

# CEMENT INDUSTRY

## Trends Report



The Energy and Resources Institute

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Compiled and Prepared by  
Ms Reeta Sharma, Information Analyst  
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### **For more information**

Reeta Sharma  
TERI  
Darbari Seth Block  
IHC Complex, Lodhi Road  
New Delhi – 110 003  
India

**Tel.** 2468 2100 (Extn. 2756)  
**E-mail** reetas@teri.res.in  
**Fax** 2468 2144 or 2468 2145  
**Web** www.teriin.org  
India +91 • Delhi (0) 11

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## 1. Introduction

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Cement is one of the key essential materials in the construction industry. It is classified into various categories based on its composition and specific end uses. Cement is classified as either Portland, blended, or specialty cement. Portland cements are mostly used around the world<sup>(1)</sup>. These have various types used in different conditions like underwater or open air. Key constituents used to manufacture cement include limestone, shells, and chalk or marl combined with shale, clay, slate, blast furnace slag, silica sand, and iron ore. To manufacture cement, Limestone, sand, and other additives are combined in rotating kilns at temperatures of up to 1450°C. This process yields a granular intermediate known as clinker, which is then ground in mills to produce cement powder. The final cement mix will include around 5% gypsum and may also include other non-clinker mineral by-products like limestone, slag, and ash from coal-fired power plants<sup>(2)</sup>.

The cement manufacturing process is complex and energy input is required at every stage, and various processes involved lead to emissions of CO<sub>2</sub> and other greenhouse gases. Cement accounts for 83% of total energy use in the production of non-metallic minerals and 94% of CO<sub>2</sub> emissions. Energy represents 20% to 40% of the total cost of cement production. The production of cement clinker from limestone and chalk by heating limestone to temperatures above 950°C is the main energy consuming process. Portland cement contains 95% cement clinker<sup>(3)</sup>. Large amounts of electricity are used in crushing the raw materials and finished cement.

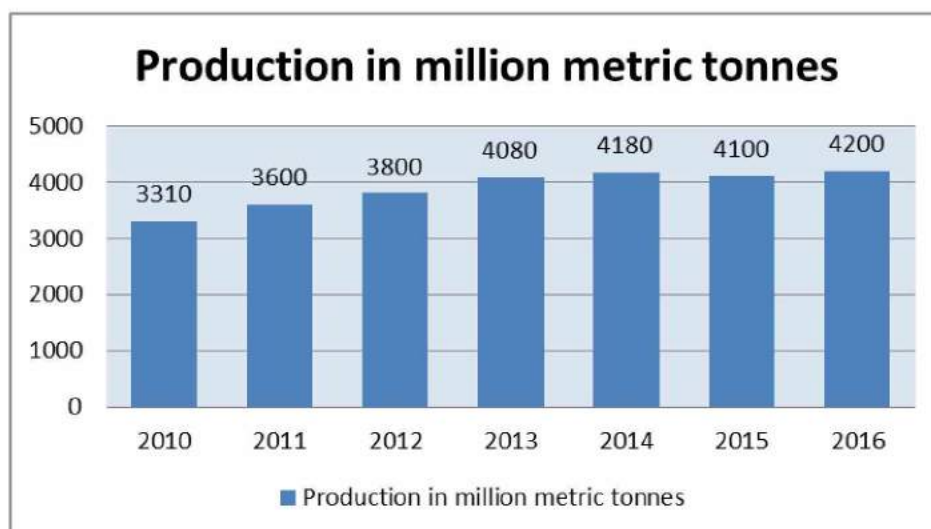
## 2. Global Cement Production

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According to a report by CII (Confederation of Indian Industries) Cement is produced in more than 150 countries across the globe<sup>(4)</sup>. During 2016, the global production capacity of cement stood at 4200 million tonnes. The total world production of cement is expected to be around 4.4 billion metric tons in 2020<sup>(5)</sup>. In 2010 cement production was reported by 3310 million tonnes. There is a slight decrease in world cement production in 2015 as China's significant decline in cement production. Cement production has showed a good increase again in year 2016. From year 2010 to 2016 cement production has increased around 890 million tonnes and further expected to grow in 2017.

There are many reasons for this expected increase in coming years in cement production. Among them one is economic growth in developing countries. With the development of the economy of a particular country, cities become more flourishing than neighbouring rural areas, which led to inward migration and urbanization<sup>(7)</sup>. This inexorably leads to increased demand for building materials, including cement. Though many of the largest and fastest-growing cement industries are now in the developing world, still for many developing countries, self-reliance in cement production is a major industrial target as it reduces the dependence on imports and reduces the cost of construction. It also enables further development of the economy through improved infrastructure. In the case of some countries it is even possible to show strong positive correlation between GDP and cement consumption over time.

As per one of the UN 2014 report, majority of the 2.5 billion new urban inhabitants projected to be in Africa and Asia in the period to 2050. Due to which countries in these continents, their regulations, and populations will most strongly influence future cement demand, the efficiency of the production process, and availability of raw material as also the types of fuels used. This clearly concludes that the global cement production will continue to rise in the coming years<sup>(6)</sup>.

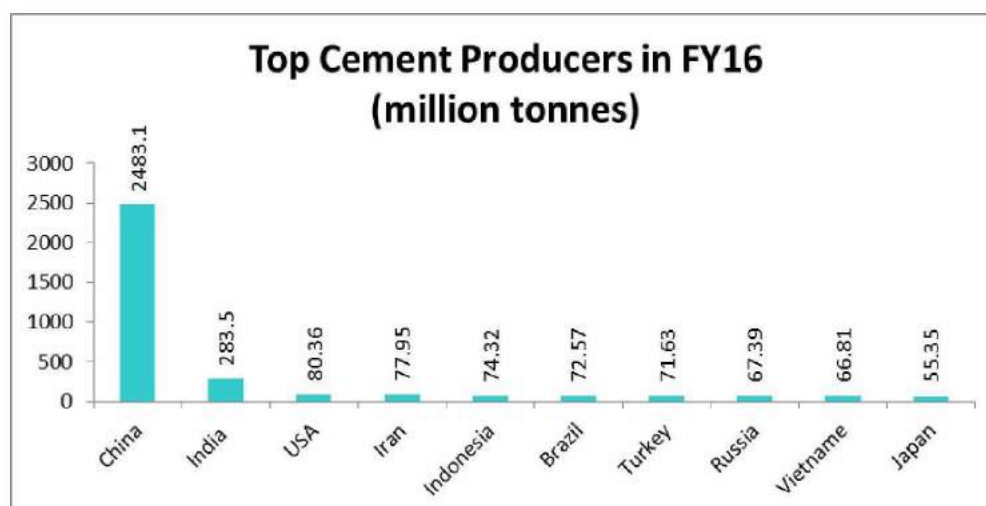


**Figure 1** World Cement Production from 2010-2016.

Source: statista@2016

## 2.1 Top Global Cement Producing Countries

Over half of the world's cement is currently produced by China which accounts for approximately 2483.1 million tonnes and India a distant second with total production of 283.50 million tonnes followed by the US. The production of cement is highly uneven and top ten countries together account for close to 70% of total cement consumption.



**Figure 2** Top Cement Producers in 2016

Source: IBEF 2017

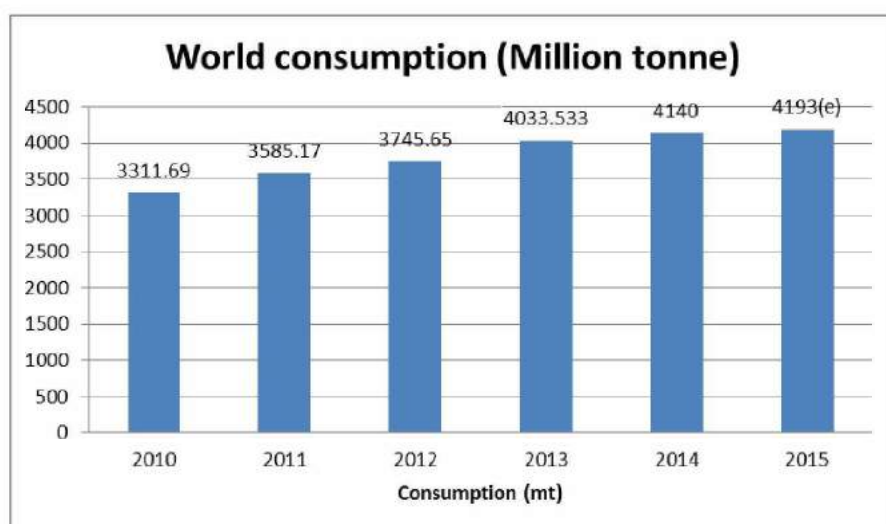


### 3. Global Cement Consumption

According to a new report by Expert Market Research, the global cement market reached a consumption value of 4.8 billion tons in 2016 and is further expected to reach nearly 6 billion tons by 2022. World cement consumption was maintained a constant growth during 2013-2015, which was less robust pace than previously expected.

In 2012, world cement consumption grew an estimated 4.3% from 3.75 billion metric tons in 2011 to 3.59 billion metric tons. Growth was achieved by demand among developing and transitional economies in Asia. These gains were partially offset by moderate declines in consumption among developed economies such as China which accounts for more than 59% of world consumption. India accounts another 7% of world cement consumption. Combined, these markets dominate world cement consumption trends. Despite the global economic slowdown, relatively strong, even if decelerating, growth in India and China is expected to account for more than two thirds of world cement consumption <sup>(20)</sup>.

Sprouting urbanization in these two countries is a vital factor in determining cement consumption as it led to a steady increase in residential and commercial building construction activities. China and India, despite being the largest global producers of cement did not export much of their production as it was domestically consumed.

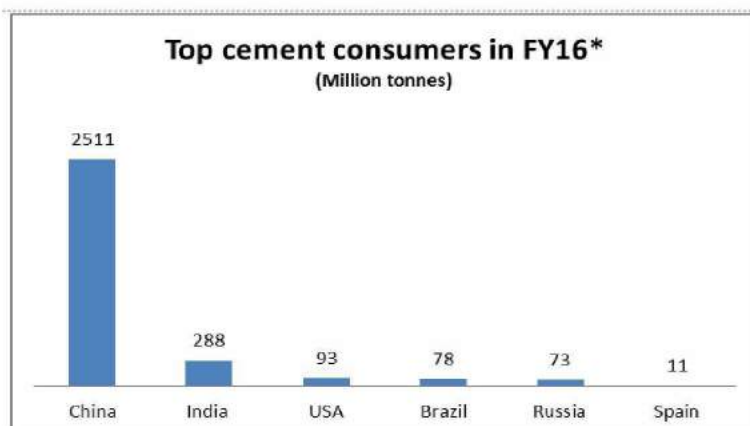


**Figure 3** World Cement Consumption from 2010-2015

Source: Source: The Global Cement Report from CemNet.com <sup>(21)</sup> and Expert Market Research. <sup>(22)</sup>

#### 3.1 Top Global Cement Consuming Countries

In 2015, China is the world's largest cement consumer with 2511 million tonnes cement consumption, followed by India (288 million tonnes). Other major cement consuming countries are Brazil, Russia and Spain as shown in Figure 4.



**Figure 4** Top cement consumers in FY16

**Source:** International Cement Review and IBEF 2017

**Note:** FY16\*-As on August 2015

According to CW Research's Global Cement Volumes Forecast Report, global cement volume growth is expected to slow down following China's significant decline, bringing down the average growth rate over the period 2015–2020 to 0.7%. The Chinese domestic market remains under pressure, as export prices are unable to compete with Mediterranean producers on a long-term basis. Nearby Russia will have lower volumes as the economic output declines, while the Indian market is boosted by strong investment in constructions sector. During 2015-2020, the main drivers of the cement industry will be Asia excluding China with an expected 5.0% increase, whilst Africa together with Central and Eastern Europe are expected to grow by 4.0%<sup>(23)</sup>.

## 4. Top Cement Exporting Countries

In the year 2016, global sales from cement exports by country amounted to US\$9.1 billion . Cement which is an essential construction material is sold in the form of grey or white powder or “clinker” lumps and modules fused together with limestone and aluminosilicates like clay.

Among various categories of Cements, Portland cement accounted for 69.4% of exported global cement supplies. The reason behind this is that Portland is the cement type used for making concrete, mortar, stucco and grout. Other cement types such as cement clinkers represented 24% while miscellaneous hydraulic cements and aluminous cements came in at 4.3% and 2.3% respectively.

Overall, the values of cement exports were down by an average -20.2% for all exporting countries since 2012 when cement shipments were valued at \$11.4 billion. Year over year, exported cement sales retreated by -12.6% from 2015 to 2016

Among continents, Asian countries accounted for the highest dollar value worth of cement exports during 2016 with shipments amounting to \$4.4 billion or 48.1% of global cement exports. In second place were European exporters at 34% while 7.5% of worldwide cement shipments originated from North America.

African exporters supplied 6.9% of total exports with 2.2% of international cement sales originating from Latin America (excluding Mexico) and Caribbean nations<sup>(14)</sup>.



## Cement Exports by Country

Below are the 15 countries that exported the highest dollar value worth of cement during 2016:

**Table 1** Cement Export by Top fifteen countries in 2016

	Countries	Value in US\$	% of Total Cement exports
1	China	US\$692.4	7.6%
2	Thailand	\$612.2 million	6.8%
3	United Arab	\$544.4 million	6%
4	Turkey	\$494.8 million	5.5%
5	Germany	\$486.3 million	5.4%
6	Spain	\$477.3	5.3%
7	Vietnam	\$403 million	4.4%
8	Japan	\$391.3 million	4.3%
9	Canada	\$368.7 million	4.1%
1	India	\$267 million	2.9%
1	Greece	\$248.6 million	2.7%
1	Senegal	\$209 million	2.3%
1	United States	\$205.9 million	2.3%
1	Pakistan	\$185.6 million	2%
1	South Korea	\$162.9 million	1.8%

Source: <http://www.worldstopexports.com/top-cement-exporting-countries/>

The listed 15 countries shipped almost two-thirds (63.4%) of global exports in 2016 (by value).

Among the above countries, the fastest-growing cement exporters since 2012 were: India (up 61.5%), United Arab Emirates (up 53.3%), Canada (up 23.5%) and Greece (up 13%).

Those countries that posted declines in their exported sales were led by: Pakistan (down - 67.4%), South Korea (down -54%), Turkey (down -37.8%), Vietnam (down -27%) and Germany (down -24.5%).<sup>(16)</sup>

## 5. Factor influencing growth of the Global Cement Sector

The global cement industry faces a number of challenges such as:

*Economic growth* – Segments of growth in the economy of any country are definitely linked to cement company growth. Further growth in Gross Domestic Product (GDP) per capita, a measurement of the average national standard of living is always a contributing factor to cement demand. Increased industrialization caused by economic development has a tendency to drive parallel increases in cement consumption.



*Cost structure and competitiveness* – There isn't much that cement companies can do regarding cost structure because the margins are less to begin with. Cost advantages are usually due to companies having access to a cheaper power source, a quality limestone reserve, or being close to bigger markets.

*Legal, regulatory, and environmental scenario* – The cement industry is affected by regulatory norms. This is happening prominent in developed countries where environmental issues are more stringent. This adds to the companies' costs.

*Technological advancement* – Advancement in cement manufacturing technologies also benefit cement industry in many ways. A disruptive innovation can give the modernizing company an advantage. For example, when companies moved from the wet manufacturing process to the dry manufacturing process, there was not only reduction in energy and CO<sub>2</sub> but a cost savings of 5%–10% of the overall cost structure

*Geographic advantages* – Cement industry are capital-intensive and it needs to secure valuable deposits over the long term. Close geographical links between cement production and mining sites is also extremely important to reduce the cost and transportation time for carrying the raw material. Not only that short routes for supply of raw materials take burden off of traffic volumes and reduce transport-related emission of pollutants.

*Raw material:* Procurement of natural raw materials will continue to form the basis for cement manufacture in future. Use of alternative raw materials can be further increased to a certain magnitude. However, potential for substitution has already been largely exhausted and very much depends on the availability of industrial by-products such as fly ash and the high quality requirements placed on cement in the future<sup>(25)</sup>.

## 6. Indian Cement Market

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India is the second biggest producer as well as consumer of cement in the world and the total cement production in the country stood 283.50 million tonnes in 2016 (fig 2). Domestic cement consumption grew 15.7 per cent CAGR during FY11-17 beating the cement production in India, says a recent note by IBEF. Further cement the cement industry is expected to grow at 6-7% in the current 2017-2018 fiscal year, which runs from 1 April 2017 to 31 March 2018.

India is producing different varieties of cement like Ordinary Portland Cement (OPC), Portland Pozzolana Cement (PPC), Portland Blast Furnace Slag Cement (PBFS), Oil Well Cement, White Cement etc. These varieties of cement are produced as per the BIS (Bureau of India Standard) specifications and its quality is comparable with the best in the world.

India has a lot of potential for development in the infrastructure and construction sector and the cement sector is expected to largely benefit from it. Some of the recent major government initiatives such as development of 100 and more smart cities are expected to provide a major boost to the sector. Further as India's per capita consumption of cement (190 kg as of March 2015) is much lesser than the developed & other developing economies; there is a significant business opportunity to cater to the unmet & rising demand. In order to meet the growing demand, cement companies are expected to pent up production by around 56 MT in the next 3 years, till 2019. It is also expected that by 2025, cement production will reach to 550 million tonnes to meet the growing domestic and export demand to other countries.<sup>(14)</sup>

India's cement industry is a vital part of its economy, providing employment to more than a million people, directly or indirectly. The price and distribution control of cement was removed in 1989 and the cement industry was de-licensed in 1991 under the Industrial (Development & Regulation) Act, 1951. Since then the Cement Industry has progressed well both in capacity/ production and as well as in process technology.

Expecting such developments in the country and aided by suitable government foreign policies, several foreign players such as Lafarge-Holcim, HeidelbergCement, and Vicat have invested in the country in the recent past. Availability of raw material such as limestone and coal is also one of the significant factor which aids the growth of this sector.

The Indian cement industry is also globally competitive with lowest energy consumption and CO<sub>2</sub> emissions. Apart from fulfilling domestic cement requirements, the industry also exports cement and clinker to around 30 countries across the globe.

## 6.1 Cement plants in India

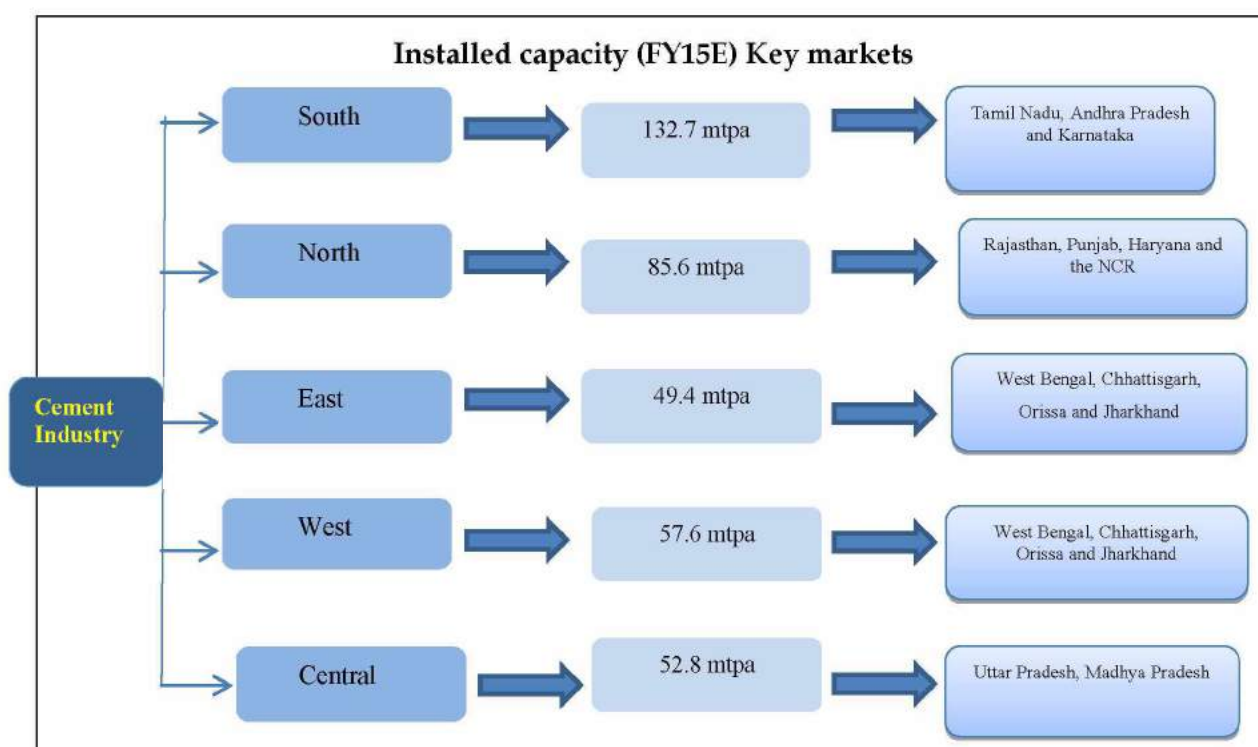
There are around 146 function registered cement companies in India and out of which 109 companies, main product is either cement or cement clinker. Of the total capacity, 98 per cent lies with the private sector and the rest with public sector, with the top 20 companies accounting for around 70 per cent of the total production (CMIE)

As of 2016, India has 209 large cement plants across states which together account for 97 per cent of the total installed capacity, while 365 small plants account for the rest as shown in table 2. Of these total 209 large cement plants in India, 77 are located in the states of Andhra Pradesh, Rajasthan and Tamil Nadu. Andhra Pradesh is the leading state with 40 large cement plants, followed by Tamil Nadu and Rajasthan having 21 and 21 plants, respectively. Major cement clusters include - Satna (Madhya Pradesh), Gulbarga (Karnataka), Yerranguntla (Andhra Pradesh), Nalgonda (Andhra Pradesh) and Chandoria (Rajasthan). Geographical distribution of cement plants in India with installed capacity is also presented in Figure 5 where south is the key market for cement industry with total installed capacity of 132.7 mtpa followed by north with total installed capacity 85.6 mtpa<sup>(3)</sup>.

**Table 2 Cement plants in India**

Cement Industry 2016	
Large Cement Plants	Mini and White Cement Plants
<b>Cement Plants: 209</b>	Cement Plants: 365
<b>Installed capacity: 378.3 mtpa</b>	Installed capacity: 11.7 mtpa
<b>Cement production: 246.34mt*</b>	Cement production: 33.66mt
Source: IBEF, 2017	





**Figure 5** Geographical distribution of cement plants in India with installed capacity

Source: IBEF, 2017

Notes: mtpa – Million Tonnes Per Annum, E-Estimates

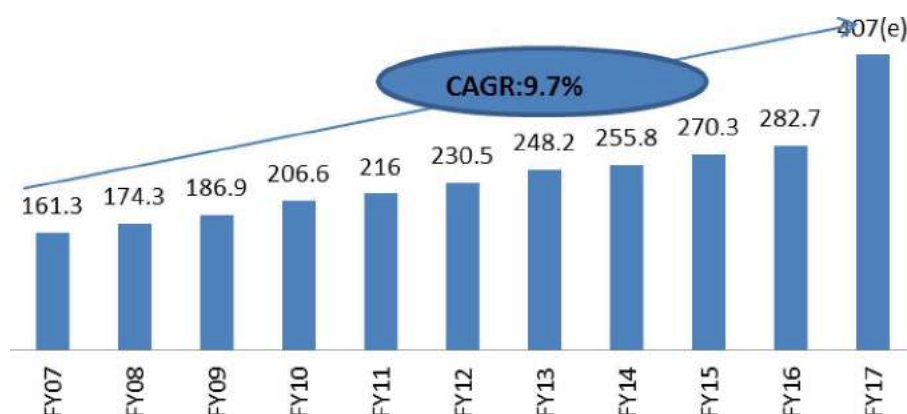
## 6.2 Production

Cement production in India has increased at a CAGR of 6.44 per cent to 282.79 million tonnes over FY07–16 while in FY07-FY15 it was increased at a CAGR of 6.7 per cent to 270.32 million tonnes which shows a slight decrease as compared to 2015. Further as per the 12th Five Year Plan, cement production is expected to reach 407 million tonnes by year 2017. In the past five years, the cement production in India grew from 207 million metric tons in 2010 up to 282.8 million in 2016, making it the second largest cement producer globally. With construction expenditures of around 427 billion U.S. dollars, India is fourth largest construction market worldwide.<sup>(15)</sup>

Availability of fly-ash from thermal power plants and use of advance technology has increased production of blended cement. The environment-friendly blended cement is more cost-efficient to produce, as it requires lesser input of clinker and energy.



## Production of cement (million tonnes)



**Figure 6** Production of cement

Source : Department of Industrial Policy & Promotion, Office of the Economic Advisor, TechSci Research

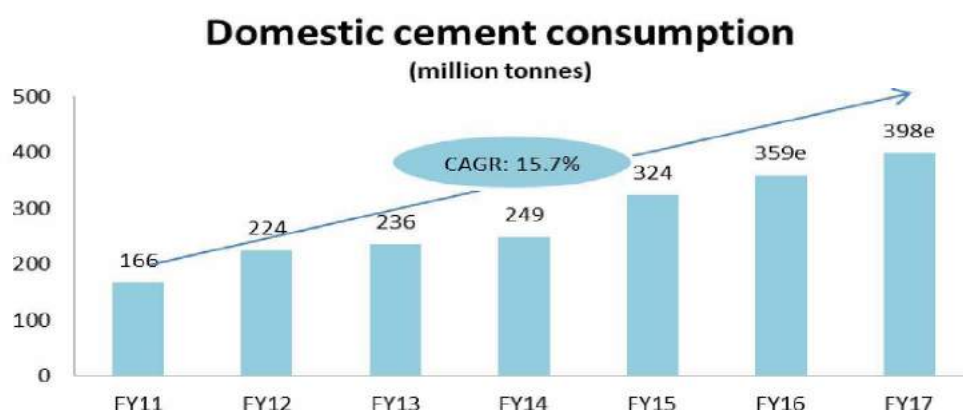
Notes: E – Estimated

## 6.3 Domestic cement consumption

The country's per capita consumption is around 190 kg as of 2015 as compared to the world average of over 350 kg per capita, which shows great potential for growth in Indian cement industry. Further domestic cement consumption has reached 324 million tonnes in 2015 from 165.63 million tonnes in 2011. The consumption is further expected to increase at a CAGR of 15.7 per cent during FY11-17 and reach 398 million tonnes as shown in **Figure 7**.<sup>(15)</sup>

With the situation coming back to normal after demonetisation, construction activities were seen to be picking up in January 2017. On the back of this, demand for cement is expected to see gradual improvement in the coming months.

The below statistic displays India's cement consumption from 2011 through 2015 with estimates for 2016 and 2017



**Figure 7** Domestic cement consumption from 2011-2015.

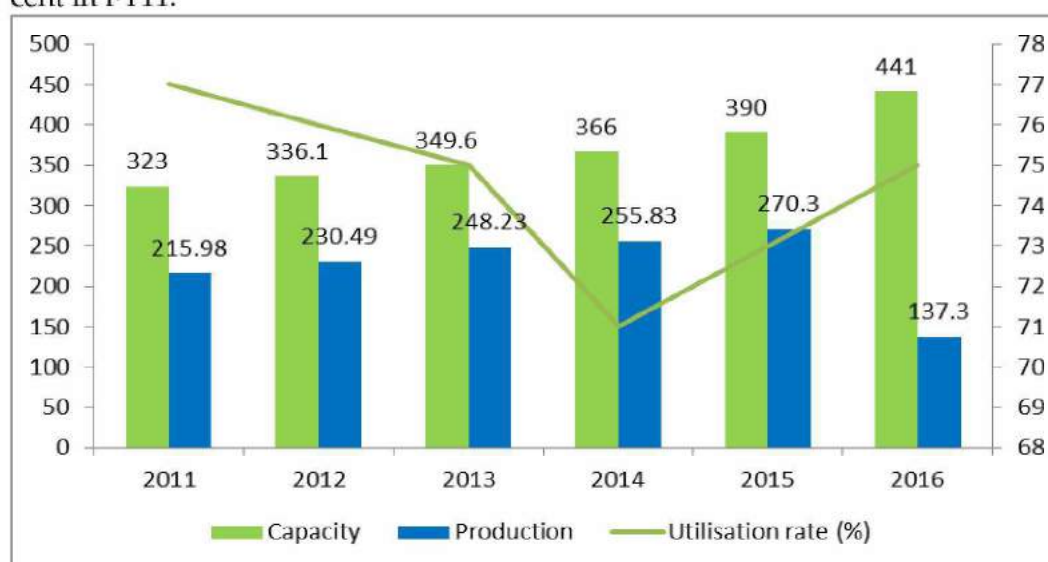
Source : IBEF 2017 Notes: E – Estimated

## 6.4 Cement capacity utilisation and Demand

Despite limited capacity addition, capacity utilization of cement industry is likely to remain stagnant in fiscal year 2017 as demand growth is expected to be weak, rating agency ICRA said in a report. In the first seven months of FY17, demand growth in the cement sector was already modest at 4.8% and after the note ban (Demonetisation in November 2017), is likely to be affected negatively by disruption to the real estate sector.

The cement sector is one of the worst hit by demonetisation; volumes have been hurt severely and a pick-up in consumption may not happen anytime soon. Hence, the outlook for the second half of FY17 is unlikely to be as bright as anticipated earlier by many analysts <sup>(15)</sup>.

Cement capacity utilisation rate is expected to touch around 67 per cent in FY16 from 77 per cent in FY11.



**Figure 8** India cement capacity utilisation and demand

Source: IBEF 2017

Notes: E-Estimate, CAGR – Compound Annual Growth rate

## 6.5 Strong Demand Drivers/consumption centre

The housing sector is the biggest demand driver of cement, accounting for about 67 per cent of the total consumption in India. The other major consumers of cement include infrastructure at 13 per cent, commercial construction at 11 per cent and industrial construction at nine per cent. <sup>(14)</sup>

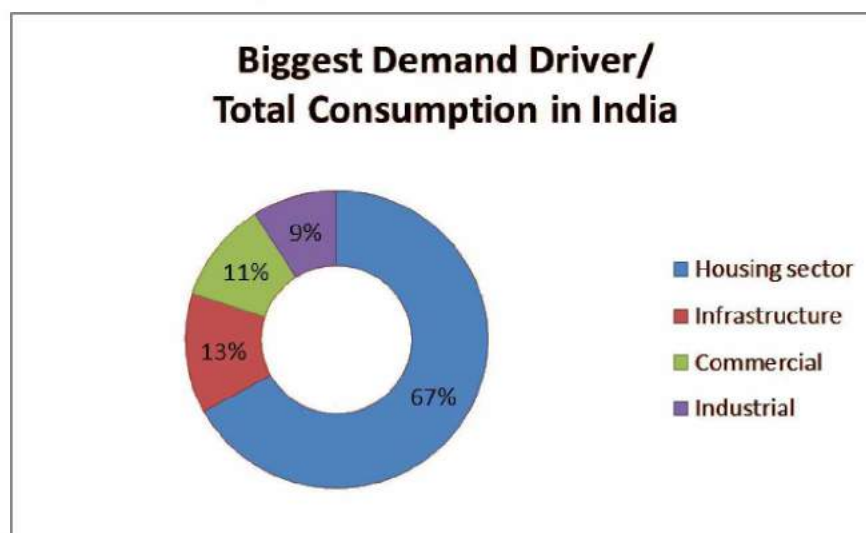
### Housing Sector growth

The Housing segment accounts for a major portion of the total domestic demand for cement in India. Real estate market is expected to grow at a CAGR of 11.6 per cent over 2011–20, with the market expected to reach USD180 billion by 2020. Growing urbanization, an increasing number of households and higher employment are primarily driving the demand for housing, accounting for 67 per cent of the total consumption. Further Initiatives by the government are expected to provide force to construction activity in rural and semi urban areas through large infrastructure and housing development projects respectively. <sup>(14)</sup>

### Infrastructure and Commercial real estate sector growth

The government is strongly focused on infrastructure development to boost economic growth and is aiming for 100 and more smart cities • It plans to increase investment in infrastructure to USD1 trillion in the 12th Five Year Plan (2012–17), compared with USD514 billion under the 11th Five Year Plan (2007–12). • Infrastructure projects such as Dedicated Freight Corridors as well as new and upgraded airports and ports are expected to further drive construction activity, the government aims to increase the ability of the railways & the services for handling & storage to ease the transportation of cement & cut of transportation costs.

To meet the rise in demand, cement companies are expected to add 56 million tonnes (MT) capacity over the next three years. The cement capacity in India may register a growth of eight per cent by next year end to 395 MT from the current level of 366 MT. It may increase further to 421 MT by the end of 2017 .<sup>(14)</sup>



**Figure 9** India cement capacity utilisation and demand  
Source : IBEF 2017

## 6.6 Key Factors for Cement Industry Growth

In the Union Budget for 2017-18 the Government proposed to assign infrastructure status to affordable housing projects and facilitate higher investments and better credit facilities. It aimed to provide housing for all by FY 2022 which will lift the cement demand. As it will facilitate the construction activities and cement demand will increase which is a very positive factor of cement industry growth in near future.

Nearly 38 per cent and 23 per cent hikes in the allocation of funds towards the rural low-cost housing under the Pradhan Mantri Awaas Yojana- Gramin Scheme will drive a 2 per cent the increase in the cement demand in FY 17.

Good and Service Taxes (GST) will increase the growth of the cement industry in India. Presently the tax rates are between 27% and 32%, but after the enactment of GST law taxes will come down to 18-20%. GST will help the cement industry in reducing its logistics costs



The spending of the Ministry of Road Transport and Highways (Rs 290 billion and Rs 649 billion respectively) will increase the cement demand in the next fiscal.

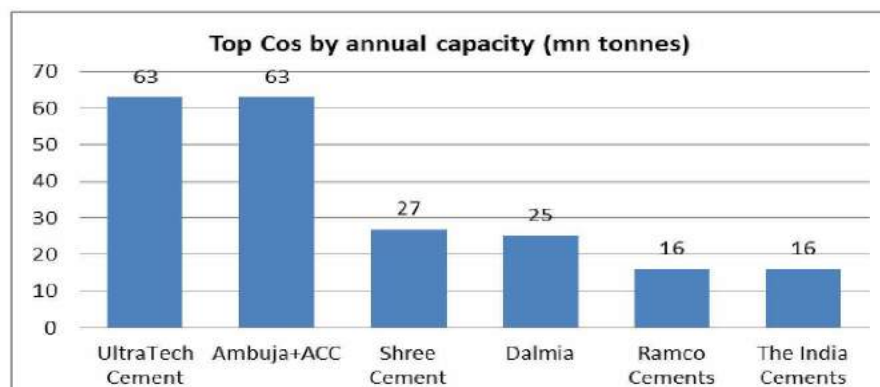
## 6.7 Cementing a Mega Merger and Top Cement Players

Few companies are dominating the Indian cement industry like Ultratech, Ambuja, ACC etc. Top companies like Ambuja Cements and ACC are in process of assessing a merger between them, which could see the Franco-Swiss group LafargeHolcim consolidating its position in India, one of the fastest growing large economies in the world. The merger between the Ambuja Cement-ACC will also create an enterprise with an annual capacity of 63 million tonnes, which is the same as the current capacity of UltraTech. UltraTech is also in the midst of completing the purchase of Jaypee's cement business, which would then take its total capacity to over 90 million tonnes. <sup>(15)</sup>

After this merger of Ambuja and ACC, the new entity will become the second largest cement company in India after Ultra Tech Cement. This merger will benefit both the companies in terms of strong financials and increased market capitalization, locational advantages, better logistics management, common resources and raw materials (like limestone mines, clay and shale) and lower manpower costing.

**Following are the top 6 companies with their installed capacity in 2016 after merging**

**Table 1** The top cement producers in India in 2016, as ranked by annual cement production capacity.



Source: The Times of India, 6 May 2017<sup>(15)</sup>

Among the top listed companies in the cement sector, the merger will give the LafargeHolcim group a combined market cap of close to Rs 80,000 crore in India. Bigger rival UltraTech Cement, owned by billionaire Kumar Mangalam Birla, has a market cap of Rs 1.19 lakh crore.

Ambuja Cement-ACC's combined sales in calendar 2016 amounted to Rs 31,511 crore, while UltraTech's FY17 sales were Rs 27,162 crore. UltraTech is in the midst of completing the purchase of Jaypee's cement business, which would then take its total capacity to over 90 million tonnes. <sup>(12)</sup>

## 7. Optimizing Energy Efficiency and CO<sub>2</sub> reduction in the Indian cement industry

World average electrical energy consumption is around 100-110 kWh/tonne cement and similarly **average** thermal energy consumption is around 850-860 kcal/kg clinker which is fairly high <sup>(16)</sup>.

The average electrical energy consumption in India is around 82 kWh/tonne cement whereas the best achievement is around 77 kWh/tonne cement. Similarly **average** thermal energy consumption is around 725 kcal/kg (Table 3) clinker whereas the best figures are around 680 kcal/ kg clinker which is much lower than the global average.

The cement industry in India is already one of the most energy efficient in the world, with relatively large production units and the use of modern technologies. In India over 95 per cent of manufacturing plants have moved from the wet / semi-wet process (*consumes more energy to evaporate the 30% plus slurry water before heating the raw materials to the necessary temperature for calcination*) to dry process of cement manufacturing . Almost 99% of the installed capacity in India uses dry process manufacturing, and about 50% of capacity <sup>(8)</sup> has been built in the last ten years.

By adopting dry process Indian cement industry have commenced moves with a specific objective of reducing electrical and thermal energy by adopting energy-efficient technologies and products, enhanced use of alternative fuels, and alternative raw materials, enriched use of renewable energy, and pursuing waste heat recovery systems.

Further, to meet the demand related to heavy infrastructure spending and on-going urbanisation projects, the cement industry is projected to almost threefold its energy demand by 2040.

**Table 3** Specific Electric and Thermal Power Consumption of Selected Countries

Specific Electric and Thermal Power Consumption of Selected Countries		
Country	Specific Electrical Energy Consumption (KW/ton of Cement)	Specific Thermal Energy Consumption (Kcal/Kg Clinker)
India	82	725
Spain	92	836
Germany	100	836
Japan	100	836
Brazil	110	884
Italy	112	908
China	118	956
Mexico	118	1003
Canada	140	1075
USA	141	1099
World Average	100-110	850-860

Source: CII Publication - Status paper on AFR Usage in Indian Cement Industry, May 2015

Indian cement industry uses a relatively high portion of fly ash and blast furnace slag as a substitute for energy-intensive clinker production.



As per recent news published in *Mint*, 15 cement companies have expressed interest in building cement plants near to NTPC's power stations. The electricity generation company sought cement producers in early 2017 to submit expressions of interest for partnerships to build 1Mt/yr cement plants. This will help in reducing the carbon footprint and producing more environmentally friendly cement as Clinker will be substituted with Fly Ash. <sup>(17)</sup>

In the future, the clinker-to-cement ratio declines from the current 0.74 to 0.62 in 2040 (reducing the energy intensity of cement production by 13%) driven by a higher availability of blast furnace slag from the cement industry. <sup>(18)</sup>

The industry has been adopting the latest technologies for energy conservation and pollution control, as well as online process and quality control based on state-of-the-art automation systems.

Further the Cement Vision of India 2025 prepared by AT Kearney/CII has projected that the Thermal Substitution Rate (TSR) or Fuel Substitution of the Indian cement industry would be about 12% by 2025 and the study of the Low-Carbon Technology Roadmap for the Indian cement industry prepared by the International Energy Association (8, 10), in collaboration with WBCSD, has projected the same to be 19% in 2030 and 25% in 2050. <sup>(9)</sup>

If the Indian cement industry is also able to move towards large-scale use of Alternative fuel resource and is able to achieve the Thermal substitution rate as envisaged in the low carbon technology roadmap, there will be a substantial contribution that the cement industry will be able to make towards resource conservation and GHG mitigation.

The projected output of this exercise is presented in the **Table-4**

It can be observed that if wastes are utilised as AFRs, there is potential to conserve coal of about 11 to 16 Mio TPA in the year 2030 and about 17 to 30 Mio TPA of coal in the year 2050. In 2020 and 2030, for every Mt of cement produced, 7 000 tonnes and 25 000 tonnes of AFs need to be co-processed, respectively. This means that we will be saving an amount of coal that we are consuming at present. This also helps in mitigating an amount of GHG emissions that we are letting into the environment. India's industrial waste is growing in volume. <sup>(19)</sup>

**Table 4.** Low carbon technology roadmap

Parameter	Unit	Base case	Low demand	High Demand				
		2010	2020	2030	2050	2020	2030	2050
Cement Production	Mio TPA	217	416	598	780	492	848	1361
Clinker to Cement Ratio		0.74	0.7	0.64	0.58	0.7	0.64	0.58
Thermal Intensity of clinker production	Kcal / Kg Clinker	725	709	694	680	703	690	678
Alternative Fuel share in total energy used	%	0.6	5	19	25	5	19	25
Coal conserved having CV of 4,500 Kcal/Kg	Mio TPA	0.16	2.3	11.2	17.1	2.7	15.8	29.7
CO <sub>2</sub> emission reduced	Mio TPA	0.19	2.8	13.8	21.0	3.3	19.4	36.5

Source: India Cement Review March 2016 <sup>(11)</sup>



## 8. Road Ahead

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- The eastern states of India are likely to be the newer and untouched markets for cement companies and could contribute to their bottom line in future. In the next 10 years, India could become the main exporter of clinker and gray cement to the Middle East, Africa, and other developing nations of the world.
- Cement plants near the ports, for instance the plants in Gujarat and Visakhapatnam, will have an added advantage for exports and will logistically be well armed to face stiff competition from cement plants in the interior of the country.
- In the last two years, logistics have emerged as a function of critical importance in cement business on par with manufacturing and marketing and sales. This is the activity that links cement from the point of its production till it reaches the hands of the ultimate consumer.
- The government also intends to expand the capacity of the railways and the facilities for handling and storage to ease the transportation of cement and reduce transportation costs.
- Companies are showing interest to set up their units near power stations to use the flyash generated from these power plants as a substitution to clinkers.
- Further India has joined hands with Switzerland to reduce energy consumption and develop newer methods in the country for more efficient cement production, which will help India meet its rising demand for cement in the infrastructure sector.
- The Government of India has decided to adopt cement instead of bitumen for the construction of all new road projects on the grounds that cement is more durable and cheaper to maintain than bitumen in the long run.

## 9. Conclusion

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India is self-sufficient in terms of cement production. For the last two decades, it is the 2nd largest cement producer as well as consumer in the world led by the enormous growth in the infrastructure & construction sector. The housing sector is the biggest consumer of the cement as it consumes 67% of the entire cement produced. Government has also launched various schemes and took various initiatives to give a boost to this sector.

The Working Group on Cement Industry constituted by the Planning Commission for the 12th Five-Year Plan period has projected a demand growth at the rate of 10.75% per annum during the plan period at an expected 9% GDP growth rate. The Working Group expects that the additional installed capacity requirement would be 139.7 million tonnes by 2017 and 1,035.3 million tonnes by 2027.

Although Indian cement industry is one of the most energy efficient in the world; to further achieve the energy efficiency, industry has presently also been trying to achieve modifications and up gradation in technology. The Working Group has observed that the Cement Industry's average energy consumption is estimated to be about 725 kcal/kg clinker

thermal energy and 82 kWh/t cement electrical energy. It is expected that the Industry's average thermal energy consumption by the end of 12th Plan (Year 2016-17) will come down to about 710 kcal/kg clinker and the average electrical energy consumption will come down to 78 kWh/t cement with continued efforts by all concerned industries. Alternate energy sources/fuels such as fly ash, jatropha having good potential in the present context of Indian economics to either partially or fully substitute coal in cement manufacture in the coming years. The Indian Cement Industry has a great potential in terms of utilization of entire hazardous waste generated in the country with indigenous as well as modern technological intervention.

## End notes

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