Strategic leaps needed

To decrease the cement industry’s CO$_2$ emissions, business models must evolve

Diversified industrial products sector
EY-Parthenon GmbH
Strategic leaps needed  To decrease the cement industry’s CO₂ emissions, business models must evolve

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Cement industry to decrease CO₂ emissions

Cement plays one of the most fundamental roles in construction, but it is also among the key drivers of climate change, responsible for **6-9% of global CO₂ emissions**.

In the 2016 Paris agreement, it was agreed to keep the global temperature increase below 2°C. To achieve this, CO₂ emissions will have to be reduced by 80-90% by 2050.

As a result, the cement industry faces increasing pressure. The Swedish activist, Greta Thunberg, who has stimulated global concern about climate change, made clear the urgency for action now at the 2019 United Nations (UN) Climate Action Summit. Also one of Europe’s largest insurers has started to insure only companies whose energy consumption uses less than 30% generated from fossil fuels. The insurance company has informed clients that if they do not comply, they may no longer be eligible for cover within the next few years.

**All industries must initiate the move toward a more carbon-conscious future.** Many, including the cement industry, have already started to address this challenge.

The key: technical progress

The cement industry is conducting significant research to reduce CO₂ emissions. According to the *International Energy Agency/Cement Sustainability Initiative Technology Roadmap 2018*, reducing emissions by approximately 24% by 2050 would be needed to meet the 2°C target. To keep global warming below 1.5°C, a CO₂ reduction of 45% would be necessary.

Conventional technical progress, such as thermal efficiency, fuel switching and the reduction of the clinker-to-cement ratio, will not suffice. The key technology required is carbon capture and storage (CCS); more recently, first steps in carbon capture and usage (CCU) have complemented CCS.

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**International Energy Agency/Cement Sustainability Initiative Technology Roadmap 2018**

- 2014: ~2,250 Mt per year
- 2050: ~2,170 Mt per year
- Reduction of clinker-to-cement ratio
- Innovative technologies (especially carbon capture and storage)

Sources: International Energy Agency/Cement Sustainability Initiative Technology Roadmap 2018, EY-Parthenon analysis
The conventional measures to reduce CO₂ emissions from cement manufacturing are:

- **Further improvements in thermal energy efficiency and fuel switching:** While thermal efficiency is already high and the potential to reduce energy demand is limited, the increase of biomass by utilizing alternative fuels is still an option in many countries. The reduction, however, is limited to the fuel CO₂; process CO₂ is not affected.

- **A reduction of the clinker-to-cement ratio:** This requires sufficient amounts of supplemental cementitious materials, some of which are limited in supply. A selection of fitting cement types delivers an initial significant improvement; however, this calls for more careful alignment of specifications, resulting in more complexity on construction sites. It would also require better alignment of the cement industry with the downstream value chain.

- **Innovative technologies:** To close the gap, CCS and potentially CCU are key elements. Still, the industry faces challenges. Aside from political environments, it requires capital investment and results in additional operational cost. Furthermore, CCS can only be realized close to appropriate carbon-storage pipelines or locations. The cement industry will have to rethink locations of plants and increase investment into these plants.

All of this means significant transformation for the cement industry. Although these measures aim only to reduce the CO₂ emissions per ton of cement and do not imply an overall reduction of cement volumes, this reduction potential is significant.

This reduction of cement output will change the value creation along the value chain of cement and concrete. Therefore, players along the cement and concrete value chain need to assess whether the adoption of new business models that are less volume-based and more value-based is an attractive strategic direction.
Transition to new business models

From the stakeholder environment, we expect a strong move from the current cement industry model to a lower-carbon cement industry, pulling all levers of investment within the value chain as well as additional measures, whether for an intermediate time in additional offset-setting or for the longer term using CCS. In the matrix below, this means moving from today’s position in the lower left corner to the right.

This move will burden the cement industry, and the key question will be how it can recover its investments and, more importantly, how first movers can turn their new low-carbon offerings into a profit.

In the short- to medium-term, as CO₂ reduction becomes increasingly crucial, the era of differentiated, carbon-conscious ‘value’ business models begins (see report sub-section: A first step: offer CO₂-reduced cement).

The change in the overall construction value chain toward stronger industrialization and module prefabrication (‘modular construction’) is a second, overlying trend. It has more drivers than environmental sustainability, (e.g., higher labor productivity, more standardization, digital approaches). We expect that the cement carbon intensity will accelerate this trend. This trend in the matrix below means moving from bottom to top.

In the longer term, this more carbon-conscious and more industrialized environment will spark the era of integrated and new business models. Cement suppliers, but also all other players along the value chain, will have to rethink and evolve their business models to remain profitable and attractive to customers, shareholders and employees (see report sub-section: A next step: more pre-fabrication).

Carbon conscious ‘value’ business model

<table>
<thead>
<tr>
<th>Likely medium/long-term scenario</th>
<th>Likely medium/long-term scenario</th>
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</thead>
<tbody>
<tr>
<td>Era of integrated and new business models</td>
<td>Era of integrated and new business models</td>
</tr>
<tr>
<td>Migration path 2: shift the value chain control point</td>
<td>Migration path 2: shift the value chain control point</td>
</tr>
<tr>
<td>Expected in short/mid term</td>
<td>Expected in short/mid term</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>CO₂ reduction</td>
<td>CO₂ reduction</td>
</tr>
</tbody>
</table>

Sources: EY-Parthenon analysis
Strategic leaps needed. To decrease the cement industry’s CO₂ emissions, business models must evolve.

In the short- and midterm, successfully evolving toward a more carbon-conscious business model will be mission-critical.
A first step: offer CO₂-reduced cement

We expect winners to make carbon-conscious ‘value’ business models and the changes to their own business model a priority for C-level decisions, especially as success factors for cement producers change.

Cement producers will have to move from a commodity-focused, volume production strategy to a more differentiated and diverse production approach, which changes the investment economics for production plants.

They will also need to switch from a commodity go-to-market approach to a differentiated offering that leverages and monetizes carbon-consciousness optimally:

- **A pull for carbon reduced cements** needs to be created. Owners and builders should be convinced that with relatively little investment (compared with the overall costs of a building; it is currently estimated that a 15% price increase in concrete leads to a 0.1% cost increase for the overall building) they can significantly contribute to addressing climate challenge

- **Cost-plus pricing must evolve into value- and usage-based pricing,** which implies a major shift in thinking, an understanding of willingness-to-pay (and who will actually pay for the upgrade), competitive pricing intelligence, and sophisticated terms and conditions will be key. Analysts estimate that the price of these ‘greener’ cements might double, so it will be crucial to optimize sales prices to protect margins
R&D, product management and sales must master the increasing complexity of a broader offering, both technically and commercially. Developing a synergetic and complementing range, clearly differentiating the products, bringing them to market to the respective customer segments, and mastering the increasingly diverse product range sales features and benefits are just some of the key new challenges that producers face.

Cement producers will have to transition from a manufacturing-centric perspective to a customer- and market-centric perspective.

Active and customer-group specific marketing will become crucial. For this, cement producers will need to define the relevant direct (e.g., construction companies), indirect (e.g., investors) and influencer (e.g., architects and planners) target groups. Each will have to be addressed with specific and relevant arguments across all touchpoints of their customer journey.

An active and professional addressing of legislative bodies and political decision-makers will become an important key element, especially to fuel the pull for CO₂ efficient cements as well as locations and access to a future CCS infrastructure.
Lastly, producers’ footprint strategies must begin to consider access to carbon capture infrastructure. Analysts assume that proximity of clinker production to sourcing of the limestone will remain key for cost-efficient production, but producers must increasingly consider the costs of access (e.g., to carbon capture pipelines).

The world’s largest cement producer, for example, already actively markets ‘low-CO$_2$ cements’. The producer focuses go-to-market around their contribution to overall building sustainability (i.e., compliance with certifications like Leadership in Energy and Environmental Design (LEED), Building Research Establishment Environmental Assessment Method (BREEAM) and Haute Qualité Environnementale (HQE)). It remains to be assessed whether all levers have already been pulled, but in any case, its smaller competitors seem substantially behind with their low-CO$_2$ cement offerings. The industry must evolve.

Cement industry transition to a carbon conscious ‘value model’

- From a commodity-focused volume production strategy ...
  - ... to a more differentiated and diverse production approach, which changes the investment economics

- From a commodity go-to-market approach ...
  - ... to a differentiated offering that leverages and monetizes willingness-to-pay for carbon-conscious products optimally

- From a manufacturing-centric perspective ...
  - ... to a customer-/market-centric perspective with target-group- and influencer-specific marketing

Sources: EY-Parthenon analysis
A next step: more pre-fabrication

The industrialization of the cement industry will essentially be driven by two factors:

First, the move of the overall construction industry toward industrialization: modular building. An increasing need for speed, a shortage of skilled labor, the growing relevance of digital tools and increasingly demanding customers, as well as efficiency potential, are driving this development.

Second, industrialized (i.e. prefabricated (pre-cast) cement/concrete modules have significant potential to contribute to decreasing CO₂ emissions: Industry experts estimate that pre-casting can reduce the amount of required cement by approximately 10% or more through more efficient material input of low-CO₂ cements and process efficiencies (5 to 7 percentage points), and reduced waste and re-usage of modular elements (2 to 3 percentage points):

- Pre-cast modules require less concrete, and therefore less cement, for the same structural integrity when developed to optimize load capacity and to minimize material input. Stairs or wall modules, for example, need no longer be solid, but may contain cavities. Better controlled manufacturing conditions allow for a reduced safety margin
- High-tech, low-CO₂ cements can be used more often and more effectively, as stricter control over critical climate factors is possible, such as humidity or temperature during the construction process, which is a precondition to using such materials

### Urbanization requires fast civil infrastructure development

- Innovative building concepts enable quick and flexible living space for fast growing urban populations
- Prefabricated building modules reduce the duration of construction sites and thus noise and environmental pollution in city centers

### Shortage of skilled labor and increasing wages require process-standardization and automation

- Increasing shortage of skilled labor (especially for on-site construction) leads to bottlenecks in the construction industry
- Industrialized prefabrication enhances productivity and requires on average less-skilled workers

- Prefabrication processes benefit from the increasing level of structured planning and collaboration along the entire value chain through the adoption of building information modelling (BIM) as the overarching data exchange and planning tool
- Other digital technologies simplify the modular approach (i.e., virtual reality for the visualization of the building design)

### Growing importance of digital tools and processes as an enabler

- Increasing adoption of modularized, sustainable and efficient building practices to enhance reliability (with respect to both financial and time-related budget)
- In addition, industrialized processes lead to a higher quality of the assembly (i.e., lower tolerances)

### Customer demands for higher efficiency and reliability in the planning and execution of projects

Sources: Desk research; Expert interviews; Project experience; EY-Parthenon analysis
Strategic leaps needed

To decrease the cement industry’s CO₂ emissions, business models must evolve.

- The manufacturing process is more efficient and scrap rates are minimized as production processes are more industrialized and thus optimized for efficient material usage.

With cement compositions and production capabilities improving constantly, these savings potentials are expected to increase further.

- Major cost cuts in site personnel and overheads, leading to overall savings potential of 5-10%.
- Also material and waste and with it on-site equipment with decreasing cost share.
- Factory-manufacturing-specific costs as largest addition to overall cost.

Cost reduction through savings in material and personal spendings

<table>
<thead>
<tr>
<th></th>
<th>Transport &amp; equipment</th>
<th>Site overhead</th>
<th>Material &amp; waste</th>
<th>Site personnel</th>
<th>On-site construction</th>
<th>Modular construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>~15%</td>
<td>~15%</td>
<td>~30%</td>
<td>~40%</td>
<td>~90-95%</td>
<td>~13%</td>
</tr>
<tr>
<td>Factory personnel</td>
<td>~13%</td>
<td></td>
<td>~17%</td>
<td>~17%</td>
<td>~4%</td>
<td>~7%</td>
</tr>
<tr>
<td>Non modular components</td>
<td>~17%</td>
<td></td>
<td>~17%</td>
<td>~17%</td>
<td>~4%</td>
<td>~7%</td>
</tr>
<tr>
<td>Factory overheads</td>
<td>~17%</td>
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<td>~7%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>~ -55%</td>
<td></td>
</tr>
</tbody>
</table>

Decrease in construction duration through more efficient production

- On-site: Planning → Construction → Remaining services
  - Time (months): 5

- Modular/Off-site: Planning → Production → Construction → Remaining services
  - Time saving of ~30-50%

1. Includes components such as fittings, connections, sub-assemblies etc.
2. Assuming that investor has already found and contracted an architect or construction firm - otherwise duration of planning phase increases to 7-9 months.

Sources: EY-Parthenon-Hochbauprognose 2018; Hauptverband der Deutschen Bauindustrie e.V.; ifo Institut; Schweizer Nationalbank; Bundesagentur für Arbeit; EY-Parthenon analysis.
All players along the cement value chain should adapt to key new challenges.
Then: decide about value chain coverage

Many cement producers have already engaged in producing cements for pre-casting. Adapted formulas cater to the specific needs of the pre-casting process. But this is currently seen as one specific segment of business, not a fundamentally new business model.

In a stronger industrialized environment, all players along the cement value chain should adapt to essentially two new key challenges:

- **Overall reduced demand**, resulting in growth challenges, overcapacity and price pressure
- **The need to reconsider the value chain coverage cement players are aiming to achieve**

**Should they restructure and align the business model** to become the perfect supplier for existing or new precasting business models?

**Should they integrate forward, occupying the value chain control point** that will have shifted to prefabrication? How much coverage should be the objective: partial pre-casting and finalization on the site, or full integration of pre-casting into their own value chain, thereby adding a second business model and restructuring the historic core? And how should a proposition be defined to successfully compete with existing and new pre-casting competitors that may enter the competitive field?

**Strategic leaps needed**

A broader value chain coverage implies a **major business model leap** with four key challenges:

1. **Make the product and service needs of architects, planners and investors the starting point** of all strategic and go-to-market decisions. Full transparency about this (e.g., investors’ shifting strategies to strongly consider the CO₂ impact of their investment strategies) is, of course, the key requirement.

2. **Add a second, more end-to-end business model** that is able to master:
   - Product development (e.g., wall modules, stairs)
   - Leads-/building-project-based business development
   - The complex, resource-intense and risk-heavy propositions of product consulting and configuration, logistics-to-construction site services, installation and after-sales
   - Stronger influencing of the overall building life cycle
   - Building operations and/or facility management

3. **Manage the complexity of entering competition with own customers.**

4. **Restructure** their own footprint and operations to retain profitability at reduced cement demand.
To achieve this, cement suppliers should consider both the ‘make’ and ‘buy’ approaches, but also entering into partnerships, platforms or ecosystems to integrate crucial skills and capabilities. This would enable an integrated solution that covers the value chain from cement production to recycling and re-usage. Such a broad value proposition would not only contribute to further decreasing cement production, but enable cost savings.

Other players should consider their strategic options:

- Today’s cement and concrete users (e.g., construction companies) should consider integrating backward and pre-cast concrete modules, thereby gaining control over the value chain control point.
- Existing players and investors should consider the potential for new business models/startups that focus on the precasting of concrete.

In any case, doing nothing is not an option. Established players will face increasingly strong competition from players who will optimize their business model to succeed in these changing times. Also, new players are likely to enter the industry with innovative business models. Ultimately, this will lead to market share losses for established players.

There are many ‘right’ decisions

In this evolving and challenging environment, it is apparent that there is no ‘single right direction.’

In the short- to medium-term, in which we expect the era of differentiated, carbon-conscious ‘value’ business models to begin, the key questions to ask are:

- Where should we invest into competencies (especially differentiation, marketing and pricing to push demand) and the production value chain to remain competitive?
- How do we go to market and retain profitability?

In the longer term, in which we expect a more carbon-conscious and industrialized environment, the key question becomes: what value chain coverage to aim for? To decide, cement players must ask themselves:

- What is our own strategy and where are our key competencies?
- How experienced are we already in customer-centric endeavors?
- How diverse, complex and risky to fulfill are our customers’ expectations regarding products and corresponding services?
- What is the political and legislative environment and what are the resulting key challenges to integrate?
- What potential financial and strategic synergies could be realized?
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