

As a global leader in building materials and the largest producer of concrete in the world, we firmly believe that concrete must play a major part in any successful transition towards a truly sustainable society. Whether the installation of clean and renewable electricity generation, the development of more efficient infrastructure, the building of new roads, or the construction of more sustainable buildings (including housing)—all of these activities require concrete.

This paper describes how CEMEX and its products, services, and building solutions can contribute to the development of a sustainable construction industry and, in the process, significantly improve the performance of buildings, infrastructure, and even whole neighborhoods and cities during their life span.

### The Issue

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The development of a sustainable construction industry is an important opportunity for CEMEX. There are several trends impacting the industry that pose a challenge and that will force traditional practices and technologies to evolve in the coming years:

- Buildings account for around 40% of final energy used globally. Typically, almost 90% of the energy used in a building during its life span is for operation, maintenance, and renovation, while only a little more than 10% is accounted for by the manufacturing and transportation of its materials, as well as for its construction.<sup>1</sup>
- The world's population will grow from today's 7.0 billion to over 9 billion by the year 2050.<sup>2</sup> In addition to this growth, there will be a massive migration of people from rural areas to cities. It is estimated that cities will comprise 3 billion additional people by 2050, as urban areas shift from representing 47% of the population in the year 2000 to approximately 70% in 2050.<sup>3</sup>
- Some natural building materials and water are becoming increasingly scarce, forcing all sectors of the construction industry to responsibly manage and find ways to reduce the use of these limited resources.

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<sup>1</sup> EEB report "Energy Efficiency in Buildings – Transforming the Markets": <http://www.wbcsd.org/pages/edocument/edocumentdetails.aspx?id=11006>

<sup>2</sup> US Census estimates: [www.census.gov/ipc/www/idb/worldpop.php](http://www.census.gov/ipc/www/idb/worldpop.php)

<sup>3</sup> United Nations, World Urbanization Prospects: The 2006 & 2007 Revisions

These trends represent a challenge, as governments struggle to provide the growing urban population with the basic infrastructure required for cities to operate and to communicate through different means. As a result, sustainable construction practices and building materials must thrive in a resource-constrained world. Infrastructure projects and buildings must be made sustainable to fulfill communities' needs, opening markets and creating new opportunities for building materials producers who can help achieve this goal.



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### **Concrete is Part of the Solution**

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Concrete is integral to our global future, providing the infrastructure we require to develop as a society, while the need for ever-improved living standards, particularly in developing countries, increases.

CEMEX calculates that, under business as usual, by 2050 global annual concrete consumption will double from the estimated 7.5 billion cubic meters used in 2006.<sup>4</sup> Studies indicate that strict constraints on carbon emissions might trigger additional demand for concrete in the order of 10% to 15% by 2050.<sup>5</sup>

### **Concrete in buildings**

The environmental benefits of concrete over the course of a building's life clearly outweigh the impacts that come from its production process and inputs. When properly designed and constructed, buildings made with concrete are durable, last for decades with little maintenance, and are able to withstand hurricanes, floods, fire, and even earthquakes. They can also be more energy efficient when they have a concrete envelope that takes advantage of concrete's thermal mass (its ability to store heat) and thermal insulation properties (its ability to reduce heat transfer through it).

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<sup>4</sup> CEMEX estimates based on global cement consumption

<sup>5</sup> Entreprises pour L'Environnement: [www.iddri.org/Activites/Conferences-internationales/08\\_Fondri\\_summary-for-industrial-decision-makers.pdf](http://www.iddri.org/Activites/Conferences-internationales/08_Fondri_summary-for-industrial-decision-makers.pdf)

## Concrete in pavements

The attributes of extended durability and low maintenance also apply to the construction and operation of concrete roads. With life cycles of over 40 years, concrete roads offer benefits such as less maintenance and lower rolling resistance (less fuel consumption) when compared to asphalt roads. Another important factor is that concrete is light in color and reflects sunlight, helping to keep temperatures down in urban areas. Architects and designers are increasingly taking advantage of this attribute, known as the Albedo Effect, especially in hot climates.



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## CEMEX's Contributions to Sustainable Construction

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In addition to the widely used standard concrete types, CEMEX is currently developing a new portfolio of special products that it is continuously updating with new offerings. Many of these special concrete products come with clear and tangible sustainable benefits for the construction applications for which they are designed. Among the most relevant ones are:

### Engineered Concrete Applications (Infrastructure and Industry)

- **Harbors & bridges:** *Self-curing concrete* improves durability and lowers maintenance. A special design of *high performance concrete* increases resistance to aggressive environments.
- **Roads:** Compared to competing materials, *concrete pavements* offer a large range of advantages such as less maintenance, longer lifetime, and higher reflectivity—which not only increases safety at night, but also directly reduces the heat island effect.<sup>6</sup> Several studies also indicate that the rigid and smooth surface of concrete pavements reduces rolling resistance and, therefore, vehicles' fuel consumption.
- **Trains, high-speed trains, light rail, and trams:** *Concrete* is a basic material in the construction of the beds and foundations of all types of mobility solutions given its durability, versatility, and low maintenance.

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<sup>6</sup> Urbanization changes by which urban regions become warmer than their rural surroundings, forming an "island" of higher temperatures.

- **Industrial applications:** *High acid-resistance concrete* is robust and durable for such uses as cooling towers in various industrial processes. Concrete is also used to harness clean, renewable energy sources such as wind, nuclear, and hydroelectric power.

### Building and Housing

- **Structure:** *Self-compacting concrete* improves the strength, durability, and life of a building structure. It also reduces energy use and noise due to concrete vibration.
- **Envelope:** *Structural lightweight concrete* and *insulating concrete forms (IFC's)* improve energy efficiency in buildings.



Concrete has performance characteristics that make it suitable for all types of buildings and infrastructure projects, enhancing their durability and reducing their energy consumption and ecological impact.

### Water and Waste Water Management

- **Exterior pavements:** *Permeable concrete* allows rainwater to filter through, reduces flooding, and decreases heat concentration.
- **Water channels:** *Conventional and impermeable concrete* reduce losses during water transportation in farming.
- **Potable water and sewage systems:** *High performance concrete* pipes are long-lasting with high structural strength. They withstand water abrasion, while offering an affordable solution.
- **Wastewater treatment plants:** Lower maintenance is achieved through *chemical-resistant concrete*, combined with high technology concrete design.

In general, concrete has performance characteristics that make it suitable for all types of buildings and infrastructure projects, enhancing their durability and reducing their energy consumption and ecological impact. During its lifetime and in its demolition phase, concrete recaptures relevant amounts of carbon dioxide (CO<sub>2</sub>), which remain embedded in recycled aggregates that are incorporated into newly built concrete structures.

## CEMEX's Position

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While it is essential to reduce the impacts on the environment from the production of building materials, this is just one area that our industry needs to address. There are significant opportunities for the construction and the building materials sector to offer products, services, and solutions to support the following objectives:

- The encouragement of sustainable practices through urban planning, regulations, and financial incentives for both individual buildings and broader urban development.
- Better building solutions that make construction processes more efficient—everyone involved in the construction industry needs to take a holistic approach to their work.
- Buildings and infrastructure projects must be designed or transformed to consume significantly less energy, water, and other resources during their use, maintenance, and renovation since their major environmental impact occurs over this phase of their lifetime.

By working closely with our value chain—suppliers, distributors, customers, architects, and urban planners—CEMEX can help create a safe and profitable industry that increases sustainability both during construction and throughout the life of a building or structure. This will minimize waste; ensure efficient energy, water, and materials use; create urban environments where people and biodiversity can flourish; and ensure that we become the supplier of choice.

Creating a sustainable construction industry requires action in four areas:

- Technologies to fulfill development needs, while preserving natural resources.
- Government policies that focus on the performance of both buildings in use and those to be built, as well as ensuring that all relevant infrastructure projects comply with a new range of requirements that optimize the large investments to be made.
- Greater market transparency that provides complete, accurate, and comparable information on the key sustainable attributes and properties of building materials and solutions.
- Financial incentives to foster more sustainable practices in construction processes and projects.

Construction materials production accounts for a relatively small proportion of the total environmental impact of a building throughout its life. By extending our involvement to urban and building design, policy, planning, and incentives, while encouraging behavioral change, we can significantly contribute not only to a more sustainable construction industry, but also to the effective transformation of buildings, infrastructure, and even whole neighborhoods and cities with a much lower carbon footprint throughout their lifetime.

Although our building materials can already contribute to a building's environmental performance, the way we promote this feature varies greatly from region to region. To secure markets for our materials in regions such as the EU, where policy development is relatively advanced, we need to ensure that all the sustainable attributes of concrete are adequately recognized and accounted for in any new regulations and emerging evaluation methodologies and frameworks. Better understanding and comparability of the sustainable attributes of buildings' materials will help customers meet the requirements of existing certifications such as Leadership in Energy and Environmental Design (LEED) in the USA, Haute Qualité Environnementale (HQE) in France, Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB) in Germany, Building Research Establishment' Environmental Assessment Method (BREEAM) in the UK, and the Comisión Nacional de Vivienda (CONAVI) in Mexico.

However, in many emerging economies, sustainable construction is not yet a primary consideration in public policy or for our customers. Given our large geographic footprint in emerging countries, CEMEX must play a key role in promoting change and encouraging faster adoption of new technologies and sustainable requirements.

## Looking Forward

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CEMEX has started to position itself as a leader in sustainable construction. We do this through public policy advocacy, involvement in sector initiatives, and engagement with our value chain. However, we also take greater advantage of the anticipated market opportunities by offering more than lower-impact building materials. For example, by partnering with architects, engineering firms, and construction companies, we will offer customers a one-stop sustainable construction service covering each construction phase: the production of building materials, the construction process, the performance of buildings in use, and the participation in wider urban development.

By promoting the development of a sustainable construction industry, we can also ensure that accountability is shared across the value chain—with all of the participants sharing the risks and opportunities that will arise.

Finally, in response to the many rapidly changing aspects of the construction sector, the financial sector must develop new and creative ways of finding and facilitating the funds required for the transformation of society. Public and private sectors are increasingly collaborating and working closer together, as significant and lasting answers to the problems posed by climate change and natural disasters require a more complex set of solutions.