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Industry Report On Aluminium Industry

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1. Indian Macro Economy an overview

The Indian economy is on a strong wicket and stable footing, demonstrating resilience in the face of geopolitical challenges. The Indian economy has consolidated its post-Covid recovery with policymakers – fiscal and monetary – ensuring economic and financial stability. Nonetheless, change is the only constant for a country with high growth aspirations. For the recovery to be sustained, there has to be heavy lifting on the domestic front because the environment has become extraordinarily difficult to reach agreements on key global issues such as trade, investment and climate.

High economic growth in FY24 came on the heels of growth rates of 9.7% and 7.0%, respectively, in the previous two financial years. The headline inflation rate is largely under control, although the inflation rate of some specific food items is elevated. The trade deficit was lower in FY24 than in FY23, and the current account deficit for the year is around 0.7% of GDP. In fact, the current account registered a surplus in the last quarter of the financial year. Foreign exchange reserves are ample. Public investment has sustained capital formation in the last several years even as the private sector shed its balance sheet blues and began investing in FY22. Now, it has to receive the baton from the public sector and sustain the investment momentum in the economy. The signs are encouraging.

National income data show that non-financial private-sector capital formation, measured in current prices, expanded vigorously in FY22 and FY23 after a decline in FY21. However, investment in machinery and equipment declined for two consecutive years, FY20 and FY21, before rebounding strongly. Early corporate sector data for FY24 suggest that capital formation in the private sector continued to expand but at a slower rate.

RBI data on India's Balance of Payments shows us that the investment interest of external investors, measured in terms of dollar inflows of new capital, was USD45.8 billion in FY24 compared to USD47.6 billion in FY23. This slight decline is in line with global trends. Reinvestment of earnings remained the same. Repatriation of investment was USD29.3 billion in FY23 and USD44.5 billion in FY24. Many private equity investors took advantage of buoyant equity markets in India and exited profitably. It is a sign of a healthy market environment that offers profitable exits to investors, which will bring newer investments in the years to come.

That said, the environment for foreign direct investment to grow in the coming years is not highly favourable for many reasons.

Interest rates in developed countries are much higher than they were during and before Covid years. This not only means a higher cost of funding but also a higher opportunity cost to invest abroad. Second, emerging economies have to compete with active industrial policies in developed economies involving considerable subsidies that encourage domestic investment. Third, notwithstanding the impressive strides made

in the last decade, uncertainties and interpretations related to transfer pricing, taxes, import duties and non-tax policies remain to be addressed. Lastly, geopolitical uncertainties, which are on the rise, will likely exert a bigger influence on capital flows, notwithstanding other reasons for preferring to invest in India.

On employment generation, the Periodic Labour Force Survey provides quarterly data on urban employment indicators and annually for the entire country, including rural India. A surge in agriculture employment is partly explained by reverse migration and the entry of women into the labour force in rural India. The Annual Survey of Industries has data on workers in nearly 2.0 lakh Indian factories. The total number of factory jobs grew annually by 3.6% between 2013-14 and 2021-22. Somewhat more satisfyingly, they grew faster at 4.0% in factories employing more than a hundred workers than in smaller factories (those with less than a hundred workers). The annual growth rate was 1.2% in the latter set of factories. In absolute numbers, employment in Indian factories has grown from 1.04 crore to 1.36 crore in this period.

Between the last Economic survey published in January 2023 and this one, big changes are afoot in the geopolitical environment. The global backdrop for India's march towards Viksit Bharat in 2047 could not be more different from what it was during the rise of China between 1980 and 2015. Then, globalisation was at the cusp of its long expansion. Geopolitics was largely calm with the end of the Cold War, and Western powers welcomed and even encouraged the rise of China and its integration into the world economy. Concerns over climate change and global warming were not so pervasive or grave then as they are now. Fourth, the advent of Artificial Intelligence casts a huge pall of uncertainty as to its impact on workers across all skill levels – low, semi and high. These will create barriers and hurdles to sustained high growth rates for India in the coming years and decades. Overcoming these requires a grand alliance of union and state governments and the private sector.

Employment generation is the real bottom line for the private sector

It is worth reiterating that job creation happens mainly in the private sector. Second, many (not all) of the issues that influence economic growth, job creation and productivity and the actions to be taken therein are in the domain of state governments. So, in other words, India needs a tripartite compact, more than ever before, to deliver on the higher and rising aspirations of Indians and complete the journey to Viksit Bharat by 2047. In more than one respect, the action lies with the private sector. In terms of financial performance, the corporate sector has never had it so good. Results of a sample of over 33,000 companies show that, in the three years between FY20 and FY23, the profit before taxes of the Indian corporate sector nearly quadrupled. Further, newspaper headlines told us that the corporate profits-to-GDP ratio rose to a 15-year high in FY24. Business Line reported, "The corporate profit for the Nifty-500 universe was up 30 per cent last fiscal to ₹14.11-lakh crore against ₹10.88 lakh crore in FY23. The nominal GDP grew 9.6 per cent y-o-y to ₹295-lakh

crore (₹269-lakh crore). Hiring and compensation growth hardly kept up with it. But, it is in the interest of the companies to step up hiring and worker compensation.

The Union government cut taxes in September 2019 to facilitate capital formation. Between FY19 and FY23, the cumulative growth in private sector non-financial Gross Fixed Capital Formation (GFCF) is 52% in current prices. During the same period, the cumulative growth in general government (which includes states) is 64%. The gap does not appear to be too wide.

Future ahead:-

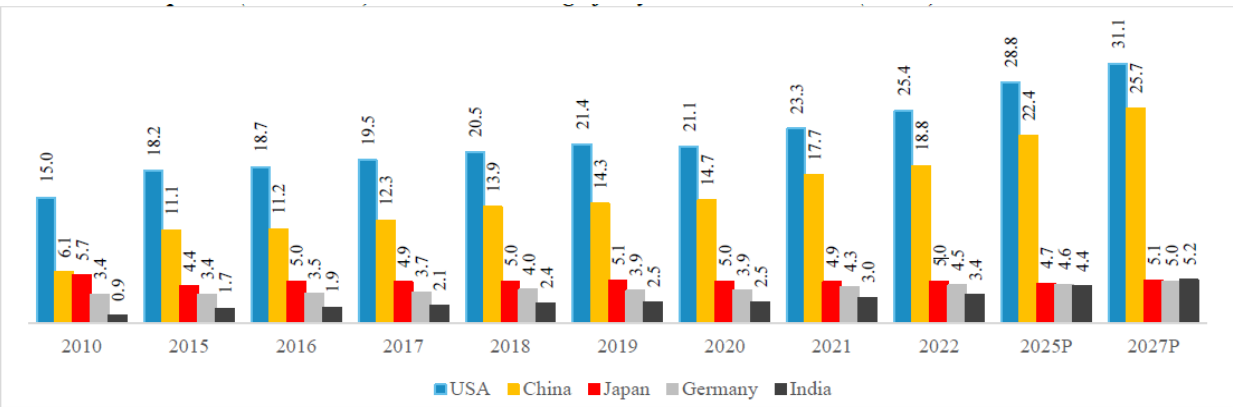
While contemplating the challenges that lie ahead, one should not be daunted because the social and economic transformation of democratic India is a remarkable success story. We have come a long way. The economy has grown from around USD288 billion in FY93 to USD3.6 trillion in FY23. India has generated more growth per dollar of debt than other comparable nations. Abject poverty has all but been eliminated. Human development indicators have improved, and more Indians, especially women, are getting educated. For all its flaws and warts, the system has delivered accountability through the democratic process and public discourse, where the occasional and rarer mature commentary proves effective. We should not lose sight of that.

Global Economy:-

Following the onset of the Covid-19 pandemic crisis, the global economy has experienced a combination of both risks and opportunities. Progressing toward recovery, the global economy started returning to normalcy after a prolonged struggle; the governments worldwide have taken swift and appropriate measures, including widespread vaccination efforts and the consistent implementation of fiscal and monetary support strategies. Right when the economic situation seemed to be improving after the Covid-19, the Russia-Ukraine geopolitical conflict unfolded, contributing to global inflationary pressures and resulting in record-high levels not witnessed in the past four decades. Moreover, the impact of the conflict between Israel and Hamas on global financial markets will be contingent on the involvement of major regional powers. If the conflict remains localized between Israel and

Hamas, its effects are likely to be limited, primarily affecting countries directly engaged in trade with Israel or Palestine. However, should the conflict extend to major oil-producing nations in the region, such as Iran, the global economy may experience significant consequences. Interruptions in the oil supply could lead to a sharp increase in energy costs for businesses and households, posing a potential threat to the overall stability of the global economy. To tackle this, Central Banks are adopting a hawkish approach and implementing interest rate hikes.

On the back of enhanced vaccination coverage and continued fiscal and monetary stimuli across countries, the GDP of the World grew by 13.2% CY 21 against a contraction of 3.0 % in CY 20. The positive trend continued into CY 22, with a growth rate of 4.7%. The global GDP is forecasted to grow from USD 101.0 trillion in CY 22 to 128.5 in CY 27, thus growing at a CAGR of 4.9% during the forecasted period. The GDP (at current price) of the major economies in the world is presented in the table below



Source: World Bank Data, IMF, RBI; CY 2022 for India refers to FY 2023 data and so on.

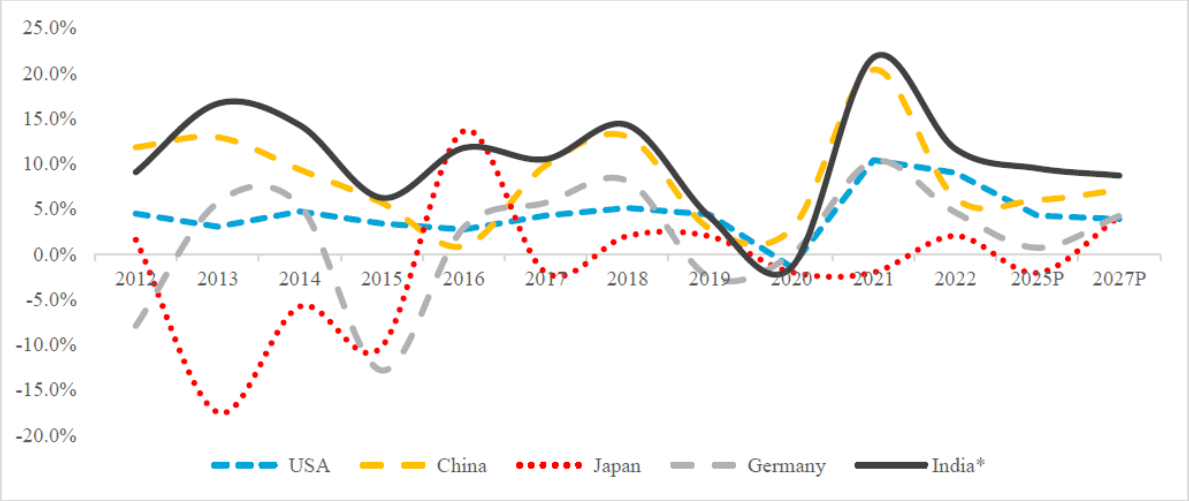
Country	Rank in GDP (CY 22)	Rank in GDP (PPP)	CY 10	CY 15	CY 16	CY 17	CY 18	CY 19	CY 20	CY 21	CY 22	CY 25P	CY 27P	CAGR (2016-21	CAGR (2022-27)
USA	1	2	15.1	18.2	18.7	19.5	20.5	21.4	21.1	23.3	25.4	28.8	31.1	4.5%	4.1%
China	2	1	6.1	11.1	11.2	12.3	13.9	14.3	14.7	17.7	18.8	22.4	25.7	9.6%	6.5%
Japan	3	4	5.8	4.4	5.0	4.9	5.0	5.1	5.0	4.9	5.0	4.7	5.1	-0.4%	0.4%
Germany	4	5	3.4	3.4	3.5	3.7	4	3.9	3.9	4.3	4.5	4.6	5.0	4.2%	2.1%
India	5	3	0.9	1.7	1.9	2.1	2.4	2.5	2.5	3.0	3.4	4.4	5.2	9.6%	8.9%
UK	6	10	2.5	2.9	2.7	2.6	2.9	2.8	2.7	2.9	3.2	3.6	4.0	1.4%	4.6%
Brazil	12	8	2.2	1.8	1.8	2.1	1.9	1.9	1.5	1.6	1.8	2.3	2.6	-2.3%	7.6%
Russia	11	6	1.6	1.4	1.3	1.6	1.7	1.7	1.5	1.8	1.9	2.2	2.3	6.7%	3.9%
World	-	-	66.6	75.2	76.5	81.4	86.5	87.7	85.0	96.5	101.0	116.5	128.5	4.8%	4.9%

The world economy has experienced a contraction in GDP growth during the pandemic i.e. in CY 20. However, the governments and central banks globally have taken decisive actions by implementing fiscal and monetary stimulus measures to bolster the process of economic recovery. Further, the gradual recovery of global supply chains and increased international trade have contributed to the positive growth trajectory. These well-calibrated initiatives and the recovery to global supply-chain have been directed towards reinstating consumer and business confidence, stimulating demand, and achieving stability in financial markets. As a result of these concerted efforts, multiple countries and regions have demonstrated encouraging signs of economic revival and notable growth.

2. Indian Macro Economy Parameters

India's economy carried forward the momentum it built in FY23 into FY24 despite a gamut of global and external challenges. The focus on maintaining macroeconomic stability ensured that these challenges had minimal impact on India's economy. As a result, India's real GDP grew by 8.2 per cent in FY24, posting growth of over 7 per cent for a third consecutive year, driven by stable consumption demand and steadily improving investment demand.

The economies of India and China witnessed remarkable growth in nominal GDP during the calendar year 2021 and 2022, following the COVID-19 pandemic. India demonstrated a substantial year-on-year nominal GDP growth rate of 21.8% in CY 21 followed by a growth of 11.7% in CY 22. Meanwhile China experienced a notable growth rate of 20.4% in CY 21 and 6.2% growth in CY 22. On the other hand, major economies like the United States and Germany reported GDP growth rates of 10.4% and 10.3% respectively during CY 21 followed by 9% and 4.7% GDP growths in CY 22. Japan, however, experienced a negative growth in GDP (-2.0%) during CY 21. Nevertheless, in CY 22, Japan's GDP rebounded with a growth rate of 2%.

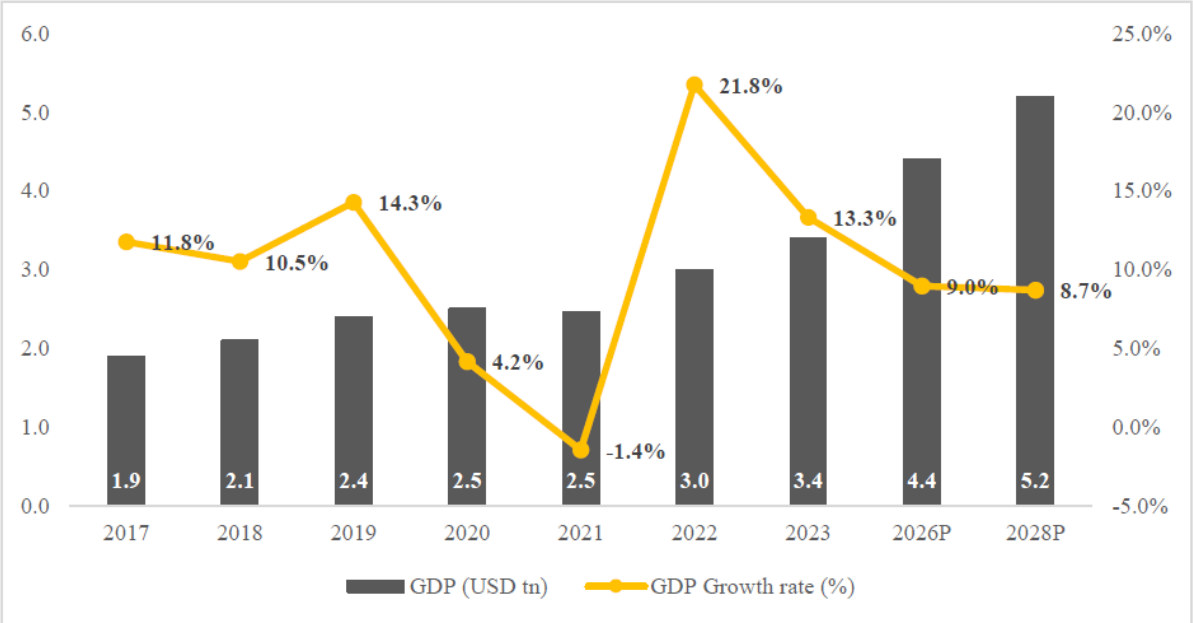


Source: India Data from RBI, Future growth rate from OECD Data, Technopak Analysis
1USD = INR 80
**For India, CY 11 represents FY 12 and so on.*

	CY 12	CY 13	CY 14	CY 15	CY 16	CY 17	CY 18	CY 19	CY 20	CY 21	CY 22	CY 25P	CY 27P
USA	4.5%	3.1%	4.8%	3.4%	2.7%	4.3%	5.1%	4.4%	-1.4%	10.4%	9.0%	4.3%	3.9%
China	11.8%	12.9%	9.4%	5.7%	0.9%	9.8%	13.0%	2.9%	2.8%	20.4%	6.2%	6.0%	7.1%
Japan	1.6%	-17.5%	-5.8%	-10.2%	13.6%	-2.0%	2.0%	2.0%	-2.0%	-2.0%	2.0%	-2.0%	4.2%
Germany	-7.9%	5.7%	5.4%	-12.8%	2.9%	5.7%	8.1%	-2.5%	0.0%	10.3%	4.7%	0.7%	4.3%
India*	**9.1%**	**16.7%**	**14.3%**	**6.2%**	**11.8%**	**10.5%**	**14.3%**	**4.2%**	**-1.4%**	**20.0%**	**11.7%**	**9.5%**	**8.7%**

India is the world's 5th largest economy and expected to be in the top 3 by FY 28
India ranked fifth in the world in terms of nominal gross domestic product ("GDP") for FY 22 and is the third largest economy in the world in terms of purchasing power parity ("PPP"). India is expected to be USD ~5.2 trillion economy by FY 28 and is estimated to be the third largest economy surpassing Germany and Japan

India's nominal GDP at current prices (In USD Tn) and GDP Growth rate (%) (FY).



India's nominal GDP has grown at a CAGR of 9.6% between FY 17 and FY 22 and is expected to continue the trend by registering an expected CAGR of 8.9% for 5-year time period from FY 23 to FY 28.

Since FY 05, the Indian economy's growth rate had been twice as that of the world economy and it is expected to sustain this growth momentum in the long term. From FY 23 to FY 28, India's nominal GDP is expected to grow at a CAGR of 8.9%, which compares favourably to the world average (4.9%) and with other major economies,

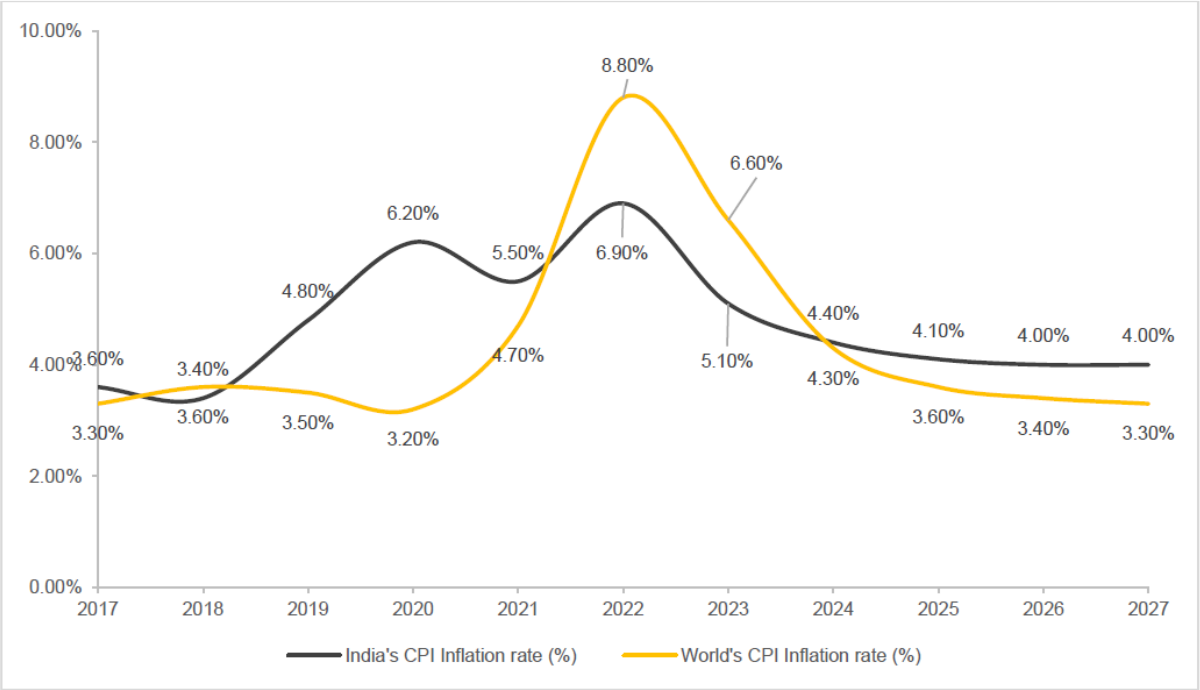
including China (6.5%), UK (4.6%), Japan (0.4%), Germany (2.1%) and the USA (4.1%) for the similar period of CY 22 to CY 27. It is also expected that the growth trajectory of Indian economy will enable India to be among the top 3 global economies by FY 28. Several factors are likely to contribute to economic growth in the long run.

These include favourable demographics, reducing dependency ratio, rapidly rising education levels, steady urbanization, growing young & working population, IT revolution, increasing penetration of mobile & internet infrastructure, government policies, increasing aspirations and affordability etc.

Macro-Economic and Overview – Inflation

Inflation is measured by the consumer price index (CPI), is defined as the change in the prices of a basket of goods and services that are typically purchased by specific groups of households. The world has witnessed a significant rise in inflation during the year 2022 where the average global inflation was recorded at 8.8%. As per the IMF report, the global inflation rate is expected to drop to 6.6% in CY 23 and 4.3% to CY 24 as compared to a pre-pandemic level of 3.5% during CY 17 to CY 19.

Comparison of India's inflation rate (%) to the World's – average consumer price (CY)



Source: IMF projection

The economies of both India and the world are undergoing a recovery process following the impact of the COVID-19 pandemic. However, the speed of their recovery is influenced not only by the severity of the COVID-19 impact but also by their ability to handle the challenges arising from the economic consequences of the ongoing geopolitical conflict between Russia and Ukraine.

Due to a substantial increase in global crude oil and commodity prices, India along with other developed countries are faced significant challenges related to high levels of inflation in recent years. Further, the pandemic has led to disruptions in global supply chains, affecting the availability of goods and raw materials. In response to this

inflationary pressure, these countries are compelled to raise their domestic interest rates. RBI has been working towards reducing inflation by increasing the Repo rate to control the supply and demand of goods and services.

The RBI has increased repo rate by a cumulative 250 basis points, from 4% in April 2022 to 6.50% in April 2023, with an aim to tackle the current inflation scenario in India. The CPI inflation rate in India has been above the Reserve Bank of India (RBI) medium-term target of 6%. The country's retail inflation slipped to 4.25% in May 2023, from 6.44% in January 2023. The CPI inflation in India is expected to fall from 6.9% in FY 22 to 5.1% in FY 23 and further dropping to 4.4% during the year 2024.

Global Inflation rate, average CPI (%) – U.S., U.K, China, Japan, India, Germany (CY)

Inflation rate (CPI%)	2017	2018	2019	2020	2021	2022	2023P	2024P	2025P	2026P	2027P
China	1.6%	2.1%	2.9%	2.4%	0.9%	2.2%	2.2%	1.9%	2.0%	2.0%	2.0%
India	3.6%	3.4%	4.8%	6.2%	5.5%	6.9%	5.1%	4.4%	4.1%	4.0%	4.0%
Japan	0.5%	1.0%	0.5%	0.0%	-0.2%	2.0%	1.4%	1.0%	1.0%	1.0%	1.0%
Germany	1.7%	1.9%	1.4%	0.4%	3.2%	8.5%	7.2%	3.5%	2.6%	2.0%	2.0%
UK	2.7%	2.5%	1.8%	0.9%	2.6%	9.1%	9.0%	3.7%	1.8%	2.0%	2.0%
USA	2.1%	2.4%	1.8%	1.2%	4.7%	8.1%	3.5%	2.2%	2.0%	2.0%	2.0%
World	3.3%	3.6%	3.5%	3.2%	4.7%	8.8%	6.6%	4.3%	3.6%	3.4%	3.3%

Source: IMF projections

Private Final consumption: -

GDP growth in India is expected to be driven by rising private final consumption expenditure. India is a private consumption driven economy where the share of domestic consumption is measured as private final consumption expenditure (PFCE). This private consumption expenditure comprises both goods (food, lifestyle, home, pharmacy etc.) and services (food services, education, healthcare etc.). High share of private consumption to GDP has the advantage of insulating India from volatility in the global economy. It also implies that sustainable economic growth directly translates into sustained consumer demand for goods and services. India's domestic consumption has grown at a CAGR of 10.4% between FY 17 and FY 23, compared to 5.5% and 12.7% in the USA and China, respectively during the similar period of CY 16 and CY 22. Further, Indian total PFCE is expected to grow at same pace during the next 5 years at a CAGR of 10.8% and projected reach to USD 3 trillion by FY 27.

In FY 22, PFCE accounted for ~60% of India's GDP. This is much higher than that in China (~39%), Germany (~50%) and comparable to that of the US (~68%) and the UK (~61%) for similar time of CY 21. With the rapidly growing GDP and PFCE, India is expected to be one of the top consumer markets in the world. It is estimated that the Private Final Consumption expenditure contribution to India's GDP will be 60.55% for FY 23.

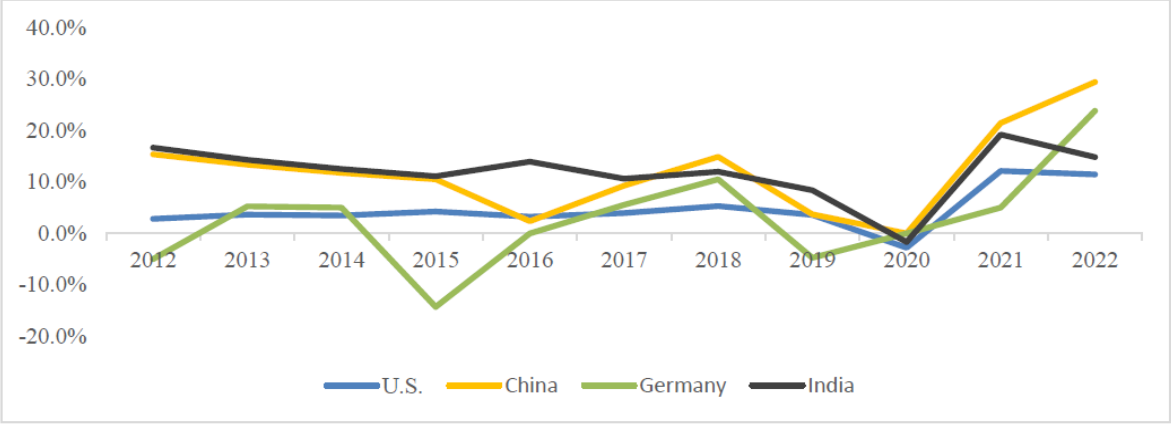
Total Private Final Consumption Expenditure in CY (Current Prices USD Tn)

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2026P	Contribution to GDP		CAGR	
														2019	2021	2022	2016-22	2022-26
U.S.	10.7	11	11.4	11.8	12.3	12.7	13.2	13.9	14.4	14	15.7	17.5	NA	67.4%	68.3%	NA	5.5%	NA
China	2.6	3	3.4	3.8	4.2	4.3	4.7	5.4	5.6	5.6	6.8	8.8	NA	39.2%	38.9%	NA	12.7%	NA
Germany	2	1.9	2	2.1	1.8	1.8	1.9	2.1	2	2	2.1	2.6	NA	51.7%	49.6%	73.1%	6.3%	NA
India*	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.4	1.5	1.5	1.8	2.1	3.0	61.0%	59.6%	60.1%	10.4%	10.8%
Italy	1.4	1.3	1.3	1.3	1.1	1.1	1.2	1.3	1.2	1.1	1.1	1.5	NA	59.8%	57.8%	79.8%	5.3%	NA
U.K.	1.7	1.8	1.8	2	1.9	1.8	1.7	1.9	1.8	1.7	2	2.6	NA	66.0%	61.1%	83.9%	6.3%	NA
World	41.7	42.6	43.8	45	42.6	43.6	46	48.5	49.3	46.9	50.2	NA	NA	56.2%	55.7%	NA	NA	NA

Source: World Bank, RBI, Technopak Research & Analysis
** For India, CY 2011 refers to FY 2012 and so on, India Data in FY*
1USD = INR 80

Total Private Final Consumption Expenditure growth (%) (CY)

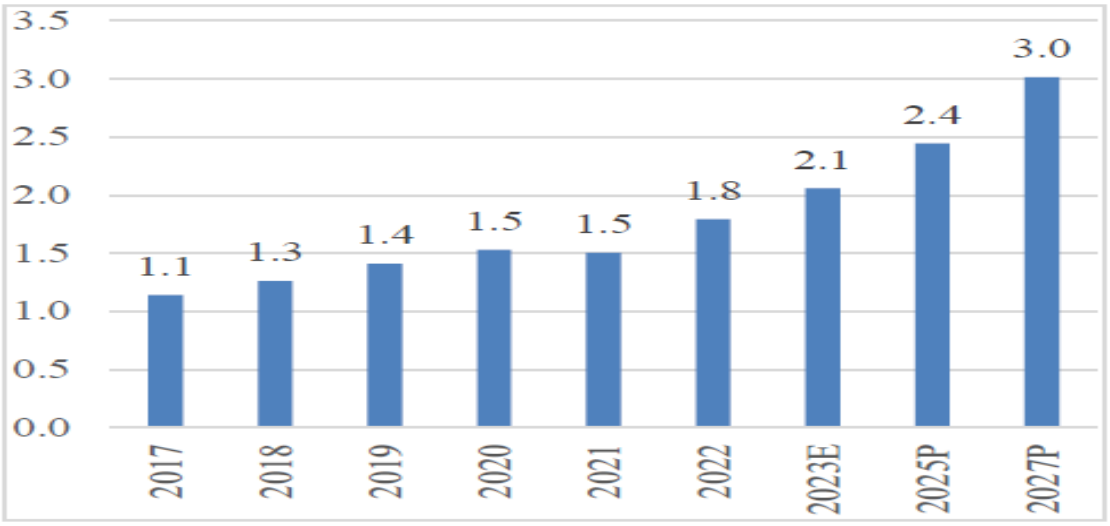
Country	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
U.S.	2.8%	3.6%	3.5%	4.2%	3.3%	3.9%	5.3%	3.6%	-2.8%	12.1%	11.5%
China	15.4%	13.3%	11.8%	10.5%	2.4%	9.3%	14.9%	3.7%	0.0%	21.4%	29.4%
Germany	-5.0%	5.3%	5.0%	-14.3%	0.0%	5.6%	10.5%	-4.8%	0.0%	5.0%	23.8%
India	16.7%	14.3%	12.5%	11.1%	13.9%	10.6%	12.0%	8.4%	-1.7%	17.1%	16.3%



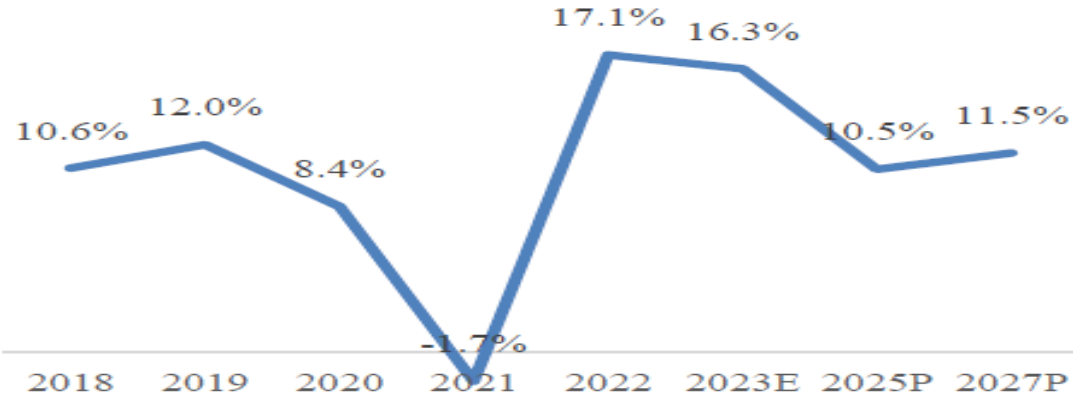
Source: World Bank, RBI, Technopak Research & Analysis
** For India, CY 12 refers to FY 13 and so on, India Data in FY. 1USD = INR 80*

Over the years, the growth rate of Total Private Final Consumption of India has always been the highest as compared to the other top economies in the world.

Total Private Final Consumption Expenditure of India (Current Prices USD Tn) FY:-

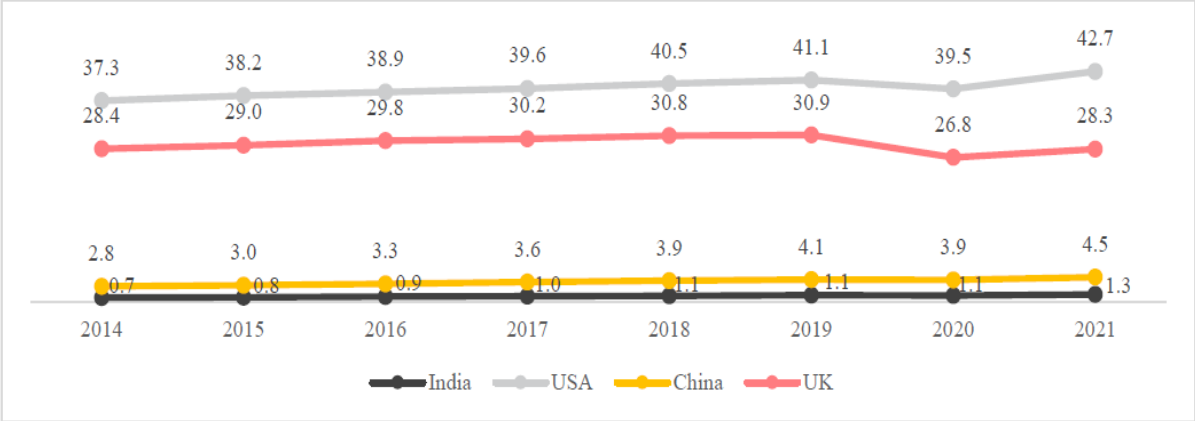


Private Final Consumption Expenditure y-o-y growth rate of India (%)



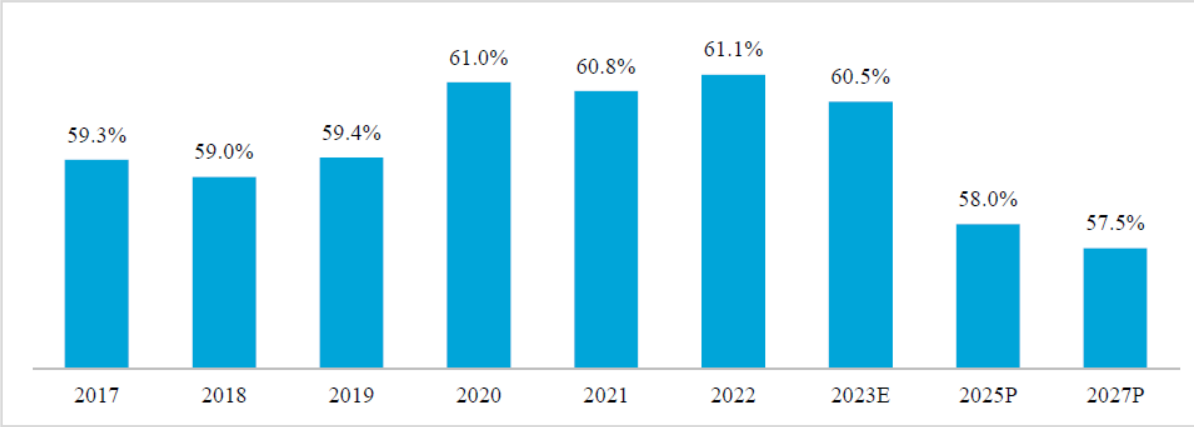
PFCE in India has exhibited varying y-o-y growth rates over the past few years. During FY 18 and FY 19, the PFCE grew by 10.6% and 12.0% respectively, indicating a robust expansion in consumer spending and a sustained momentum in private consumption. However, FY 21 witnessed a significant contraction in PFCE growth, with a y-o-y rate of -1.7% caused by the COVID-19 pandemic. Data for FY 22 estimate a substantial rebound with a growth rate of 17.1%, reflecting the anticipated revival in consumer demand as the economy recovers from the pandemic-induced downturn. With a projected growth rates of 10.5% in FY 25 and 11.5% in FY 27, it is forecasted to have a sustained positive trajectory for PFCE growth rate in India.

Per Capita Final Consumption Expenditure:-



Source: RBI, World Bank, Note: Per capita consumption for countries other than India include per capita final consumption expenditure for NPISHs and households
Note: India's per capita consumption is at current prices while for other countries, it is at constant 2015 USD prices.
Note: CY 2014 represents FY 2015 and so on for India.
1USD = INR 80

Private Final Consumption Expenditure to India's GDP:-



Source: Ministry of Statistics and Program Implementation

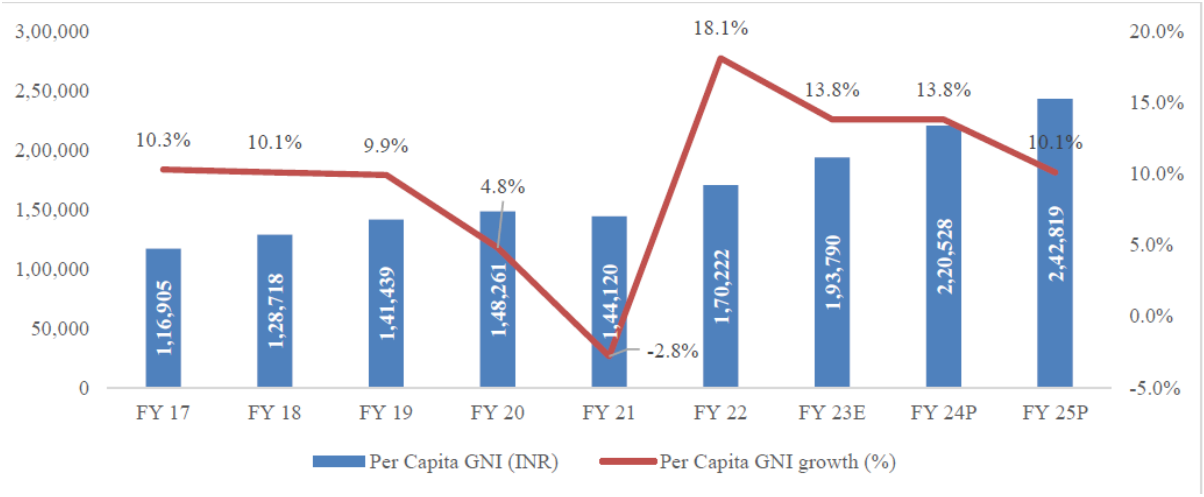
A high share of private final consumption expenditure to GDP indicates that the economy is driven by consumer spending, which can be a positive sign for economic growth. However, if the share of private consumption expenditure is too high, it can lead to inflationary pressures and an unsustainable economy. India's share of private

final consumption expenditure to GDP has increased over the years and has recorded 61.12% in FY 22 from 59.34% in FY 17. As per Ministry of Statistics and Program Implementation report, the share of India's PFCE to GDP will account for approximately 60.55% in FY 23.

Per Capita Income Growth:-

Income growth, presented by the GNI (Gross National Income) which is defined as the total amount of money earned by a country's businesses and individuals. India's gross national income growth with a CAGR of ~8% for the period FY 17 to FY 22 and is expected to continue the growth momentum with a CAGR of 12.6% from FY 22 to FY 25. Growing GNI is one of the strongest drivers for higher private consumption trends. The GNI per capita for the top five economies of the world such as the USA (USD 76,370), China (USD 12,850), Japan (USD 42,440), Germany (USD 53,390) and the UK (USD 48,890) is higher for CY 22 than that of India's GNI of USD 2,422 (INR 1,93,790) for a similar period of FY 23.

India's GNI Per Capita (INR) (Current Prices) and Y-o-Y growth trend (FY):-

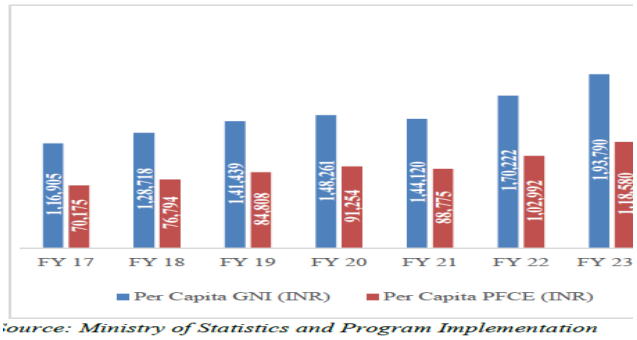


Correlation between India's Per Capita income growth to per capita consumption growth:-

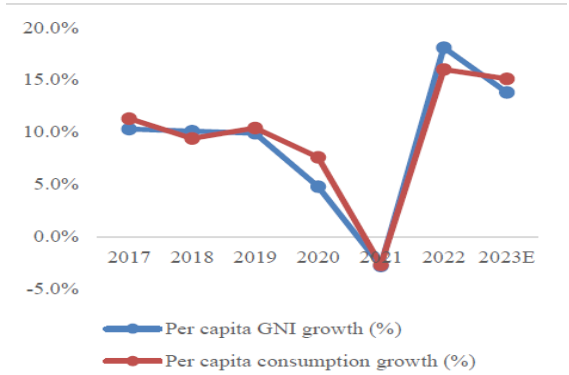
In recent years, India has experienced a significant economic growth, with per capita income increasing from INR 1.16 lakhs in FY 17 to INR 1.70 lakhs in FY 22 and is expected to have reached INR 1.93 lakhs during FY 23. During this period, there has also been a corresponding increase in per capita consumption, as people have more money to spend on a variety of goods and services. The per capita PFCE of India increased from INR 0.70 lakhs in FY 17 to INR 1.02 lakhs in FY 22 and INR 1.18 lakhs

in FY23. There is generally a positive correlation between a country's per capita income growth and per capita consumption growth.

Correlation between India's per capita income growth and per capita PFCE growth (%) (FY)

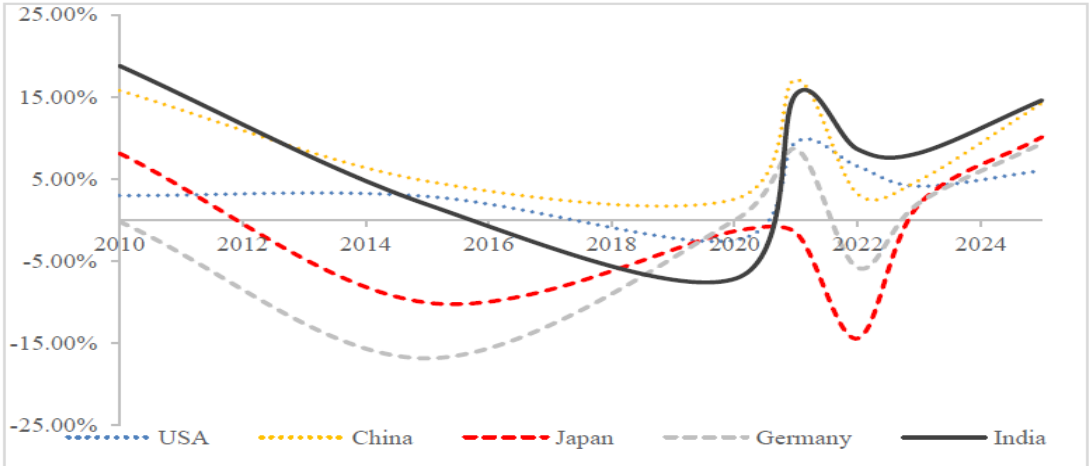


Source: Ministry of Statistics and Program Implementation



India's Per Capita GDP has almost doubled from year 2010 to 2023. India's per capita income has grown at a CAGR of 6.50% from the period of CY 15 to CY 22 while the per capita GDP for other developed and developing countries such as US, China, Japan and Germany grew at the CAGR of 4.10%, 7.12%, -0.25% and 2.36% respectively over a similar time period of CY 15 to CY 22.

Per Capita GDP growth rate of top 5 economy in the world (US$)



	2010	2015	2020	2021	2022	2023P	2025P
USA	3.0%	2.9%	-2.5%	9.5%	6.6%	4.1%	6.0%
China	15.8%	4.7%	2.6%	17.1%	3.2%	4.8%	14.3%
Japan	8.1%	-10.1%	-1.4%	-1.5%	-14.4%	1.9%	10.1%
Germany	-0.2%	-16.8%	0.0%	8.7%	-5.8%	2.1%	9.4%
India	**18.8%**	**1.9%**	**-7.2%**	**15.3%**	**8.6%**	**8.2%**	**14.6%**

Source: IMF Projection

Sectorial share of Gross value added (GVA)

The shares of the agriculture, industry and services sector in overall GVA (Gross value added) at current prices were 17.7 per cent, 27.6 per cent and 54.7 per cent respectively in FY24. GVA in the agriculture sector continued to grow, albeit at a slower pace. Erratic weather patterns during the year and an uneven spatial distribution of the monsoon in 2023 impacted overall output. This is reflected in the marginal decline in total foodgrain output for FY24 of 0.3 per cent as per the third advanced estimate of foodgrain production released by the Ministry of Agriculture and Farmers' Welfare (MoAFW).

Within the industrial sector, manufacturing GVA shrugged off a disappointing FY23 and grew by 9.9 per cent in FY24. Manufacturing activities benefitted from reduced input prices while catering to stable domestic demand. The input price advantage was reflected in the subdued growth in the Wholesale Price Index (WPI) inflation, which led to a deflator of (-)1.7 per cent for the manufacturing sector during FY24. Manufacturers also passed on the reduction in input prices to consumers, reflected in the sustained decline in the core consumer price inflation. The strength of manufacturing is further corroborated by the strong performance of the HSBC India PMI for manufacturing, which consistently remained well above the threshold value of 50, indicating sustained expansion and stability in India's manufacturing sector. Construction activities displayed increased momentum and registered a growth of 9.9 per cent in FY24 due to the infrastructure buildout and buoyant commercial and residential real estate demand.

Outlook of the Indian Economy: -

The Indian economy recovered swiftly from the pandemic, with its real GDP in FY24 being 20 per cent higher than the pre-COVID, FY20 levels. This meant a CAGR of 4.6 per cent from FY20, despite a 5.8 per cent decline in FY21 inflicted by the pandemic. During the decade ending FY20, India grew at an average annual rate of 6.6 per cent, more or less reflecting the long-run growth prospects of the economy. This is the background against which we can see the prospects for FY25.

IMF projects the global economy to grow at 3.2 per cent in 2024, with risks being broadly balanced. The average annual global growth was 3.7 per cent during the decade ending FY20. Inflationary pressures have moderated in most economies with declining global commodity prices and easing of supply chain pressures. However, core inflation remains sticky and driven by high service inflation. Many central banks have hinted at the peaking of the interest rate hike cycle. The ECB has already cut the policy rate, while the Fed has hinted at reducing the rate in 2024. If the services inflation across economies moderates faster, that may allow central banks to bring forward the monetary policy easing cycle earlier than currently anticipated. A likely reduction in policy rates by central banks of AEs, especially the Fed, will open the space for central banks of EMEs to follow the lead, bringing down the cost of capital.

On the downside, any escalation of geopolitical conflicts in 2024 may lead to supply dislocations, higher commodity prices, reviving inflationary pressures and stalling monetary policy easing with potential repercussions for capital flows. This can also influence RBI's monetary policy stance. The global trade outlook for 2024 remains positive, with merchandise trade expected to pick up after registering a contraction in volumes in 2023. Conversely, increased fragmentation along geopolitical lines and renewed thrust on protectionism may distort merchandise trade growth, impacting India's external sector. Global financial markets have scaled new heights, with investors betting on global economic expansion. However, any corrections in the elevated financial market valuations may have ramifications for household finances and corporate valuation, negatively impacting growth prospects. Hiring in the information technology sector had slowed down considerably in FY24, and even if hiring does not decline further, it is unlikely to pick up significantly. However, leveraging the initiatives taken by the government and capturing the untapped potential in emerging markets, exports of business, consultancy and IT-enabled services can expand. Despite the core inflation rate being around 3 per cent, the RBI, with one eye on the withdrawal of accommodation and another on the US Fed, has kept interest rates unchanged for quite some time, and the anticipated easing has been delayed.

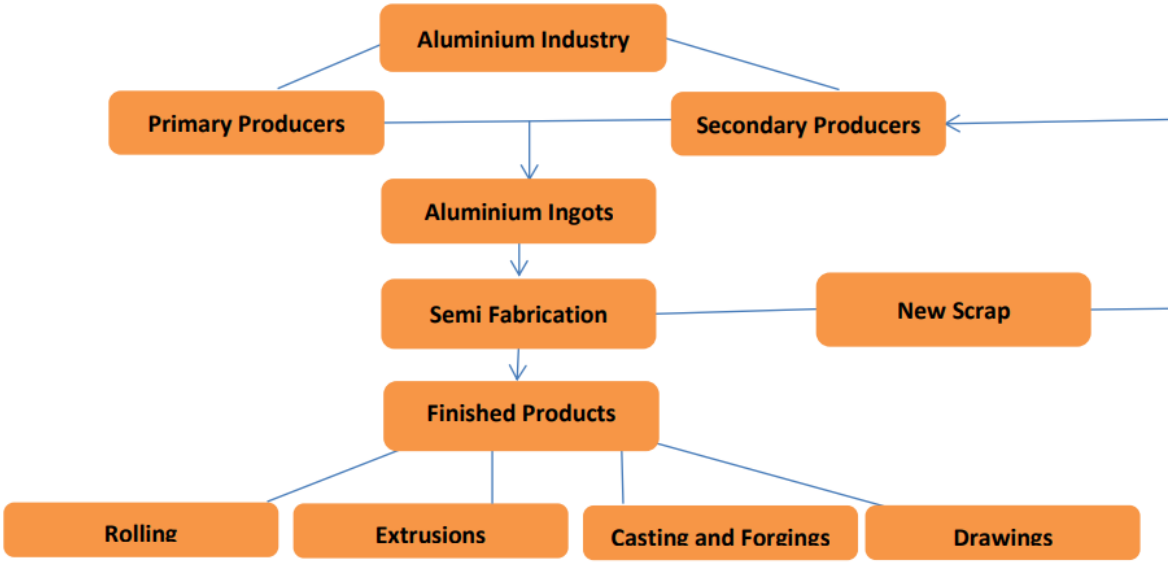
Domestic growth drivers have supported economic growth in FY24 despite uncertain global economic performance. Improved balance sheets will help the private sector cater to strong investment demand. A note of caution is warranted here. Private capital formation after good growth in the last three years may turn slightly more cautious because of fears of cheaper imports from countries that have excess capacity. While merchandise exports are likely to increase with improving growth prospects in AEs, services exports are also likely to witness a further uptick. A normal rainfall forecast by the India Meteorological Department and the satisfactory spread of the southwest monsoon thus far are likely to improve agriculture sector performance and support the revival of rural demand. However, the monsoon season still has some ways to go. Structural reforms such as the GST and the IBC have also matured and are delivering envisaged results.

3. Aluminium industry structure and board overview

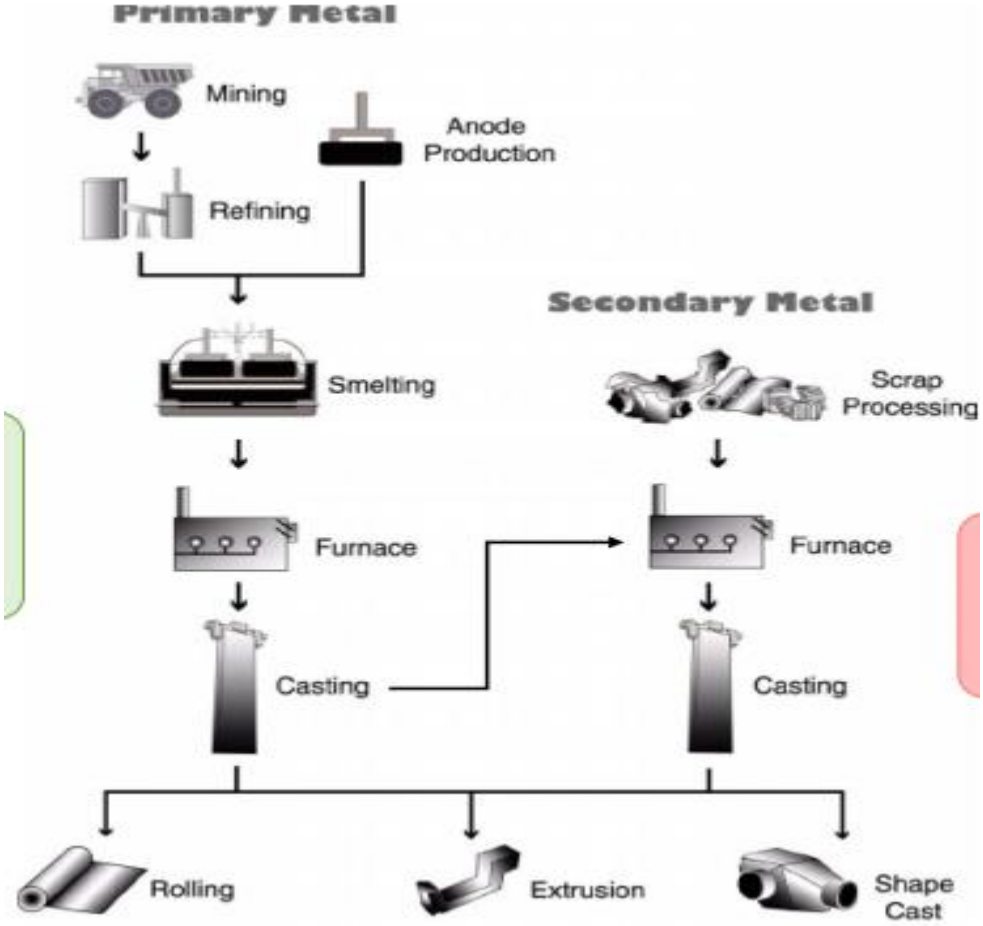
Introduction:-

Aluminium industry is one of the leading segments of the Indian economy and is expected to play a significant role in its future growth. Aluminium is one of the lightest metals in the world and as a result it is used widely in the production of multiple products. This metal has a shiny silver colour and it is malleable meaning it can be bend without breaking. In nature, aluminium is found in an ore called bauxite. Bauxite is the basic raw material in the aluminium manufacturing process. Bauxite is converted into alumina in alumina refineries. After the iron and steel industry, aluminium is the second most important industry. The Aluminium production process can be divided into upstream and downstream activities. The upstream process involves mining and refining activities, while downstream process involves smelting and casting & fabricating. Aluminium downstream fabricated products include rods, sheets, extrusions and foils. Aluminium is used in the production and distribution of electricity in the modern world, household utensils and electric appliances, aircraft manufacturing, rail coaches, nuclear and defence accessories, and so on. The industry meets the requirements of a wide range of industries including engineering, electrical and electronics, automobile and automobile components, etc. Aluminium is the 3rd most available element present in the earth's crust and the 2nd most used metal after steel.

Structure of Aluminium Industry: -



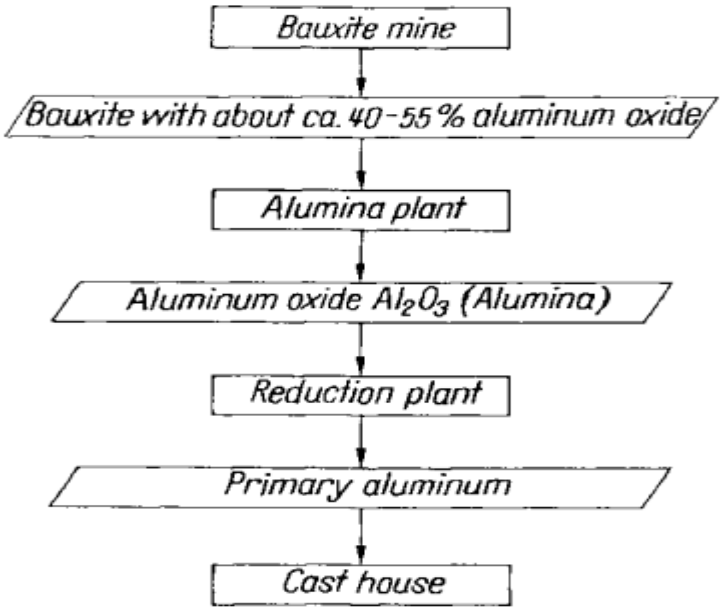
Process flow of Aluminium Production Process:-



Production Process:-

Extraction of Aluminum:-

The extraction of Aluminum from its ore and subsequent processing into finished products takes place in a series of successive operations, each largely independent of the other. Generally the various processes are carried out at different plant sites.



Bauxite Mining:-

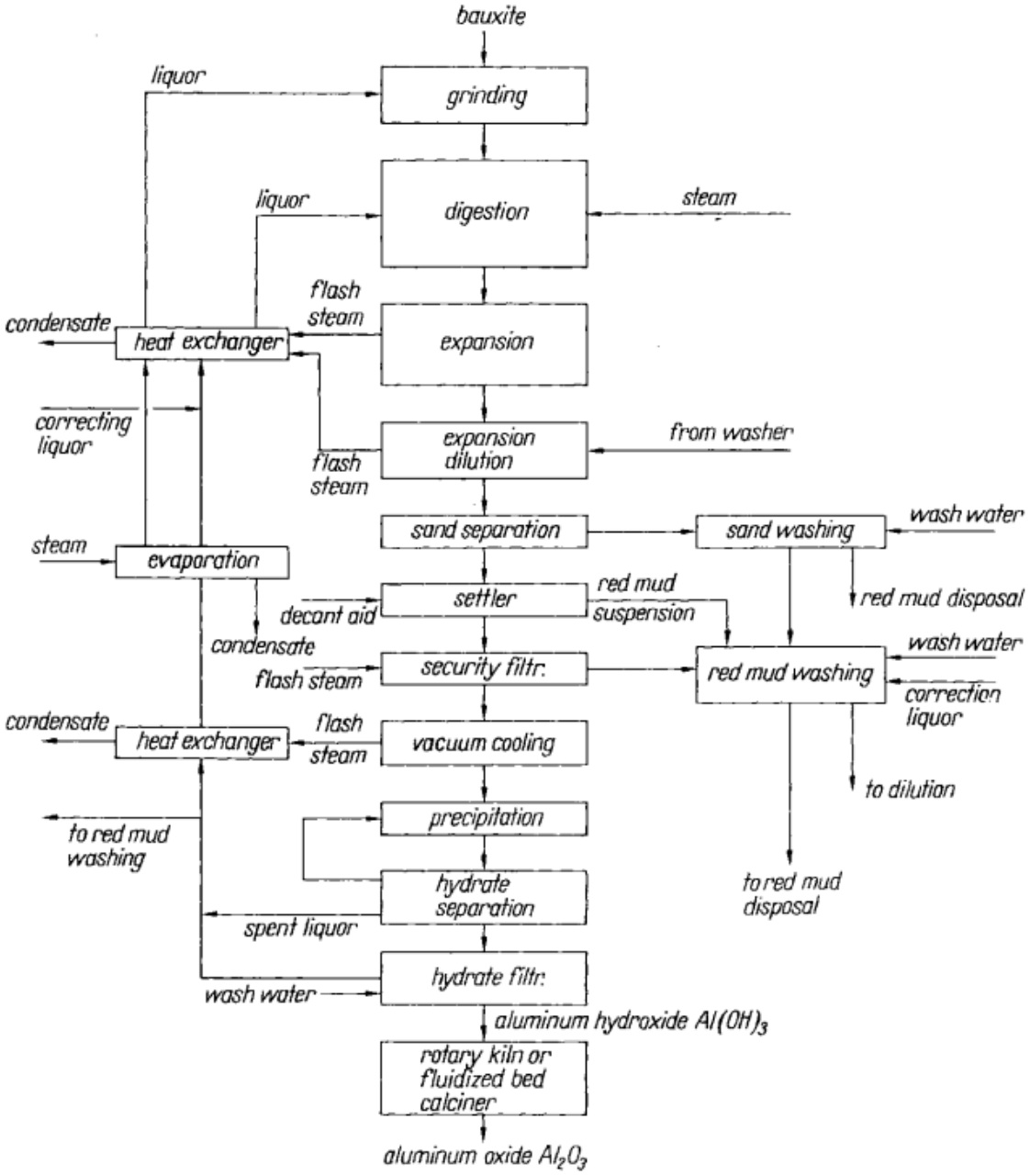
Aluminum comprises approximately 8% of the earth's crust, making it second only to silicon (27.7%). Iron is third at about 5%. Metallic Aluminum is not found in nature. The principal ore from which Aluminum is extracted is called bauxite. Bauxite is a weathered rock containing two forms of hydrated Aluminum oxide, either mostly a monohydrate AlO(OH) in caustic bauxite, or mostly a trihydrate Al(OH)3 in lateric bauxite. Besides these compounds, bauxite contains iron oxide, which usually gives it a reddish-brown colour, as well as silicates (clay, quartz) and titanium oxide. The crystal structure also contains 12–20% by weight of water. . Tropical monohydrate bauxite grades yielding 35–55% Al2 O3 will no doubt continue to be the most favored aluminum ores for many decades.

The Alumina plant:-

The starting material for electrolytic smelting of Aluminum is pure, anhydrous Aluminum oxide (Al2O3) called alumina.

The bauxite from the mine is crushed and ground. It is then mixed with a solution of caustic soda and pumped into large autoclaves. There, under pressure and at a temperature of 110–270°C, the alumina contained in the ore is dissolved to form sodium aluminate. The silica in the bauxite reacts and precipitates from solution as sodium-

Aluminum-silicate. Iron and titanium oxide and other impurities are not affected chemically, and being solid, settle out of solution. This waste material, known as red mud, is separated from the sodium aluminate solution, washed to recover the caustic soda, and then pumped to disposal areas.



Primary Aluminum Production: -

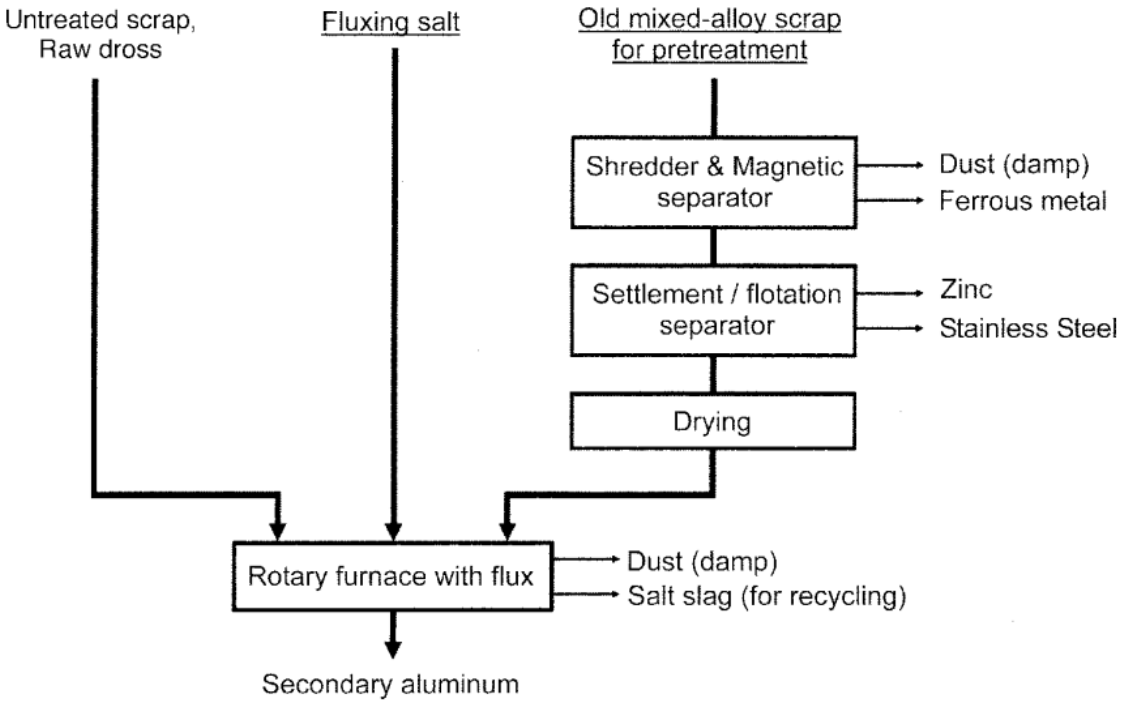
Throughout the world, primary aluminum is still produced by the electrolysis of alumina in molten fluoride salt. In the Hall-Héroult process, the electrolyte is molten cryolite (Na_3AlF_6) in which 2–8% of alumina (Al_2O_3) is dissolved. To lower the melting point, industrial cryolite-alumina mixtures also contain various amounts of other salts, such as aluminum fluoride (AlF_3) and calcium fluoride (CaF_2); sometimes lithium carbonate (Li_2CO_3) is present and, less frequently, magnesium fluoride (MgF_2) is introduced. These additions also improve current efficiency and reduce evaporation losses. For each tonne of aluminum produced, the smelting process consumes, in addition to electrical energy, about 1.95 tonnes of alumina, 0.5 tonnes of anode coke, and small amounts of fluoride salts.

Primary aluminum:-

Smelters produce primary aluminum (as opposed to secondary, or recycled, aluminum) with a purity of 99.7–99.9%. The main impurities are iron and silicon, together with smaller amounts of zinc, magnesium, manganese, and titanium. Typical analyses also show traces of copper, chromium, gallium, sodium, lithium, calcium, vanadium, and boron. Passing chlorine gas through the molten aluminum can remove traces of sodium, lithium, calcium, and, if necessary, magnesium. Filtering can remove suspended particles, such as oxides and carbides. Hydrogen, the only gas soluble to any extent in aluminum, can be removed by degassing with chlorine, nitrogen, or, better still, argon. International standards distinguish two types of unalloyed aluminum: “pure aluminum” of 99.0–99.9% and “high-purity” aluminum of at least 99.97%, which is produced by further refinement.

The Production of Secondary Aluminum:-

A used aluminum part, whether extrusion, sheet or plate, forging or casting, or a used finished product such as a can or a cast wheel, can be efficiently remelted and reconverted via the appropriate fabrication route—ingot casting, extruding, rolling or die-casting—into a new usable form. The resulting material loss by surface oxidation, called melt loss, varies from a few tenths of one percent in the case of clean, uncoated, massive castings or forgings to as much as 10% for light-gage coated packaging scrap. Melt loss depends very much on the type of feedstock: its shape and gage and the type and thickness of lacquer or other form of coating—all of these factors have a major influence on the amount of metal “lost.” Melt loss also depends very much on the chosen method of melting.



Processing of Aluminum:-

Ingot casting (DC casting):-

Primary aluminum and also scrap are cast into rolling ingot (slab), extrusion ingot (billet) and wire bar ingot, and, to a lesser extent, forging stock in the casthouses of the reduction plants or semifabricated products plants. Appropriate alloying elements are added in the melting or holding furnaces, after which the metal is cleaned and cast. Reduction plant cast houses also produce pigs from a part of the primary metal.

Mold Casting;-

In foundries, cast products are usually produced from pre alloyed metal supplied by secondary smelters. In some cases, casting alloys are prepared from a primary metal base for products that must meet rigid requirements that can be achieved only with minor amounts of impurities (for example, iron).

There are three main aluminum casting processes: sand casting, permanent mold casting, and die casting, which usually produces a finished part in one step. Unlike semi fabricated products plants, foundries may deliver a finished product which requires no further forming

Special casting processes:-

The continuous casting of strip, wire, and rod belong to this family. Lately, continuous strip casting processes are experiencing the most rapid growth.

Semi fabricated products plants:-

An aluminum plant for the production of semifabricated products (sometimes called a "semis" plant) may receive ingots for fabrication directly from the reduction plant or from their own remelt shop. Typical fabrication steps in a semis plant are shown in Fig. 2.10. The first operation is the hot deformation of the cast ingot at temperatures between 350°C and 550°C. Depending on the process, the deformation may be executed by hot rolling, extrusion, or forging. Such hot-working is often followed by cold deformation such as the cold rolling of sheet or drawing of tube. Some semifinished products are supplied in the as-fabricated condition in the form of extruded shapes, forged parts, and hot-rolled sheet or coils. Prior to delivery, extruded shapes are usually stretched for straightening and stess relieval, which imparts a small amount of cold work to the material.

Subsequent fabrication of aluminum semi fabricated products:-

Semi fabricated products undergo further fabrication before they are sold to the consumer as a finished product. The fabricators use a great number of techniques in finishing aluminum. The primary objective of the fabricator is to impart the desired shape to the work piece. The techniques may produce chips (milling, turning, boring, etc.) or be chipless (deep drawing, stretch forming, impact extrusion, blanking, bending, spinning). Surface treatment of aluminum is of special importance and may include mechanical polishing, etching, brightening of the aluminum by electrolytic or chemical processes and the generation of thicker oxide layers through anodizing.

Types of Aluminum Alloys:-

As mentioned earlier, the production of semi fabricated products utilizes three different types of aluminum, namely super purity, commercial purity, and alloys. Alloys are used for producing castings or fabricating wrought products. The alloys used for castings contain a greater amount of alloying additions than those used for wrought products. The addition of alloying elements has the effect of strengthening the wrought alloys and improving the castability of the casting alloys.

The most important elements that are added to aluminum, in alphabetical order, are bismuth (Bi), boron (B), chromium (Cr), copper (Cu), iron (Fe), lead (Pb), magnesium (Mg), manganese (Mn), nickel (Ni), silicon (Si), titanium (Ti), zinc (Zn), and zirconium (Zr). Magnesium is the most frequent addition to aluminum. In some alloys, two or more elements are used in combination (e.g., magnesium together with silicon or manganese). There are also alloys of aluminum containing only manganese or only silicon. The alloying elements are added to bring about changes in the properties of aluminum,

4. India Aluminium Industry

Primary aluminium production in India:-

Aluminium is produced industrially by electronic reduction of alumina through a smelting process termed as the Hall Heroult process. As explained in a note14 by the Indian aluminium company BALCO, the raw materials apart from alumina are carbon, aluminium fluoride and cryolite. Aluminium is formed at 9000 C even as once formed it can be quickly cooled since it has a melting point of 6000 C. Smelting of aluminium is energy intensive, requiring around 13460 kwh per tonne and power costs accounts for close to 40 per cent of aluminium making. Alumina, in turn, is produced by the Bayer process involving dissolution of crushed bauxite ore in caustic soda, precipitating alumina trihydrate that is then calcined to give alumina. In all, it will require 4 mt of bauxite to produce 1.935 mt of alumina which when smelted yields 1 mt of primary aluminium. There are four producers of primary aluminium in India. One is a public sector company NALCO. Another company BALCO has 49 per cent ownership by the government even as 51 per cent is with Sterlite industries which is a subsidiary of the Vedanta Group. The other two companies are HINDALCO run by the Aditya Birla Group and Vedanta limited run by the Vedanta Group.

All the four aluminium producing companies have integrated production facilities starting from alumina refining to running aluminium smelters. All of them also have captive power generation facilities to cater substantially to their needs. A good part of alumina produced by them is also linked to captive bauxite mines owned by these producers, although they do not fully cover their production needs. The balance is met through linkages and long-term arrangements. Some of the producers also have captive coal mines, even as they are still too few and do not cover all the fuel needs for their captive power plants which are overwhelmingly coal based.

Recycled or Secondary aluminium making in India:-

Recycling aluminium waste or scrap has become a growing business in India, even as the sector remains largely unregulated and unorganised. The investment needs of a recycling facility are far lower compared to primary production. A google search brings forth the names of at least a hundred Indian aluminium scrap recycling companies. A few appear somewhat larger in size with claims of ISO certifications for their manufacturing processes, but others less so. All but a few of them are also in the MSME sector. The Aditya Birla group has a recycling unit at Taloja in Maharashtra with a capacity of 25,000 tonnes per annum. An MOU has also been signed by the group in 2018 with the Government of Gujarat29 for setting up a bigger recycling unit in the state.

According to the draft non-ferrous metals recycling policy circulated by the Ministry of Mines, 30 per cent of Indian recycling companies produce 70 per cent of secondary

aluminium with stringent quality measures 30 . The remaining 70 per cent of companies produce around 30 per cent and their products are largely sold to SMEs, which in turn follow stringent quality norms. In other words, the contention is that the stringency of demand has ensured that much of the industry adheres to quality conformance. The draft policy document estimates that only around 10 per cent of production, mainly of recyclers catering to extrusion manufacturers and utensil makers, may not be maintaining rigid quality norms.

The recycling of aluminium can be of home scrap, new scrap or old scrap. Home scrap is the scrap generated by an aluminium manufacturing facility in the form of trimmings or cuttings and is often recycled in the manufacturing facility itself. New scrap is also pre-consumer scrap generated by an aluminium product manufacturing facility, such as an extrusions maker, but which has to be sent to another unit for recycling. Old scrap refers to used and discarded scrap after the product's end of life.

Notwithstanding the extent of sorting any used scrap may have undergone, it may still retain contamination with foreign elements. Various methods are employed to ensure separation before they can be remelted. But aluminium recycling is still very attractive in that the recycling process uses only 5 per cent of energy requirements as compared to the manufacture of primary aluminium. Seen from a conservation point of view as well, the scrap retains 95 per cent of energy content and recycling is both an economically and environmentally an advisable course to follow.

Recycling of used scrap involves three or four stages - collection, sorting and recovery and refining or remelting. Collection starts from households, municipal waste and other sources of waste generation which then makes its way to small and medium waste collectors and to merchants of metal waste. The stage of sorting and recovery involves shredding and various modes of separating other elements, including through eddy current separation, electromagnetic separation, gravity separation, colour sensors and using x-rays. Few Indian recyclers, however, have the full range in their facilities.

India's manufacture of recycled aluminium depends for its raw material needs mainly on imported aluminium scrap which have shown a five times growth from FY2018 to FY2024. From only Rs.934.00 lakh in FY2017-18 to Rs.6500. 00 lakhs in FY2023-24. India principally imports ISRI graded scrap (HS 76020010), which to some extent mitigates the limitations of our recycling facilities. While domestic scrap is also known to be used, this is estimated at only 10-15% of total scrap used for secondary aluminium production in the country. Domestic scrap is not as well sorted and graded and it is known to be largely used by utensil manufacturers and some extruders.

Downstream Aluminium Products:-

It can be estimated that there are around 4000 companies involved in the downstream Indian aluminium industry, 39 although if very small units are counted they are likely to be more. The downstream sector comprises manufacturers of both intermediate products - such as rods and bars, plates and slabs, wire rods and wires, castings and forgings - and further value added products like foils and custom made sheets, tubes and pipes, profiles and structures for a variety of uses, door and window frames, stranded wires and cables, solar panel frames and mountings, kitchen utensils, vehicle wheels and auto components, apart from a host of other items; some downstream processing involves upto the intermediate stage and, in certain cases, even beyond. There are also a few other large companies in the intermediate and further downstream segments, but the bulk of aluminium product companies are in the SME or even micro enterprises category. Broadly, the downstream manufacturing process consists of casting aluminium into required products, or in making extruded shapes for which aluminium metal is extremely well suited, or of aluminium rolling that can produce sheets and foils and other flat items.

The casting process can be either sand casting or die casting. In sand casting, reusable or permanent sand moulds of different shapes are prepared within which molten metal is filled. In die casting, which produces casts with thinner walls and has other advantages, the moulds are permanent, made up of cast iron or steel and the molten metal is forced into the mould under high pressure (pressure die casting) or from above (gravity die casting). Die casting is used when volumes are large. More than 60 per cent of the demand for die casting in India today is from the automotive sector. Other sectors using cast products include building and construction, electrical components, telecom and computing and aerospace.

Source;-http://www.balcoindia.com/operations/pdf/Aluminium-ProductionProcess.pdf
Ministry of Trade & Commerce.
India's Aluminium Industry: Pathways for Aatmanirbharta; Delhi Policy Group.
The Aluminium Secondary Manufacturers Association (ASMA) i

5. Aluminium Industry Growth prospect

Aluminium demand is forecast to grow by 33.3 Mt in the following decade, going from 86.2 Mt in 2020 to 119.5 Mt in 2030. Around 37% of this growth is expected to come from China, followed by 26% from Asia ex. China, 15% from North America and 14% from Europe.

The highest growth in terms of absolute demand will come from the Transportation sector which, driven by decarbonization policies and the shift from vehicles powered by traditional fossil fuels to electric vehicles (EVs), will go from consuming 19.9 Mt of aluminium in 2020 to consuming 31.7 Mt in 2030. Most of this growth will come from China (33%), North America (22%) and Europe (19%). In the second part of the following decade, CRU expects governments to start gradually phasing out subsidies that currently support growth in EV sales, which will lead to the cost of EVs vs ICEs to become a key factor for the industry. Due to this, it is imperative for the aluminium industry to reduce production costs to compete with steel, which represents a cheaper and potentially greener alternative. Working on integrating the whole value chain to study possible synergies between manufacturers and producers to reduce costs and approaching big OEMs to educate and promote the use of aluminium as a viable or better option for new and lighter vehicle designs will be crucial to secure and enhance the intensity of use of aluminium within this sector.

In the Electrical sector, the transition towards green energy sources will strengthen the sector's demand for aluminium, which will reach 15.6 Mt in 2030 starting from 10.4 in 2020. China is expected to account for 47% of this growth. The Electrical sector represents one of the most substantial opportunities for the aluminium industry in coming years: as countries transition to renewable energies – which are more intensive in the use of aluminium than traditional energy sources – and expand their power grids. Supporting solar power projects through alliances with designers and manufacturers can be key to increase aluminium demand coming from this sector, as solar power requires over four times more aluminium per installed megawatt than wind power, and around 25 times more than coal. In addition to this increase in consumption from renewables, the need for conductor cables for power distribution will also increase. Although these conductors have been traditionally made from copper, transitioning to aluminium

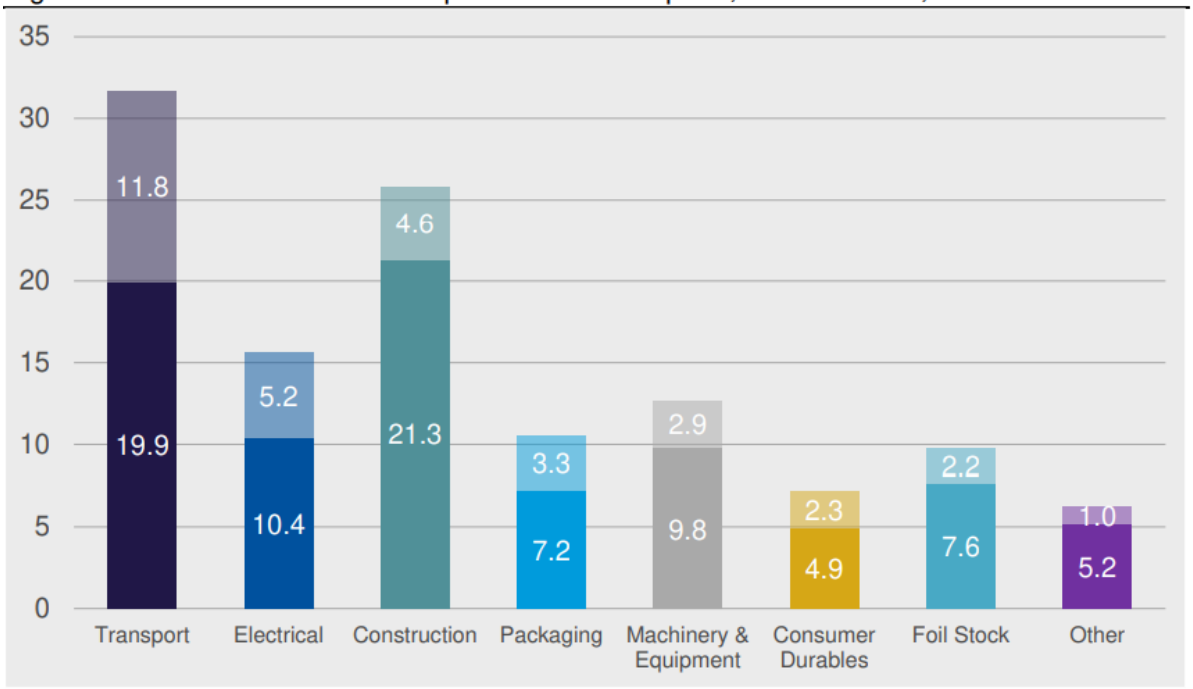
represents a viable alternative and can be beneficial from a cost perspective, especially when physical space is not a constraint. For this to happen at a large scale, CRU believes working with specifiers and policy makers to update current standards which have been traditionally made with copper cable in mind, will be key.

Construction is expected to show relatively low growth in the next decade as consumption increases from 21.2 Mt in 2020 to 25.8 Mt in 2030. Following a slightly different path than other sectors, growth will come mainly from Asia ex. China as demand remains linked to infrastructure spending and urbanization rather than green trends. Although is not yet clear if the implementation of green codes and rating systems will boost the demand of aluminium coming from the Construction sector, CRU believes that working with policy makers on making these initiatives mandatory and assuring the inclusion of aluminium as a low carbon material in relevant building codes is a positive first step. In addition to this, due to the increase on residential construction's share of the market since the instauration of measures against the spread of Covid-19 and the rise of the "Work-From-Home" economy, it is essential for these mandatory policies to be adopted in both commercial and residential construction in order to take full advantage of future Construction trends.

Finally, aluminium consumption from the Packaging sector will increase from 7.2 Mt in 2020 to 10.5 Mt in 2030, driven mainly by the rise in popularity of canned drinks in North America, Europe, and China. The surge of demand for canned drinks in recent years, and the subsequent demand of aluminium from the Packaging sector, has been fuelled by the emergence of new products as well as a strong consumer preference for packaging options that are environmentally friendly. This is strongly linked to the negative perception that consumers in Western economies have of PET and other plastics that normally compete with aluminium in this space. Due to this dynamic, it is especially relevant for the aluminium industry to focus on looking after aluminium's public perception as a green, recyclable material with a low carbon footprint.

Decarbonization policies and the shift towards a more sustainable world are expected to have a substantial impact on aluminium demand. The adoption of renewable energies and electric vehicles (EVs), as well as the implementation of sustainable solutions in the Packaging and Construction sectors will represent major opportunities for the aluminium industry. Total aluminium consumption is expected to grow by 33.3 Mt in the following decade, going from 86.2 Mt in 2020 to 119.5 Mt in 2030. Around 75% of this demand growth is forecast to come from the Transportation (35%), Electrical (16%), Construction (14%) and Packaging (10%) sectors combined.

Figure 1 Aluminium semi-finished products consumption, 2020 vs 2030, Mt

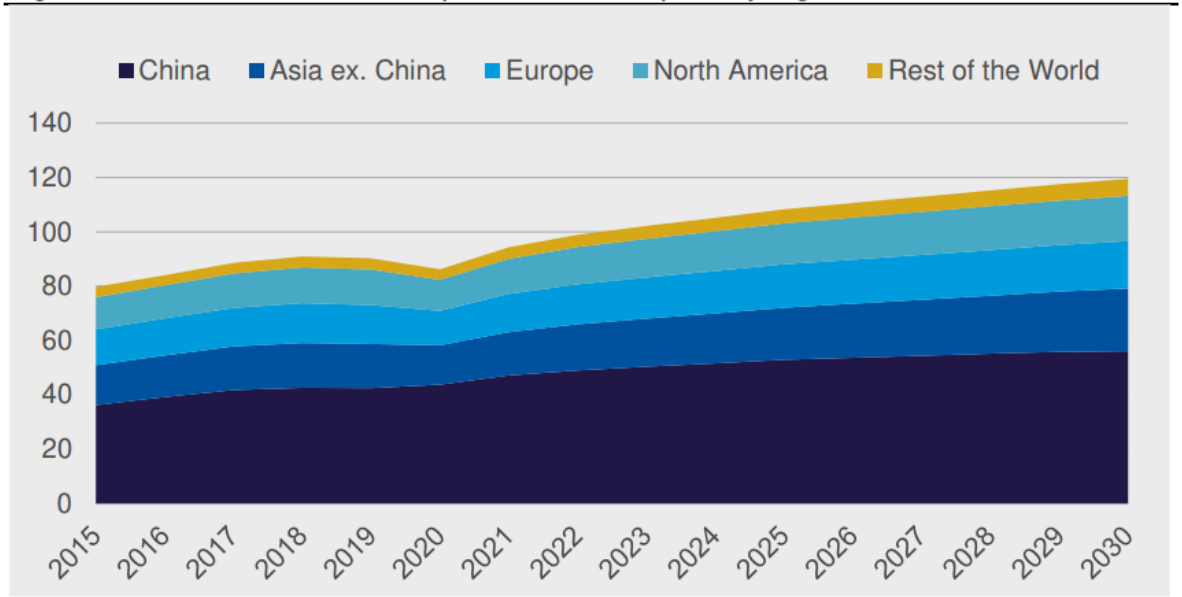


6. Global scenario Aluminium industry

Global aluminium consumption:-

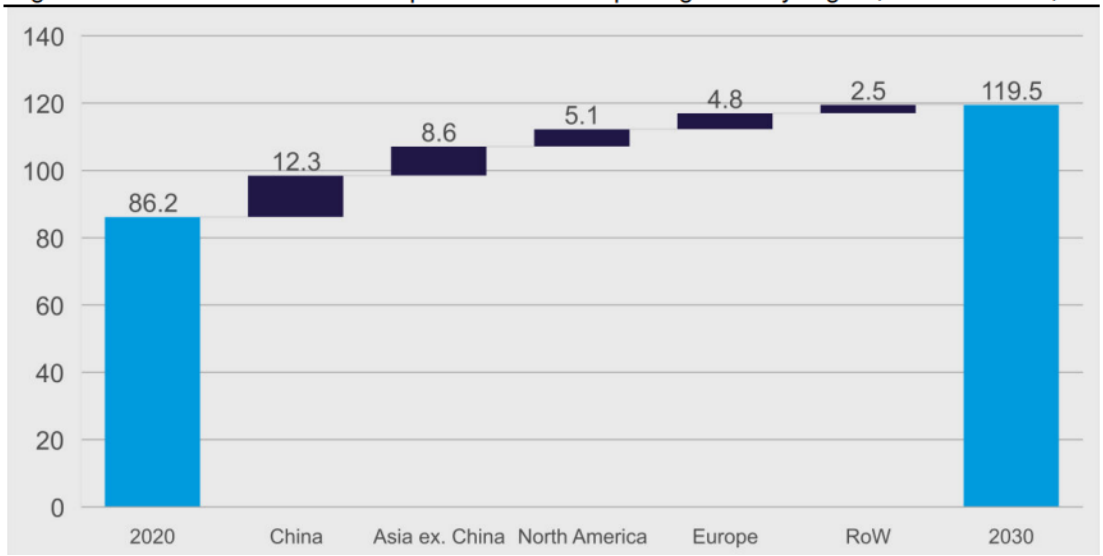
The aluminium industry is the world's second largest metals industry after the steel industry. Global consumption of aluminium semi-finished products in 2020 reached 86.1 Mt, 6.4 Mt more than the 79.7 Mt consumed in 2015.

Figure 2 Aluminium semi-finished products consumption by region, 2015 – 2030, Mt



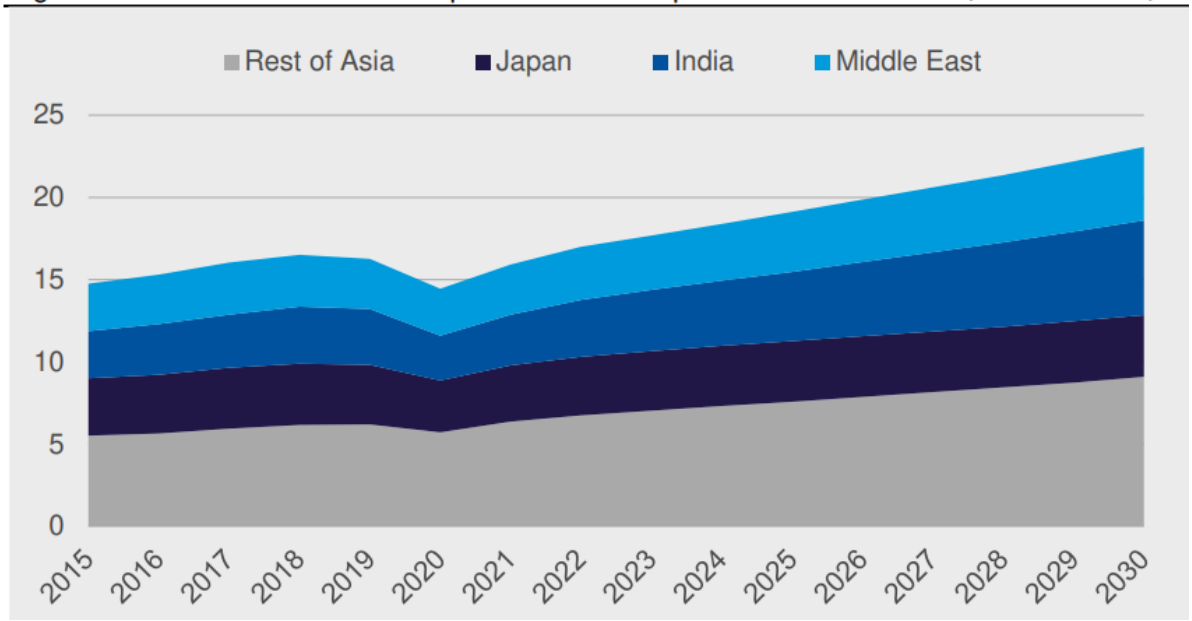
China has historically been the World's biggest consumer of semi-finished aluminium products by a large margin, making up for more than 45% of the market since 2015. In 2020, the country accounted for more than 50% of the World's demand for the first time, reaching a total consumption of 43.8 Mt and experiencing growth from 2019 despite the Covid-19 pandemic. Other key regions include Asia ex. China, Europe, and North America. Europe and North America accounted for 15 and 13% of global consumption in 2020 at 12.7 and 11.5 Mt respectively, with consumption decreasing by 11 and 13% each due to the pandemic. In the longer term, China is expected to remain the biggest semis-consuming country by a large margin. The country will continue to account for close to 50% of global demand. The Chinese semis fabricated industry will have to prepare itself for a slowing in the rate of demand increases, moving from a 3.9% CAGR in the 2015-2020 period to a 1.9% CAGR from 2021 to 2030. With China set to adopt a more sustainable growth path, the country will move from a state-led economy to a more consumer-led one.

Figure 3 Aluminium semi-finished products consumption growth by region, 2020 vs 2030, Mt

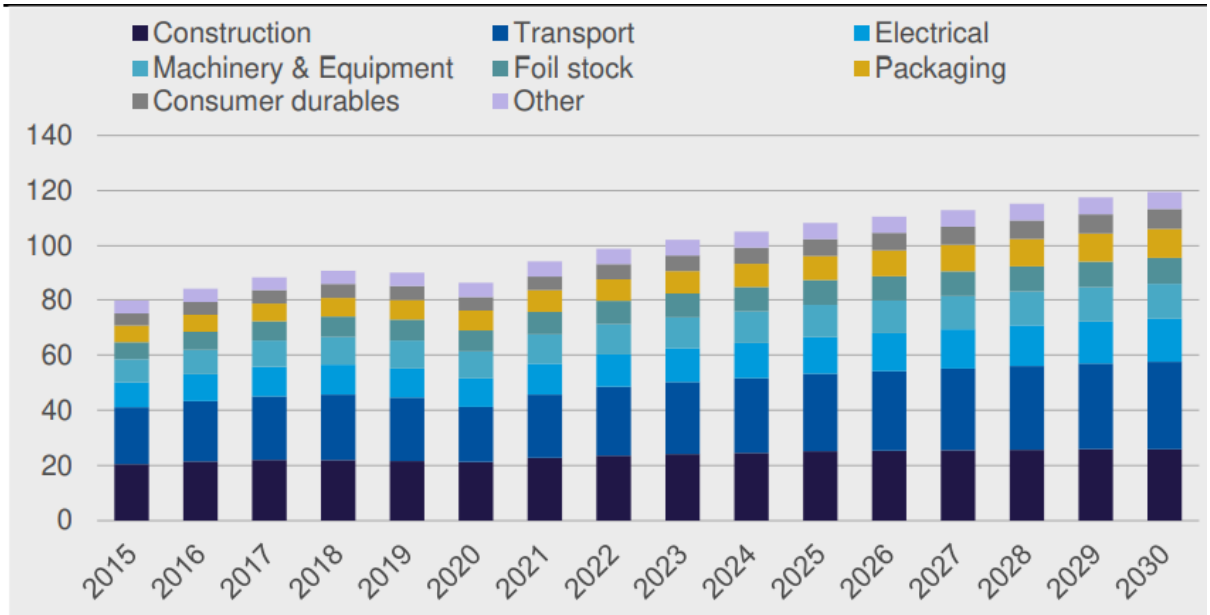


In terms of absolute consumption growth, China will see an increase of 12.3 Mt between 2020 and 2030, while the US and Europe will grow by 5.1 and 4.8 Mt, respectively. Around 61% of the 8.6 Mt growth expected to come from Asia ex. China will be distributed among India (35%), the Middle East (19%) and Japan (7%).

Figure 4 Aluminium semi-finished products consumption in Asia. Ex China, 2015 – 2030, Mt

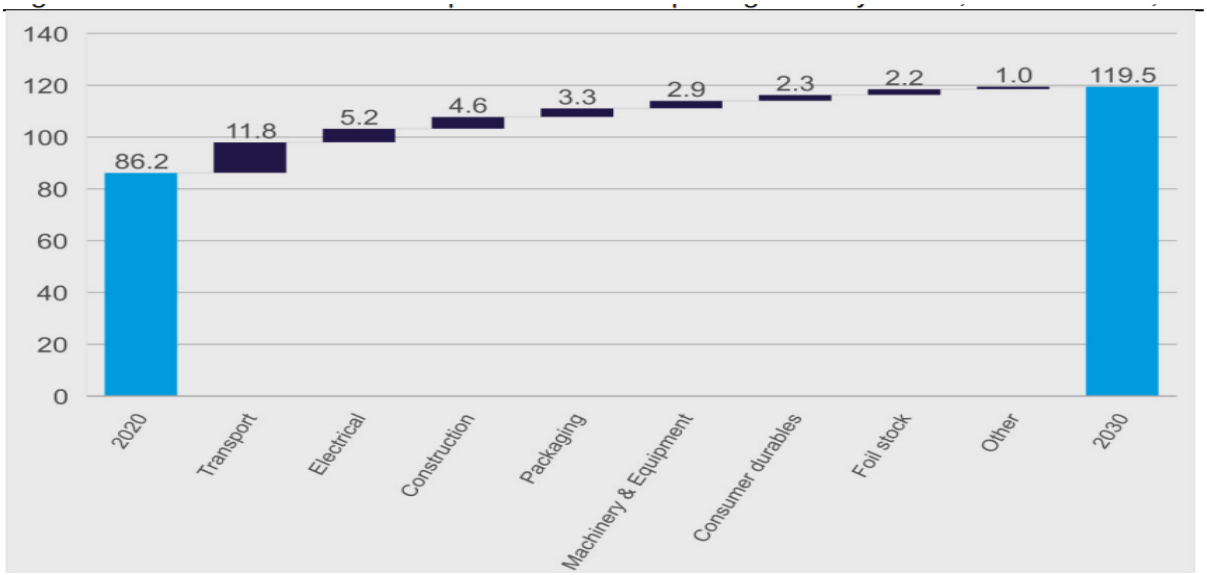


Aluminium semi-finished products consumption by sector, 2015 – 2030, Mt:-



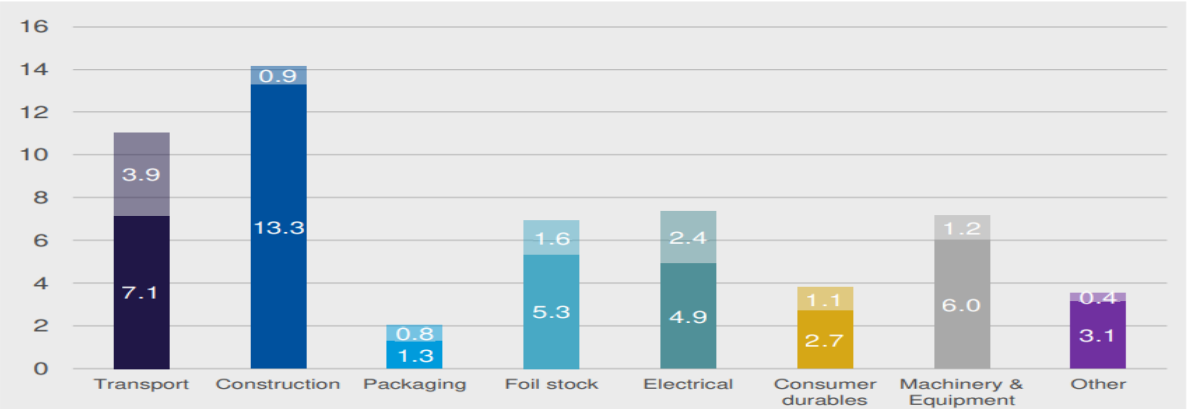
It expects that this distribution will change slightly in the upcoming decade, mainly due to Construction showing the slowest growth across all sectors with a 1.4% CAGR, going from 22.7 Mt in 2021 to 25.2 Mt in 2030. The Transportation sector will remain the main consumer of aluminium going forward, reaching a global demand of 31.7 Mt in 2030 – around 8.7 Mt more than its 2021 consumption of 23.0 Mt. Other sectors such as Electrical and Packaging will also show substantial growth during this period, increasing their respective consumptions by 5.2 Mt and 3.3 Mt.

Aluminium semi-finished products consumption growth by sector, 2020 vs 2030, Mt

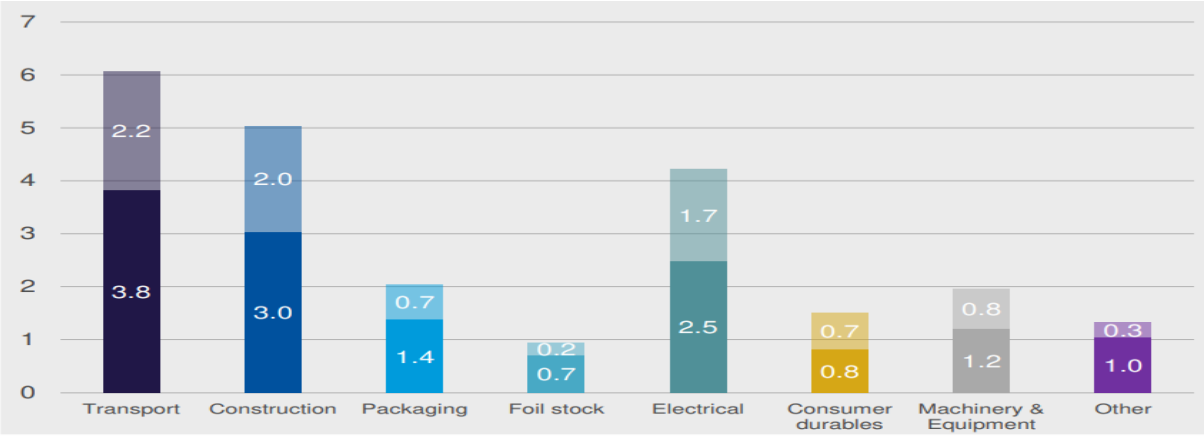


Region wise Aluminium Consumption Trend in Coming Years:

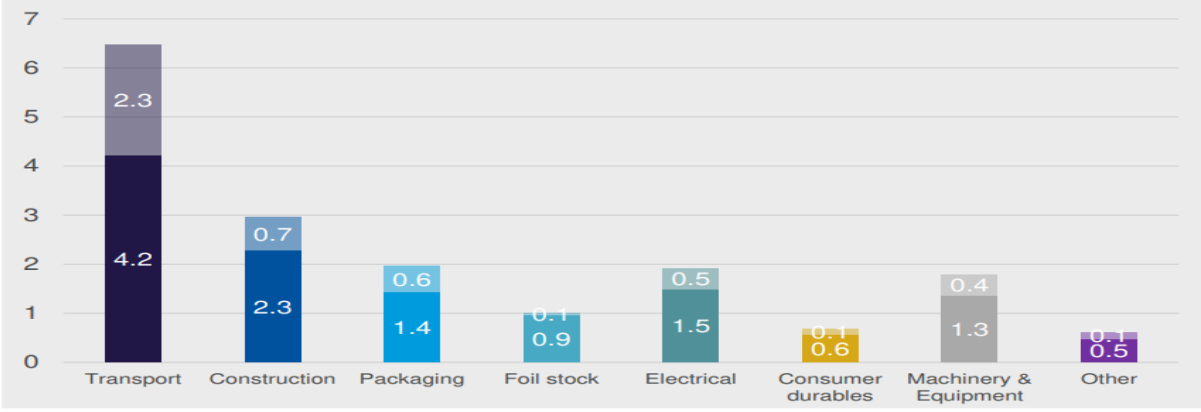
Aluminium semi-finished products consumption by sector in China, 2020 vs 2030, Mt



Aluminium semi-finished products consumption by sector in Asia ex. China, 2020 vs 2030, Mt



Aluminium semi-finished products consumption by sector in Europe, 2020 vs 2030, Mt



Source- CRUGROUP.COM

Consumptions of Aluminium Products – Indian Scenario:-

Aluminium is the second most used metal in the world after steel. Aluminium is more environment- friendly than steel, plastic and other materials. The metal that made flying possible, is sustainable, light and energy efficient. Aluminium has widespread uses throughout the economy and is equally important to both the industrial and consumer sectors. Aluminium is used in the Aerospace Industry as well as other industries requiring light metal. On the industrial side, aluminium is heavily used in electrical power transmission, machinery & equipment and construction. Aluminium usage in automobiles is rising and is expected to increase internationally. India's auto sector consumes about 4% aluminium. Over the past five years considerable progress has been made in aluminium intensive vehicle production.

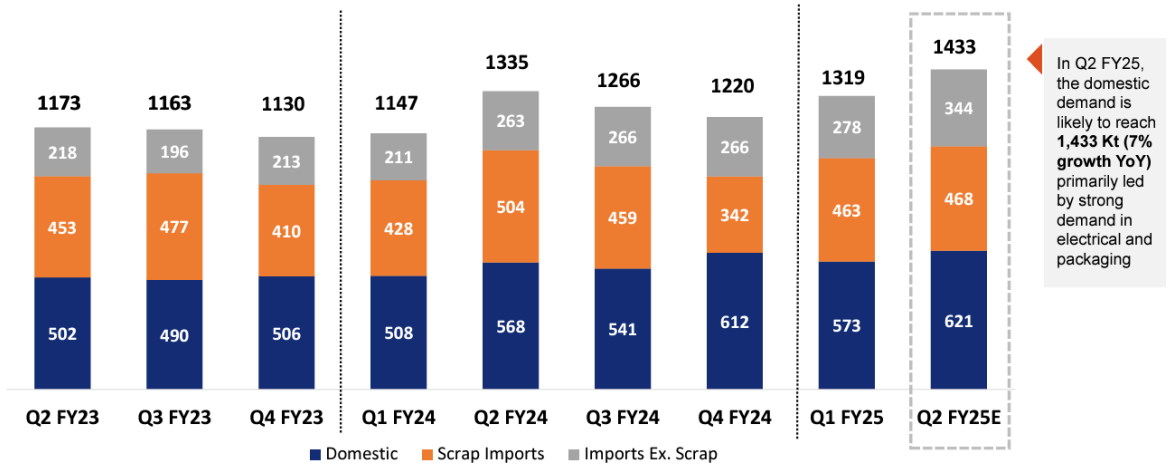
Housing, in particular, make heavy use of the lightweight material as a substitute for steel and wood in doors, windows and sidings. Aluminium is also used in a variety of retail products including cans, packaging, air conditioners, furniture and automobile. In addition, India has pioneered the replacement of copper by aluminium in power transmission & distribution which has enhanced the demand for aluminium. There are nearly 600 cable and conductor manufacturing units in the country, having a total capacity of about 4,00,000 tpy. The major end-use of aluminium is as rolled sheets, extrusions and foils. India Foils, Pennar Aluminium and Century Extrusions are the major players in the extrusion & foil market**.**

Key sectors to drive aluminium consumption in India are Auto, Power, Electronics, Railways, Aerospace & Defence Construction, Solar Energy and Aluminium packaging. China was the largest producer as well as consumer during the year, contributing about 57% share of the world production (36.15 million tonnes) and 55% of the world consumption (35.71 million tonnes) of aluminium. The world excluding China is expected to see aluminium consumption growth of around 1% in the year 2019 from around 2% in the year 2018 due to likely moderation in demand from North America and Europe. In India, the power, packaging, transport, construction, machinery and equipment sectors are key demand drivers of aluminium. The domestic imports of aluminium products, including scrap, are growing significantly, which is a major concern for the domestic aluminium producers. In advanced economies, aluminium is increasingly replacing wood and steel in Building Sector. Aluminium cans and containers are used extensively, world over. Aluminium is also the ideal packaging material for pharmaceuticals and processed foods.

In India, aluminium was consumed mainly in the Electrical sector (48%), followed by Automobile & Transport sector (15%), Construction (13%), Consumer Durables (7%), Machinery & Equipment (7%), Packaging (4%) and others (6%). In the Electrical sector, aluminium usage is in overhead conductor, and power cable used in generation, transmission and distribution of electricity. Aluminium is also used in switchboards, coil windings, capacitors, etc.

As per Technology Vision Document 2035, the per capita consumption of aluminium in India is among the lowest in the world with only 2.2 kg as compared to the world average of roughly 8 kg and with that of the developed nations which is 22-25 kg. Alumina is produced from bauxite. About one tonne of alumina is produced from 3 to 3.5 tonnes of bauxite and about one tonne of aluminium is produced from about two tonnes of alumina.

Industry demand for Domestic Aluminium:- ***(figure in Killo tonne)***



#Source: Company Annual Report

Aluminimum Production – Global Scenario: -

World production of alumina was 140 million tonnes in 2021. China continued to be the leading producer with a share of about 55% which is followed by Australia (14%), Brazil (7%), India (5%) and Russia (2%) & UAE (2% each). World production of aluminium was at 67 million tonnes in 2021. China continued to be the leading producer with a share of about 57% which is followed by Russia, (5%), India (5%) & Canada (5%).

World Production of Alumina
(By Principal Countries)

(In '000 tonnes of Al_2O_3 content)

Country	2019	2020	2021
World: Total (rounded off)	**131200000**	**134600000**	**140700000**
China	71474166	73131946	77480000
Australia	20239198	120836304	20624088
Brazil	9170800	10185000	11171300
India*[(d)]	6706500	6624500	7325000
Russia	27550000	2873000	3054000
UAE	1100000	1920000	2300000
Saudi Arabia	1798340	1782041	1879000
Ireland	1860970	1822368	1878000
Ukraine	1690000	1725000	1800000
Spain	1595000	1553000	1536000
Other countries	12799824	12167385	11180265

Source: BGS World Mineral Production, 2016-2020.

(d) Years ended 31st March following that stated

** During 2018-19, 2019-20 and 2020-21 India's production of alumina was 6,446, 6,670 and 6,520 thousand tonnes, respectively.*

World Production of Aluminium (Primary)
(By Principal Countries)

(in '000 tonnes)

Country	2019	2020	2021
World: Total (rounded off)	**62900000**	**65200000**	**67000000**
China	35043604	37080401	38502600
Russia	3635089	3638000	3640000
India*[d]	3635089	3154493	3583800
Canada	2853771	2520000	3157762
UAE	2600000	1548000	1561222
Bahrain	1365005	1585017	1558529
Australia	1569591	1330000	1431000
Norway	1312000	1010563	1431000
Saudi Arabia	967000	1010563	998000
USA	1126032	1026217	907846
Other countries	880615	8703598	9095927

Source: BGS World Mineral Production, 2016-2020

(e) Years ended 31 March following that stated. # estimated

** During 2018-19, 2019-20 and 2020-21 India's production of aluminium was 3,696, 3,635 and 3,619 tousand tonnes, respectively.*

Principle Producers in the Aluminium Industry:-

Australia:-

Production of aluminium showed a marginal increase in Australia in 2019 compared with that in 2017. The increase was attributed to the restart of capacity in 2017 at the Portland, Victoria, smelter; production increased by 46% compared with that in 2017. On January 19, 2017, capacity that was shut down after a power failure on 1st, December 2016, was restarted at the 3,85,000-t/yr smelter. By midOctober 2017, the smelter was producing at 85% of its capacity, the same rate as before the shutdown. The smelter was a joint venture of Alcoa of Australia Ltd (55%), CITIC Nominees Pty. Ltd (22.5%), and Marubeni Aluminium Australia Pty. Ltd (22.5%). Alcoa of Australia was owned by Alcoa (60%) and Alumina Ltd (40%)

Bahrain

Aluminium Bahrain B.S.C. (Alba) continued construction on a sixth potline that would have a capacity of 5,40,000 t/ yr when completed in 2019. The project also included an expansion of Alba's captive powerplant. Production from some pots started in December, and full ramp-up of the new capacity was scheduled for 2020. The project would increase the smelter's capacity to 1.5 million metric tons per year from 9,60,000 t/yr.

Brazil:-

Primary aluminium production decreased by 18% as compared with that in 2017. In April, Norsk Hydro temporarily shut down 2,30,000 t/yr of capac-ity at the 4,60,000-t/yr Albras aluminium smelter in Barcarena, citing a shortage of alumina. In March, Norsk Hydro temporarily shut down one half of the capacity at the adjacent 6.3-Mt/ yr Alunorte alumina refinery, citing high water levels in the red mud im-poundment after heavy rainfall. The Albras smelter, a joint venture between Norsk Hydro (51%) and Nippon Amazon Aluminium Co. Ltd (49%), would re-turn to full production once the Alunorte refinery resumed full production.

In July, the Government extended the elimination of a 6% tariff on unwrought primary aluminium imports through the end of June 2019. A quota of 2,82,500 t of unwrought primary aluminium would be permitted to be imported without payment of the tariff. Since 2014, the Government has eliminated the 6 % tariff on imported aluminium for a limited amount of metal during a specific time, citing the shutdown of smelting capacity caused by high power prices. The most recent quota was for 1,73,000 t of primary aluminium imports from July 1, 2017, through 30th June 2018. The elimination of the tariff caused prices in Brazil to decrease even though the capacity at the Albras smelter was shut down in April. Novelis was planning to expand the secondary smelting and rolling capacity in Pindamonhangaba. Smelting capacity would increase to 4,50,000 t/yr from 3,90,000 t/yr, and rolling capacity would increase to 6,80,000 t/yr from 580,000 t/yr. The mill produced beverage can sheet and other aluminium packaging products from UBCs and other scrap. The project was scheduled to start in February 2019 and was scheduled for completion in 2021.

China

Primary aluminium production in 2018 was 35.8 Mt, 11% more than the 32.3 Mt in 2017. Aluminium production increased from an average rate of 98,200 metric tons per day (t/d) in the first quarter of the year to 1,02,000 t/d for the remainder of the year. Smelters in 31 cities, mainly in the Eastern and Central Provinces, shut down 30% of their capacity from 15th November, 2017, until 15th March, 2018. The Government cited winter pollution control efforts for ordering the shutdown of capacity at primary aluminium smelters, alumina refineries and powerplants. When the restrictions on production expired, some of the capacity affected by the policy was restarted. At the end of the year, the Government instituted a similar production cut from 5th October, 2018, to 31st March, 2019, to reduce pollution during the winter. The policy required aluminium smelters and alumina refineries to close 30% of their capacity and carbon anode plants to close 50% of their capacity. The policy applied to facilities in 26 cities.

In order to contain smelter capacity, the Government had implemented a capacity replacement quota system in recent years. To expand capacity, companies were required to purchase capacity replacement quotas from companies that had shut down older, inefficient capacity. In the last quarter of the year, decreasing aluminium prices and increasing production costs were cited for capacity shutdown at several smelters throughout China. An estimated 3.2 Mt/yr of capacity was shutdown during the year for economic reasons.
Import restriction were cited for aluminum scrap imports declining by 28% as compared with those of the prior year. Scrap availability from domestic sources enough that secondary smelters did not need to import scrap, and imports were expected to decline in future years. China was considering a complete ban on imports of solid waste, including aluminium scrap, by 2021. Environmental concerns and goals to advance the domestic recycling industry were cited for the proposed ban on scrap imports.

Oman:-
Production increased by 50% compared with that in 2017 because capacity at the 3,75,000-t/yr Sohar smelter was restarted after a power failure on 4th August, 2017, resulted in a shutdown. Production was restarted in mid-September 2017, and the ramp-up was completed by April 2018. The Sohar smelter was a joint venture among Oman Oil Co. S.a.O.C. (40%), Abu Dhabi National Energy Co. PJSC (40%) and Rio Tinto (20%).

United Arab Emirates:-
Aluminum production increased slightly compared with that in 2017 because new capacity completed in 2016 was ramped-up. Emirates Global Aluminium PJSC completed a modernisation and expansion project at the Jebel Ali smelter in October 2017. The project replaced 520 smelting pots in two potlines with pots that were more energy efficient and produced fewer emissions of perfluorocarbons. Capacity of the smelter increased by 58,000 tpy.

Indian Scenario – Aluminium Production:-

Installed Capacity of Alumina (2021-22)

(In '000 tonnes)

Producer	Plant	Annual capacity
Total		**7475**
Public Sector		
National Aluminium Co. Ltd	Damanjodi (Odisha)	2275
Private Sector Bharat Aluminium Co. Ltd	Korba (Chhattisgarh)	200#
Hindalco Industries Ltd	Renukoot (Uttar Pradesh) -	3000 700
	Belagavi (Karnataka)-	350
	Muri (Jharkhand)-	450
	Utkal Alumina (Odisha) -	1500
Vedanta Aluminium Co. Ltd	Lanjigarh (Odisha)	2000

Source: Information received from the companies/Annual Reports.

Production of Aluminium 2019-20 to 2021-22

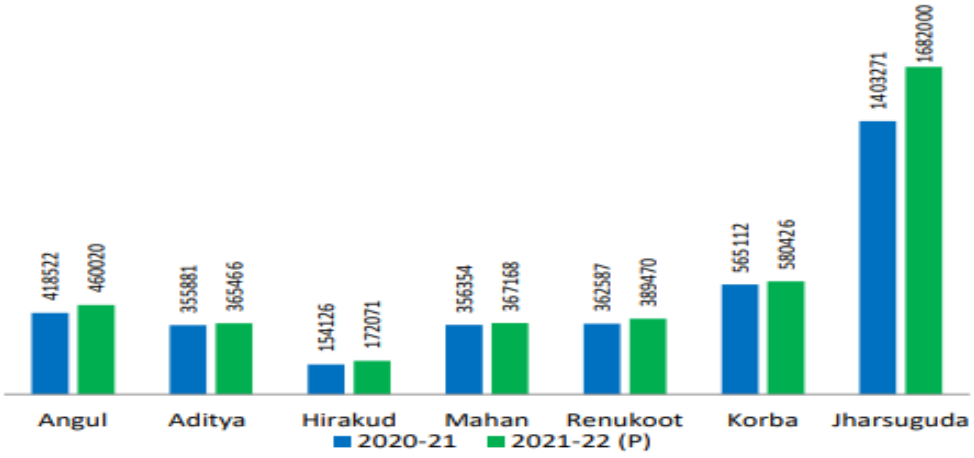
(Quantity in tonnes; Value in ₹'000)

Year	Production	
	Qty	Value
2019-20	3635089	455960160
2020-21	3619237	415967702
2021-22 (P)	4016621	714320466

Production of Aluminium 2020-21 and 2021-22 (By Plants)

(In tonnes)

Producer	Plant	Production	
		2020-21	2021-22 (P)
National Aluminium Co. Ltd	Angul	418522	460020
Hindalco Industries Ltd	Aditya	355881	365466
	Hirakud	154126	172071
	Mahan	356354	367168
	Renukoot	362587	389470
Bharat Aluminium Co. Ltd	Korba	565112	580426
Vedanta Aluminium Ltd	Jharsuguda	1403271	1682000

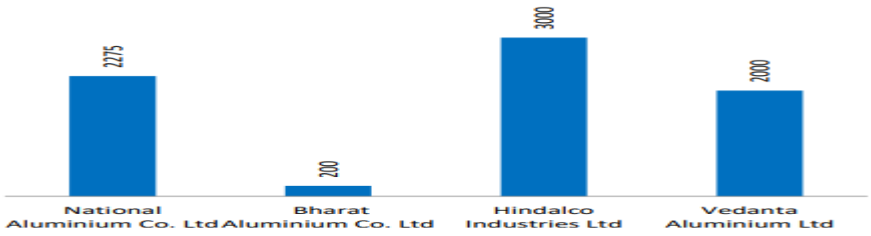


Installed Capacity of Alumina 2021-22 ((By Producers)

(In '000 tonnes)

Producer	Plant	Annual capacity
Total		**7475**
Public Sector		
National Aluminium Co. Ltd	Damanjodi (Odisha)	2275
Private Sector Bharat Aluminium Co. Ltd	Korba (Chhattisgarh)	200#
Hindalco Industries Ltd	Renukoot (Uttar Pradesh) -	3000 700
	Belagavi (Karnataka)-	350
	Muri (Jharkhand)-	450
	Utkal Alumina (Odisha) -	1500
Vedanta Aluminium Co. Ltd	Lanjigarh (Odisha)	2000

Source: Information received from the companies/Annual Reports.



Production of Alumina (including Calcined alumina) 2019-20 to 2021-22

(Quantity; Value in ₹'000)

Year	Production	
	Quantity	Value
2019-20	6670576	130410346
2020-21	6520842	118069838
2021-22(P)	7229508	159576853

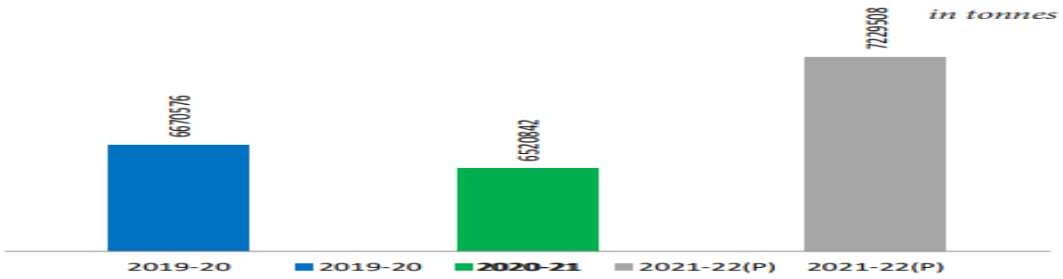
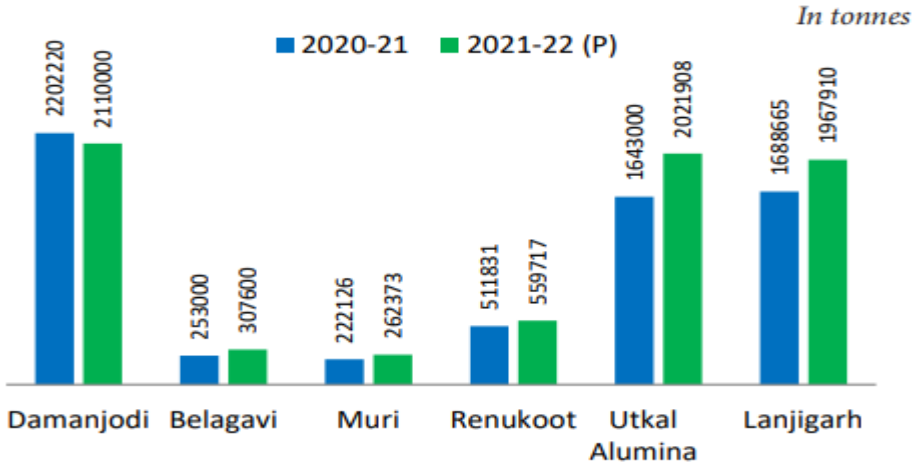


Fig 4: Production of Alumina (including Calcined alumina) 2019-20 to 2022-22

Production of Alumina 2020-21 and 2021-22 (By Plant)

(In tonnes)

Producer	Plant	2020-21	2021-22 (P)
National Aluminium Co. Ltd	Damanjodi	2202220	2110000
Hindalco Industries Ltd	Belagavi	253000	307600
	Muri	222126	262373
	Renukoot	511831	559717
	Utkal Alumina	1643000	2021908
Vedanta Aluminium Ltd	Lanjigarh	1688665	1967910



Export & Import Scenario: -

Export Scenario:-

Exports of alumina increased by 18% to 1,487 thousand tonnes in 2021-22 from 1,265 thousand tonnes in the previous year. Exports were mainly to UAE (50%), Oman (16%), China (9%) and Malaysia (6%). Exports of aluminium and alloys increased drastically by 46% to 3,454 thousand tonnes from 2,735.

Exports of Alumina
((By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**1265941**	**28280781**	**1487035**	**47334417**
UAE	706087	15048867	745938	22936746
Oman	183711	3891344	244982	8394532
China	69353	1658847	133323	4018156
Qatar	61208	1284659	30714	909852
Malaysia	61330	1203104	95678	2864082
Egypt	61683	1182271	92027	2953898
Taiwan	23266	921583	22700	941879
UK	30935	734852	31312	730576
Korea	14037	564754	18490	797254
Other countries	53496	1758538	39682	1891347

Exports of Aluminium and Alloys Incl. Scrap
(By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**2735588**	**427759670**	**3454121**	**791688112**
Korea	603730	79903721	544473	113328421
USA	160795	37510442	270434	82666048
China	219829	29862598	487586	94661686
Turkey	25514	4442749	320151	66426511
Mexico	77356	12689868	146144	30200871
Italy	28592	5005313	158098	36801783
Greece	66598	596608	159919	36386353
Japan	62609	8470779	118441	23606891
Netherlands	21300	4652293	127039	32504416
Croatia	2	1934	94334	21766254
Other countries	1469263	235623365	1027502	253338878

Figures rounded off

Exports of Aluminium (By Items)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All items	**2735588**	**427759670**	**3454121**	**791688112**
Aluminium & Alloys : Unwrought	2324305	317093138	2932260	622444035
Aluminium Alloys Unwrought	240867	36269198	466857	107772630
Aluminium Ingots	2081831	280582856	2462842	514076586
Aluminium Unwrought Nes	1607	241084	2561	594819
Aluminium & Alloys : Worked	231811	45462208	308958	80005080
Aluminium & Alloys :Worked (Bars, Rods, Plates)	164374	28138974	221750	52848855
Aluminium & Alloys :Worked (Bars, Rods, Profiles)	47824	13330801	65170	21514780
Aluminium Worked (Bars, Rods, Profiles etc.)	19613	3992433	22038	5641445
Aluminium & Alloys, Worked, Nes	170757	63784997	199044	86361195
Aluminium & Scrap	5428	598217	9529	1604369
Aluminium Powders & Flakes	3287	821110	4330	1273433

Figures rounded off

Imports: -

Import of alumina increased by 9% to 2,549 thousand tonnes in 2021-22 from 2,334 thousand tonnes in the previous year. Imports were mainly from Australia (38%), Vietnam (27%), Indonesia (26%), China (3.6%) and Netherlands (1%). Imports of aluminium & alloys including scrap also increased 13% to 2,334 thousand tonnes in 2021-22 from 2,060 thousand tonnes in the previous year. The imports were mainly from USA (21%), China (11%), Malaysia (4%), UAE (8%), UK (8%), Saudi Arabia (7%) and Republic of Korea (2.4%).

Imports of Alumina
(By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**2334786**	**57491719**	**2549567**	**82447635**
Australia	1323262	30057614	957664	27069771
Indonesia	490792	10803369	654730	19029897
Vietnam	378634	8817322	682631	22554543
China	62128	3706946	92555	6313320
Netherlands	19710	972577	25074	1428683
Germany	5686	752942	7122	949584
USA	3418	531390	4302	823975
Canada	3630	441073	3102	416853
Bahrain	28092	302334	50774	672294
Other countries	18499	1098489	28362	1699986

Figures rounded off

Imports of Aluminium Alloys Incl. Scrap
(By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**2060227**	**299126164**	**2334438**	**452887747**
China	228165	54307692	250509	76342593
USA	332610	36918693	479644	72677925
UAE	181587	25032890	188607	36663829
Malaysia	127515	19415186	79672	15939942
UK	147742	16647921	179648	27522218
Saudi Arabia	128621	16357314	157267	29347969
Korea	51085	11663612	58355	16508772
Thailand	40730	8824410	53597	16521970
Bahrain Is	53510	8042213	54589	12034735
Netherlands	76260	8196043	78386	11589611
Other countries	692402	93720190	754164	137738183

Figures rounded off

Imports of Aluminium (By Items)

Item	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All items	**2060227**	**299126164**	**2334438**	**452887747**
Aluminium & Alloys:Unwrought	265121	39500561	213611	45666154
Aluminium Alloys Unwrought	36521	5567424	50835	10244963
Aluminium Ingots	224566	33335909	161124	35041224
Aluminium Unwrought Nes	4034	597228	1652	379967
Aluminium & Alloys:Worked	369440	83394272	390525	116853619
Aluminium & Alloys:Worked (Bars,Rods,Plates)	134777	29387734	126761	37013014
Aluminium & Alloys:Worked (Bars,Rods,Profiles)	191905	45018990	191905	71007555
Aluminium Worked(Bars,Rods,Profiles Etc)	42758	8987548	42758	8833050
Aluminium &Alloys,Worked,Nes	52537	27206116	52537	32363370
Aluminium & Scrap	1369546	148399920	1369546	257308920
Aluminium Powders & Flakes	3583	625295	3583	695684

Figures rounded off

7. Aluminium Industry- Present Indian scenario

The Indian primary Aluminium industry consists of three major players i.e. National Aluminium Company Limited (NALCO), Hindalco Industries and Vedanta Ltd., having a total production capacity of 4.13 million tons. The total production of Primary Aluminium metal was about primary producers, i.e., NALCO, Hindalco and Vedanta was 1.90 million tons in FY 2022-23, and 2.21 million tons in FY 2023-24, i.e. increase by 0.31 million tons (approx. 16%) against previous year. t is expected that by 2033, India's Aluminium demand may increase to 9 million tons. India's per capita Aluminium consumption is only 3.1 kg compared to the world average of 12 kg and China's at 31.7 kg.

A study conducted by CRU has revealed that global aluminium demand will increase significantly by 2030 and that the aluminium sector will need to produce an additional 33.3 Million tons to meet demand growth in all industrial sectors – from 86.2 Million tons in 2020 to 119.5 Million tons in 2030. The study details demand across key industrial sectors and regions in a post-Covid economy. Transportation, construction, packaging and the electrical sectors are the four key sectors that will drive demand, accounting for 75% of the total metal required. Two-thirds of this growth is expected to come from China, which will require 12.3 Million tons, the rest of Asia adding a further 8.6 Million tons, North America 5.1 Million tons and Europe 4.8 Million tons. Together, these four regions alone will account for more than 90 per cent of the additional aluminium required globally.

According to the report, decarbonisation policies plus a shift from fossil fuels in the transport sector will see an increase in EV production to 31.7 Million tons in 2030 (compared to 19.9 in 2020). Renewable energy demands will also see a rise in demand for aluminium for solar panels, as well as replacing existing copper cabling for power distribution. In total, the electric sector will require an additional 5.2 Million tons by 2030. The construction sector will require an additional 4.6 Million tons by the end of the decade. Urbanisation will account for 44% of growth, coming from Asia (excluding China). Aluminium packaging will rise from 7.2 Million tons in 2020 to 10.5 Million tons in 2030, driven by an increase in the popularity of canned drinks across North America, Europe and China. A surge in demand for environmentally friendly packaging combined with new products is also behind the increase.

Aluminium is an important input to a number of technologies critical to the energy transition and a significant source of CO2. Direct emissions from the global aluminium sector have been steadily rising. Therefore countries transit to clean technologies, in response to the urgent need for climate action and sustainable lifestyles, the shift to a 'Net Zero' economy is expected to be metal intensive and aluminium has been identified

as one of the critical metals that will aid clean energy solutions, green technologies and sustainable systems. Aluminium is a lightweight material, which is ideal for use in Es,

'Green Buildings' and power cabling. Based on the International Energy Agency's projections for a sub- two degrees global warming scenario, consistent with the Paris Agreement (Beyond 2°C Scenario or B2DS), demand (including recycled aluminium and scrap) could increase from the present level by 80% to around 170Mt by 2050. t is estimated, in this context, that to cater to this huge spurt in demand, up to 28.5% increase in global primary aluminium production shall be required (from around 70 Mt in 2023 to 90Mt in 2050), while the rest may be met from secondary sources and scrap.

The Global Primary Aluminium production for the FY 2023-24 is estimated to be 71.162 million tons against world consumption of 70.724 million tons, resulting in market surplus of 0.438 million tons. Primary Aluminium prices has slumped around 11.57% in FY 2023-24 with respect to FY 2022-23. The major factors which may have affected the price are subdued demand, economic deceleration in the Western world, inflationary pressures, elevated bank interest rates, escalating energy costs, and geopolitical crises collectively contributes to the uncertainty in the aluminium industry. On a positive outlook, the primary catalyst for aluminium demand is expected to be the transportation industry, with the electric vehicle sector playing a significant role in driving this demand. The renewable energy sector may also play a vital role in the demand generation of aluminum. The aluminium recycling sector contributes significantly to sustainability, as industry leaders actively pursue strategies to decarbonize their manufacturing processes, with a dedicated emphasis on achieving future net-zero emissions. China is progressively transitioning towards greater utilization of hydropower and other renewable energy sources for producing low –carbon aluminium.

Indian Aluminium demand has so far remained resilient to economic headwinds and performed well in FY 2023-24. India's economic indicators send some positive signals while demand from end-users points to a mixed picture. As per RBI, India's GDP growth outlook is expected to be 7.3 % YOY for FY 2023-24 as compared to 7.2% for 2022-23. Inflation is expected to reduce to 5.4% in FY 2023-24 from 6.7% in FY 2022- 23. India has a projection to reduce carbon emissions by 1 billion tonnes by 2030 and also intends to reduce oil import dependency. Hence, Government of India envisages faster adoption and promotion of Es as a means to achieve these objectives. The future of the E market is bright, and aluminium will continue to play a significant role in driving innovation and sustainability in this exciting and dynamic industry.

The Aluminium industry in India faces several daunting challenges including rising imports, and escalating production and logistical costs. The industry's sustainability is also affected by non-competitive energy costs and severe shortage of coal allotted to the Nonpower sector. Corrective measures such as rationalization of duties, rectification of the inverted duty structure on critical inputs etc. is expected to improve cost

competitiveness of the industry, as well as attract fresh new investment. India has sufficient domestic capacity to meet the country's aluminium demand of about 4.5 million MT. The Indian Primary aluminium industry is well resourced to expand further and contribute significantly to the country's economic growth, development and wealth creation.

The total domestic production of Aluminium metal by Aluminium producers in the year 2020-21 to 2023-24 is given at below Table.

SL. No	Producer	2020-21	2021-22	2022-23	2023-24
1	Nalco	4,18,522	4,60,000	4,60,000	4,63,428
2	Hindalco	12,40,917	3,03,517 1	3,49,862	13,70,742
3	Vedanta group	9,70,477	2,69,083	2,87,689 2	23,58,813
	Total	**36,29,916**	**40,32,600**	**40,97,551**	**41,92,983**

Domestic Sales of Aluminium

(Figs. in Tons)

Sl No.	Producer	2020-21	2021-22	2022-23	2023-24
1	NALCO	2,30,643	3,23,809	4,38,876	4,18,946
2	HINDALCO	4,80,279	6,38,702	6,84,421	8,13,834
3	VEDANTA GROUP	6,36,378	6,05,510	7,75,198	9,78,706
	Total	**13,47,300**	**15,68,021**	**18,98,495**	**22,11,486**

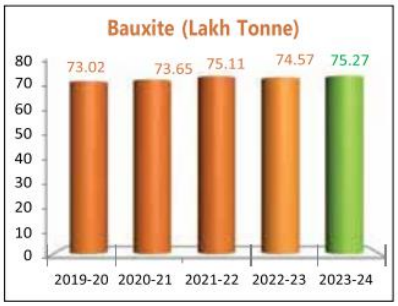
Export Sales of Aluminium

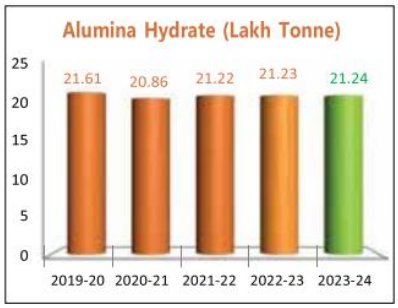
(Figs. in Tons)

Sl No.	Producer	2020-21	2021-22	2022-23	2023-24
1	NALCO	1,92,174	1,33,085	25,214	51,163
2	HINDALCO	7,80,206	6,67,233	6,63,188	5,55,010
3	VEDANTA GROUP	13,56,740	16,64,724	15,10,452	13,79,979
	Total	**23,29,120**	**24,65,042**	**21,98,854**	**19,86,152**

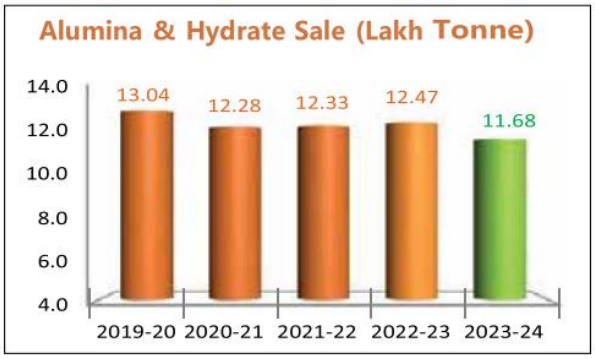
Trends of Production & Sales Parameters:-

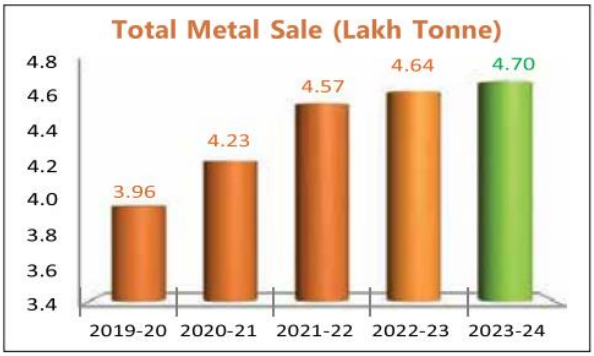
Production





Sales





Source:- Ministry of Mines Government of India

8. SWOT Analysis

Strength:-

Aluminium is the commonest metal in Earth's crust, the third most plentiful chemical element on the planet (after oxygen and silicon) and the second most popular metal for making things (after iron and steel). Aluminium is seen and used every day without even thinking about it. Disposable drinks cans are made from it and so is cooking foil. The silvery metal is found in many places from jet engines in airplanes to the hulls of hi-tech warships. Aluminium is soft, lightweight, fire-proof and heat-resistant, easy to work into new shapes, and able to conduct electricity. It reflects light and heat very effectively and it doesn't rust. It reacts easily with other chemical elements, especially oxygen and readily forms an outer layer of aluminium oxide, if it is left in the air.

Bauxite is the primary source of aluminum and is converted into alumina, which is then further processed to obtain aluminum metal. India is indeed one of the largest producers of bauxite in the world with an output of around 22.8 Million Tonnes in 2023. The country holds huge bauxite reserves with over 50% located in the eastern state of Odisha. This availability of bauxite ensures a stable and consistent supply of raw material for the production of aluminum, which is a key advantage for the aluminum industry in India. Having abundant bauxite reserves also helps in reducing the dependency on imports for raw materials, thereby improving the self-sufficiency of the aluminum industry. This can lead to cost advantages and increased competitiveness for Indian aluminum manufacturers.

At about 4.19 Million Tonnes per annum (MTPA), India has the second-largest aluminium production in the world, followed by Russia at 4.0 MTPA, while China has the largest production of 42.065 Million Tonnes. Indian being the third biggest consumer in the world is expected to approximately double its aluminium demand over the next decade which is from 4.9 Million Tonnes it is expected to jump to 9.0 Million Metric Tonnes by 2033. Aluminium is a strategic metal that propels India's GDP. However, India's per capita Aluminium consumption is only about 3.1 kg compared to the world average of 12 kg and China's per capita consumption of 31.7 kg. This provide opportunity for growth of aluminum industry. The industries that require aluminium in the country mostly include power, consumer durables, transportation, construction and packaging etc. worldwide there are 3,000 application of aluminium metal. The Indian government is investing heavily in infrastructure including railways and airports, while housing construction and the auto industries are also booming. India's ambitious infrastructure development plans will significantly impact the demand for aluminium. The construction of new airports, railways, highways, smart cities and other infrastructure projects necessitate using aluminium due to its lightweight, durability, conductivity and corrosion resistance, being used as alternate material to iron, steel, copper etc.

Aluminium can be recycled infinite times without losing any of its excellent properties. There are estimates that as much as 75% of all aluminium ever produced, equalling to 1.5 Billion Tonnes, is still in circulation. The recycled aluminium, derived from scrap metal is produced with 95% of the energy savings required to produce primary aluminium. Also, recycling does not generate any liquid or solid effluents and has CO_2 imprint of only about 0.3 MT per ton of Aluminium produced.

Weaknesses:

India can significantly boost its export earnings by expanding its production capacity of downstream aluminium products. Although primary aluminium production in the country has increased significantly over the last decade, the rate of value addition inside the country remains low. This can be achieved by development of new products/applications through investments in R&D activities, which are presently being carried out at a limited scale. Further, lack of an extensive and reliable logistics network for efficient supply chain management also acts as an impediment towards achieving this goal. India also encounters high outflow of precious foreign exchange from the country on account of import of Aluminium scrap. In absence of adequate Aluminium scrap generation and handling infrastructure within the country, Aluminium recyclers are forced to look for suppliers abroad. The primary aluminium industry in India is highly dependent on global market conditions and prices which is impacting the bottom line of manufacturers. In the recent years, the volatility of aluminium prices in the global market has had a significant impact on the Indian aluminium industry. The Indian aluminium industry needs to focus on developing innovative ways of reducing the cost of production, such as using renewable energy sources and increasing operational efficiency. The industry also needs to diversify its product offerings and explore new markets to overcome the impact of price fluctuations in the global market. India is one of the significant producers of aluminium in the world, and the production of aluminium in the country is primarily dependent on traditional sources of energy such as coal-fired power plants. The country has a limited reserve of coal, which is the primary source of energy for aluminium production. The coal-fired power plants used to produce aluminium have a significant impact on the environment. These plants are a major source of greenhouse gas emissions, which contribute to global warming and climate change. According to International Aluminium Institute data to produce 1 MT of primary aluminium generates 16 T of CO_2 . Therefore, use of energy source matters greatly in primary aluminium production. The best producers in class currently emit around 4 T of CO_2 per ton of primary aluminium, which is 3-4 times less CO_2 than the global average. In conclusion, the excessive dependence on traditional energy sources for aluminium production in India is a significant challenge that needs to be addressed. The use of new technology in refining and smelting coupled with the switch to renewable energy and utilization of carbon capture systems can help reduce the environmental impact of aluminium production, promote energy security, and mitigate health hazards caused by the use of fossil fuels.

Opportunities and Threats:

Opportunities:

Global aluminium demand (primary and secondary) will increase by almost 40% by 2030. The aluminium sector will need to produce an additional 33.3 Million Tonnes to meet demand growth in all industrial sectors – from 86.2 Million Tonnes in 2020 to 119.5 Million Tonnes in 2030. Transportation, construction, packaging and electrical sectors are four key sectors that will drive demand, accounting for 75% of the total metal required. 37% of this growth is expected to come from China, which will require 12.3 Million Tonnes, the rest of Asia adding a further 8.6 Million Tonnes, North America 5.1 Million Tonnes and Europe 4.8 Million Tonnes. Together, these four regions alone will account for more than 90 per cent of the additional aluminium required globally.

The highest growth in terms of absolute demand is expected to come from the transportation sector which, driven by decarbonization policies and the shift from vehicles powered by traditional fossil fuels to Electric Vehicles (EVs), is expected to go from consuming about 19.9 Million Tonnes of aluminium in 2020 to 31.7 Million Tonnes in 2030. As countries transit to clean technologies, in response to the urgent need for climate action and sustainable lifestyles, the shift to a 'Net Zero' economy is expected to be metal-intensive and aluminium has been identified as one of the critical metals that will aid this transition, catering to the emerging demand for clean energy solutions, green technologies and sustainable systems. Aluminium is a lightweight material, which is ideal for use in EVs, 'Green Buildings' and power cabling. Based on the International Energy Agency's projections for a sub-two degrees global warming scenario, consistent with the Paris Agreement (Beyond 2°C Scenario or B2DS), demand (including recycled aluminium and scrap) could increase from the present level by 80% to around 170 Million Tonnes by 2050. It is estimated, in this context, that to cater to this huge spurt in demand, up to 28.5% increase in global primary aluminium production shall be required (from around 70 Million Tonnes in 2023 to 90 Million Tonnes in 2050), while the rest may be met from secondary sources and scrap.

In the Electrical sector, the transition towards green energy sources will strengthen the sector's demand for aluminium, which may reach 15.6 Million Tonnes in 2030 up from 10.4 Million Tonnes in 2020. Supporting solar power projects through alliances with designers and manufacturers can be key to increase aluminium demand coming from this sector, as solar power requires over four times more Aluminium per installed megawatt than wind power and around 25 times more than coal. In addition to this, increase in consumption from renewables, the need for conductor cables for power distribution is expected to increase. Although these conductors have been traditionally

made from copper, transitioning to aluminium represents a viable alternative and can be beneficial from a cost perspective.

Construction is expected to show relatively low growth in the next decade as consumption increases from 21.2 Million Tonnes in 2020 to about 25.8 Million Tonnes in 2030. Following a slightly different path as compared to other sectors, growth is expected to come mainly from Asia ex. China as demand remains linked to infrastructure spending and urbanization rather than green trends.

Aluminium consumption from the Packaging sector is likely to increase from 7.2 Million Tonnes in 2020 to 10.5 Million Tonnes in 2030, driven mainly by the rise in popularity of canned drinks in North America, Europe and China. The surge of demand for canned drinks in recent years and subsequent demand of aluminium from the Packaging sector, has been fuelled by the emergence of new products as well as a strong consumer preference for packaging options that are environmentally friendly.

The Aluminium industry has witnessed a technological evolution with big players altering their production methods to include automation, Internet of Things (IoT) and Artificial Intelligence (AI). AI is used to predict equipment failures before they occur, allowing for timely maintenance and reducing downtime. AI suggest adjustments to improve efficiency, reduce energy consumption, and minimize waste. Further, AI system are used for real-time monitoring and quality control during the production process. Computer vision technology and machine learning can detect defect and anomalies in aluminium products more accurately and faster than human inspectors. AI improves workplace safety by monitoring equipment and operations to detect hazardous condition and alert workers in real-time. The integration of AI in the aluminium production industry may transform operation by enhancing efficiency, reducing cost and improving quality of the products.

Threats:

Trade policies including tariffs and sanctions may drastically alter the dynamics of the aluminium trade. EU sanctions against Russia, including a ban on imports of Russian aluminium wire and wire rod could dramatically impact the market scenario for the aluminium and aluminium products globally. Further, in April, 2024, US and UK imposed sanctions on the Russian metals including copper, aluminium, and nickel. This was aimed at curbing Russia's revenue from metal exports supporting its military operations in Ukraine. Resulting into rise of Russian-origin aluminum inventory at LME warehouse along with rising resistance for buying Russian metal by European and US companies. Such trade disputes and geopolitical tensions may lead to supply chain disruption, increased cost and increased inventory levels.

Geopolitical tension between the countries such as Houti (a militant group) attack in the Red Sea, which is a crucial maritime route for the transportation of raw material including bauxite and alumina. Disruption of the sea route to Europe resulting into

increased logistical costs with routes becoming approximately 40% longer, extending transit time. In another instance, in the month of March, 2024, Rio Tinoto, one of the largest multinational Mining and Metal Corporation in the world declared force majeure on third-party contracts for alumina exports from its refineries in Queensland, Australia, due to restricted gas supply at its operations. There was a "significant" incident involving the Queensland Gas Pipeline, which supplies gas to Gladstone, predominantly for industrial use.

Some of the other challenges faced by the aluminium industry are power shortage in Yunnan province of China, bauxite supply disruption and closure of refinery. Yunnan is rich in hydropower generation but would be facing tight electricity supply in 2024 with the power shortage expected to reach 27 billion KWh, a latest report from state-backed Kunming Power Exchange Center. In another event in December 2023, China faced raw material shortage, particularly of bauxite, due to disruption in supply from Guinea. Bauxite is the primary ore for aluminium production and alumina supply. Guinea is Africa's biggest producer of the Bauxite, with around 33% of the world's bauxite reserves located in the country. In 2023, Guinea accounted for 70% of China's bauxite imports. Further, closure of refinery like Alcoa, Kwinana refinery in Western Australia with a production capacity of 2.2 million MT/year has disrupted the supply of alumina, a critical raw material in aluminium production.

As the world shift towards greener practices and technological advancement, various challenges ranging from environmental regulation to market volatility may be faced by the Aluminium industry. Aluminium production is energy-intensive and often associated with high carbon emission. Decarbonising and sustainable aluminium production is poised to become the foremost focus on the supply side. The global aluminium industry is set to prioritise achieving net-zero and carbon-neutral, making it a central driving force in the sector. The Carbon Border Adjustment Mechanism (CBAM) is the world's first carbon border tax, created by the European Union (EU) with the aim of reducing carbon emissions which came into effect from October, 2023. Currently, there are no financial obligation or taxes imposed on the reported emissions up to December 2025. However, from 2026, the CBAM is expected to transition to its definitive regime, where a carbon pricing mechanism will be implemented, and companies will likely need to purchase CBAM certificates to account for embedded carbon emissions in their exported goods. The price of these certificates will be linked to the EU Emissions Trading System (EU ETS) allowance price. In essence, CBAM is not currently a tax, but it is expected to become one in 2026. The imposition of CBAM and other similar measures may be detrimental to Indian Aluminium exporters, since carbon-emission intensity for Indian Primary aluminium players remains high, as

compared to the world average, at present. This would make Indian aluminium more expensive and therefore, less competitive, as compared to domestic production in those countries, leading in turn, to loss of market and export revenues for Indian aluminium players.

In addition to the above, other perennial threats to the domestic Aluminium industry include potential downturns in the economy, fluctuations in global prices/exchange rates and cheaper aluminium imports.

9. Industry Outlook

International Outlook:

Global Aluminium production during July – September, 2024 quarter is expected to be 18.346 Million Tonnes, while consumption during this period is likely to be 18.387 Million Tonnes, implying that the market will be in deficit of 0.041 Million Tonnes in the short-run. A resurgence of manufacturing activity in the world's largest economies like US and China may be attributed to a surge in demand for industrial metals. Emerging economies, especially in Asia (notably China and India), will likely see increased consumption due to urbanization and infrastructure development. Global disinflation to continue and projected to moderate from 6.8% in 2023 to 5.9% in 2024 and further to 4.5% in 2025.

Aluminium price trend for the year 2024 has shown substantial improvement. Since February, 2024, the rally has been associated with a notable increase in the global demand and supply uncertainties i.e. aluminium sanction on Russian metals from US and UK, closure of refinery like Alcoa Kwinana refinery in Western Australia, and a fire at Jenema's Queensland Gas Pipeline which may have affected refineries production in Queensland, Australia. The average monthly alumina prices rapidly surged from January, 2024.

One of the main drivers of growth is the increasing awareness of sustainability, which has led to an increased demand for lightweight and recyclable metals like aluminium. The expanding use of electric vehicles, which rely on aluminium to reduce the weight of the vehicle without compromising on strength, is another factor propelling the aluminium market.

Major aluminium producers are investing in expanding production capacities and developing new technologies. The U.S based Century Aluminium is coming up with low-carbon smelter, Emirates Global Aluminium (EGA) new recycling facility in Germany. Aluminium Corporation of China (Chalco) has signed a framework agreement to cooperate on the development of an alumina refinery in Guinea. Tomango Aluminium, Australia premier smelter shift towards clean energy. Aluminium Bahrain B.S.C. (Alba) has introduced a new low-carbon aluminium product line. So, 2024 may see a notable increase in adopting greener technologies and increase the use of renewable energy in production are expected to intensify.

As the world moves towards a low-carbon future, businesses must adapt and evolve to remain competitive. Year 2023 saw a notable increase in renewable energy installations, with over 500 GWs of solar and wind capacity installed, with huge increases in Chinese deployment of solar. It is estimated that, 2024 will see double digit percentage growth in renewable energy installation. The London Metals Exchange (LME) initiated a consultation process mandating aluminium brand producers, eligible for delivery under

its contracts, to furnish carbon emissions data by March, 2025. The objective is to synchronise the aluminium market with the stipulations of Europe's Carbon Border Adjustment Mechanism (CBAM), which imposes carbon-related expenses on specific imported goods.

Overall, the International aluminium industry is poised for growth, driven by rising demand in construction, automotive and packing industries. Hope of US interest rate cut, can stimulate borrowing and spending by both consumers and businesses, which may boost industrial growth and thus, prices. However, it may face challenges related to potential geopolitical disruption, supply uncertainty, sustainability and regulatory pressure.

Domestic Outlook:

Indian Aluminium demand remained resilient in the financial year 2023-24 with increase in domestic consumption by 12% compared to the financial year 2022-23. Similarly, production of metal also increased in the financial year 2023-24 by 2.20% compared to the financial year 2022-23. As per RBI, India's GDP growth outlook is expected to be 7.0% YoY for the financial year 2024-25 as compared to 7.6% in the financial year 2023-24 and inflation is expected to moderate to 4.5% in the financial year 2024-25 from 5.4% in the financial year 2023-24. India Aluminium Market was valued at USD 11.28 billion in 2023, and is predicted to reach USD 19.76 billion by 2030, with a CAGR of 7.6% from 2024 to 2030.

ICRA has estimated that the domestic aluminium demand growth to remain healthy at 9 percent annually through the financial year 2023-24 and the financial year 2024-25. This growth is driven by several factors including the Indian government massive infrastructure development plans, growing urbanization levels and initiatives like housing for all schemes, as well as investment in the metro rail network and aluminium-bodied Vande Bharat trains.

The power transmission and distribution sector is a major consumer of aluminium in India. With the Central Electricity Authority planning a substantial expansion of capacity. In addition, the Government of India's ambitious target to achieve 500 GW of renewable energy capacity by 2032, would require significant capacity addition for the transmission lines in the coming decade. Further, an improvement in the solar rooftop installation market along with large capacity additions expected in the solar module manufacturing in India in the next 3-4 financial years, would also drive domestic aluminium demand as a part of the renewable energy transition drive.

India has a projection to reduce carbon emissions by 1 Billion Tonne by 2030 and also intends to reduce oil import dependency. Hence, Government of India envisages faster adoption and promotion of EVs as a means to achieve these objectives. India is targeting

30% overall (80% in 2W & 3W segments) penetration in EVs by 2030. Aluminium is an essential material in the EV market, playing a vital role in battery technology, body

construction and infrastructure and driving sustainability. Use of aluminium in EVs would enable manufacturers to build vehicles that are more energy efficient and the lower weight translates into an additional 10-15% increase in efficiency and range, which in turn will drive higher EV adoption among consumers. The future of the EV market is bright, and aluminium will continue to play a significant role in driving innovation and sustainability in this exciting and dynamic industry.

A snapshot of Aluminium production, Domestic sales and Exports by Primary producers along with Aluminium consumption in India is tabulated hereunder:

Description	2023-24	2022-23	Change (%)
Aluminium production ('000 MT)	4,192.98	4,097.55	2.3%
Aluminium domestic sales ('000 MT)	2,211.48	1,898.50	16.5%
Aluminium export sales ('000 MT)	1,986.15	2,198.85	(9.7%)
Aluminium imports ('000 MT)	2,737.14	2,542.14	7.7%
Total aluminium consumption ('000 MT)	4,948.62	4,440.64	11.4%

Best Regards,

T.G Uday Associate Director,
Infomerics Analytics & Research Pvt Ltd

Date:24-12-24

Place:-Bangalore