# Indian Minerals Yearbook 2018

## (Part- II :Metals and Alloys)

## 57th Edition

# LEAD & ZINC

### (FINAL 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.

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%.

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 2017-18 due to shutdown of the operation of Edayar Zinc Limited (EZL). Edayar Zinc Limited (Formerly Binani Zinc Limited) produced zinc from imported concentrates. During the year 2017-18, EZL did not operate its plant and pursuant to repealing of Sick Industrial Companies (Special Provisions) Act, 1985, the reference made to Board of Industrial and Financial Reconstruction (BIFR) got abated.

## 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".

## 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*

## PRODUCTION & STOCKS

### Lead & Zinc Ores and Concentrates

The entire output of lead & zinc ore and concentrates in 2016-17 and 2017-18 was reported by mines owned by Hindustan Zinc Ltd, a private sector company.

The production of lead and zinc ore at 12.61 million tonnes in 2017-18 increased by 6% as compared to that in the previous year (Tables-2 & 3). The metal content of lead and zinc in the ore produced in 2017-18 works out to 2,27,248 tonnes and 8,31,938 tonnes respectively .

During the year 2017-18, 13.23 million tonnes of lead & zinc ore was treated as against 10.84 million tonnes in 2016-17 (Table-4).

The production of lead concentrates in 2017-18 at 3,06,399 tonnes increased by 14% as compared to the previous year. Entire production of lead concentrates was reported from Rajasthan (Tables - 5 & 6).

The production of zinc concentrates increased from 14,84,244 tonnes in 2016-17 to 15,39,655 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 2017-18 worked out to be 8.33% (1.77% Pb and 6.56% Zn) as against 9.47% (1.82% Pb and 7.65% Zn) in 2016-17. The metal content of ore treated at Rampura Agucha mine in Bhilwara district Rajasthan was the highest at 11.86% (1.52% Pb and 10.34% Zn). The lead concentrates produced during 2017-18 were of grade 56.73% Pb as against 56.28% Pb in 2016-17. Metal content of zinc concentrates produced worked out to 50.18% Zn in 2017-18 as against 50.92% Zn in the previous year.

### Stock

Mine-head closing stocks of lead concentrates in 2017-18 were 32,555 tonnes as against 7,917 tonnes in 2016-17. 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 2017-18 were 24,834 tonnes as against 66,595 tonnes in 2016-17. 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 2017-18 under review was 8,391 as against 7,337 in 2016-17.

### Lead and Zinc Metals

The production of primary lead during 2017-18 increased to 1,68,245 tonnes from 1,42,231 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 7,91,461 tonnes in 2017-18 increased by 18% as compared to that 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, 2017-18**

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

## Table – 3 : Production of Lead and Zinc Ore, 2016-17 and 2017-18 (By State)

(In tonnes)

| State | 2016-17 | | | 2017-18 | | |
|---|---|---|---|---|---|---|
| | Ore Produced | Metal content | | Ore Produced | Metal content | |
| | | Lead (Pb) | Zinc (Zn) | | Lead (Pb) | Zinc (Zn) |
| **India** | **11881238** | **213436** | **888666** | **12613866** | **227248** | **831938** |
| Rajasthan | 11881238 | 213436 | 888666 | 12613866 | 227248 | 831938 |

## Table – 4 : Lead and Zinc Ore Treated, 2016-17 and 2017-18 (By State)

(In tonnes)

| State | 2016-17 | | | 2017-18 | | |
|---|---|---|---|---|---|---|
| | Ore Treated | Metal content | | Ore Treated | Metal content | |
| | | Pb | Zn | | Pb | Zn |
| **India** | **10836827** | **196767** | **828750** | **13232379** | **233753** | **868024** |
| Rajasthan | 10836827 | 196767 | 828750 | 13232379 | 233753 | 868024 |

## Table – 5 : Production of Lead Concentrates, 2015-16 to 2017-18 (By State)

(Quantity in tonnes; Value in ₹'000)

| State | 2015-16 | | 2016-17 | | 2017-18 | |
|---|---|---|---|---|---|---|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| **India** | **261857** | **7885122** | **268047** | **9669267** | **306399** | **11429378** |
| Rajasthan | 261857 | 7885122 | 268047 | 9669267 | 306399 | 11429378 |

## Table – 6 : Production of Lead Concentrates, 2016-17 and 2017-18 (By Sector/State/Districts)

(Quantity in tonnes; Value in ₹'000)

| State/District | 2016-17 | | | | 2017-18 | | | |
|---|---|---|---|---|---|---|---|---|
| | No. of mines | Production | | | No. of mines | Production | | |
| | | Quantity | Pb% | Value | | Quantity | Pb% | Value |
| **India** | **8** | **268047** | **56.28** | **9669267** | **8** | **306399** | **56.73** | **11429378** |
| **Private Sector** | **8** | 268047 | 56.28 | 9669267 | 8 | 306399 | 56.73 | 11429378 |
| **Rajasthan** | **8** | 268047 | 56.28 | 9669267 | 8 | 306399 | 56.73 | 11429378 |
| Ajmer* | 1 | - | - | - | 1 | - | - | - |
| Bhilwara | 1 | 102068 | 59.33 | 3294063 | 1 | 91412 | 57.41 | 2920824 |
| Rajsamand | 2 | 116939 | 53.17 | 4278705 | 2 | 164327 | 55.39 | 5901582 |
| Udaipur | 4 | 49040 | 57.36 | 2096499 | 4 | 50651 | 59.89 | 2606972 |

***:** *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, 2015-16 to 2017-18 (By State)

(Quantity in tonnes; Value in ₹'000)

| State | 2015-16 | | 2016-17 | | 2017-18 | |
|---|---|---|---|---|---|---|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| **India** | **1473811** | **34943088** | **1484244** | **43385599** | **1539655** | **49799283** |
| Rajasthan | 1473811 | 34943088 | 1484244 | 43385599 | 1539655 | 49799283 |

## Table – 8 : Production of Zinc Concentrates, 2016-17 & 2017-18 (By Sector/State/Districts)

(Quantity in tonnes; Value in ₹'000)

| State/District | 2016-17 | | | | 2017-18 | | | |
|---|---|---|---|---|---|---|---|---|
| | No. of mines | Production | | | No. of mines | Production | | |
| | | Quantity | Zn% | Value | | Quantity | Zn% | Value |
| **India** | **@** | **1484244** | **50.92** | **43385599** | @ | **1539655** | **50.18** | **49799283** |
| Private Sector | **@** | 1484244 | 50.92 | 43385599 | @ | 1539655 | 50.18 | 49799283 |
| **Rajasthan** | **@** | **1484244** | **50.92** | **43385599** | @ | **1539655** | **50.18** | **49799283** |
| Bhilwara | @ | 1129276 | 50.74 | 30741266 | @ | 1064141 | 50.11 | 32475626 |
| Rajsamand | @ | 290993 | 50.21 | 9907697 | @ | 402884 | 49.56 | 13616705 |
| Udaipur | @ | 63975 | 57.43 | 2736636 | @ | 72630 | 54.53 | 3706952 |

*@ Associated mines with lead concentrates*

## Table – 9 : Mine-head Closing Stocks of Lead Concentrates, 2016-17 & 2017-18 (By State)

(In tonnes)

| State | 2016-17 | 2017-18 (P) |
|---|---|---|
| **India** | **7917** | **32555** |
| Rajasthan | 7917 | 32555 |

## Table – 10 : Mine-head Closing Stocks of Zinc Concentrates, 2016-17 & 2017-18 (By State)

(In tonnes)

| State | 2016-17 | 2017-18 (P) |
|---|---|---|
| **India** | **66595** | **24834** |
| Rajasthan | 66595 | 24834 |

## Table – 11 : Production of Lead Metal, 2015-16 to 2017-18

(Quantity in tonnes; Value in ₹'000)

| Year | Lead Primary | |
|---|---|---|
| | Quantity | Value |
| 2015-16 | 145257 | 20363511 |
| 2016-17 | 142231 | 23270410 |
| 2017-18 (P) | 168245 | 28487471 |

## Table – 12 : Production of Zinc Metal, 2015-16 to 2017-18

(Quantity in tonnes; Value in ₹'000)

| Year | Zinc Ingots | |
|---|---|---|
| | Quantity | Value |
| 2015-16 | 758944 | 108928344 |
| 2016-17 | 672010 | 128211275 |
| 2017-18 (P) | 791461 | 169157981 |

**Table – 13 : Production of Lead (Primary), 2016-17 and 2017-18 (By State/Plant)**

(Quantity in tonnes; Value in ₹'000)

| State | Plant | 2016-17 | | 2017-18 | |
|---|---|---|---|---|---|
| | | Quantity | Value | Quantity | Value |
| **India** | | **142231** | **23270410** | **168245** | **28487471** |
| Rajasthan | HZL Chanderiya/ Dariba | 142231 | 23270410 | 168245 | 28487471 |

**Table – 14 : Production of Zinc (Ingots), 2016-17 and 2017-18 (By States/Plants)**

(Quantity in tonnes; Value in ₹'000)

| State | Plant | 2016-17 | | 2017-18 | |
|---|---|---|---|---|---|
| | | Quantity | Value | Quantity | Value |
| **India** | | **672010** | **128211275** | **791461** | **169157981** |
| Rajasthan | HZL Chanderiya/ Debari/Dariba | 672010 | 128211275 | 791461 | 169157981 |

## 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. In 2017-18, at Rampura-Agucha Mine, the opencast operations have been completed and the mine is fully turned into underground mine of lead and zinc, with an annual production capacity of 5.0 million tonnes of lead zinc ore. Sindesar-Khurd mine is the highly mechanised and largest ore producing underground mine with annual production capacity of 4.50 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, 4.0 million tonnes and 1.2 million tonne of lead & zinc ore, respectively (Table-15).

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

| Mine | Ore | Capacity (million tpy) |
|---|---|---|
| **Total** | | **15.60** |
| Zawar Mines, Distt. Udaipur, Rajasthan. | Zinc-lead | 4.00 |
| Rajpura-Dariba, Distt. Rajsamand, Rajasthan. | Zinc-lead | 0.90 |
| Sindesar-Khurd Mine, Distt. Rajsamand, Rajasthan. | Zinc-lead | 4.50 |
| Rampura-Agucha, Distt. Bhilwara, Rajasthan. | Zinc-lead | 5.00 |
| Kayad Distt. Ajmer Rajasthan. | Zinc-lead | 1.20 |

***Source :*** *HZL Annual Report 2017-18*

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 one of the oldest mine 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 2017-18, the Zawar group of mines produced 2.17 million tonnes ore at 2.5% Zn and 2% Pb feed grade. During the year 2017-18, Mochia and Baroi declines were connected to production level enhancing hauling capacity. Mochia - Balaria portal & North Baroi were developed as new entry locations.

The Rajpura-Dariba mine of HZL is an undergound mine commissioned in 1983. It is located at 75 kilometers north-east of Udaipur, Rajasthan. Mining is carried out by using the Vertical Crater Retreat method and Blast hole stoping method. Mined out stopes are backfilled with cement tailings. During the year 2017-18, Rajpura- Dariba Mine produced 0.89 million tonnes ore at 4.8% Zn and 1.1% Pb feed grade. In 2017-18, the development of decline was completed such as all parts of the mine is accessible through decline. Rock Breaker was installed in underground crusher to improve fregmentation for higher metal recoveries during beneficiation. A monitoring system was installed to improve load carrying capacity of trucks. At different levels in underground raise boring was done to improve ventilation system.

Rampura-Agucha mine is located at 230 km north of Udaipur in Bhilwara district, Rajasthan and it was commissioned in 1991. It is high zinc-lead reserve grades averaging 15.7%. In 2017-18, the production of ore carried out from both surface mining and underground mining. The year 2017-18 is the last year for the mine to produce ore from surface mining and the mine is fully transformed from surface mining to underground mining. The underground mine project includes a production shaft of 955 meters depth and 7.5 m diameter at hauling capacity of 3.75 million tonnes per annum, two declines from surface, two ventilation shafts and a paste fill plant. The underground mine development achieved 20 km in the year 2017-18. In the year 2017-18, the mine produced 3.8 million tonnes of ore which is 30% of total ore production of HZL as against 40% last year at 11.4% Zn and 1.6% Pb feed grade. The main production shaft is expected to commence commercial production by 2019.

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. Access to the mine is presently through declines (North and South), while ore hauling is planed to start through shaft in the year 2019. During the year 2017-18, Sindesar-Khurd mine produced 4.5 million tones ore at 3.9% Zn and 2.1% Pb grade. It produces high silver content ore at 113 gm/tonne. The mine is set to reach the enhanced targeted capacity of 4.5 million tonnes. 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 lode which has an annual capacity of 2.5 million tonnes & two auxiliary lens SKA2 and SKA6, are functioning at 1.5 million tonnes capacity. The development of the main production shaft of 1050 m depth, and 7.5 m diameter having 3.75 million tonnes hauling capacity is under progress. In 2017-18, the SKA6 section of the mine has been fully converted to wi-fi. In Sindesar - Khurd mine 21 tonnes capacity Load Haul Dump (LHD) machines and 65 tonnes capacity Low Profile Dump Truck (LPDT) machines are working for ore transportation.

Kayad mine is newly developed underground mine near Ajmer, Rajasthan. It is commissioned in 2013 having small but high grade ore at 6.4% Pb & Zn ore deposit. The mine has access through decline for ore and waste transportation. During the year 2017-18, Kayad mine has received environmental clearance to increase ore production from one million tonnes to 1.2 million tonnes per annum. Longitudinal Long Hole Open Stoping method is

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

(In tonnes)

| Company | Lead capacity tpy | Production | | Zinc capacity tpy | Production | |
|---|---|---|---|---|---|---|
| | | 2016-17 | 2017-18 (P) | | 2016-17 | 2017-18 (P) |
| Hindustan Zinc Ltd | 201000 | 142231 | 168245 | 843000 | 672010 | 791461 |
| Edayar Zinc Ltd | - | - | - | 38000 | - | - |
| **Total** | **201000** | **142231** | **168245** | **881000** | **672010** | **791461** |

used for the steeper and thinner portion of ore body and Transverse Long Hole Open Stoping method for flatty dipping and thick portion of the ore body. In the year 2017-18, the mine produced 1.2 million tonnes ore as compared to one million tonnes in the previous year at average feed grade of 8.7 % Zn and 1.2% 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 1,16,000 tonnes per annum of lead metal, respectively. Thus, the smelting capacity for lead (primary) in the country presently is 2,01,000 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 (5,35,000 tonnes) and Dariba (2,20,000 tonnes). Edayar Zinc Ltd's plant at Binanipuram (Aluva), Kerala with capacity of 38,000 tonnes per annum. Thus, the smelting capacity for zinc in the country is 8,81,000 tonnes per annum. EZL produced zinc from imported concentrates but since the company declared as sick unit, it did not operate its plant. Besides lead & zinc capacities, HZL has capacities to produce 600 tonnes per annum of silver. HZL is an India's largest manufacturer of sulphuric acid which is by-product of its smelting operations. In 2017-18, HZL produced 1.40 million tonnes of sulphuric acid, as compared to 1.18 million tonnes in the previous year.

The Registrar of Companies 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 2017-18, the Edayar Zinc Limited did not operate its plant and pursuant to the repealing of Sick Industrial Companies (Special Provisions) Act, 1985 (SICA), the refrenece made to Board of Industrial and Financial Reconstruction (BIFR) got abated.

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 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 2,15,000 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 2017-18, Chanderia Lead-Zinc smelter produced 4,97,049 tonnes of zinc and 72,450 tonnes of lead as compared to 4,35,664 tonnes of zinc and 46,474 tonnes of lead

in previous year. A new project of 1,60,000 million tonne of Zinc Residue Fuming Project will commence by 2019. 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 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 and now it reached to 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 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 2017-18, zinc smelter Debari produced 76,979 tonnes of zinc as compared to 46,442 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 220,000 tonnes per annum while lead smelter was commissioned in July, 2011 with a capacity of 1,16,000 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 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 2017-18, the smelter produced 2,17,433 tonnes of zinc and 95,797 tonnes of lead metal as compared to 1,89,882 tonnes of zinc and 92,535 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.

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 protfolio 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), $SO_2$, $NO_x$ 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 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 2017-18, the enviorment expenses of HZL was ₹59 crore. Hindustan Zinc Limited runs a 20 MLD STP in Udaipur,which treated effluent of 6,215,000 Kilolitres during the year 2017-18 and recovered about 5,731,650 kilolitres of water. 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 floatation & ore retreatment technology to increase ore-to-metal ratio will reduce waste and increase 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/m$^3$ while the permissible limit for $SO_x$ is 50 µg/m$^3$.

## 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 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 regularity bodies and to file periodic returns every six months on collenction 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 and extruded products, alloys, cable sheathing and other industries.

The apparent consumption of lead during the year 2016-17 and 2017-18 was calculated on the basis of production of lead (primary) and imports & exports of refined lead (unwrought). The apparent consumption thus arrived at was 1,75,599 tonnes in 2016-17 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 | 2016-17 | 2017-18 |
|---|---|---|
| Total Production Lead (Primary) | 142231 | 168245 |
| Total Imports* | 110749 | 119919 |
| Total Exports* | 77381 | 124729 |
| Apparent Consumption (Primary) | 175599 | 163435 |

** 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 2016-17 and 2017-18 was calculated on the basis of production of zinc, import & export of zinc (not alloyed). The apparent consumption, thus arrived at was 6,48,481 tonnes in 2016-17 and 6,50,755 tonnes in 2017-18 (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)**

(In tonnes)

| Item | 2016-17 | 2017-18 |
|---|---|---|
| Total Production Zinc | 672010 | 791461 |
| Total Imports* | 179403 | 117322 |
| Total Exports* | 202932 | 258028 |
| Apparent Consumption | 648481 | 650755 |

**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

### lead

The world's reserves of lead were estimated at 83 million tonnes in terms of lead content. Australia possesses 29% of the world's reserves followed by China (22%), Russia (8%), Peru, Mexico & Turkey (7% each) and USA (6%), etc. (Table- 19).

### Zinc

The world's reserves of zinc were estimated at 230 million tonnes. Australia accounts for 28% of world's zinc reserves, followed by China (19%), Peru & Mexico (9% each), Kazakhstan (6% ), USA (5%), India (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)** | **83000** |
| Australia[(a)] | 24000 |
| Bolivia | 1600 |
| China | 18000 |
| India* | 2500 |
| Kazakhstan | 2000 |
| Mexico | 5600 |
| Peru | 6000 |
| Russia | 6400 |
| Sweden | 1100 |
| USA | 5000 |
| Turkey | 6100 |
| Other countries | 5000 |

***Source:*** *Mineral Commodity Summaries, 2019, USGS.*
*(a) For Australia, Joint Ore Reserve Committee-compliant reserves were about 12 million tonnes*
** India's total reserve/ resources USGS 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)** | **230000** |
| Australia[(a)] | 64000 |
| Bolivia | 4800 |
| Canada | 3000 |
| China | 44000 |
| India* | 10000 |
| Kazakhstan | 13000 |
| Mexico | 20000 |
| Peru | 21000 |
| Sweden | 1400 |
| USA | 1100 |
| Other countries | 33000 |

***Source:*** *Mineral Commodity Summaries, 2019, USGS.*
*(a) For Australia, Joint Ore Reserve Committee-compliant reserves were about 24 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 ore was about 4.9 million tonnes in terms of lead content in the year 2017 which is about 2% more than the previous year. China is the leading producing country with 2.3 million tonnes (47%) followed by Australia (9%), USA and Peru (6% each), Mexico (5% ), Russia & India (4% each), etc. (Table-21).

## Zinc

World mine production of zinc ore was at 12.50 million tonnes in terms of zinc content in the year 2017. China is at top position with 4.3 million tonnes thus contributed 34% followed by Peru (12%), Australia (7%), India & USA (6% each), Mexico (5%), Kazakhstan & Canada (3% each), etc. (Table- 22).

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

(In '000 tonnes of metal content)

| Country | 2015 | 2016 | 2017 |
|---|---|---|---|
| **World Total (rounded off)** | **5000** | **4800** | **4900** |
| Argentina | 30 | 28 | 28 |
| Australia | 653 | 441 | 459 |
| Bolivia | 75 | 90 | 112 |
| China | 2335 | 2337 | 2300 |
| India*(d) | 144 | 151 | 173 |
| Iran | 44 | 47 | 48 |
| Ireland | 31 | 20 | 17 |
| Kazakhstan | 41 | 71 | 112 |
| Korea, Dem. P.R. of [e] | 33 | 39 | 34 |
| Macedonia | 38 | 31 | 40 |
| Mexico | 264 | 242 | 243 |
| Morocco | 32 | 30 | 38 |
| Peru | 316 | 314 | 307 |
| Poland | 69 | 63 | 74 |
| Russia | 180 | 195 | 202 |
| South Africa | 35 | 39 | 48 |
| Sweden | 79 | 76 | 71 |
| Tajikistan[e] | 31 | 47 | 51 |
| Turkey | 33 | 29 | 30 |
| USA | 367 | 335 | 302 |
| Other countries | 170 | 174 | 211 |

***Source:*** *World Mineral Production, 2013-17, BGS*

** India's production of primary lead in 2014-15, 2015-16 and 2016-17 was 127 thousand tonnes, 145 thousand tonnes and 142 thousand tonnes respectively*

*(d) Year ended 31st March following that stated*

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

(In '000 tonnes of metal content)

| Country | 2015 | 2016 | 2017 |
|---|---|---|---|
| **World Total (rounded off)** | **13400** | **12600** | **12500** |
| Australia | 1610 | 884 | 841 |
| Bolivia | 442 | 487 | 504 |
| Canada | 290 | 301 | 344 |
| China | 4749 | 4711 | 4300[e] |
| India*(d) | 741 | 756 | 784 |
| Ireland | 236 | 148 | 131 |
| Kazakhstan | 384 | 366 | 375 |
| Mexico | 787 | 662 | 671 |
| Peru | 1421 | 1337 | 1473 |
| USA | 825 | 805 | 730[e] |
| Other countries | 1915 | 2143 | 2347 |

**Source :** *World Mineral Production, 2013-17, BGS*

**India's production of primary zinc in 2014-15, 2015-16 and 2016-17 was 733 thousand tonnes, 759 thousand tonnes and 672 thousand tonnes respectively*

*(d) Year ended 31st March following that stated*

## Lead

As per World Metal Statistics, 2018, report, world refined lead production (includes secondary production) was 11.22 million tonnes in which secondary lead production was 6.27 million tonnes in the year 2017. Secondary lead production represented about 56% of total refined lead production worldwide in 2017 which is similar in 2016. The global production of refined lead in the year 2017 increased by 0.4% than previous year. China is the largest producer of refined lead with 4.71 million tonnes in the year 2017 and contributed 42 % of world refined lead production followed by USA (9%), Korea Rep. of (7%), India (5%), Germany, United Kingdom & Mexico (3% each), etc.

World consumption of refined lead was 11.61 million tonnes in the year 2017 (including secondary lead) which is 2.7% more than the previous year. China is the largest refined lead consuming country with 4.8 million tonnes consumption during the year 2017 which was 41.3% of world refined lead consumption followed by USA (14%), Korea, Rep.of & India (5% each), Germany (4%), and Italy (2%), etc. International Lead & Zinc Study Group (ILZSG) anticipates that global demand for refined metal will rise to 11.87 million tonnes in 2019. This will mainly be a

consequence of increase in consumption in India, Japan and Korea Rep. of that are expected to more than offset a reduction in China of 1.1%.

A generalised view of the development in various counties along with the country-wise description sourced from latest avialable publication of Minerals Yearbook of 'USGS', 2015 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 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 13.8 million tonnes in the year 2017 and is 0.7% increase than the previous year.

China was the largest producer of refined zinc with 6.22 million tonnes in the year 2017 which contributed 45% of world refined zinc production followed by Korea Rep. of (8%), India (6%), Canada, Japan & Spain (4% each), Australia (3%), Peru & Kazakhstan (2% each), etc.

The world consumption of refined zinc was 14.23 million tonnes in the year 2017 which is 3% increase than the previous year. China was the largest refined zinc consuming country with 6.96 million tonnes in the year 2017 which accounted for 49% of world followed by USA (6%), India & Korea, Rep. of (5% each), Germany & Japan (3% each), etc.

ILZSG forecasts that world demand of refined zinc metal is expected to increase by 0.6% to 13.77

million tonnes in 2019. Zinc demand is forecasted due to zinc consumption will be rise by 0.7% in Europe, 1% in USA, 0.6% in China. Zinc consumption is also expected to rise in India and Mexico and to remain stable in Japan & Korea Rep. of.

To give a generalised view of the development in various counties, the country-wise description is sourced from latest avialable publication of Minerals Yearbook of 'USGS', 2016 is furnished below.

**Australia**

Zinc mine production in Australia decreased by 44% in 2016 as compared with the previous year mainly as result of several mine closures. Glencore moved the Mount Isa Mine's Black Star open pit zinc mines to a maintenance phase after mining out the existing reserves. Consolidated Tin Mines also closed its Mount Garnet mine until additional funding could be secured.

**Canada**

Zinc mine production in Canada was 322,000 tonnes in 2016, 16% more than that in 2015. Production increased in 2016 owing mostly to increase in zinc production at Glencore's Kid Creek mine and Matagami mill and also to record production at Caribou Mine of Trevali Mining Corporation. This incresed production offset the closure of Yukon Zinc Corporation's Wolverine Mine and Nyrstar's Myra Falls Mine.

**China**

Zinc mine production in China increased slightly in 2016 from that of 2015 to 4.8 million tonnes and took place predominantly in the Nei Mongol Autonomous Region and Hunan & Yunnan Provinces, where combined production accounted for more than one-half of China's zinc in concentrate production in 2016. According to Beijing Antaike Information Development Co. Ltd (Antaike), increase in zinc prices and decrease in smelter treatment charges resulted in considerable mine profit which stimulated an increase in output. As a result of the increase in mine production, the imports of zinc in concentrate decreased by 38% in 2016 to about 2 million tonnes. About 50% of China's zinc concentrate imports (gross weight) were sourced from Australia and Peru.

Zinc metal production incresed slightly to 6.3 million tonnes in 2016 as compare to 6.1 million tonnes in 2015. Zinc smelters in China were reported to have operated at stable production rates in 2016. Hunan, Shaanxi, and Yunnan were the three leading zinc-metal-producing Provinces in China and accounted for slightly over one-half of the country's zinc metal production in 2016. Domestic smelter production capacity in China remained unchanged in 2016 compared with increase in 2015.

China's zinc consumption increased in 2016 from that of 2015 coinciding with higher utilization rate in the country's automotive, construction and galvanizing sectors. ILZSG reported a 9% increase in zinc consumption in 2016 compared with slight decrease in 2015.

**Finland**

Zinc mine production in Finland increased significantly in 2016 owing to the ramp-up and first full year of production at Terrafame Ltd's mine located in Sotkamo. The mine produced 22,600 tonnes of zinc during its first full year. Zinc smelter production decreasd by 5% in 2016 owing to disruptions in production, including fire in the cell house, and lower recovery levels at Boliden's Kokkola smelter.

**Honduras**

Zinc mine production decreased by 37% in Honduras in 2016 The Nyrstar NV sold the El Mochito mine, the only zinc mine in Honduras to Ascendant Resources Inc., Canada. The new owner agreed to sell 100% production of the zinc concentrate to Nyrstar for a period of 10 years. Ascendant announced plans to implement optimization programs focused on increase in mine production.

**Ireland**

Zinc mine production in Ireland decreased by 37% in 2016 from that of 2015 to 1,49,000 tonnes of contained zinc mostly as a result of the closure of Vedanta's Lisheen Mine due to reserve depletion. Mining activities and concentrate production at Lisheen stopped in late 2015. Boliden's Tara Mine was the only zinc producing mine in Ireland in 2016.

**Peru**

Zinc mine production in Peru decreased by 6% in 2016 from that of 2015 mostly as a result of decreased production at the Antamina copper-zinc mine and suspensions of production at Glencore's Iscaycruz Mine and Volcan's Cerro do Pasco mining unit. Zinc production decreased by 12% at Antamina in 2016 to 1,95,000 tonnes primarily as a result of decrease in copper-zinc ore processed. In 2018 to 2020, zinc production at Antamina was projected to increase as mining was expected to take place in an area of higher zinc ore 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 and the proportion of copper to copper-zic ore produced. In 2015 Glencore announced plans to reduce its zinc mine production by 500,000 tonnes per year in response to low lead and zinc prices. The suspension of Iscaycruz mine was included in this reduction and the mine remained suspended throughout 2016. Operations at Volcan's Cerro do Pasco mining unit were temporarily suspended from November 2015 to November 2016.

**Spain**

Zinc mine production increased by an estimated 53% in 2016 compared with that in 2015 mostly as a result of increased production in Aguas Tenidas Mine The mine located in Valdelamusa, had a zinc production capacity of 58,000 tonnes per annum for the majority of 2016. The company completed work to double zinc capacity to 1,16,000 tonnes per annum in the fourth quarter of 2016.

# 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 negligible in 2017-18 as compared to only one tonne in 2016-17.

Exports of lead and alloys including scrap increased to 1,59,543 tonnes during 2017-18 as compared to 1,08,065 in the preceding year. Export of lead and alloys increased to 1,59,530 tonnes in 2017-18 as compared to 1,08,064 tonnes in the previous year. Export of refined lead, unwrought also increased to 1,24,729 tonnes in 2017-18 as compared to 77,381 tonnes in the previous year. In 2017-18, USA with 35% followed by Rep. of Korea (26%) and Bangladesh (8%) 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, lead & alloys unwrought, pig lead, antimonial lead worked, lead and alloys (bars, rods, plates, etc.).

Imports of lead ores & concentrates decreased drastically by 64% to 2,220 tonnes in 2017-18 as compared to 6,217 tonnes in 2016-17. Imports were mainly from Turkey (15%) and UAE & Saudi Arabia (14% each). Total imports of lead & alloys and scrap during 2017-18 were at 3,51,648 tonnes as compared to 3,04,913 tonnes during 2016-17, out of which imports of lead and alloys during 2017-18 were 2,53,352 tonnes as compared to 2,38,262 tonnes in 2016-17.

Imports comprised mainly of lead and alloys and the rest was scrap (28%). The major suppliers during 2017-18 were Korea, Rep. of (18%) Australia (14%), UAE & Vietnam (9% each) and Malaysia, UK and USA (7% each) (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 decreased drastically by 98% to 1,206 tonnes in 2017-18 as against 53,912 tonnes in the previous year. China is the solely export destination of zinc ores & concentrates accounted by almost all the export of zinc ores and concentrates.

Exports of zinc & alloys and scrap during 2017-18 were 2,86,979 tonnes as against 2,28,025 tonnes in the preceding year. Almost entire exports during 2017-18 were of zinc & alloys while those of scraps were nominal. China (30%), Korea, Rep. of (17%), Malaysia (13%) and Chinese Taipei/Taiwan (6%) were the main export destinations for zinc alloys & scrap. Exports of zinc (scrap) were only at 216 tonnes in 2017-18 as compared to 48 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.

There were no imports of zinc ores & concentrates during 2017-18 as against 1771 tonnes during the previous year. Imports of zinc and alloys during 2017-18 were at 1,91,601 tonnes as compared to 2,41,074 tonnes in 2016-17. Imports of zinc (scrap) were 81,171 tonnes during 2017-18 as compared to 69,746 tonnes in 2016-17. Imports of zinc or spelter were at 1,56,012 tonnes in 2017-18 as compared to 2,09,779 tonnes during the previous year. The major suppliers of zinc & alloys during 2017-18 were Korea, Rep. of (69%), UAE (10% ), Australia (4%) and Iran (2%) etc. (Tables- 41 to 45).

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **108064** | **15867389** | **159530** | **25570818** |
| Korea, Rep. of | 18263 | 2661217 | 44663 | 7119499 |
| USA | 48758 | 6875963 | 44043 | 6856285 |
| Bangladesh | 2307 | 329951 | 13700 | 2167879 |
| Vietnam | 4415 | 661474 | 11765 | 1957571 |
| Chinese Taipei/Taiwan | 10531 | 1668120 | 9548 | 1571596 |
| Thailand | 2888 | 441525 | 8801 | 1369996 |
| UAE | 8650 | 1414622 | 8006 | 1306687 |
| Philippines | 403 | 52579 | 5292 | 836516 |
| Indonesia | 964 | 137966 | 2585 | 428623 |
| Oman | 948 | 136039 | 2243 | 415061 |
| Other countries | 9937 | 1487933 | 8884 | 1541105 |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **1** | **33** | **++** | **52** |
| South Africa | - | - | ++ | 23 |
| USA | - | - | ++ | 17 |
| Australia | - | - | ++ | 12 |
| Bangladesh | 1 | 33 | - | - |

## Table – 25 : Exports of Lead & Alloys Including scrap (By Countries)

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **108065** | **15868134** | **159543** | **25572181** |
| Korea, Rep. of | 18263 | 2661217 | 44663 | 7119499 |
| USA | 48758 | 6875963 | 44043 | 6856285 |
| Bangladesh | 2307 | 329951 | 13700 | 2167879 |
| Vietnam | 4415 | 661474 | 11765 | 1957571 |
| Chinese Taipei/Taiwan | 10531 | 1668120 | 9548 | 1571596 |
| Thailand | 2888 | 441525 | 8801 | 1369996 |
| UAE | 8650 | 1414622 | 8017 | 1307718 |
| Philippines | 403 | 52579 | 5292 | 836516 |
| Indonesia | 964 | 137966 | 2585 | 428623 |
| Oman | 948 | 136039 | 2243 | 415061 |
| Other countries | 9938 | 1488678 | 8886 | 1541437 |

## Table – 26 : Exports of Lead and Waste & Scrap (By Countries)

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **1** | **745** | **13** | **1363** |
| UAE | - | - | 11 | 1031 |
| Nepal | 1 | 728 | 2 | 217 |
| Uganda | - | - | ++ | 80 |
| Yemen Republic | - | - | ++ | 34 |
| Kenya | ++ | 14 | ++ | 1 |
| Gabon | ++ | 3 | - | - |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **77381** | **11165711** | **124729** | **19653387** |
| USA | 45072 | 6361197 | 43998 | 6841549 |
| Korea, Rep. of | 7848 | 1139225 | 31850 | 5001337 |
| Bangladesh | 796 | 115578 | 10521 | 1357297 |
| Vietnam | 3666 | 539006 | 9843 | 1639068 |
| Chinese Taipei/Taiwan | 10531 | 1668120 | 9544 | 1570829 |
| Thailand | 2269 | 333958 | 7097 | 1078655 |
| Philippines | 403 | 52579 | 5292 | 836516 |
| UAE | 2888 | 415742 | 3079 | 474747 |
| Sri Lanka | ++ | 46 | 542 | 86807 |
| Iran | - | - | 483 | 75249 |
| Other countries | 3908 | 540260 | 2480 | 391333 |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **17181** | **2736278** | **20654** | **3581916** |
| Korea, Rep. of | 6836 | 1010733 | 9831 | 1639325 |
| UAE | 3387 | 637646 | 2096 | 389835 |
| Oman | 765 | 110056 | 2050 | 382587 |
| Thailand | 503 | 89202 | 1586 | 268985 |
| Bangladesh | 854 | 121882 | 1280 | 209925 |
| Indonesia | 316 | 43798 | 1181 | 202451 |
| Japan | 862 | 118617 | 635 | 109696 |
| Saudi Arabia | 1247 | 176561 | 557 | 86113 |
| Vietnam | 396 | 64025 | 427 | 75362 |
| Pakistan | 151 | 23261 | 248 | 51040 |
| Other countries | 1864 | 340497 | 763 | 166597 |

**Table – 29 : Exports of Lead (Scrap) (By Countries)**

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **1** | **745** | **13** | **1363** |
| UAE | - | - | 11 | 1031 |
| Nepal | 1 | 728 | 2 | 217 |
| Uganda | - | - | ++ | 80 |
| Yemen Republic | - | - | ++ | 34 |
| Kenya | ++ | 14 | ++ | 1 |
| Gabon | ++ | 3 | - | - |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **6217** | **318697** | **2220** | **149369** |
| UAE | 581 | 44017 | 315 | 34419 |
| Saudi Arabia | 260 | 9436 | 312 | 21517 |
| Turkey | 4181 | 210212 | 334 | 19708 |
| Yemen Republic | 343 | 10190 | 258 | 14928 |
| Sudan | 145 | 4661 | 191 | 14044 |
| Morocco | 137 | 10786 | 150 | 12490 |
| Estonia | 107 | 4218 | 248 | 11259 |
| Ethiopia | - | - | 130 | 8009 |
| South Africa | 214 | 12459 | 97 | 6612 |
| Jordan | 172 | 8720 | 160 | 5062 |
| Other countries | 77 | 3998 | 25 | 1321 |

## Table – 31 : Imports of Lead and Alloys Including Scrap : Total (By Countries)

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **304913** | **40065602** | **351648** | **52503753** |
| Korea, Rep. of | 62022 | 9183868 | 62194 | 10584499 |
| Australia | 46376 | 6380614 | 47894 | 7780336 |
| Vietnam | 22558 | 2792268 | 30680 | 4683430 |
| UAE | 36122 | 4168035 | 30870 | 4310529 |
| Malaysia | 18494 | 2438437 | 24819 | 3826480 |
| UK | 18974 | 2525194 | 24059 | 3445105 |
| USA | 18280 | 2123195 | 23774 | 3408962 |
| Bangladesh | 14160 | 2084860 | 12206 | 1990675 |
| Burundi | - | - | 5043 | 836165 |
| Sri Lanka | 4142 | 535216 | 5116 | 791879 |
| Other countries | 63785 | 7833915 | 84993 | 10845693 |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **238262** | **32861867** | **253352** | **40639649** |
| Korea, Rep. of | 62022 | 9183868 | 62194 | 10584499 |
| Australia | 44451 | 6148603 | 44999 | 7379222 |
| Vietnam | 22558 | 2792268 | 30680 | 4683430 |
| Malaysia | 17990 | 2376612 | 23938 | 3726404 |
| UAE | 20767 | 2791193 | 22121 | 3428944 |
| Bangladesh | 14160 | 2084860 | 12206 | 1990675 |
| Burundi | - | - | 5043 | 836165 |
| Sri Lanka | 4142 | 535216 | 5116 | 791879 |
| Myanmar | 2650 | 366590 | 5087 | 789115 |
| UK | 8114 | 1142162 | 4916 | 766280 |
| Other countries | 41408 | 5440495 | 37052 | 5663036 |

## Table – 33 : Imports of Lead (Scrap) (By Countries)

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **66651** | **7203735** | **98296** | **11864104** |
| USA | 18096 | 2091814 | 23369 | 3329435 |
| UK | 10860 | 1383032 | 19143 | 2678825 |
| UAE | 15355 | 1376842 | 8749 | 881585 |
| Kuwait | 3081 | 310354 | 6619 | 623860 |
| Australia | 1925 | 232011 | 2895 | 401114 |
| Netherlands | 1420 | 164013 | 2044 | 280049 |
| Germany | 2487 | 296679 | 1942 | 274615 |
| Yemen Republic | - | - | 3422 | 273507 |
| Ghana | 1301 | 97941 | 2923 | 266437 |
| South Africa | 629 | 70501 | 1817 | 238804 |
| Other countries | 11497 | 1180548 | 25373 | 2615873 |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **6367** | **817080** | **5827** | **903644** |
| UAE | 4464 | 589638 | 3601 | 555647 |
| Nigeria | 292 | 35012 | 482 | 76865 |
| Jordan | 50 | 5939 | 350 | 55444 |
| Bangladesh | 40 | 5708 | 300 | 50159 |
| Sri Lanka | - | - | 300 | 45888 |
| Azerbaijan | 144 | 21437 | 147 | 21207 |
| Tanzania | - | - | 124 | 20263 |
| Saudi Arabia | 577 | 66201 | 109 | 16277 |
| Zambia | - | - | 104 | 14396 |
| South Africa | - | - | 64 | 11973 |
| Other countries | 800 | 93145 | 246 | 35525 |

## Table – 35 : Imports of Lead Unrefined, NES (By Countries)

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **44516** | **5930455** | **46846** | **7169219** |
| Bangladesh | 14120 | 2079152 | 11816 | 1925398 |
| Vietnam | 8286 | 1052777 | 7262 | 1111762 |
| UAE | 5601 | 726211 | 6644 | 1009502 |
| Malaysia | 5768 | 753274 | 4240 | 637934 |
| Saudi Arabia | 3450 | 400346 | 2607 | 364140 |
| Sri Lanka | 1250 | 163230 | 2150 | 330572 |
| Nigeria | 542 | 63651 | 2127 | 310250 |
| Yemen Republic | 885 | 108110 | 1658 | 246912 |
| Jordan | 655 | 80776 | 1425 | 207700 |
| Thailand | 250 | 35367 | 1235 | 185345 |
| Other countries | 3709 | 467561 | 5682 | 839804 |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **110749** | **15347116** | **119919** | **19414429** |
| Korea, Rep. of | 42977 | 6151751 | 46101 | 7597705 |
| Australia | 38713 | 5310761 | 38073 | 6235946 |
| Malaysia | 4923 | 650490 | 9588 | 1501117 |
| Burundi | - | - | 4534 | 755004 |
| UAE | 5343 | 692371 | 4580 | 706901 |
| Mayanmar | 1500 | 226805 | 4337 | 677265 |
| UK | 7507 | 1054019 | 3979 | 626474 |
| Thailand | 2494 | 332662 | 1638 | 254207 |
| Nepal | 468 | 54325 | 1060 | 150594 |
| Sri Lanka | 850 | 110144 | 800 | 130693 |
| Other countries | 5974 | 763788 | 5229 | 778523 |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **53912** | **3990176** | **1206** | **31460** |
| China | 11913 | 832091 | 1206 | 31457 |
| Canada | ++ | 1 | ++ | 2 |
| Germany | - | - | ++ | 1 |
| USA | ++ | 7 | - | - |
| Korea, Rep. of | 31423 | 2368367 | - | - |
| Japan | 10576 | 789709 | - | - |
| UK | ++ | 1 | - | - |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **228025** | **40967513** | **286979** | **61679962** |
| China | 16026 | 3120056 | 85433 | 18614786 |
| Korea, Rep. of | 36493 | 6273618 | 48030 | 10441309 |
| Malaysia | 51837 | 9616658 | 36960 | 7802485 |
| Chinese Taipei/Taiwan | 23945 | 4242039 | 17732 | 3655423 |
| UAE | 10504 | 1908432 | 14677 | 3101596 |
| Nepal | 6412 | 1084457 | 13116 | 2757024 |
| USA | 7149 | 1305983 | 13203 | 2704558 |
| Bangladesh | 8827 | 1603549 | 7477 | 1637161 |
| Indonesia | 8701 | 1493227 | 7533 | 1589593 |
| Kenya | 7947 | 1337397 | 7153 | 1545548 |
| Other countries | 50184 | 8982097 | 35665 | 7830479 |

## Table – 39 : Exports of Zinc & Alloys (By Countries)

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **227977** | **40960486** | **286763** | **61654611** |
| China | 16026 | 3120056 | 85433 | 18614786 |
| Korea, Rep. of | 36493 | 6273618 | 48030 | 10441309 |
| Malaysia | 51837 | 9616658 | 36960 | 7802485 |
| Chinese Taipei/Taiwan | 23945 | 4242039 | 17732 | 3655423 |
| UAE | 10479 | 1904773 | 14591 | 3092829 |
| Nepal | 6411 | 1084152 | 13115 | 2756813 |
| USA | 7147 | 1305729 | 13202 | 2704343 |
| Bangladesh | 8827 | 1603549 | 7477 | 1637161 |
| Indonesia | 8701 | 1493227 | 7533 | 1589593 |
| Kenya | 7947 | 1337397 | 7153 | 1545548 |
| Other countries | 50164 | 8979288 | 35537 | 7814321 |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **48** | **7027** | **216** | **25351** |
| Singapore | 20 | 2778 | 103 | 13347 |
| UAE | 25 | 3659 | 86 | 8767 |
| Belgium | - | - | 25 | 2809 |
| USA | 2 | 254 | 1 | 215 |
| Nepal | 1 | 305 | 1 | 211 |
| Bhutan | - | - | ++ | 1 |
| Israel | - | - | ++ | 1 |
| Mauritius | ++ | 2 | - | - |
| UK | ++ | 29 | - | - |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **1771** | **86640** | - | - |
| Turkey | 1394 | 61466 | - | - |
| Spain | 257 | 16166 | - | - |
| Japan | 45 | 2931 | - | - |
| USA | 26 | 2285 | - | - |
| Korea, Rep. of | 24 | 2263 | - | - |
| Morocco | 10 | 847 | - | - |
| UAE | 15 | 682 | - | - |

## Table – 42 : Imports of Zinc and Alloys Including Scrap (By Countries)

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **310820** | **47056547** | **272772** | **53324306** |
| Korea, Rep. of | 140545 | 22582330 | 131777 | 27859994 |
| UAE | 26679 | 4016369 | 28151 | 5186256 |
| USA | 13397 | 1787029 | 13071 | 2287998 |
| Australia | 9783 | 1509822 | 10108 | 2035373 |
| Netherlands | 2233 | 317288 | 6492 | 1108166 |
| Italy | 4946 | 667198 | 6409 | 1083912 |
| Saudi Arabia | 5748 | 748472 | 5940 | 970671 |
| Spain | 13160 | 1930510 | 4451 | 855442 |
| Malaysia | 13257 | 1869154 | 4223 | 760973 |
| Thailand | 7065 | 937538 | 4128 | 673361 |
| Other countries | 74007 | 10690837 | 58022 | 10502160 |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **241074** | **38274764** | **191601** | **40230229** |
| Korea, Rep. of | 139607 | 22468887 | 131363 | 27795720 |
| UAE | 21055 | 3278855 | 19923 | 3835178 |
| Australia | 9339 | 1452553 | 7828 | 1667236 |
| Iran | 1521 | 233261 | 3489 | 662456 |
| Spain | 11832 | 1766206 | 2985 | 619332 |
| Kazakhstan | 6471 | 1047358 | 2955 | 591836 |
| Netherlands | 1095 | 161939 | 2372 | 448927 |
| China | 1882 | 553966 | 893 | 430310 |
| USA | 4465 | 663421 | 2101 | 428373 |
| Uzbekistan | 850 | 126854 | 1877 | 415205 |
| Other countries | 42957 | 6521464 | 15815 | 3335656 |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **209779** | **32501012** | **156012** | **2189028** |
| Korea, Rep. of | 119826 | 19071978 | 105661 | 2271181 |
| UAE | 20501 | 3203752 | 19356 | 3741345 |
| Australia | 6974 | 1056348 | 5304 | 1125320 |
| Iran | 1521 | 233261 | 3489 | 662456 |
| Spain | 11795 | 1761243 | 2967 | 615883 |
| Kazakhstan | 6471 | 1047358 | 2955 | 591836 |
| Netherlands | 1093 | 159968 | 2346 | 443784 |
| Uzbekistan | 850 | 126854 | 1877 | 415205 |
| Myanmar | 603 | 116191 | 1821 | 397218 |
| Unspecified | 2678 | 388578 | 1719 | 324787 |
| Other countries | 37467 | 5335481 | 8517 | 1600013 |

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

| Country | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Qty (t) | Value (₹'000) | Qty (t) | Value (₹'000) |
| **All Countries** | **69746** | **8781783** | **81171** | **13094077** |
| USA | 8932 | 1123608 | 10970 | 1859625 |
| UAE | 5624 | 737514 | 8228 | 1351078 |
| Italy | 4888 | 599913 | 6168 | 955661 |
| Saudi Arabia | 5316 | 693280 | 5777 | 942959 |
| Netherlands | 1138 | 155349 | 4120 | 659239 |
| Mexico | 3212 | 394713 | 3241 | 518030 |
| Thailand | 4032 | 495986 | 3262 | 514099 |
| Germany | 1798 | 239715 | 2877 | 458016 |
| Malaysia | 2646 | 337855 | 2708 | 436823 |
| Indonesia | 1559 | 204488 | 2240 | 371205 |
| Other countries | 30601 | 3799362 | 31580 | 5027342 |

## FUTURE OUTLOOK

ILZSG forecasts that world lead metal production is expected to increase by 2.5% to 11.94 million tonnes in 2019 due to expected increse in China and India. The consumption of refined lead metal is expected to increase by 1.2% to 11.87 million tonnes in 2019 due to increase in consumption in India, Japan and Korea Rep. of. ILZSG also forecast that world zinc mine production will rise by 6.2% to 13.48 million tonnes in 2019. This will be driven mainly by an expected 29.4% rise in Australia, 3.3% increase China, expand in South Africa, as a result of higher output at Vedanta's Gamsberg mine and in Canada, Cuba, India and Namibia. World demand for refined zinc metal is forecasted to rise by 0.6% to 13.77 million tonnes in 2019. Demand is forecast to continue to growing demand in China and India, to remain stable in Japan, South Korea and to fall in Thailand.

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 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 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 of zinc metal 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. 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.