	38

*Figures rounded off***Table – 42 : Imports of Zinc and Alloys Including Scrap
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	272773	53324303	278088	56463018
Korea, Rep. of	131777	27859994	115817	25365240
UAE	28151	5186257	26544	5098972
USA	13071	2287998	17879	3200610
Australia	10109	2035374	12937	2715280
Japan	360	101307	11179	2402311
Malaysia	4223	760972	7581	1427510
Italy	6409	1083911	6344	1197473
China	893	430310	4091	1131460
Belgium	3128	546434	5244	1074884
Saudi Arabia	5940	970671	5714	974222
Other countries	68712	12061075	64758	11875056

Figures rounded off

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**Table – 43 : Imports of Zinc & Alloys
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	191603	40230230	184253	40200064
Korea, Rep. of	131363	27795720	115481	25307467
UAE	19923	3835179	13233	2732555
Australia	7828	1667237	11549	2466323
Japan	243	82264	11073	2384854
China	893	430310	4067	1127705
Malaysia	1515	324150	4337	890611
Myanmar	1821	397218	4115	847719
Belgium	935	195989	3527	771192
Russia	93	19857	2432	495383
Singapore	5	1201	2177	453868
Other countries	26984	5481105	12262	2722387

*Figures rounded off***Table – 44 : Imports of Zinc or Spelter
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	156012	32189028	144267	30929337
Korea, Rep. of	105661	22271181	87004	19125107
UAE	19356	3741345	12270	2552616
Japan	73	14338	10627	2250496
Australia	5304	1125320	8642	1808233
Myanmar	1821	397218	4115	847719
China	157	28401	3199	640199
Malaysia	156	25841	3125	604440
Russia	93	19857	2432	495383
Belgium	247	51186	2276	459857
Singapore	5	869	1891	380128
Other countries	23139	4513472	8686	1765159

Figures rounded off

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**Table – 45 : Imports of Zinc (Scrap)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	81171	13094077	93837	16262958
USA	10970	1859625	16587	2895409
UAE	8228	1351078	13311	2366418
Italy	6168	955661	6196	1082882
Saudi Arabia	5777	942959	5599	954020
Netherlands	4120	659239	3487	592568
Malaysia	2708	436823	3244	536899
UK	1829	294162	2900	482780
Mexico	3241	518030	2677	482388
Vietnam	1766	302238	2542	468178
Thailand	3262	514099	2573	441062
Other countries	33102	5260163	34721	5960354

Figures rounded off

FUTURE OUTLOOK

ILZSG forecasts that world lead metal production is expected to increase by 1.7% to 11.96 million tonnes in 2020 due to expected increase in Australia and India. The consumption of refined lead metal is expected to increase by 0.8% to 11.90 million tonnes in 2020 due to increase in consumption in India, Japan and Republic of Korea. ILZSG also forecasts that world zinc mine production will rise by 4.7% to 13.64 million tonnes in 2020. This will be driven due to a number of new projects and expansions in existing capacity in India, Kazakhstan, Mexico and Portugal. World demand for refined zinc metal is forecasted to rise by 0.9% to 13.80 million tonnes in 2020. Demand is forecasted due to increase in demand by 1.2% in China and 1.1% in USA during 2020.

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

As every major national plan 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 erection of mobile towers, higher investment in the infrastructure. Railways will also lead in 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 had predicted that zinc demand would grow at the rate of 8 to 9% in the current decade (2010-20).

Lead metal will remain in demand for the electric vehicles in view of decline in demand for petrol-fuel driven automobiles. Increased volume of transportation prompted by higher industrialisation is going to keep lead in demand. The Government thrust upon Automobile Industries to produce battery running vehicles is likely to encourage investment in battery vehicles and this would raise huge demand for lead metal in the future.