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CHAPTER-III

CEMENT INDUSTRY IN THE WORLD, IN INDIA AND IN KARNATAKA.

3.1 INTRODUCTION:

Cement is one of the core industries which plays a vital role in the growth and expansion of a nation. It is basically a mixture of compounds, consisting mainly of silicates and aluminates of calcium, formed out of calcium oxide, silica, aluminium oxide and iron oxide. The demand for cement, being a derived one, depends primarily on the pace of activities in the business, financial, real estate and infrastructure sectors of the economy. Cement is considered preferred building material and is used worldwide for all construction works such as housing and industrial construction, as well as for creation of infrastructures like ports, roads, power plants, etc. Thus, it can said to be a significant contributor to the Government's revenue collection and a pillar of overall planned development of an economy.

In the chapter-II, the conceptual and functional frame work of materials management has been discussed. This chapter intends to present history of cement and growth and development of cement industry in the World, in India, and in Karnataka.

3.2. HISTORY OF CEMENT:

In the most general sense of the word, cement is a binder, a substance that sets and hardens independently, and can bind other materials together. The word "cement" traces to the Romans, who used the term opus caementicium to describe masonry resembling modern concrete that was made from crushed rock with burnt lime as binder. The volcanic ash and pulverized brick additives that were added to the
burnt lime to obtain a hydraulic binder were later referred to as *cementum*, *cimentum*, *cāment*, and *cement*.

Cement used in construction is characterized as **hydraulic** or **non-hydraulic**. Hydraulic cements (e.g., Portland cement) harden because of hydration, chemical reactions that occur independently of the mixture's water content; they can harden even underwater or when constantly exposed to wet weather. The chemical reaction that results when the anhydrous cement powder is mixed with water produces hydrates that are not water-soluble. Non-hydraulic cements (e.g. gypsum plaster) must be kept dry in order to retain their strength. The most important use of cement is the production of mortar and concrete—the bonding of natural or artificial aggregates to form a strong building material that is durable in the face of normal environmental effects.

Concrete should not be confused with cement, because the term *cement* refers to the material used to bind the aggregate materials of concrete. Concrete is a combination of a cement and aggregate.

### 3.2.1. Early uses

It is uncertain where it was first discovered that a combination of hydrated non-hydraulic lime and a pozzolan produces a hydraulic mixture (see also: Pozzolanic reaction), but concrete made from such mixtures was first used by the Ancient Macedonians and three centuries later on a large scale by Roman engineers. They used both natural pozzolans (trass or pumice) and artificial pozzolans (ground brick or pottery) in these concretes. Many excellent examples of structures made from these concretes are still standing, notably the huge monolithic dome of the Pantheon in Rome and the massive Baths of Caracalla. The vast system of Roman aqueducts also made extensive use of hydraulic cement.
Although any preservation of this knowledge in literary sources from the Middle Ages is unknown, medieval masons and some military engineers maintained an active tradition of using hydraulic cement in structures such as canals, fortresses, harbors, and shipbuilding facilities. The technical knowledge of making hydraulic cement was later formalized by French and British engineers in the 18th century.

3.2.2. Modern cement

Modern hydraulic cements began to be developed from the start of the Industrial Revolution (around 1800), driven by three main needs:

Hydraulic cement render (stucco) for finishing brick buildings in wet climates.
Hydraulic mortars for masonry construction of harbor works, etc., in contact with sea water.

*Development of strong concretes.*

In Britain particularly, good quality building stone became ever more expensive during a period of rapid growth, and it became a common practice to construct prestige buildings from the new industrial bricks, and to finish them with a stucco to imitate stone. Hydraulic limes were favored for this, but the need for a fast set time encouraged the development of new cements. Most famous was Parker's "Roman cement". This was developed by James Parker in the 1780s, and finally patented in 1796. It was, in fact, nothing like any material used by the Romans, but was a "Natural cement" made by burning septaria – nodules that are found in certain clay deposits, and that contain both clay minerals and calcium carbonate. The burnt nodules were ground to a fine powder. This product, made into a mortar with sand, set in 5–15 minutes. The success of "Roman Cement" led other manufacturers to develop rival products by burning artificial mixtures of clay and chalk.
John Smeaton made an important contribution to the development of cements when he was planning the construction of the third Eddystone Lighthouse (1755–59) in the English Channel. He needed a hydraulic mortar that would set and develop some strength in the twelve hour period between successive high tides. He performed an exhaustive market research on the available hydraulic limes, visiting their production sites, and noted that the "hydraulicity" of the lime was directly related to the clay content of the limestone from which it was made. Smeaton was a civil engineer by profession, and took the idea no further. Apparently unaware of Smeaton's work, the same principle was identified by Louis Vicat in the first decade of the nineteenth century. Vicat went on to devise a method of combining chalk and clay into an intimate mixture, and, burning this, produced an "artificial cement" in 1817. James Frost, working in Britain, produced what he called "British cement" in a similar manner around the same time, but did not obtain a patent until 1822. In 1824, Joseph Aspdin patented a similar material, which he called Portland cement, because the render made from it was in color similar to the prestigious Portland stone.

Setting time and "early strength" are important characteristics of cements. Hydraulic limes, "natural" cements, and "artificial" cements all rely upon their belite content for strength development. Belite develops strength slowly. Because they were burned at temperatures below 1250 °C, they contained no alite, which is responsible for early strength in modern cements. The first cement to consistently contain alite was made by Joseph Aspdin's son William in the early 1840s. This was what we call today "modern" Portland cement. Because of the air of mystery with which William Aspdin surrounded his product, others (e.g., Vicat and I.C. Johnson) have claimed precedence in this invention, but recent analysis of both his concrete and raw cement have shown that William Aspdin's product made at Northfleet, Kent was a true alite-based cement. However, Aspdin's methods were
"rule-of-thumb": Vicat is responsible for establishing the chemical basis of these cements, and Johnson established the importance of sintering the mix in the kiln. William Aspdin's innovation was counterintuitive for manufacturers of "artificial cements", because they required more lime in the mix (a problem for his father), a much higher kiln temperature (and therefore more fuel), and the resulting clinker was very hard and rapidly wore down the millstones, which were the only available grinding technology of the time. Manufacturing costs were therefore considerably higher, but the product set reasonably slowly and developed strength quickly, thus opening up a market for use in concrete. The use of concrete in construction grew rapidly from 1850 onwards, and was soon the dominant use for cements. Thus Portland cement began its predominant role.

In the US the first large scale use of cement was Rosendale cement a natural cement mined from a massive deposit of a large dolostone rock deposit discovered in the early 19th century near Rosendale, New York. Rosendale cement was extremely popular for the foundation of buildings (e.g., Statue of Liberty, Capitol Building, Brooklyn Bridge) and lining water pipes. But its long curing time of at least a month made it unpopular after World War One in the construction of highways and bridges and many states and construction firms turned to the use of Portland cement. Because of the switch to Portland cement, by the end of the 1920s of the 15 Rosendale cement companies, only one had survived. But in the early 1930s it was soon discovered that Portland cement while it had a faster setting time was not as durable, especially for highways, to the point that some states stopped building highways and roads with cement. An engineer, Bertrain H. Wait, whose company had worked on the construction of the New York Cities Catskill Aqueduct, and was impressed with the durability of Rosendale cement, came up with a blend of both Rosendale and synthetic cements which has the good attributes of both: it was highly durable and had a much faster setting time. Mr. Wait convinced the New York Commissioner of Highways to construct an...
experimental section highway near New Paltz, New York, of one sack of Rosendale to six sacks of synthetic cement, and it was proved a success and for decades hence the Rosendale-synthetic cement blend became common use in highway and bridge construction.

3.2.3. Types of modern cement

Cement is made by heating limestone (calcium carbonate) with small quantities of other materials (such as clay) to 1450 °C in a kiln, in a process known as calcination, whereby a molecule of carbon dioxide is liberated from the calcium carbonate to form calcium oxide, or quicklime, which is then blended with the other materials that have been included in the mix. The resulting hard substance, called 'clinker', is then ground with a small amount of gypsum into a powder to make 'Ordinary Portland Cement', the most commonly used type of cement (often referred to as OPC).

Portland cement is a basic ingredient of concrete, mortar and most non-specialty grout. The most common use for Portland cement is in the production of concrete. Concrete is a composite material consisting of aggregate (gravel and sand), cement, and water. As a construction material, concrete can be cast in almost any shape desired, and once hardened, can become a structural (load bearing) element. Portland cement may be grey or white.

Portland cement blends

Portland cement blends are often available as inter-ground mixtures from cement manufacturers, but similar formulations are often also mixed from the ground components at the concrete mixing plant.

Portland blastfurnace cement contains up to 70 % ground granulated blast furnace slag, with the rest Portland clinker and a little gypsum. All compositions produce high ultimate strength, but as slag content is increased, early strength is
reduced, while sulfate resistance increases and heat evolution diminishes. Used as an economic alternative to Portland sulfate-resisting and low-heat cements.

**Portland flyash cement** contains up to 35% fly ash. The fly ash is pozzolanic, so that ultimate strength is maintained. Because fly ash addition allows a lower concrete water content, early strength can also be maintained. Where good quality cheap fly ash is available, this can be an economic alternative to ordinary Portland cement.

**Portland pozzolan cement** includes fly ash cement, since fly ash is a pozzolan, but also includes cements made from other natural or artificial pozzolans. In countries where volcanic ashes are available (e.g. Italy, Chile, Mexico, the Philippines) these cements are often the most common form in use.

**Portland silica fume cement.** Addition of silica fume can yield exceptionally high strengths, and cements containing 5–20% silica fume are occasionally produced. However, silica fume is more usually added to Portland cement at the concrete mixer.

**Masonry cements** are used for preparing bricklaying mortars and stuccos, and must not be used in concrete. They are usually complex proprietary formulations containing Portland clinker and a number of other ingredients that may include limestone, hydrated lime, air entrainers, retarders, waterproofers and coloring agents. They are formulated to yield workable mortars that allow rapid and consistent masonry work. Subtle variations of Masonry cement in the US are Plastic Cements and Stucco Cements. These are designed to produce controlled bond with masonry blocks.

**Expansive cements** contain, in addition to Portland clinker, expansive clinkers (usually sulfoaluminate clinkers), and are designed to offset the effects of drying shrinkage that is normally encountered with hydraulic cements. This allows large floor slabs (up to 60 m square) to be prepared without contraction joints.

**White blended cements** may be made using white clinker and white supplementary materials such as high-purity metakaolin.
Colored cements are used for decorative purposes. In some standards, the addition of pigments to produce "colored Portland cement" is allowed. In other standards (e.g. ASTM), pigments are not allowed constituents of Portland cement, and colored cements are sold as "blended hydraulic cements".

Very finely ground cements are made from mixtures of cement with sand or with slag or other pozzolan type minerals that are extremely finely ground together. Such cements can have the same physical characteristics as normal cement but with 50% less cement particularly due to their increased surface area for the chemical reaction. Even with intensive grinding they can use up to 50% less energy to fabricate than ordinary Portland cements.

Non-Portand hydraulic cements

Pozzolan-lime cements. Mixtures of ground pozzolan and lime are the cements used by the Romans, and can be found in Roman structures still standing (e.g. the Pantheon in Rome). They develop strength slowly, but their ultimate strength can be very high. The hydration products that produce strength are essentially the same as those produced by Portland cement.

Slag-lime cements. Ground granulated blast furnace slag is not hydraulic on its own, but is "activated" by addition of alkalis, most economically using lime. They are similar to pozzolan lime cements in their properties. Only granulated slag (i.e. water-quenched, glassy slag) is effective as a cement component.

Supersulfated cements. These contain about 80% ground granulated blast furnace slag, 15 % gypsum or anhydrite and a little Portland clinker or lime as an activator. They produce strength by formation of ettringite, with strength growth similar to a slow Portland cement. They exhibit good resistance to aggressive agents, including sulfate.

Calcium aluminate cements are hydraulic cements made primarily from limestone and bauxite. The active ingredients are monocalcium aluminate CaAl₂O₄ (CaO · Al₂O₃ or CA in Cement chemist notation, CCN) and mayenite Ca₁₂Al₁₄O₃₃ (12 CaO · 7 Al₂O₃, or C₁₂A₇ in CCN). Strength forms by hydration to
calcium aluminate hydrates. They are well-adapted for use in refractory (high-temperature resistant) concretes, e.g. for furnace linings.

**Calcium sulfoaluminate cements** are made from clinkers that include ye'elimite \((\text{Ca}_4\text{(AlO}_2\text{)}_6\text{SO}_4\text{ or C}_4\text{A}_3\text{S} \text{ in Cement chemist's notation})\) as a primary phase. They are used in expansive cements, in ultra-high early strength cements, and in "low-energy" cements. Hydration produces ettringite, and specialized physical properties (such as expansion or rapid reaction) are obtained by adjustment of the availability of calcium and sulfate ions. Their use as a low-energy alternative to Portland cement has been pioneered in China, where several million tonnes per year are produced. Energy requirements are lower because of the lower kiln temperatures required for reaction and the lower amount of limestone (which must be endothermically decarbonated) in the mix. In addition, the lower limestone content and lower fuel consumption leads to a CO\(_2\) emission around half that associated with Portland clinker. However, SO\(_2\) emissions are usually significantly higher.

"Natural" cements correspond to certain cements of the pre-Portland era, produced by burning argillaceous limestones at moderate temperatures. The level of clay components in the limestone (around 30–35 %) is such that large amounts of belite (the low-early strength, high-late strength mineral in Portland cement) are formed without the formation of excessive amounts of free lime. As with any natural material, such cements have highly variable properties.

**Geopolymer cements** are made from mixtures of water-soluble alkali metal silicates and aluminosilicate mineral powders such as fly ash and metakaolin.

### 3.2.4 Environmental impacts

Cement manufacture causes environmental impacts at all stages of the process. These include emissions of airborne pollution in the form of dust, gases, noise and vibration when operating machinery and during blasting in quarries, and damage to countryside from quarrying. Equipment to reduce dust emissions during
quarrying and manufacture of cement is widely used, and equipment to trap and separate exhaust gases are coming into increased use. Environmental protection also includes the re-integration of quarries into the countryside after they have been closed down by returning them to nature or re-cultivating them.

**CO₂ emissions**

Cement manufacturing releases CO₂ in the atmosphere both directly when calcium carbonate is heated, producing lime and carbon dioxide, and also indirectly through the use of energy if its production involves the emission of CO₂. The cement industry produces about 5% of global man-made CO₂ emissions, of which 50% is from the chemical process, and 40% from burning fuel. The amount of CO₂ emitted by the cement industry is nearly 900 kg of CO₂ for every 1000 kg of cement produced. The high proportion of carbon dioxide produced in the chemical reaction leads to large decrease in mass in the conversion from limestone to cement. So, to reduce the transport of heavier raw materials and to minimize the associated costs, it is more economical for cement plants to be closer to the limestone quarries rather than to the consumer centers.

In certain applications, lime mortar, reabsorbs the same amount of CO₂ as was released in its manufacture, and has a lower energy requirement in production than mainstream cement. Newly developed cement types from Novacem and Eco-cement can absorb carbon dioxide from ambient air during hardening. Use of the Kalina cycle during production can also increase energy efficiency.

### 3.3. CEMENT INDUSTRY IN THE WORLD

#### 3.3.1. Introduction

Cement is the glue that holds the concrete together, and is therefore critical for meeting society’s needs of housing and basic infrastructure such as bridges, roads, water treatment facilities, schools and hospitals. Concrete is the second most
consumed material after water, with nearly three tones used annually for each person on the planet.

3.3.2. World Production and Capacity

Cement production worldwide keeps growing. In the 1990’s it increased by about 50%. In 2003, 1940 million tonnes of cement were manufactured worldwide. Such a quick growth from the dynamic development of cement industry in Asia. However, it has increased to 3300 million tonnes in 2010 and 3400 million tonnes in 2011. A country-wise production and capacity of cement in the years 2010 and 2011 are shown in the following table.
## Table 3.1

**World Cement production and Clinker Capacity**

<table>
<thead>
<tr>
<th></th>
<th>Cement Production</th>
<th>Clinker capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
<td>2011</td>
</tr>
<tr>
<td>United States (includes Puerto Rico)</td>
<td>67200</td>
<td>68400</td>
</tr>
<tr>
<td>Brazil</td>
<td>59100</td>
<td>62600</td>
</tr>
<tr>
<td>China</td>
<td>1880000</td>
<td>2000000</td>
</tr>
<tr>
<td>Egypt</td>
<td>48000</td>
<td>45000</td>
</tr>
<tr>
<td>Germany</td>
<td>29900</td>
<td>33000</td>
</tr>
<tr>
<td>India</td>
<td>210000</td>
<td>210000</td>
</tr>
<tr>
<td>Indonesia</td>
<td>22000</td>
<td>22000</td>
</tr>
<tr>
<td>Iran</td>
<td>50000</td>
<td>52000</td>
</tr>
<tr>
<td>Italy</td>
<td>36300</td>
<td>35000</td>
</tr>
<tr>
<td>Japan</td>
<td>51500</td>
<td>470000</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>47200</td>
<td>46000</td>
</tr>
<tr>
<td>Mexico</td>
<td>34500</td>
<td>35000</td>
</tr>
<tr>
<td>Pakistan</td>
<td>30000</td>
<td>30000</td>
</tr>
<tr>
<td>Russia</td>
<td>50400</td>
<td>52000</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>42300</td>
<td>44000</td>
</tr>
<tr>
<td>Spain</td>
<td>23500</td>
<td>20700</td>
</tr>
<tr>
<td>Thailand</td>
<td>36500</td>
<td>36000</td>
</tr>
<tr>
<td>Turkey</td>
<td>62700</td>
<td>64000</td>
</tr>
<tr>
<td>Vietnam</td>
<td>50000</td>
<td>50000</td>
</tr>
<tr>
<td>Other Countries</td>
<td>480000</td>
<td>480000</td>
</tr>
<tr>
<td>(rounded)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>World Total</td>
<td>3310000</td>
<td>3400000</td>
</tr>
<tr>
<td>(Rounded)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Data in thousand metric tons)
3.3.3. Cost and transportation Issue

Cement is a basic ingredient for the construction industry. Cement is made out of limestone, shell, clay mined out of a quarry close to the plant. The raw material is crushed, and then heated at temperature in excess of 1000°C in rotating kiln to become clinker. Clinker is then mixed with gypsum and ground to a fine powder to produce final grade of cement. The technology is a continuous process and is highly energy intensive.

Cost of cement is, 29% energy, 27% raw materials, 32% labour and 12% depreciation.

The weight to price ratio make transportation cost very high. The competitive radius of a typical cement plant for most common types of cement extends no more than 300 kilometers. However, cement can be shipped economically by sea and inland waterway over great distances, extending greatly the competitive radius of cement plant and the cost to transport the cement it produces through its distribution terminals bear significantly on the plant’s competitive position and the prices it may charge. The minimum efficient size for a cement plant is around 1 million ton a year.

As a consequence of a relatively low minimum efficient plant and transportation costs cement production is highly fragmented. It is estimated that there are around 1500 integrated cement production plants in the world. Although the industry has seen the emergence of strong global players such a Lafarge or CEMEX, the share of the four largest firms account only for 23% of the overall demand.

Cement is distributed in bags or is delivered to construction sites through ready mix lorries.
3.3.4. World cement demand

World cement demand was 2,283 million tons in 2005, with China accounting for 1,064 MT (47% of total). The expected demand for 2010 is estimated at 2836 MT China will increase its demand by 250 million tons during the period, an increase higher than the total yearly European demand.

Table 3.2
World Production and Capacity

<table>
<thead>
<tr>
<th>Demand for cement in Million Tons</th>
<th>2005</th>
<th>2010</th>
<th>Growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>170</td>
<td>200</td>
<td>2.9%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>208</td>
<td>236</td>
<td>2.2%</td>
</tr>
<tr>
<td>Asia/Pacific</td>
<td>1500</td>
<td>1900</td>
<td>5.2%</td>
</tr>
<tr>
<td>other Regions</td>
<td>405</td>
<td>500</td>
<td>4.7%</td>
</tr>
<tr>
<td>WORLD Cement Demand</td>
<td>2283</td>
<td>2836</td>
<td>4.7%</td>
</tr>
</tbody>
</table>

3.3.5. Main Global Competitors

The major competitors in world trade related to cement are

- LAFARGE
- HOLCIM
- HEIDELBERG
- CEMEX

The brief details relating to their status are presented below:

**Lafarge**

Lafarge is the world leader in building material. It operates in 76 countries in four majors sectors: cement, aggregates, roofing and gypsum. It defines itself as a multi local global firm. Over the past years it invested heavily in emerging countries. Its recent association with the Chinese group Shui On gave the group a 21 Million Tons presence in this country.
Table 3.3

Global Competitive Position of Lafarge

<table>
<thead>
<tr>
<th>LAFARGE</th>
<th>2004</th>
<th>2005</th>
<th>Cement</th>
<th>Aggregate</th>
<th>Roofing</th>
<th>Gypsum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (MS)</td>
<td>17900</td>
<td>18910</td>
<td>47.6%</td>
<td>33.7%</td>
<td>9.5%</td>
<td>9.2%</td>
</tr>
<tr>
<td>Net Income</td>
<td>1300</td>
<td>1690</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees</td>
<td>80,000</td>
<td>40,000</td>
<td>21,000</td>
<td></td>
<td>12,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Number of plants*</td>
<td>1538*</td>
<td>152*</td>
<td>1141</td>
<td>162</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>Number of Countries</td>
<td>158</td>
<td>43</td>
<td>27</td>
<td>35</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Global Competitive position</td>
<td>#1</td>
<td>#2</td>
<td>#1</td>
<td>#3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.4

Number of Plant and Capacity of Lafarge

<table>
<thead>
<tr>
<th>CEMENT</th>
<th>Europe</th>
<th>North America</th>
<th>Middle East</th>
<th>Eastern Europe</th>
<th>Latin America</th>
<th>Africa</th>
<th>Asia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Plants*</td>
<td>35</td>
<td>24</td>
<td>16</td>
<td>12</td>
<td>15</td>
<td>16</td>
<td>34</td>
<td>152</td>
</tr>
<tr>
<td>Capacity (Million Tons)</td>
<td>38.8</td>
<td>20.2</td>
<td>17.1</td>
<td>19.5</td>
<td>11</td>
<td>14.1</td>
<td>46</td>
<td>166.7</td>
</tr>
</tbody>
</table>

(* including grinding plants)
Holcim

Holcim is one of the world’s leading suppliers of cement and aggregates (crushed stone, sand and gravel) as well as further activities such as ready-mix concrete and asphalt including services. The group holds majority and minority interests in more than 70 countries on all continents, and employs some 90,000 people. Holcim has a strong presence in India.

Table 3.5  
Global Competitive Position of Holcim

<table>
<thead>
<tr>
<th>HOLCIM</th>
<th>2004</th>
<th>2005</th>
<th>Cement</th>
<th>Aggregate</th>
<th>Ready Mix and Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (MS)</td>
<td>10657</td>
<td>14774</td>
<td>68.2%</td>
<td>7.2%</td>
<td>24.6%</td>
</tr>
<tr>
<td>Net Income</td>
<td>710</td>
<td>1232</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees</td>
<td>59,900</td>
<td>34,500</td>
<td>6,500</td>
<td>18,750</td>
<td></td>
</tr>
<tr>
<td>Number of Plants*</td>
<td>1638</td>
<td>140</td>
<td>398</td>
<td>1100</td>
<td></td>
</tr>
<tr>
<td>Number of Countries</td>
<td>70</td>
<td>47</td>
<td>22</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Global Competitive Position</td>
<td>#2</td>
<td>#5</td>
<td>#3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3.6
Plant and Capacity of Holcim

<table>
<thead>
<tr>
<th>CEMENT</th>
<th>Europe</th>
<th>North America</th>
<th>Africa Middle East</th>
<th>Latin America</th>
<th>Asia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Plants*</td>
<td>47</td>
<td>20</td>
<td>17</td>
<td>28</td>
<td>28</td>
<td>140</td>
</tr>
<tr>
<td>Capacity (Million Tons)</td>
<td>42</td>
<td>22.3</td>
<td>15.3</td>
<td>34.9</td>
<td>40.7</td>
<td>155.2</td>
</tr>
</tbody>
</table>

(* including grinding plants)

Heidelberg

Originated in Germany the Heidelberg group is concentrating on cement production.

Table 3.7
Sales and net Income of Heidelberg

<table>
<thead>
<tr>
<th>HEIDELBERG</th>
<th>2004</th>
<th>2005</th>
<th>Cement</th>
<th>Aggregate</th>
<th>Ready Mix and Alsphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (MS)</td>
<td>8592</td>
<td>9676</td>
<td>57.3%</td>
<td>31.6%</td>
<td>15.2%</td>
</tr>
<tr>
<td>Net Income</td>
<td>-413</td>
<td>584</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees</td>
<td>41,200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CEMENT</th>
<th>Europe</th>
<th>North America</th>
<th>Africa Middle East Asia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales in MS</td>
<td>2537</td>
<td>1540</td>
<td>1246</td>
<td>5323</td>
</tr>
<tr>
<td>Sales in Million Tons</td>
<td>30.3</td>
<td>42.4</td>
<td>17</td>
<td>89.7</td>
</tr>
</tbody>
</table>
CEMEX

Cemex is the 3rd largest cement company in the world measured by cement production capacity. Originated from Mexico By 2005 it had achieved an estimated production capacity of 94 million tons per year. It was the number one producer of ready-mix with 76 Million tons, one of the largest aggregate producer with 175 Million tons and one of the top cement traders in the world selling more than 17 Million tons in the world selling more than 17 Million tons in 2005. It is present in the Americas, Europe and Asia, although not in India nor China.

Financial Million US$

Table 3.8

Financial strategy of CEMEX

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net sales</td>
<td>4793793</td>
<td>5590453</td>
<td>683115</td>
<td>6654052</td>
<td>7072925</td>
<td>7806225</td>
<td>15221804</td>
</tr>
<tr>
<td>Opening Income</td>
<td>1428629</td>
<td>1644439</td>
<td>1630788</td>
<td>1333863</td>
<td>1436723</td>
<td>1771730</td>
<td>2469439</td>
</tr>
<tr>
<td>Consolidated Net</td>
<td>1022377</td>
<td>1071929</td>
<td>1314135</td>
<td>572999</td>
<td>652003</td>
<td>1273398</td>
<td>2149845</td>
</tr>
<tr>
<td>EBITDA</td>
<td>1779448</td>
<td>2018466</td>
<td>2225030</td>
<td>1950982</td>
<td>2081157</td>
<td>2429097</td>
<td>35340990</td>
</tr>
<tr>
<td>free cash flow*</td>
<td>866000</td>
<td>92000</td>
<td>1127000</td>
<td>982895.8</td>
<td>1118000</td>
<td>1384000</td>
<td>1993000</td>
</tr>
</tbody>
</table>

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# Table 3.9

CEMEX Cement Break Down by Region

<table>
<thead>
<tr>
<th>CEMEX Break by region</th>
<th>% of total sales</th>
<th>% of total assets</th>
<th>number of cement plants</th>
<th>installed capacity (Mtons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>19</td>
<td>17.5%</td>
<td>15</td>
<td>27.2</td>
</tr>
<tr>
<td>USA</td>
<td>25</td>
<td>17.5%</td>
<td>12</td>
<td>13.3</td>
</tr>
<tr>
<td>South and Central America Caribbean</td>
<td>9</td>
<td>8.0%</td>
<td>13</td>
<td>15.4</td>
</tr>
<tr>
<td>Spain</td>
<td>9</td>
<td>6.8</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>UK</td>
<td>9</td>
<td>11.9%</td>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>Rest of Europe</td>
<td>16</td>
<td>11.7%</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>Asia</td>
<td>2</td>
<td>2.9%</td>
<td>4</td>
<td>10.7</td>
</tr>
<tr>
<td>Africa and middle East</td>
<td>3</td>
<td>2.2%</td>
<td>1</td>
<td>4.9</td>
</tr>
<tr>
<td>Other (trading)</td>
<td>8</td>
<td>21.6%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>65</td>
<td>98.2</td>
</tr>
</tbody>
</table>
## Table 3.10
Geographical Location

<table>
<thead>
<tr>
<th>Region</th>
<th>LAFARGE</th>
<th>HOLCIM</th>
<th>CEMEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>Austria Germany Greece France Italy Spain</td>
<td>Austria Belgium Germany Italy Spain Switzerland</td>
<td>UK Germany France Spain</td>
</tr>
<tr>
<td>North America</td>
<td>USA Canada</td>
<td>USA Canada</td>
<td>USA Canada</td>
</tr>
<tr>
<td>Central and Eastern</td>
<td>Czech Republic</td>
<td>Bulgaria</td>
<td>Croatia</td>
</tr>
<tr>
<td>Europe</td>
<td>Moldavia</td>
<td>Czech Republic</td>
<td>Latvia</td>
</tr>
<tr>
<td></td>
<td>Poland</td>
<td>Hungary</td>
<td>Poland</td>
</tr>
<tr>
<td></td>
<td>Russia</td>
<td>Poland</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Romania</td>
<td>Romania</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serbia</td>
<td>Slovakia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slovenia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ukraine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America</td>
<td>Brazil</td>
<td>Argentina</td>
<td>Dominican Rep</td>
</tr>
<tr>
<td></td>
<td>Chile</td>
<td>Brazil</td>
<td>Columbia</td>
</tr>
<tr>
<td></td>
<td>Equador</td>
<td>Chile</td>
<td>Costa Rica</td>
</tr>
<tr>
<td></td>
<td>Honduras</td>
<td>Columbia</td>
<td>Mexico</td>
</tr>
<tr>
<td></td>
<td>French</td>
<td>Costa Rica</td>
<td>Nicaragua</td>
</tr>
<tr>
<td></td>
<td>Mexico</td>
<td>Ecuador</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Venezuela</td>
<td>Mexico</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa and Middle East</td>
<td>Egypt</td>
<td>Egypt</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jordan</td>
<td>Morocco</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kenya</td>
<td>South Africa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Morocco</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nigeria</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turkey</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uganda</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zimbabwe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asia</td>
<td>China</td>
<td>Bangladesh</td>
<td></td>
</tr>
<tr>
<td></td>
<td>India</td>
<td>Indonesia</td>
<td>Philippines</td>
</tr>
<tr>
<td></td>
<td>Indonesia</td>
<td>Malaysia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Korea</td>
<td>Philippines</td>
<td>Thailand</td>
</tr>
<tr>
<td></td>
<td>Malaysia</td>
<td>Philip pines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Philippines</td>
<td>Sri Lanka</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vietnam</td>
<td>Thailand</td>
<td></td>
</tr>
</tbody>
</table>
3.3.6. Sustainable Development in Cement Industry

Concrete is second only to water as the most consumed substance on earth, with nearly one ton of the material used annually for each person on the planet. Cement is the critical ingredient in concrete, locking together the sand and gravel constituents in inert matrix; it is the 'glue' which holds together much of modern society’s infrastructure. This summary highlights a cement-sector initiative undertaken by ten major cement companies from around the world under the auspices of the World Business Council for Sustainable Development (WBCSD). The WBCSD is a coalition of 160 international companies united by a shared commitment to sustainable development via the three pillars of economic growth, ecological balance and social progress. WBCSD members are drawn from more than 30 countries and 200 major industrial sectors. Details about the organization, its mission, and products are available at their website.

Sustainable Development and the Cement Industry

Sustainable Development (SD) is most frequently defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Sustainable development focuses on social, environmental, and financial factors and on appropriate governance mechanisms to help manage the delicate balance between sometimes competing objectives. Sustainable development involves local as well as global issues. It is not the same in all countries, or in all businesses. Depending upon local circumstances the emphasis on economic growth, social progress and environmental management can vary considerably.

Why is this an issue to the cement industry?

There has been a dramatic increase in the expectations of what business should deliver to society. Beyond jobs and profits, companies are increasingly held accountable for social and environmental achievements. Until recently, many
companies have said proper stewardship of the environment will be one of the major factors affecting their success in the future. The future has clearly arrived, and today few doubt that sustainable development is the major challenge for society as a whole. Like many industries, the cement industry is working learn how it fits into this new picture: what new roles must it play to insure its continued viability? What issues are important to stakeholders?

Cement is a global commodity, manufactured at thousands of local plants. Because of its weight, cement supply via land transportation is expensive, and generally limited to an area within 300 km of any one plant site. The industry is consolidating gloabally, but large, international firms account for only 30% of the worldwide market. In many developed countries, market growth is slow or nil, with cement used in bulk primarily for infrastructure construction. in developing markets, growth rates are more rapid. China is the fastest growing market today. In these markets, a large fraction of sales are as bagged product to individual customers. Because it is both global and local, the cement industry faces a unique set of issues, which attract attention from communities near the plant and at an international level. They are complex issues ranging from local dust, noise and employment concerns to the potential impact of cement manufacturing on climate change. The industry has a low public profile, although some issues have generated a great deal of emotional debate. Such as those related to managing wastes. Alternative fuels and raw materials used in manufacture.

Three members of the cement industry. Cimpor, Holcim and Lafarge, approached the World Business Council for Sustainable Development (WBCSD) in 1999, asking them to organize a structured evaluation of the sustainable of the sustainable development issues facing the cement industry over the next 20 years. These companies recognized that many of their current practices (energy efficiency programs, use of waste materials, quarry and risk management) were
both essential elements of their business, as well as well as key parts of sustainability concerns. In short, these companies realized both the business opportunities and the need to properly address sustainable development issues as part of their business strategy and their ‘license to operate’. By engaging with a wide community of interested parties before a crisis might develop, they hoped to encourage discussion of the issues in ways that were balanced, interactive, and constructive.

Cement project Goals
The cement project was set up with four primary goals:

- To deliver an independent, credible evaluation of the cement industry’s current performance across the sustainability dimensions: environment, economic and social.
- To provide recommendations and guidance on what could be done to improve performance over the next 20 years.
- To identify specific actions, goals, timeframes, and an engagement plan for implementation by industry, as well as identifying actions which required cooperative efforts with other members of civil society.
- To provide analysis and implementation tools to assist the entire industry (both participants and observers of this project) in moving forward.

Project Structure
This study is one of a number of sector-initiatives at the WBCSD. These include work dealing with Forestry, Mobility, Mining and Minerals, Electric Utilities, and the Financial Sector. Each project is at a different stage of common organizational elements: (1) a Working Group, made up of member company representatives; (2) external sponsors, who have contributed both financial and intellectual support; (3) an independent assurance group, which serves as a ‘referee’ to make sure the project research was complete, fair, and balanced;
FIGURE 3.1 Cement Study Structure

(4) Independent consulting and search organizations, and (5) active stakeholder engagement throughout the work. The WBCSD Secretariat serves in a coordinating role for these five elements, as well as managing a project web site, a variety of external communications activities.

**Project participants**

The three initiating companies, serving as co-chairs for the project, worked quickly to recruit seven others interested in exploring a similar set of issues. The ten companies participating (below) represent over 30% of the current world market capacity.

**Company participants in sustainable Cement Project** (The Working Group Cement)

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cemex (Mexico)</td>
<td>Hoicim (Switzerland)</td>
</tr>
<tr>
<td>Cimpor (Portugal)</td>
<td>RMC Group (UK)</td>
</tr>
<tr>
<td>Italcementi (Italy)</td>
<td>Siam Cement (Thailand)</td>
</tr>
<tr>
<td>Lafarge (France)</td>
<td>Taiheiyo Cement (Japan)</td>
</tr>
<tr>
<td>Heidelberg Cement (Germany)</td>
<td>Votorantim (Brazil)</td>
</tr>
</tbody>
</table>

**Assurance Group**
An unusual feature of WBCSD member-led projects is the independent nature of the research. In this case, Battelle Memorial institute (a US-based not-for-profit research organization) was retained by the WBCSD to develop an independent View of the cement industry, including recommendations for future action. While industry participants provided a great deal of input to the study, the recommendations were left in the hands of the consultant. An Assurance Group has reviewed the multiple viewpoints, which need to be included in sustainable development. Members of the Assurance Group included:

- Mostafa Tolba, former director of UNEP
- William Reilly, former Administrator of the US Environmental Protection Agency
- Corinne Lepage, former Environment Minister of France
- Victor Urquidi, past president and Professor Emeritus of Collegio Mexico
- Istvan Lang, past president of the Hungarian Academy of Sciences

All notes from the Assurance Group meetings are publicly available on the project web site, in Keeping with the WBCSD’s goal of having a transparent research process.

**Stakeholders**

A key part of the project research was identifying stakeholder concerns. During the scoping phase of the project, telephone and one-on-one interviews were conducted with a number of individual stakeholders to identify key issues. The selection of research topics was further confirmed through a series of local stakeholder dialogues in Brazil, Thailand, Portugal and Egypt. During these discussions, stakeholder groups of 10-40 people reviewed the study plan, objectives, and approach. Their comments were incorporated in fine-tuning the work. In later phases of the project, meetings were held with key public policy and NGO organizations in Brussels and Washington, DC to test the preliminary finding and conclusions against their understandings. Further Changes were made
to communicate the work more effectively. A workshop was also held in Beijing to explore how the sustainability concepts developed during the project might be applied in this large developing economy.

**Study Content and Execution**

An initial review paper was completed with the consulting firm of Arthur D. Little in early 2000 to identify and define key issues facing the cement industry. Results from this work were further refined by the Working Group Cement (company participants) and Battelle leading to a set of 13 focused sub studies as primary basis for the research program. Facilitated stakeholder meetings noted above added to and clarified research goals.

![FIGURE 3.2 Sub-studies and the Sustainable Development Triangle](image)
Most of the sub studies fall within a typical sustainable development triangle covering environmental, social, and economic matters. Governance concerns were also addressed by looking at a variety of public policy instruments and key performance indicators. An additional set of issues dealing with stakeholder communications was highlighted as critical, both in the initial review, and during subsequent meetings with stakeholders.

Status

The research phase of the project is nearing completion. More than 1500 pages of material have been assembled to help understand where the cement industry fits into a more sustainable world. Early drafts of the reports are now undergoing review and revision. More than seventy external experts have been invited to comment on specific elements of the work, to help insure accuracy, thoroughness, and fair representation of diverse viewpoints. Results from the consultants’ reports will be available by April 2002, and widely distributed electronically (Via the project website) and in printed summaries. Initial conclusions point to eight issues that are critical for the cement industry to address in any sustainable Development plan and action program:

1. Resource Productivity-enhanced through improved practices in quarrying, energy use, and waste recovery/reuse

2. Climate Productivity-via understanding, measuring and managing CO₂ emissions

3. Emissions Reductions-including dust from quarrying, No, So, and other airborne pollutants

4. Ecological Stewardship-both in resource conservation, and in quarry management and restoration programs
5. Employee well-being-improved through greater attention to occupational health and safety concerns

6. Community well-being-improved by enhanced dialogue and engagement

7. Regional Development, and

8. Stakeholder Value creation-by fully incorporation sustainable development into business strategy

Next Steps

This work represents the beginning of a twenty-year change process. Reports are a good starting point, but they do not necessarily guarantee change. Battelle’s reports are the first step in this extended process. As a second step, the ten organizing companies have agreed to put forward a specific series of commitments, actions, programs and measurements to help define their sustainability agenda. Part of these commitments will include continued open, transparent engagement with their stakeholders. Already the project has produced two important results:

A guide for cement plant managers on managing and improving local stakeholder communications, and

A standard protocol for measuring and reporting CO2 emissions

The protocol has been verified by independent third party auditors, and is now recognized by the intergovernmental panel on Climate Change (IPCC) and the World Resources Institute (WRI), among others. Additional analytical tools have also been developed during the study and will be available as part of the project output.
At this time, it is too early to identify details of this Action Plan, except to say that it will contain measurable targets, public reporting and mechanisms for ongoing engagement. The Action Plan will be complete in the 3rd quarter, 2002 and will also be widely distributed both in electronic and printed format.

3.4. GROWTH AND DEVELOPMENT OF CEMENT INDUSTRY IN INDIA

3.4.1. Industry background

The history of the cement industry in India dates back to the 1889 when a Kolkata-based company started manufacturing cement from Argillaceous. But the industry started getting the organized shape in the early 1900s. In 1914, India Cement Company Ltd was established in Porbandar with a capacity of 10,000 tons and production of 1000 installed. The World War I gave the first initial thrust to the cement industry in India and the industry started growing at a fast rate in terms of production, manufacturing units, and installed capacity. This stage was referred to as the Nascent Stage of Indian Cement Company. In 1927, Concrete Association of India was set up to create public awareness on the utility of cement as well as to propagate cement consumption.

The cement industry in India saw the price and distribution control system in the year 1956, established to ensure fair price model for consumers as well as manufacturers. Later in 1977, government authorized new manufacturing units (as well as existing units going for capacity enhancement) to put a higher price tag for their products. A couple of years later, government introduced a three-tier pricing system with different pricing on cement produced in high, medium and low cost plants propagate cement consumption.

Cement Company, in any country, plays a major role in the growth of the nation. Cement industry in India was under full control and supervision of the Government. However, it got relief at a large extent after the economic reform.
But Government interference, especially in the pricing, is still evident in India. In spite of being the second largest cement producer in the world, India falls in the list of lowest per capita consumption of cement with 125 kg. The reason behind this is the poor rural people who mostly live in mud huts and cannot afford to have the commodity. Despite the fact, the demand and supply of cement in India has grown up. In a fast developing economy like India, there is always large possibility of expansion of cement industry.

India, being the second largest cement producer in the world after China with a total capacity of 151.2 Million Tones (MT), has got a huge Cement Company. With the Government of India giving boost to various infrastructure projects, housing facilities and road networks, the cement industry in India is currently growing at an enviable pace. More growth in the Indian cement industry is expected in the coming years. It is also predicted that the cement production in India would rise to 236.16 MT in FY11. It's also expected to rise to 262.61 MT in FY12.

The cement industry in India is dominated by around 20 companies, which account for almost 70% of the total cement production in India. In the present year, the Indian cement companies have produced 11 MT cement during April-September 2009. It took the total cement production in FY09 to 231 MT.

3.4.2. Cement Industry in the Pre-Independence Period

The first endeavor to manufacture cement dates back to 1889 when a Calcutta based company endeavored to manufacture cement from Argillaceous (kankar).

But the first endeavor to manufacture cement in an organized way commenced in Madras. South India Industries Limited began manufacture of Portland cement in 1904. But the effort did not succeed and the company had to halt production.
Finally it was in 1914 that the first licensed cement manufacturing unit was set up by India Cement Company Ltd at Porbandar, Gujarat with an available capacity of 10,000 tons and production of 1000 installed. The First World War gave the impetus to the cement industry still in its initial stages. The following decade saw tremendous progress in terms of manufacturing units, installed capacity and production. This phase is also referred to as the Nascent Stage of Indian Cement Industry.

During the earlier years, production of cement exceeded the demand. Society had a biased opinion against the cement manufactured in India, which further led to reduction in demand. The government intervened by giving protection to the Industry and by encouraging co-operation among the manufacturers. In 1927, the Concrete Association of India was formed with the twin goals of creating a positive awareness among the public of the utility of cement and to propagate cement consumption.

3.4.3. Cement Industry in the Post-Independence Period

The growth rate of cement was slow around the period after independence due to various factors like low prices, slow growth in additional capacity and rising cost. The government intervened several times to boost the industry, by increasing prices and providing financial incentives. But it had little impact on the industry.

In 1956, the price and distribution control system was set up to ensure fair prices for both the manufacturers and consumers across the country and to reduce regional imbalances and reach self-sufficiency.
3.4.4. Cement Industry under Five Year's Plan

First Five Year Plan (1951-56)

- The First Five Year Plan was presented by Jawaharlal Nehru in 1951. The First Five Year Plan was initiated at the end of the turmoil of partition of the country. It gave importance to agriculture, irrigation and power projects to decrease the country's reliance on food grain imports, resolve the food crisis and ease the raw material problem especially in jute and cotton. Nearly 45% of the resources were designated for agriculture, while industry got a modest 4.9%. The focus was to maximize the output from agriculture, which would then provide the impetus for industrial growth.

- Though the first plan was formulated hurriedly, it succeeded in fulfilling the targets. Agriculture production increased dramatically, national income went up by 18%, per capita income by 11% and per capita consumption by 9%

Second Five Year Plan (1956-61)

- The Second Five Year Plan was initiated in a climate of economic prosperity, industry gained in prominence. Agriculture programmes were formulated to meet the raw material needs of industry, besides covering the food needs of the increasing population. The Industrial Policy of 1956 was socialistic in nature. The plan aimed at 25% increase in national income.

- In comparison to First Five Year plan, the Second Five Year Plan was a moderate success. Unfavorable monsoon in 1957-58 and 1959-60 impacted agricultural production and also the Suez crisis blocked International Trading increasing commodity prices.
Third Five Year Plan (1961-66)

- While formulating the third plan, it was realized that agriculture production was the destabilizing factor in economic growth. Hence agriculture was given due importance. Also allotment for power sector was increased to 14.6% of the total disbursement.

- Emphasis was on becoming self reliant in agriculture and industry. The objective of import substitution was seen as sacrosanct. In order to prevent monopolies and to promote economic developments in backward areas, unfeasible manufacturing units were augmented with subsidies. The plan aimed to increase national income by 30% and agriculture production by 30%.

- The wars with China in 1962 and Pakistan 1965 and bad monsoon in almost all the years, meant the actual performance was way of the target.

Fourth Five Year Plan (1969-74)

- At the time of initiating the Fourth Plan it was realized that GDP growth and rapid growth of capital accumulation alone would not help improve standard of living or to become economically self-reliant. Importance was given to providing benefits to the marginalized section of the society through employment and education.

- Disbursement to agricultural sector was increased to 23.3%. Family planning programme was given a big stimulus.

- The achievements of the fourth plan were below targets. Agriculture growth was just at 2.8% and green revolution did not perform as expected. Industry too grew at 3.9%.
Fifth Five Year Plan (1974-79)

- As a result of inflationary pressure faced during the fourth plan, the Fifth Plan focused on checking inflation. Several new economic and non-economic variables such as nutritional requirements, health, family planning etc were incorporated in the planning process. Investment mix was also formulated based on demand estimated for final domestic consumption.
- Industry got the highest allocation of 24.3% and the plan forecasted a growth rate of 5.5% in national income.
- The fifth plan was discontinued by the new Janata government in the fourth year itself.

Sixth Five Year Plan (1980-85)

- The Janata Government moved away from GNP approach to development, instead sought to achieve higher production targets with an aim to provide employment opportunities to the marginalized section of the society. But the plan lacked the political will.
- The Congress government on taking office in 1980 formulated a new plan with a strategy to lay equal focus on infrastructure and agriculture.
- The plan achieved a growth of 6% pa.

Seventh Five Year Plan (1985-89)

- The first three years of the Seventh Plan saw severe drought conditions, despite which the food grain production rose by 3.2%. Special programmes like Jawahar Rozgar Yojana were introduced. Sectors like welfare, education, health, family planning, employment etc got a larger disbursement.
Eighth Five Year Plan (1992-97)

- The Eighth Plan was initiated just after a severe balance of payment crisis, which was intensified by the Gulf war in 1990. Several structural modification policies were brought in to put the country in a path of high growth rate. They were devaluation of rupees, dismantling of license prerequisite and decrease trade barriers.
- The plan targeted an annual growth rate of 5.6% in GDP and at the same time keeping inflation under control.

Ninth Five Year Plan (1997-2002)

It was observed in the eighth plan that, even though the economy performed well, the gains did not percolate to the weaker sections of the society. The Ninth Plan therefore laid greater impetus on increasing agricultural and rural incomes and alleviates the conditions of the marginal farmer and landless laborers.

Tenth Five Year Plan (2002-2007)

- The aim of the Tenth Plan was to make the Indian economy the fastest growing economy in the world, with a growth target of 10%. It wanted to bring in investor friendly market reforms and create a friendly environment for growth. It sought active participation by the private sector and increased FDI's in the financial sector.
- Emphasis was laid on corporate transparency and improving the infrastructure.
- It sought to reduce poverty ratio by 5 percentage points by 2007 and increase in literacy rates to 75 per cent by the end of the plan.
- Increase in forest and tree cover to 25 per cent by 2007 and all villages to have sustained access to potable drinking water.
Eleventh Five Year Plan (2007-2012)

- The Eleventh Plan has the objective to increase GDP growth to 10%.
- Increase agricultural GDP growth to 4% per year to ensure a wider spread of benefits. Create 70 million new work opportunities. Augment minimum standards of education in primary school.
- Reduce infant mortality rate to 28 and malnutrition among children of age group 0-3 to half of its present level. Ensure electricity connection to all villages and increase forest and tree cover by five percentage points.

3.4.5. Cement Production, Capacity, and Consumption-A Glimpse

- Production and growth

  Domestic demand plays a major role in the fast growth of cement industry in India. In fact the domestic demand of cement has surpassed the economic growth rate of India. The cement consumption is expected to rise more than 22% by 2009-10 from 2007-08. In cement consumption, the state of Maharashtra leads the table with 12.18% consumption, followed by Uttar Pradesh. In terms of cement production, Andhra Pradesh leads the list with 14.72% of production, while Rajasthan remains at second position.

  The production of cement in India grew at a rate of 9.1% during 2006-07 against the total production of 147.8 MT in the previous fiscal year. During April to October 2008-09, the production of cement in India was 101.04 MT comparing to 95.05 MT during the same period in the previous year. During October 2009, the total cement production in India was 12.37 MT compared to a production of 11.61 MT in the same month in the previous year. However, in 2010, the production of cement in India went upto 210 million tonnes and it remains same in the year 2011. The cement companies are also increasing their productions due to the high market demand. The cement companies have seen a net profit growth rate
of 85%. With this huge success, the cement industry in India has contributed almost 8% to India's economic development.

• **Comparison of GDP and Cement Consumption Growth**

Over the past several years, the cement industry has grown in tandem with India’s economic growth, which has resulted in the country becoming the second-largest producer and consumer of cement in the world. The demand for cement is correlated with a country’s economic growth, since the industry’s main growth drivers – construction (housing and commercial) and infrastructure investments are the key components of its GDP. The average growth in the demand for cement in the country was 9.1% while its average GDP growth was 7.3% during the period FY01-FY10 (with its average cement demand to its GDP multiplier being 1.2).

Graph 3.3 Comparison of Indian GDP and Cement consumption Growth
• **Cement Consumption and Growth**

Cement consumption in India reached approximately 197 million tonnes at the end of March 2010, with the domestic market value of the industry reaching Rs.778 billion. Cement companies have increased their production and capacity over the years to keep pace with the increasing demand in the country. Its installed capacity (monthly add-up) increased from 115 million tonnes per annum in FY01 to 245 million tonnes per annum in FY10, while its production increased from 94 million tonnes in FY01 to more than 200 million tonnes in FY10.

![Graph 3.4 Indian's Cement Consumption and Growth](image)

- **Per capita Cement Consumption**

India’s cement industry has grown to become second largest in the world and still has immense growth potential.
*Demand Break up by Segment*

Indian’s cement industry has demonstrated healthy growth in the past decade, primarily driven by the buoyancy in the country’s economy, which has resulted in increased investment in the two key end-user markets of the cement industry—the infrastructure and residential real estate sectors.

Source: CMA

**FIGURE 3.6 Demand break-up by segments (FY06-FY10)**
Improved demand from residential real estate (Housing)

During FY06-FY10, approximately 522 million tonnes of cement was used by the residential real estate sector, which contributes 63.4% to the total domestic cement demand in the country. Given the intense shortage of housing in the country, this segment has been the primary demand driver for the cement industry. Over the years, the demand for residential real estate has only increased, fuelled by increasing urbanization, rising income levels, decreasing household sizes, easy availability of home loans and tax incentives for borrowers.

The total shortage in housing during the Eleventh Five year plan (2007-2012), is expected to be 74 million units, the majority of which is expected to be generated by rural and below the poverty line (BPL) households, The Government has launched various initiatives such as the National Rural Employment Guarantee Scheme (NREGS) and the Indira Awas Yojana to improve rural income, which may increase the demand for rural housing in the country.

3.4.6. Pricing and Cost Analysis

Price Analysis

Due to the cyclical nature of the industry, cement prices show large fluctuation owing to the demand-supply scenario, capacity utilization and expected capacity additions in the near future. They tend to increase during periods of high demand growth and high capacity utilization and witness a downward movement if the industry sees low capacity utilization. However, despite the peak and trough cycles, cement prices have witnessed an overall growth during the last decade, with a CAGR of 6%
After declining in 1997-2000, cement prices bounced back in the latter part of 2000, due to regulated supply by manufacturers, especially in south. During 2001-05, the industry was unable to sustain the price rise witnessed in previous cycles as large capacity additions in 2002 disturbed the demand-supply equilibrium. Furthermore, the reduced level of cooperation among producers led to weakening of cement prices, especially in south and west India.

Cement prices witnessed a turnaround in 2005 and demand increased due to investments in road infrastructure, accelerated growth in housing construction and increased demand from the Middle East. Moreover, during this time, there were no significant capacity additions, which led to the shrinking of the demand-supply gap and higher utilization rates, which resulted in a price rise. Cement manufacturers reduced their prices in 2008, as the Government announced 4% excise duty cuts as part of the stimulus provided to industries to recover from the global economic slowdown. However, in early 2009, companies took advantage of the strong demand from government-funded infrastructure projects and the real estate sector, and began increasing their prices from February 2009. In June 2009, prices were at an all-time high.
However, in the latter half of 2009, cement prices started falling due to the economic slowdown and excess capacity. They declined by 10% till the end of December 2009, as 28 million tonnes of fresh capacity began production during April-December 2009. Between January 2010 and March 2010, prices rose temporarily due to the onset of the high demand season. After March 2010, they declined continuously, affected by the sluggish growth in demand and rapid addition in capacity. More recently (since October 2010), the industry has witnessed a rise in prices due to the supply discipline implemented by large players.

**All India: cement prices and utilization trend**

Due to the regional nature of the industries, prices vary across regions — regional prices are a function of regional consumption and cement production capacity. Prices in regional that have surplus capacity have historically been lower than those in the regions with a tight supply demand scenario. However, the difference in prices between any two regions does not normally exceed the differential in freight cost incurred in transporting the cement from the cement surplus region to the cement deficit one. For example, transporting cement from Nalagonda in Hyderabad to Jaipur, Delhi and Kolkata would entitle a freight cost of Rs100, Rs111 and Rs114 per 50 Kg bag respectively which exceed the price differential.
**Cost Analysis**

The operating costs of Indian cement companies have grown at a CAGR of 5% from Rs.1239 per tonne in FY01 to Rs.1868 per tonne in FY10. Over the years, the share of energy costs has declined, while that of freight costs has seen a rise in total operating costs. The average energy costs of cement companies increased at a CSGR of mere 2% from Rs626 per tonne in FY10, largely due to commissioning of captive power plants, use of more energy-efficient kilns by cement manufacturers, as well as an increase in the share of blended cement in overall cement production. The share of blended cement increased to 74% in FY10 from 57% in FY05. The share of raw material costs has marginally increased due to the rise in input costs as well a 25% increase in the royalty on limestone.

**Key operating cost trend in ₹ per tonne**

<table>
<thead>
<tr>
<th></th>
<th>FY01</th>
<th>FY02</th>
<th>FY03</th>
<th>FY04</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw material</td>
<td>290</td>
<td>279</td>
<td>266</td>
<td>244</td>
<td>289</td>
<td>289</td>
<td>346</td>
<td>388</td>
<td>434</td>
<td>484</td>
</tr>
<tr>
<td>Power</td>
<td>303</td>
<td>304</td>
<td>289</td>
<td>263</td>
<td>298</td>
<td>298</td>
<td>312</td>
<td>333</td>
<td>333</td>
<td>313</td>
</tr>
<tr>
<td>Fuel</td>
<td>323</td>
<td>303</td>
<td>297</td>
<td>284</td>
<td>324</td>
<td>324</td>
<td>390</td>
<td>407</td>
<td>354</td>
<td>411</td>
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<tr>
<td>Freight</td>
<td>323</td>
<td>309</td>
<td>295</td>
<td>284</td>
<td>312</td>
<td>312</td>
<td>340</td>
<td>432</td>
<td>483</td>
<td>553</td>
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<tr>
<td>Total</td>
<td>1,239</td>
<td>1,195</td>
<td>1,161</td>
<td>1,180</td>
<td>1,330</td>
<td>1,461</td>
<td>1,496</td>
<td>1,677</td>
<td>1,929</td>
<td>1,868</td>
</tr>
</tbody>
</table>

*Average cost trend of ACC, Ambuja, Grasim, Ultratech, India Cements, Dalmia Cements, Piramal Cements, Shree Cements, Madras Cements and JK Cement.

**TABLE 3.11** Operating cost trend in Rs. Per tonne
3.4.7. Major Players in Indian Cement Industry

There are a number of players prevailing in the cement industry in India. However, there are around 20 big names that account for more than 70% of the total cement production in India. The total installed capacity is distributed over around 129 plants, owned by 54 major companies across the nation.
TABLE-3.12

Some of the Major Names in the Indian cement industry:

<table>
<thead>
<tr>
<th>Company</th>
<th>Installed capacity</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC</td>
<td>18.640</td>
<td>17.902</td>
</tr>
<tr>
<td>Gujarat Ambuja</td>
<td>14.860</td>
<td>16.094</td>
</tr>
<tr>
<td>Ultratech</td>
<td>17.000</td>
<td>13.707</td>
</tr>
<tr>
<td>Grasim</td>
<td>14.115</td>
<td>14.649</td>
</tr>
<tr>
<td>India Cements</td>
<td>6.810</td>
<td>8.434</td>
</tr>
<tr>
<td>J.K. Group</td>
<td>6.680</td>
<td>6.174</td>
</tr>
<tr>
<td>Jaypee Group</td>
<td>6.531</td>
<td>6.316</td>
</tr>
<tr>
<td>Century textile</td>
<td>6.300</td>
<td>6.636</td>
</tr>
<tr>
<td>Madras cement</td>
<td>5.470</td>
<td>4.550</td>
</tr>
<tr>
<td>Birla Corp</td>
<td>5.113</td>
<td>5.150</td>
</tr>
<tr>
<td>Lafarge</td>
<td>5.000</td>
<td>4.573</td>
</tr>
</tbody>
</table>

Source: Construction Industry Institute (CII-2012)

(a) Associated Cement Companies Ltd (ACCL)

Associated cement companies ltd manufactures ordinary Portland cement, composite cement and special cement and has begun offering its marketing expertise and distribution facilities to other producers in cement and related areas. It has twelve manufacturing plants located throughout the country with exports to SAARC nations. The company plans capital expenditure through expansion of existing units and/or through acquisitions. Alone-care assets are to be divested to release locked up capital. It is also expected to actively pursue overseas project engineering and consultancy services.
(b) Birla Corporation Ltd

Birla corporation’s products includes acetylene gas, auto trim parts, casting, cement, jute goods, yarn, calcium carbide etc. the cement division has an installed capacity of 4.78 million metric tones and produced 4.77 million metric tones of cement in 2003-04. The company has two plants in Madhya Pradesh and Rajasthan and one each in West Bengal and Uttar Pradesh holds a market share of 4.1 percent. It manufactures ordinary Portland cement (OPC), Portland pozzolana cement, fly ash-based ppc, lowalkali Portland cement, Portland slag cement, low heat cement and sulphate resistant cement. Large quantities of its cement are exported to Nepal and Bangladesh. Going forward, the company is setting up its captive power plant to remain cost competitive.

(c) Century Textiles and Industries Ltd (CTIL)

The product portfolio of CTIL includes textiles, rayon, cement, pulp and paper, shipping property and land development, builders and floriculture. Cement is the largest division of CTIL and contributes to over 40% of the company’s revenues. The company has an installed capacity of 4.7 million tones with total cement production of 5.43 million tones in 2003-04. CTIL has four plants that manufacture cement, one in Chattisgarh, two in Madhya Pradesh and one in Maharashtra. Going forward, the company has scripted a three pronged strategy closing down its shipping business, continuing with its chemical and adhesive division, and focusing on cement, rayon and paper as its long-term business plan.

(d) Grasim – Ultra Tech Cemco

Grasim is product profile includes staple fibre (VSF) gray cement, white cement, sponge iron, chemicals and textiles with the acquisition of ultra Tech; L&T cement division in early 2004. grasim has now became the world’s seventh
largest cement producer with a combined capacity of 31 million tones. Grasim (with ultra Tech) held a market share of around 21% in 2003-04. It has plants in Madhya Pradesh, chattisgarth, Punjab, Rajasthan, TamilNadu and Gujarat among others. The company plans to invest over us $9 million in the next two years to augment capacity of its cement and fibre business. It is also plans to focus on its international ventures, ramping up to the capacity of Alexandra carbon Black in Egypt to 1,70,000 tonnes per annum.

(From 1,20,000 tpa) and raising the capacity of the carbon black plant in china from 12,000 tpa to 60,000 tpa.

(e) Gujarat Ambuja cements Ltd (GACL)

Gujarat Ambuja cements Ltd was setup in 1986 with the commencement of commercial production at its 2million tones plant in Chandrapur, Maharashtra. The group has linker manufacturing facilities at Himachal Pradesh, Gujarat, Maharashtra, Chhattisgarh, Punjab and Rajasthan. The company has a market share of around 10%, with a strong foothold in the northern and western markets. Its total sales aggregated US $ 526 million with a capacity of 12.6 million tonnes in 2003-04. Gujarat Ambuja is India’s largest cement exporter and one of the most cost efficient firms. GACL has a 14.45 percent state in ACC, making it the second largest cement group in the country, after Grasim ultra Tech cemco. The company is scouting for a capacity of around two million tones in the northern and western market. It has around US $ 195-220 million for acquisitions.

(f) India Cement

India cement is the largest cement producer in Southern India with a total capacity of 8.8% millions tons and plants in Andhra Pradesh and Tamil Nadu. The company has a market share of 5.4% with total cement production of 6.36 Million tones in 2008-09. Its product profile includes ordinary Portland cement
and blended cement. The company has limited its business activity to cement; through it has a marginal exposure to the shipping business. The company plans to reduce its man power significantly in its future. It also expects the export market to open up, with the Gulf emerging as a major importer.

(g) Jai Prakash Associates Limited

Jai Prakash Industries, now known as Jai Prakash Associates Limited (JAL) is part of the Jaypee group with business in Civil Engineering, hospital, cement, hydro power, design consultancy and IT. It has an annual capacity of 4.6 millions tons with plants located in Rewa & Bela (Madhya Pradesh) and Sadva Khurd (Uttar Pradesh). The company has a market share of 3.8% with the cement division contributing US $ 172 million to revenue in 2003-04. The company is upgrading its capacity to 6.5 million tones through the modernizing of the existing units and commissioning of a new grinding unit at Tanda (Uttar Pradesh) with an investment of US $163 million, Jay Prakash Associates has decided to concentrate on its core business of construction and engineering and leave its cement plant to its subsidiary Jaypee Rewa Cement Ltd. The company manufactures a wide range of world class cement of OPC grades 43, 53, IRST-40 and special brands of Pozzolana cement.

(h) J.K. Synthetics

J.K. Synthetics, a Singhania Group company, started manufacturing nylon at Kota in 1962. Subsequently, its diversified into Phy, nylon tyre-cord, cement (in 1975) acrylic and white cement (in 1984). The company has a market share of 2.7% JK Synthetics limited in restructuring its business division into separate entities JK Cements and JK synthetics. After the restructuring it will be left with a cement plant at Nimbahera in Rajasthan with a capacity of 3.26 metric tones and manufacturing white cement.
(i) Madras Cements

Madras Cement Ltd is one of the oldest cement companies in the southern region and is a part of the Ramco group. The company is engaged in cement, clinker, dolomite, dry mortar mine, lime stone, ready mix cement (RMC) and units generated from wind mills. The company has three plants in Tamil Nadu, one in Andhra Pradesh and a mini cement plant in Karnataka. It has a total capacity of 5.47 million tones annually and holds a market share of 3.1% Madras cement plants to expand by putting up RMC plant. As Karnataka is a promising market, the company is further expanding its capacity from the present 1.5 million tonnes to 3.4 million tonnes through an investment of US $ 9 Million.

(j) Holcim

Holcim, earlier known as Holder bank, has a cement production capacity of 141.9 million tones. It is a key play in aggregates, concrete and construction related services. It has a strong market presence in over 70 countries and is a market leader in South America and in a number of European and overseas markets. Holcim entered India by means of a long term strategic alliance with Gujarat Ambuja Cement Ltd., (GACC). The alternative alliance aims to strengthen these clinker and cement trading activities in south Asia, the middle east and the region adjoining the Indian Ocean. Holcim also intended to use India as an additional base for its IT operations R&D Projects as well as a procurement sourcing has to generate additional synergies and value for the group.

(k) Ital Cementic Group

The Ital Cementic group in one of the largest producer and distributors of cement with 60 cement plants. 547 concrete batching units and 155 quarries spread across 19 countries in Europe, Asia, Africa and North America. Ital cement is present in the Indian Market through 50-50 joint venture company with Zuari Cements. All initiates in Southern India are routed through the joint venture company, while Ital cementi is free to buy deals in its individual
capacity in northern India. The joint venture company has a capacity of 3.4 million tonnes and market share of 2.1 per cent.

(l)Lafarge India

Lafarge India Pvt. Ltd., a subsidiary of the Lafarge group, has a total cement capacity of 5 millions tonnes and a clinker capacity of 3 million tones in the country. Lafarge commenced operations in 1999 and currently has a market share of 3.4 per cent. It exports clinker and cement to Bangladesh and Nepal. It producers Portland slag cement, ordinary Portland cement and Portland Pozolana cement. The Indian cement plants are located in Chattisgrah & Rajasthan. Lafarge cement has become the largest cement selling firm in the Indian markets of West Bengal, Bihar, Jharkhand and Chhattisgarh.

3.4.8. Recent developments in cement industry in India

- UltraTech Cement is going to absorb its sister concern Samruddhi Cement to become biggest cement company in India.
- World's leading foreign funds like HSBC, ABN Amro, Fidelity, Emerging Market Fund and Asset Management Fund have together bought 7.5% of India Cements (ICL) at a cost of US$ 124.91 million.
- Cimpor, a Cement company of Portugal, has bought 53.63% stake that Grasim Industries had in Shree Digvijay Cement.
- French cement company Vicat SA bought 6.67% share of Sagar Cement at a cost of US$ 14.35 million.
- Holcim now holds 56% stake of Ambuja Cement. Previously it held 22% of stake. The company utilized various open market transactions to increase its stakes. It invested US$ 1.8 billion for that.
Recent Investments in the Indian Cement Industry

- In a recent announcement, the second largest cement company in South India, Dalmia Cement declared that it's going to invest more than US$ 652.6 million in the next 2-3 years to add 10 MT capacity.
- Anil Ambani-led Reliance Infrastructure is going to build up cement plants with a total capacity of yearly 20 MT in the next 5 years. For this, the company will invest US$ 2.1 billion.
- Anil Ambani-led Reliance Cementation is also going to set up a 5 MT integrated cement plant in Maharashtra. It will invest US$ 463.2 million for that.
- Jaiprakash Associates Ltd has signed a MoU with Assam Mineral Development Corporation Limited to set up a 2 MT cement plant. The estimated project cost is US$ 221.36 million.
- Rungta Mines (RML) is also planning to invest US$ 123 million for setting up a 1 MT cement plant in Orissa.

3.4.9. Opportunities, Threats, Risks and Concerns

The cement industry is going through its boom period with full capacity utilization. Powered by the GDP growth of 8.9%, the annual demand for cement in the country continues to grow at 8-10%. As per NEAER study, under high growth scenario, the demand for cement (including export) is expected to increase to 244.82 million tons by 2011-12. As per the study, the demand is expected to be much higher at 311.37 million tons, if the optimistic projections of the road and the housing sectors are met. The industry has responded to their with substantial new capacity announcement, the materialization of the capacities, however, is likely to be delayed due to the heavy order book position of the suppliers. It is expected that demand growth will outstrip supply till the materialization of such new capacities. However the current high level of international crude prices and is
impact on the domestic prices of petroleum products is likely to make a dent in the profitability but its impact will have to be seen depending upon ability of the economy to pass on such cost increases to the consumer.

While the target cost would be optimized on the imported coal through usage of company’s ownerships for part of the quantity, the international prices of imported coal and its volatility together with the strengthening of the dollar against rupee could derail this. This could impact the delivery prices of imported coal and also the cost of production. The government has taken steps to increase the availability of indigenous coal for its expanded capacity across various plants which can mitigate the impact of such high cost of imported coal for the plants located near the coal fields in India. The government’s continuing efforts to remain in cement prices by freeing imports and banning exports could artificially disable the normal market price mechanisms for detaining prices.

The rise in the price of cement because of the gap of demand & supply in the market is a common phenomenon. The demand for cement is much higher than its actual supply. But with the production maximization, which can be encountered in next few years, this gap may narrow down, that may ensure the market to be in equilibrium.

Decreasing per capita consumption doesn’t affect the total consumption for the cement. It means the infrastructure; housing construction is using the bulk of the production. Inspite of the high price of the product, the demand is still high because of the increasing rate of infrastructural development. Domestic price of cement is rising as well as the imported cement price is lowering. This may be in decrease the gap between supply and demand. Major demand was from the housing sector, which may shift to infrastructure as lots of infrastructural development processes has already being taken up and due to the increased price, housing segment started showing a slowdown during 2000 to 2010.
3.4.10. Future of Indian Cement Industry

Given the sustained growth in the housing sector, the Government's emphasis on infrastructure (both at the national and the state level) and increased global demand, the outlook for India's cement industry is exceedingly bright. The demand growth for the current fiscal is expected to be in the region of 10 per cent, which will translate into a demand of 175 Mt. To meet this rising demand, many Indian companies are going for capacity expansion. Close to 54 Mt of additional capacity is to come up in the next three years, with an investment of around US$ 5.31 billion.

According to a Deutche Bank report, close to 5.1 Mt will be added by second half of 2007-08, while 11.46 Mt will be added in 2008-09. Around 28.90 Mt is likely to be added in 2009-10 and 2.87 Mt in 2010-11. A similar projection by National Council of Applied Economic Research (NCAER) for cement consumption, on a conservative basis, has placed cement demand at 225 Mt by the fiscal year 2011. If the Government goes ahead with infrastructure projects as planned, consumption is likely to be much higher at 291 Mt.

In the overseas market, there are many enquiries for cement with reasonable prices. About 36 states in the US are facing shortage of cement and their construction activity has slowed down. To overcome the problem, the US has relaxed the import duty on cement recently.

The cement sector is expected to witness strong production and consumption growth of 10% during FY2007 in line with the economic growth because of the strong co-relation with GDP and the increased activity in the construction sector. Future drivers of cement demand growth in India would be increased spending on road and housing projects.
The housing sector, which accounts for around 55-60% of total demand, is also likely to continue to be one of the driving force behind cement demand. It is estimated that requirement of new dwelling units over a period of 25 years (1996-97 to 2020-21) will be around 140 million units requiring an investment of approximately Rs. 20,000 billion.

Besides, demand from infrastructure projects and industrial/commercial ventures account for 20% each. Even as NHDP-I (comprising the Golden Quadrilateral or GQ and North-East-South-West or NESW) near completion (GQ by end-2006, and NESW by 2009), demand in the port and airport segments may pick up, keeping demand buoyant. Further, NDHP-III to NHDP-VII (2006-15) envisages construction of another 36,000 kms of roads at an estimated cost of Rs. 1,270 billion.

Overall, from the demand perspective, the fundamentals look bright, and cement demand in the medium term is expected to grow by around 9%. Growth of 9% per annum from FY2006-10 would result in cement production increasing to around 196 mt in FY2010. By comparison, consumption could increase to 190 mt in FY2010. China, the world’s largest producer of cement, has seen sustained cement production average annual growth of 10% since 1980, mostly due to the enormous infrastructure development that country has experienced over this period.

This conclusion is on the basis of expectation of increased spending on road and housing projects. The Union Budget for FY2007 has provided further thrust to the infrastructure sector through several initiatives, such as:

- Budget support on the National Highways Development Programme (NHDP) increased from Rs. 93.20 billion in 2005-06 to Rs. 99.45 billion in 2006-07.
The NHDP envisages an investment of Rs. 2,200 billion on concessions/contracts to be awarded by 2012;

- Special accelerated road development programme for the North Eastern region at an estimated cost of Rs.46.18 billion has been approved. The Government has also decided to develop 1,000 kms of access controlled Expressways.
- 'Bharat Nirman’ to focus on 6 components of rural infrastructure including irrigation, roads, water supply, housing, rural electrification and rural telecom connectivity.
- Outlay on 'Bharat Nirman’ increased from Rs. 121.60 billion to Rs. 186.96 billion.
- Increase in outlay from Rs. 45 billion to Rs. 71.21 billion with the objective of improving the pace of implementation of irrigation projects.

3.4.11 Future Modernization Needs of the Indian Cement Industry

Although the industry has largely set up plants with energy efficient equipment, there are still some areas for further improvements like:

- Appropriate pre-blending facilities for raw materials.
- Fully automatic process control and monitoring facilities including auto samplers and controls.
- Appropriate co-processing technologies for use of hazardous and non hazardous wastes .
- Interactive standard software expert packages for process and operation control with technical consultancy back-up.
- Energy efficient equipment for auxiliary/minor operations.
- Mechanized cement loading operations, palletization/shrink wrapping .
- Bulk loading and transportation, pneumatic cement transport .
- Low NOx/SO2 combustion systems and precalciners .
• Standards for making composite cement so that all the flyash and other industrial waste viz. slag are fully used.
• Co-generation of power through cost-effective waste heat recovery system (only one demonstration unit in operation).
• Horizontal roller mills (Horo Mills) for raw material and cement grinding
• Advanced computerized kiln control system based on artificial intelligence

3.5. CEMENT INDUSTRY IN KARNATAKA:
3.5.1. Present Scenario & Strengths

Karnataka ranks 7th in terms of production of cement in the country. There are 16 Cement industries in Karnataka producing around 11 million tons per annum of cement (which is around 6.51% of India’s production. The export of cement from Karnataka was 0.01 Million Tons.

The State has lime stone deposits of about 17,253 million tons out of India’s total reserves of 76,464 million tons (22.56%) of India’s reserve. 126 companies have been granted leases for mining lime stone in an area of 7991 hectares of land and these companies are annually extracting 16.29 million tons of limestone. 19 cement projects are approved in the State by the State High Level Clearance Committee in the last 3 years with a total capacity of 44 million tons per annum. The state government expects to add at least 20 million tones of cement by the end of 2011.

The booming demand for cement, both in India and abroad, has attracted global majors to the state. These include Lafarge from Switzerland, Heidelberg from Germany and others.
3.5.2. Potential & Opportunities

India’s per capita production of 115 kilograms per year lags the world average of 250 kilograms & China’s production of more than 450 kilograms per person. Also, the per capita consumption in India is estimated to be 150 kilograms per annum which is less than one-third China’s per capita consumption. Clearly, there remains room for growth in the industry in India.

Given the sustained growth in the housing sector, the Government’s emphasis on infrastructure (at both the national and the state level) and increased global demand, the outlook for cement industry is exceedingly bright.

The demand growth for the current fiscal is expected to be in the region of 10%, which will translate into a demand of 175 Million Tons.

Projection by National Council of Applied Economic Research (NCAER) for cement consumption, on a conservative basis, has placed cement demand at 225 Million Tons by the fiscal year 2011. If the Government goes ahead with infrastructure projects as planned, consumption is likely to be much higher at 291 Million Tons. The World Bank’s estimated investment of US$475 billion would further translate into atleast 600 Million Tons of demand for cement by 2015.

The state expects to add atleast 20 Million Tons of cement production by the fiscal year 2011.
### 3.5.3. Major Players in Karnataka

<table>
<thead>
<tr>
<th>Name of the company</th>
<th>Place</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC wadi Gulbarga</td>
<td>Gulbarga</td>
<td>2.11 and 2.60 million tones per annum (mtpa)</td>
</tr>
<tr>
<td>Vasavadatta Cement</td>
<td>Sedam, Gulbarga</td>
<td>1.2 mtpa</td>
</tr>
<tr>
<td>Kudithini</td>
<td>Bellary</td>
<td>1.2 mtpa</td>
</tr>
<tr>
<td>Thondebhavi,</td>
<td>Chickballapur</td>
<td>1.6 mtpa</td>
</tr>
<tr>
<td>Rajashree Cements</td>
<td>Malkhed, Sedam, Gulbarga</td>
<td>2.60 mtpa</td>
</tr>
<tr>
<td>formerly Mysore Cement</td>
<td>Ammasandra, Tumkur</td>
<td>0.57 mtpa</td>
</tr>
<tr>
<td>Heidelberg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement Corporation of India</td>
<td>Kurkunta Gulbarga</td>
<td>0.20</td>
</tr>
<tr>
<td>HMP cements</td>
<td>Shahhabad, Gulbarga</td>
<td>0.48 mtpa</td>
</tr>
<tr>
<td>Kanoria Industries</td>
<td>Bagalkot</td>
<td>0.33 mtpa</td>
</tr>
<tr>
<td>JK Cement</td>
<td>Maddapur, Mudhol Bagalkot</td>
<td>3.0 mtpa</td>
</tr>
<tr>
<td>JP Cement (Zawar)</td>
<td>Shahabad</td>
<td>0.2 mtpa</td>
</tr>
<tr>
<td>Rain Cements</td>
<td>Ballari</td>
<td>0.4 mtpa</td>
</tr>
<tr>
<td>Grasim</td>
<td>Harihara</td>
<td>0.36 mtpa</td>
</tr>
</tbody>
</table>

- **Prime Locations of Business**

Potential district for establishment of Cement Industry based on the limestone reserves, connectivity and availability of land are Belgaum, Bellary, Bijapur, Chitradurga, Dharwad, Gulbarga, Hassan, Shimoga, Tumkur & Uttar Kannada.

- **Available Resources**

The approximate limestone deposits of all grades – proved, probable and possible are 17,253 Million Tons, out of India’s total reserves of 76,464 Million Tons. Large limestone deposits are found in the districts of Belgaum, Bellary, Bijapur, Chitradurga, Gulbarga, Shimoga, Tumkur and Uttar Kannada.
126 companies have been granted leases for mining limestone in an area of 7,991 hectares of land and these companies are annually extracting 16.29 Million tons of limestone.

- **Infrastructure Available:**

  Vast stretch of land is being acquired by the Government in the districts of Belgaum, Bellary, Bijapur, Chitradurga, Dharwad, Gulbarga, Hassan, Shimoga, Tumkur & Uttar Kannada. A state of art industrial infrastructure will be developed in this land focusing only the cement industries.

- **Karnataka Cement corridor:**

  Karnataka Cement industries are showing signs of good growth. Gulbarga, Bagalkot, Chitradurga have been identified as Cement Hub centers. This thread is for capturing all cement industry related developmental activities in Karnataka. According to the department, the government is keen on finalizing the cement project as soon as possible as it would be a good signal for other big-ticket entrepreneurs to invest in the state, particularly in cement segment. The state has developed ten sector-specific industrial zones, including one for cement, in the state. The cement corridor covers Gulbarga, Bagalkot, Chitradurga and Belgaum districts. The department has cleared the proposals of global cement plant giant Lafarge and Shree Cement. Both the companies would invest Rs1,500 crore each to set up 3-mtpa cement plants in Gulbarga district. Indian cement has also received the government nod for its plant.

**3.5.4. Karnataka Cement Projects**

- ACC Cements is expanding its Wadi cement unit located at Kuditini in Bellary district of Karnataka with an investment of Rs. 5100 million. The new cement grinding unit will have a capacity of 3.0 mtpa. The unit will source Clinker (15,50,000 MTPA) from ACC NWCL and Coal from Western
Coalfields (100000 tpa), blast furnace slag from (11,00,000 MTPA) steel plants located in Bellary, fly ash (2,00,000 MTPA) from nearby cement plants and Gypsum (1,50,000 TPA).

➢ Zuari Industries is planning to re-enter cement business after exiting the same in 2006. The company had sold its equity stake to its partner Italcementi and it has rights to set up a cement unit Gulbarga plant (The rights to refuse expire in October 2010 by Italcementi). The company plans to set up a 3 million tpa cement unit with an investment of Rs. 15,000 million. It may be noted, large capacities are expected to come up in the next two years, but in the long run cement remains to be lucrative with bright economic prospects for the country.

➢ Chambal Fertilizers & Chemicals Ltd plans a cement plant at Ferozabad in Gulbarga district of Karnataka with an investment of Rs. 9750 million. The project involves setting up of a 3.2 mtpa capacity cement unit, clinker unit (2.0 mtpa) and a captive power generation unit of 50 MW capacity. The unit be of dry process technology and will consume Limestone (3.30 MTPA) from captive, Bauxite (0.024 MTPA) from Belgaum, Kolhapur, Goa Gypsum (0.1615 MTPA) from SPIC, EID Pary, RCF, Coromondel Fertilizers, Vizag, Coal (0.615 MTPA) from Singareni Collieries & Western Coal Fields slag (0.750 MTPA) from Jindal Steel, Laterite (0.157 MTPA) from Tandur, Kodambal, Bellary and fly ash (0.30 MTPA) from captive power plant. The project is yet to get statutory clearances and may take off later this year.

➢ Dalmia Cement to set up cement plant at Yadwad, Gokak in Belgaum in Karnataka. The project involves setting up of a Cement Plant (4.0 MTPA), Clinker (2.6 MTPA) and Captive Power Plant (40 MW. The unit will manufacture 42% Ordinary Portland Cement (OPC), 3% Pozzolana Portland Cement (PPC) and 55% Slag Cement (PSC) . The total project cost is estimated at Rs. 10427 million. Cement plant will be based on dry process and pre-calciner technology. Electrostatic precipitators (ESPs), bag house and bag filters will be provided to control gaseous and fugitive emissions from different
sources. Total water requirement from Ghataprabha River will be 3,100 m³/day.

➢ Anjani Portland Cement is planning to set up a greenfield unit in Bijapur district of Karnataka which is near the Sedam cement belt. The capacity envisaged is around 1 million tpa and the funds will be met from debt and internal accruals. The project is likely to go operational by 2014.

➢ Vicat Sagar, the French cement major is planning to set up a greenfield cement plant in Karjikhed & Burugupalli Village, Chincholi village in Gulbarga district in Karnataka. It will add two clinker production lines with dry process with a capacity of 5.5 mtpa and the first production line is expected to get ready by 2012. The first phase will entail an investment of 17,500 million. The International Finance Corp, a member of World Bank group is expected to invest Rs.4500 million in the project.

➢ Kesoram Cement, a B K Birla Group company is planning to expand its Sedam cement plant in Gulbarga district of Karnataka. It plans to install a 2.5 mtpa cement unit, 1.71 mtpa clinker unit along with a 18 MW captive power generation unit. These projects will entail an investment of Rs.9250 million. Apart from this, the company also will also install waste heat recovery systems at various units of Sedam plant with an investment of Rs. 2000 million. The company’s board has given approval for these projects and completion is likely by end 2012.

➢ Dalmia Cement (Bharat) is planning to set up a new cement plant located to be located at Village Kokanhalli- Hoshalli in Gulbarga district of Karnataka. The project involves setting up a 4.0 mtpa cement plant, a 40 MW captive power plant. The cement and clinker production will be 12,500 TPD and 8,000 TPD respectively. Cement plant will be based on dry process and pre-calciner technology. Cement manufacturing will involve raw meal grinding, blending,
pre-calcining, clinker burning and cement grinding. The project is estimated to cost Rs.10273.6 million. The project has received statutory clearances

➤ Shree Cements is planning to set up a new cement plant and a power plant in Karnataka. The project involves setting up a cement plant with a capacity of 3.0 million tpa cement plant and a 100 MW power plant. The project is estimated to cost Rs.20,000 million. As of June 2010, the mining lease has been allotted to the company for the cement plant and both the projects have received approval from the High Power Committee of Karnataka.

➤ VRL Cement (a group company of VRL Logistics) is planning to set up a green field cement plant in Badami in Bagalkot district in Karnataka. The company had signed an MoU with the state government. The new unit will have a capacity of 2.0 mtpa and will entail an investment of Rs.9540 million. The company had asked for 300 acres of land from the government and formed a joint-venture with MML (a state owned mining company) for sourcing limestone.

➤ Murali Industries is setting up a cement plant at Aloor village in Gulbarga district. The project involves setting up a Cement Plant with a capacity of .25 Million Tpa and 3X25 MW Captive Power Plant. The project is estimated to cost Rs.10,000 million and had been commissioned recently.

➤ Gulbarga Cement is setting up a greenfield cement unit at Ferozabad, Kirani, Somnathahalli Villages in Gulbarga district of Karnataka. The project involves setting up a cement plant with a capacity of 3.5 million tpa and a 100 MW captive thermal power plant. The project is estimated to cost Rs.11,000 million. The project received approval from the state government of Karnataka. The project is under implementation.

➤ Chettinad Cement Corp is planning to set up a greenfield cement plant and a captive power plant in Karnataka. The project involves setting up a cement plant with a capacity of 2.5-million tpa and a 30-MW captive power plant in
Gulbarga district of Karnataka. The project is likely to cost Rs. 6,000 million. The project is in the planning stage.

3.5.5. ACC IN KARNATAKA

ACC IN KARNATAKA – A STRONG BOND

Karnataka has always been important in ACC’s map. Our association with the state goes beyond 70 years when the company’s erstwhile cement plant was set up in Shahabad. ACC Wadi was established in 1963. Later India’s first 1 million tonne plant was installed at Wadi in 1982. The New Wadi Cement plant was commissioned in 2001 boasting of the world’s largest cement kiln. Today Wadi and the adjoining New Wadi Plant are a fully integrated cement manufacturing facility with independent mines and a captive power plant. Power from this plant will be wheeled through the state Grid to run Thondeshvani Cement Works. The Thondeshvani project is part of a larger expansion project being implemented by ACC in the state of Karnataka which will enhance our capacity in the state by 3 million tonnes per annum from the existing 5.8 million tonnes per annum to 8.8 million tonnes per annum. Today ACC has the largest presence among cement producers in Karnataka, with more than 900 dealers and 2600 selling points in every district, tehsil and village. ACC introduced Ready Mixed Concrete business in India as well as Karnataka in Bengaluru. Many landmark structures in the state have been built with ACC cement.

ACC has a special bond with the people of Karnataka. A mammoth community development scheme is under implementation at Wadi meant to improve the quality of life and provide sustainable livelihoods to the people around Wadi. Recently ACC pledged resources to help rehabilitate the people affected by the recent floods in the state. In 2007 we established an Anti-Retroviral Treatment centre for patients of HIV/AIDS approved by Government of India. Called the ACC Ayushmaan Trust, this is India’s first ART centre to be set
up outside a hospital – also the first to be set by a company anywhere in the world. It is operated as a world class treatment centre and offers voluntary testing and counseling services.

With its huge investments in the state, ACC has ensured a long-term relationship with the state of Karnataka.

_A GREEN FIELD PROJECT_

ACC Thondebhavi Cement Works was set up as a Greenfield project in the picturesque Thondebhavi village, in Gauribidanur Tehsil of Chikballapur District, Karnataka. Installed at a cost of about Rs 350 Crores, this cement grinding plant has a capacity of 1.60 Million Tonnes per annum and will produce Fly-ash based Portland Pozzolana Cement. Clinker is supplied by ACC’s modern cement plants at Wadi in Gulbarga district and despatched by rail. The Thondebhavi plant will have its own railway siding. The new plant becomes the nearest cement plant for Bengaluru city thus ensuring fresh and prompt supply of cement to this fast expanding metropolis.

_ULTRA MODERN AND LATEST GENERATION PLANT_

Thondebhavi Cement plant is designed as a latest generation cement grinding plant that is fully automated and can be operated by a single button - making it the first one of its kind in India. The grinding system at this plant comprises state-of-the-art Vertical Roller Mill (VRM) technology, supplied by Loesche Germany with a grinding capacity of 250 tons/ hour. The Mill equipped with three masters and three support rollers will enable fine grinding to achieve fineness of 4000 Blaines and thus produce cement of superior quality.

Clinker received from ACC Wadi is stored in a large concrete silo that has a capacity of 1 lakh tonnes. Clinker and Gypsum are fed to the Vertical Roller Mill under controlled parameters where they are interground and blended with high
quality processed fly-ash to make Portland Pozzolana Cement (PPC) of superior quality. The PPC thus produced is conveyed from the VRM and stored in two concrete silos, each capable of storing 10000 Tons. The finished product is then sent for packing through two Rotary Packers each having 16 spouts. Cement is packed in bags of 50 kilograms each or supplied in bulk. The entire process and operations of the plant are fully automated and monitored continuously from the controlled process control through the Computerized Central Control Room (CCR).

GREEN CEMENT

ACC Thondebhavi offers Fly-ash based Portland Pozzolana Cement with hydraulic binding properties not found in ordinary cements that allow improved workability while mixing. Due to its inherent characteristics, this cement makes superior concrete that is highly corrosion resistant, more impermeable and capable of withstanding aggressive soil and environments. ACC Fly-ash based PPC has ingredients which enables concrete to grow in strength over the years.

All these contribute to make more durable concrete as compared to ordinary cements.

ACC Fly-ash based PPC provides additional advantages for practically all types of construction applications – commercial and residential complexes, foundations, columns, beams, slabs and RCC jobs. It is especially recommended for mass concreting and where prevailing soil and environment conditions take heavy toll on constructions made with ordinary cements.
ACC Fly-ash based PPC is an eco-friendly cement.

It is available in specially designed 50-kg bags that are tamper-proof and seepage-proof. Thondebhavi can also supply cement in bulk tankers to large projects and ready mixed concrete producers.

AN ENVIRONMENT FRIENDLY PLANT

ACC Thondebhavi is designed to demonstrate the deep commitment of its parent organization ACC to the cause of sustainable development and to protecting the environment. From the drawing board itself, this plant was envisaged as being most environmental friendly in terms of its manufacturing process, raw materials, its energy efficiency, safety standards and its general layout and aesthetics. The end product is itself totally “Green Cement”. The cement manufacturing process involved here does not generate any waste water or effluent. Nor is any other solid waste generated. Water used in the process is recycled and reused while waste water generated from domestic usage in the plant will pass through soak pits to the ground water table. We have also taken initiatives to provide for Rain Water Harvesting. All this makes this plant a “Zero Discharge Zero Solid Waste Plant”.

ACC has invested considerable resources to ensure that the plant maintains the highest possible standards in environment management. The plant is equipped with sophisticated air pollution control systems to stop dust and fugitive emissions comprising a 14 module Bag house, Dust suppuration systems and dust collectors installed at all transfer points.

A GREEN BELT AROUND A GREEN CEMENT PLANT

To illustrate its environment-friendly ethos, the Thondebhavi Cement Plant has been designed to enhance the natural beauty of its environs. More than half of the
land area of the plant campus is dedicated to cultivating of a luscious and verdant Green belt. The entire plant will stand in a greenery filled campus surrounded by carefully tended horticulture and landscaped gardens.

**PARTNERING ECONOMIC DEVELOPMENT IN KARNATAKA**

ACC Thondevhavi becomes the first major industrial unit to be established in Chikballapur District. Besides this the plant will generate considerable opportunities to create sustainable livelihoods to well over 1200 people through direct and indirect employment and the creation of ancillary businesses such as road transport and other trades. We expect the new plant will enable the Government of Karnataka to earn substantial revenue by way of direct and indirect taxes.
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