

# The performance of glass industry in India: A Study of Temporal Analysis

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**Abstract -** The glass industry plays a crucial role in fortifying its products sustainability and contributing to other sectors environmental enhancement. Most of the glass industry's products, over 90 per cent, are distributed to various other industries. In India, this sector is primarily propelled by the construction, automotive, packaging, and infrastructure sectors. The past decade has witnessed substantial growth and expansion within the Indian glass industry. This analytical paper endeavours to evaluate the growth and development of the glass industry in India, and an attempt has been made to identify the primary issues and challenges faced by this sector. This study employs secondary data from the Ministry of Commerce and Industry, India, and United Nations Development Organizations to evaluate employment generation and exports and describe the trends and patterns in the number of glass units and output from 1999 to 2019. The findings suggest variations in the number of units, employment generation, production and export of the glass industry in India over the two decades. Growing concerns about the environment and energy conservation worldwide, coupled with the growth of the building and automotive industries, have resulted in an increasing trend.

**Keywords:** Trends; Growth; Export; Sustainability; Glass industry.

## I. INTRODUCTION

Glass is one of the most valuable materials in our daily life. Its low cost and varied properties like durability, thermal and chemical tolerance, transparency, and recyclability make it a popular material for numerous products across various industries. Recycling a single tonne of glass conserves 322KwH of energy, prevents the emission of 246 kg of CO<sub>2</sub> and the consumption of 1.2 tonnes of virgin raw material, leads to cost savings in waste transportation and disposal, but also signifies the superior quality and meticulous packaging of products enclosed in glass (Saran, V. 2017). Moreover, glass significantly reduces the amount of waste that needs to be processed or discarded. Flat glass is frequently used in construction and automobiles. Glass containers are used in food, beverage, and pharmaceutical industries. India ranks within the top 15 global markets for glass packaging and stands as the third fastest-growing market, following Turkey and Brazil. The majority of glass demand in India is attributed to container glass, which holds a 50 per cent share in the country's glass consumption by value. However, India's per capita glass consumption remains relatively low, standing at 1.6 kg in contrast to the 8-9 kg observed in developed nations and the 30-35 kg recorded in the US. The Indian glass industry is mainly unorganized, with a 45-50 per cent share consisting of many micro and small players, while few prominent players dominate the organized sector. Advanced glass processing facilities for the building, fire safety, and automotive industries, together with a mirror line,

are produced by Saint Gobain, Asahi, and Hindustan National Glass, which together account for around 42 per cent of the overall glass manufacturing market. With an installed capacity of 550 tonnes of glass per day, the AIS Taloja factory will enable the firm to create automotive raw glass that meets the highest standards, thereby increasing its entire production capacity by around 60 per cent. The Firozabad glass industry contributes around 70 per cent of the total glass production in the unorganized sector in India and employs approximately 5 lakh people directly or indirectly.

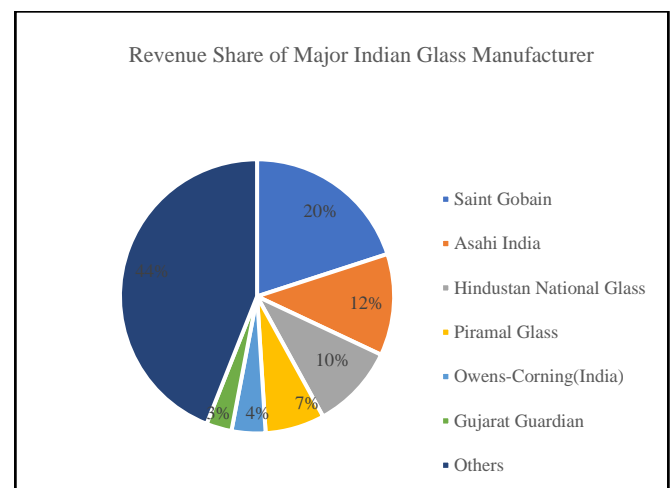


Fig. 1 Share of major glass manufacturer in India

The glass industry in India is quite old and well-established. For a long while, it was mostly a cottage industry. The

industry has evolved and changed in recent years. From rudimentary mouth-blown and hand-working processes, the industry has grown to adopt modern processes and automation largely. India's per-capita glass container consumption is 1.8 kg, much lower than in other nations. This provides a possibility of good upside potential. The glass industry in India is primarily driven by the construction, automotive, packaging, solar glass and infrastructure sectors. Over the past decade, this cluster has seen significant growth and expansion. Between 2000 and 2006, the flat glass industry witnessed a remarkable increase of approximately 80 per cent; the outcome was a compound annual growth rate of 10.1 per cent.

On the other hand, the glass container sector witnessed a 12 per cent growth trajectory and is anticipated to achieve the highest revenue of US\$ 2048.7 million by the end of 2030, in contrast to the US\$ 1154.9 million recorded in 2020 (Kenneth Research, 2022). In 2022, India's flat glass market reached US\$ 3.3 billion and is expected to reach US\$ 4.8 billion by 2028, exhibiting a Compound Annual Growth Rate(CAGR) of 6.97 per cent during the forecast period (IMARC, 2022). Similarly, the Indian container glass market is anticipated to register a CAGR of 6.78 from 2022 to 2027 (Singh, A., 2018). The packaging industry in India is estimated to be worth US\$ 15 billion, with a growth rate of 14-15 per cent CAGR in previous years. In 1999, the per capita consumption of glass stood at 0.41 kg, but by 2006, it had risen to 0.76 kg (Sejal Glass, 2020). The flexible packaging share 30 per cent, rigid plastic 19 per cent, printed cartons 12 per cent and glass share only 7 percent, the growth in Pharmaceutical Segment is expected as the movement towards glass from alternate packaging is expected with change in consumer demand. Packed food segment is driving growth with emerging market of speciality sauce, dressings, olive oil. This segment is expected to grow the fastest with the change in consumer perception towards alternate packaging.

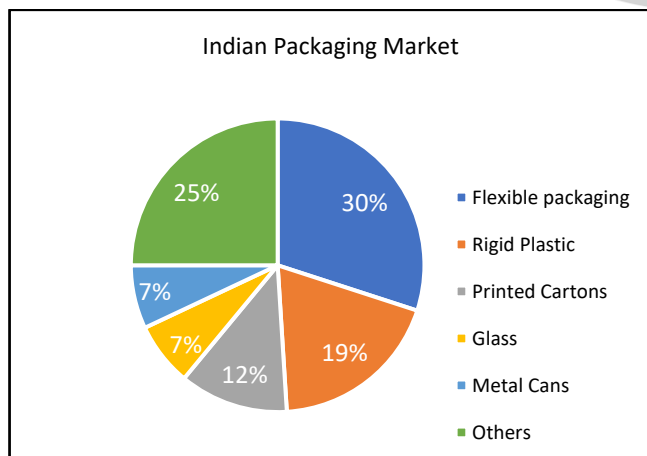


Fig. 2 Share of packaging market in India

The Master Guide to Indian Glass reveals that the demand for flat glass has been steadily increasing annually, averaging 12 per cent to 15 per cent over the last 2-3 years

and is expected to maintain a long-term growth rate of around 3.8 per cent per year. Furthermore, In recent years, there has been an annual growth in demand for processed glass of over 30 per cent (Sejal Glass, 2020). With the growing construction industry, the demand for different construction materials, including products such as commercial glass, is also increasing rapidly. The growth of the Indian retail glass market is expected to be influenced by this particular factor. Over the past few years, the nation has shifted its focus towards renewable energy, contributing to the demand for solar panels (The Hindus Business Line, 2021). As per the India Brand Equity Foundation (IBEF), India reported a 250 per cent expansion in the use of renewable energy between 2014 and 2021. Besides this, in July 2021, the Ministry of New and Renewable Energy has planned to undertake the Rooftop Solar Program Phase II, which would encourage the deployment of rooftop solar (RTS) throughout the country. On the other hand, the market's growth can additionally be linked to the rising need for commercial glass from the automotive industry, backed by the rise in the production of different types of vehicles in the nation. Figure 3 shows the division of the Indian market of the Glass Industry comprises architecture, automobiles, value-added glasses, furniture and mirror share of 45, 15, 15, 15 and 10 per cent, separately.

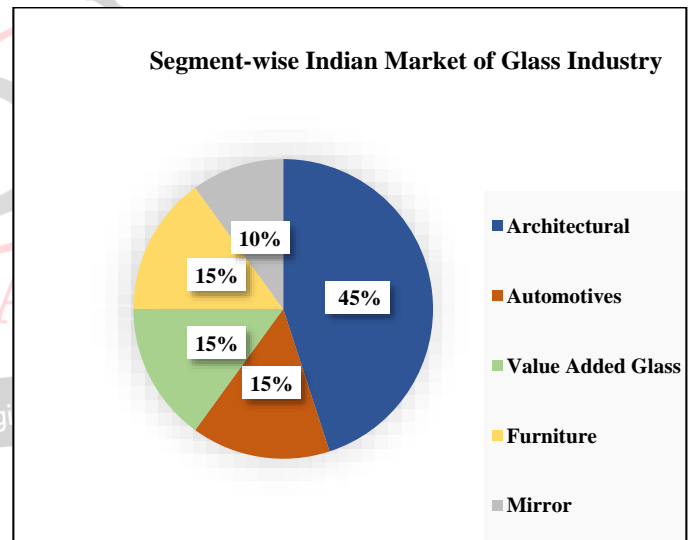


Fig. 3 Division of glass industry market in India

The glass industry offers numerous employment opportunities and plays a significant role in advancing a country's economy by enabling the progression of the production value chain. For instance, glass containers facilitate agribusiness growth, contributing to economic development. As global concerns regarding climate change intensify, the glass industry also assumes a crucial responsibility in promoting sustainability and fostering the "greening" of other sectors. The sustainability of the glass industry in India holds great value because of its capacity to generate employment for many individuals and its contribution to environmental protection, as glass products are entirely recyclable. Consequently, this paper aims to

examine the growth and development of the glass industry in India, analyze the spatial and temporal aspects of glass exports, and identify the significant challenges and issues faced by the industry.

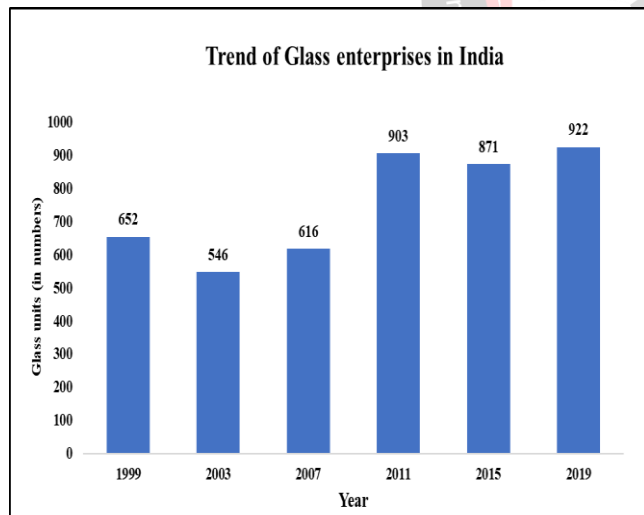
## II. MATERIAL AND METHODS

The present study analyses secondary data sources about India's glass and glassware industry. These sources include data on the number of units, employment, exports, and output collected from reputable organizations such as the Ministry of Commerce and Industry, United Nations Industrial Development Organization (UNIDO), Ministry of Medium, Small Enterprises (MSME), and All India Glass Manufacturing Federation (AIGMF), and India Brand Equity Foundation (IBEF) over two decades. The present analysis uses 1999-2019 data for trends and patterns of a number of glass units, employment generation and production obtained from UNIDO and export data obtained from the Ministry of Commerce and Industry, India. Data have been calculated with simple arithmetic ratios and percentages and interpreted and represented cartographically using different techniques like line and bar graphs.

## III. RESULT AND DISCUSSION

### 3.1 Number of Glass enterprises in India

Figure 4 depicts that the number of Glass units has experienced fluctuations over the years, owing to various factors such as the increasing consumption of beverages, demand for pharmaceutical packaging, and growing demand from the automotive and construction industries.



Source: UNIDO, INDSTAT 4 2023, ISIC Revision 4

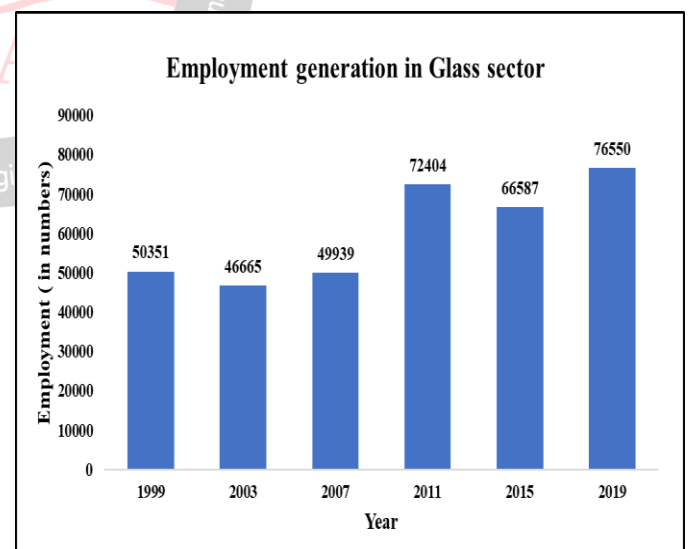
Fig. 4 Number of registered glass units in India

According to the International Labour Organization (ILO) report of 2015, more than 90 per cent of glass industry products are sold to other sectors. In 1999, the number of glass units was recorded at 652, which decreased to 567 by 2004 due to reduced demand for glass products in India. However, there has been a notable increase in the number of glass enterprises in India, with the highest number of glass

industry units recorded in 2019 at 922, driven by the increasing consumption of beverages. The consumption of liquids such as soft drinks, bottled water, milk, and alcohol is on the rise, leading to a growing demand for glass beverage containers. This demand is further fueled by rising disposable income, increased living standards, and the use of single-serve containers. Glass packaging offers improved protection against environmental elements. It helps to maintain the product's flavour and scent for an extended period. According to the statistics obtained from the International Organization of Motor Vehicle Manufacturers (OICA) reports the overall presentation of automobiles and commercial vehicles country increased from 2831542 units and 725531 units respectively in the year 2010 to 3622225 units and 892682 units respectively in the year 2019. About 75 per cent of the total glass industries are concentrated in Uttar Pradesh, Maharashtra, Gujarat, Karnataka and Andhra Pradesh. The highest share in the number of factories in the glass industry is Uttar Pradesh, with a share of 36.9 per cent, followed by Gujarat at 15 per cent, Andhra Pradesh and Tamil Nadu at 5.6 per cent and Karnataka at 4 per cent.

### 3.2 Employment in the Glass production in India

Figure 5 illustrates a gradual yet consistent upward trend in employment within the glass industry starting from 1991. This growth can be attributed to the increasing demand for glass in various sectors such as construction, automotive, packaging, and infrastructure. The rise in population and disposable incomes has led to an increase in people's expenditure on various needs, including their demand for glass for safety and hygiene purposes. This surge in demand has stimulated the glass market.



Source: UNIDO, INDSTAT 4 2023, ISIC Revision 4

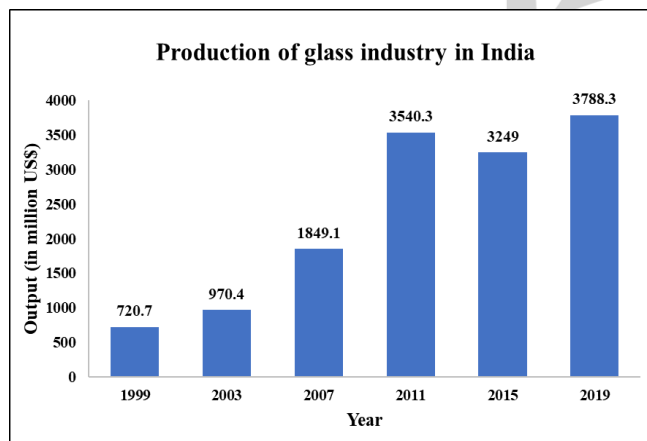
Fig. 5 Employment generation in glass industry in India

According to the United Nations Industrial Development Program (UNIDP), the number of individuals directly employed in the Indian glass industry reached 50,351 by 1999, which further increased to 55,091 within a span of two

years. Additionally, there were approximately 500,000 jobs indirectly linked to the industry. However, between 2001 and 2003, there was a decline in employment, with the number of people directly employed decreasing from 48,060 to 46,665. Nevertheless, there was a subsequent increase in employment, with 70,169 and 72,404 individuals directly employed in 2010 and 2011, respectively. The organized glass industry in India directly employs around 3 million people and provides indirect employment to 500,000 individuals. On the other hand, the unorganized sector employs approximately 500,000 to 600,000 people. Notably, the Firozabad glass industry, which is India's most significant glass cluster, contributes to 70 per cent of the total glass production in the unorganized sector.

### 3.3 Output of glass industry in India

Figure 6 shows that the output of glass production in India exhibits a fluctuating yet upward trajectory. In the year 1999, the production value amounted to US\$ 720.7 million, which subsequently witnessed a significant increase to US\$ 1318.2 million in 2004. This notable growth can be attributed to the expansion of the flat glass sector, which experienced a remarkable surge of over 80 per cent between the years 2000 and 2006.



Source: UNIDO, INDSTAT 4 2023, ISIC Revision 4

Fig. 6 Performance of glass industry in India

In the year 1999, the production value amounted to US\$ 720.7 million, which subsequently witnessed a significant increase to US\$ 1318.2 million in 2004. This notable growth can be attributed to the expansion of the flat glass sector, which experienced a remarkable surge of over 80 per cent between the years 2000 and 2006. Consequently, this expansion resulted in a compound annual growth rate of 10.1 per cent. Subsequently, in 2005, there was a notable decrease in production amounting to US\$ 1230.4 million. This decline was primarily attributed to the escalating costs of raw materials and the surging gas prices, both of which impeded the growth of glass production in India. Conversely, the pinnacle of production was observed in 2018, reaching a remarkable US\$ 4,111 million. This surge was primarily

driven by the escalating demand from the construction industry, electronic displays, and the increasing installation of solar panels, among other factors. As per the Department for Promotion of Industry and Internal Trade in India, the projected investment amount in the glass industry for the fiscal year 2021 is INR 57.12 billion (equivalent to US\$ 0.77 billion), which marks a significant increase from the INR 5.67 billion (equivalent to US\$ 0.08 billion) invested in the previous fiscal year of 2020.

### 3.4 Export of Glass and Glassware in India

Figure 7 illustrates a consistent upward trend in glass exports from 1999 to 2014, with occasional minor decline. The data indicates that the glass industry in India is experiencing growth and transformation, characterized by an increase in exports and a shift towards modern automation techniques.



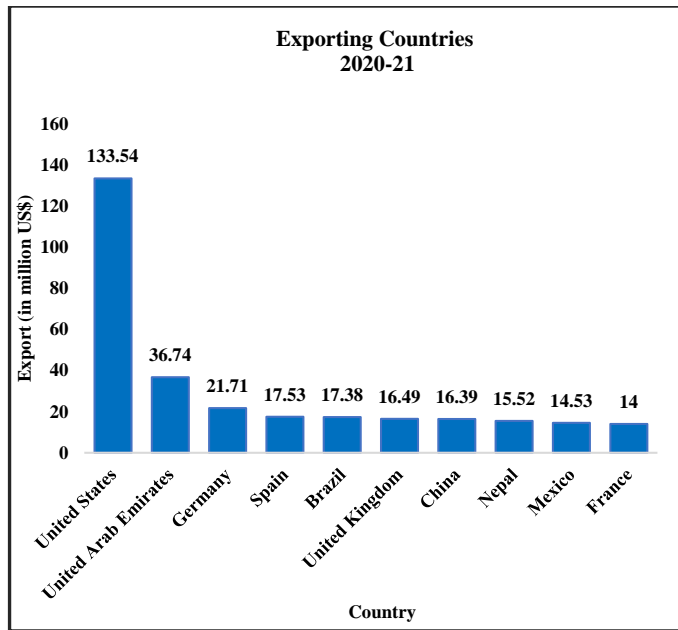
Source: Ministry of Commerce & Industry, India, 2019

Fig. 7 India total glass export

Furthermore, there is an expected expansion in the glass packaging market in the upcoming years, with a particular emphasis on environmentally friendly and visually appealing glass bottles. According to the Ministry of Commerce & Industry in India, the value of glass and glassware exports rose from US\$ 90.81 million in 1999 to US\$ 588.39 million in 2019. This growth can be attributed to the implementation of globalization and liberalization policies, as stated by the All India Glass Manufacturers Federation (AIGMF), which facilitated the flourishing and expansion of this sector from local to global levels.

Between 2012 and 2016, India witnessed a 3 per cent increase in the value of glass exports. However, in 2014, there was a significant decline in exports due to a change in ruling party and subsequent alterations in export policies from 2014 to 2016. Additionally, there was a 7 per cent decrease in export sales during 2015-16. The subsequent dip in exports occurred during the demonetization period, which resulted in a severe financial crisis and the closure of numerous industrial units. This had a detrimental impact on the glass and bangle industry, which is a crucial component

of Firozabad's economic backbone, leaving over 135,000 workers unemployed and disrupting the balance between labor supply and demand. In 2017, India's glass exports to the world amounted to US\$ 719.5 million, compared to US\$ 100.54 million in 2016. India currently exports glass products to over 150 countries globally, with the United States, United Arab Emirates, Germany, Nepal, and the United Kingdom being the largest recipients of Indian glass and glassware exports, according to the India Brand Equity Foundation (IBEF). Overall, the average value of Glass & Glassware exports in India from 1996 to 2020 stands at US\$ 321.65 million, reaching a peak of US\$ 719.50 million in 2017 and a record low of US\$ 53.22 million in 1998.



Source: International Brand Equity Foundation (IBEF), 2020

Figure 7.1 Country wise share of glass export

Figure 7.1 indicate that the global market for Indian glassware is fragmented and distributed among various countries, without any dominant demand. These figures highlight the significant potential for Indian exporters of glass and glassware to enhance their involvement in international trade and improve their performance. Notably, the United States stands as the largest market for Indian glass products, accounting for a substantial US\$ 133.54 million and representing 26.53 percent of exports in the 2020-21 period. The United Arab Emirates holds a share of 7.3 percent, followed by Germany with 4.31 percent, and Spain and Brazil with shares of 3.48 and 3.45 percent, respectively. Collectively, these top five countries contribute to over 45.07 percent of the total Glass And Glassware exports from India, amounting to a total export value of US\$ 226.9 million. Furthermore, the top ten countries collectively account for 60.36 percent of the glass and glassware export value from India.

Table 1: State-wise Production of Glass in India 2022

States/Union Territory	Amount (in billion INR)	Share (in per cent)
Maharashtra	2.28	29.41
Gujarat	2.21	28.42
UP	1.04	13.43
Tamil Nadu	0.67	8.62
Haryana	0.40	5.14
Bihar	0.25	3.21
Telangana	0.21	2.66
Delhi	0.13	1.61
Rajasthan	0.12	1.59
West Bengal	0.12	1.50
Andhra Pradesh	0.08	1.07
Punjab	0.08	1.06
Karnataka	0.05	0.61
Kerala	0.04	0.45
MP	0.03	0.43
Jharkhand	0.03	0.37
Goa	0.02	0.21
<b>Total</b>	<b>₹7.76 Billion</b>	<b>100</b>

Sources: International Brand Equity Foundation (IBEF), 2022

According to Table 1, total production of glass industry in India was ₹7.76 billion in 2022. Maharashtra, Gujarat, and Uttar Pradesh demonstrate the highest performance in glass export (2021-22), accounting for 29.42 per cent, 28.42 per cent, and 13.43 per cent respectively. Tamil Nadu, Haryana, Bihar, Telangana, Delhi, Rajasthan, West Bengal, Andhra Pradesh, and Punjab collectively contribute approximately 25 per cent of the total exports. The remaining states can be classified as minor contributors.

#### IV. ISSUES AND CHALLENGES:

Despite a significant growth potentials, glass manufacturing industry faces several challenges and issues that can impact production, profitability, and growth. Some of the common challenges faced by the industry include higher cost of raw material, low per capita glass container consumption, competition and innovation pressure, mining issues and delayed leases and the need to adopt sustainable practices.

##### i. High cost of raw material

Indian glass manufacturers are currently confronted with the formidable challenge of escalating raw material prices in the glass manufacturing sector. The rise in expenses for raw materials has adversely affected the financial outcomes of glass production firms. Major raw materials in making glass are silica sand, soda ash, limestone and cullet (broken glass). Soda ash, one of the major raw materials, accounts for about 50-55 per cent of the total cost of raw materials, followed by cullet and silica sand. Cullet can be recycled into the furnace to reduce energy consumption (1 per cent cullet increase = saving of 2.5 Kcal/Kg glass). Prices of soda ash increased 6 per cent year of year from Rs. 25.3/kg in April 2017 to Rs. 26.8/kg. April in 2018 was the third consecutive month in which prices had risen. Consequently,

this has significantly reduced profit margins within the glass industry in recent years.

### ii. Tough competition

The Industry is highly competitive in terms of marketing, distribution, service, tapping far off markets on all counts both in the domestic market as well as in exports. Glass industry is facing stiff competition from Chinese Products: As China is dumping its products in India; it is becoming difficult for domestic industries to survive. Increased imports of Chinese glass which is available at cheap rate and also offers a wide range of glass has caused difficulties for the glass industry. India's glass imports include products like float glass, cullet, glassware, etc. Highest imports are from China with a value of US\$ 394 million (43 per cent of total imported glass), followed by USA, Malaysia, Germany, Indonesia and Japan. Other countries being Austria, Taiwan, France, U.A.E., Czech Republic, etc. In 2018, the country's glass imports were at US\$ 1,245 million, which makes India a net importer of glass.

### iii. Low demand of Indian glass in world market

India exhibits low glass container consumption in comparison to other countries. The per capita glass consumption in India is 1.8 kg, compared with 8-9 kg in developed countries and 27 kg in the United States. In comparison to other countries, India's glass consumption is low and therefore needs to be promoted for glass industry to foster growth. The promotion of glass through various campaigns which signifies the purity and its environment friendly nature for the society is one of the ways to combat challenges faced by the glass industry.

### iv. Limited access to new and improved technology

Usage of conventional technologies in different clusters has impacted the overall efficiency and productivity of the units. Majority of units in Firozabad are comes under bangle clusters which is very labour intensive and requires technology intervention at multiple steps to improve the final output. They used old furnaces, their style of production has not modified and have poor insulation in last 30-40 years. There is limited usage of good quality refractory blocks that often leads to breakdown of the furnaces and increases the overall consumption of fuel that further increases the overall cost of production. This leads to usage of poor quality material in construction of pots and furnaces that reduces the overall life and leads to large quantity of heat loss.

### v. Growing alternatives of glass in India

Growing alternatives of glass has adversely affected the glass packaging industry. The output of plastic product is more than glass. In 2008, the production of plastic was US\$ 616733.8 million with increases US\$ 2393825.6 million in 2019. A number of alternatives of glass are now available in the market at a lower cost, so people mostly prefer those which adversely affect the glass industry. But with the key

properties such as inertness, transparency, recyclability etc. glass will overcome the issues of fragility and bulkiness which will enable the consumer to satisfy their changing needs.

### vi. Awareness of glass as eco-friendly building material or packaging solution

Recyclability of product and sustainable energy are two benefits of glass for which the awareness among people needs to be created. Glass is one such construction material which is 100 per cent recyclable compared to brick or concrete which is one of the biggest advantage to conserve natural resources. It contributes significantly to sustainable energy by using the right thin film coated glass products in facade or on windows. Lack of awareness among the people is another big challenge for the industry.

Despite these challenges, the glass industry in India has significant growth potential, driven by factors such as increasing demand from the construction and automotive sectors, as well as growing consumer awareness about health, hygiene, and eco-friendliness. The industry is expected to grow significantly in the next few years, providing opportunities for those willing to invest in new technologies and processes.

## V. CONCLUSION

The glass industry in India has come a long way from melting in traditional mouth-blown, coal-fueled pot furnaces to using natural gas-blown furnaces. The number of registered glass manufacturing units in India has almost doubled in the last 20 years. This growth is led by the container glass segment, expanding the automotive and construction sectors. The glass and glassware exports rose from US\$ 90.81 million in 1999 to US\$ 588.39 million in 2019. In the year 1999, the production value amounted to US\$ 720.7 million, which subsequently witnessed a significant increase to US\$ 3788.3 million in 2019, growth rate about 19 percent during this period. Approximately 75 per cent of the total glass manufacturing units are in U.P, Maharashtra, Karnataka and Andhra Pradesh. USA, UAE and Germany are India's top three glass export partners. Overall, the Indian glass industry is expected to continue growing, driven by the construction industry, electronic displays, and solar panels. However, the increasing cost of raw materials may restrain the growth of the industry. The growth in the glass industry is characterised by the increase use of processed & reflective glass as the Indian customer has become more aware about the importance of glass in effectively addressing the concerns of safety and energy efficiency. The industry's own high energy use remains a challenge, although in the last few decades companies have introduced innovations in glass production processes to reduce waste and boost efficiency. With support from the International Finance Corporation (IFC) and the private sector, the industry can continue to improve its energy

efficiency while meeting increased demand for sustainable glass products. In conclusion, the glass industry in India has experienced a steady increase in employment over the years, driven by the growing demand in various sectors. The organized and unorganized sectors both play a significant role in providing employment opportunities, with the Firozabad glass industry being a prominent contributor to the unorganized sector's production.

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