Brazil: a view on the future

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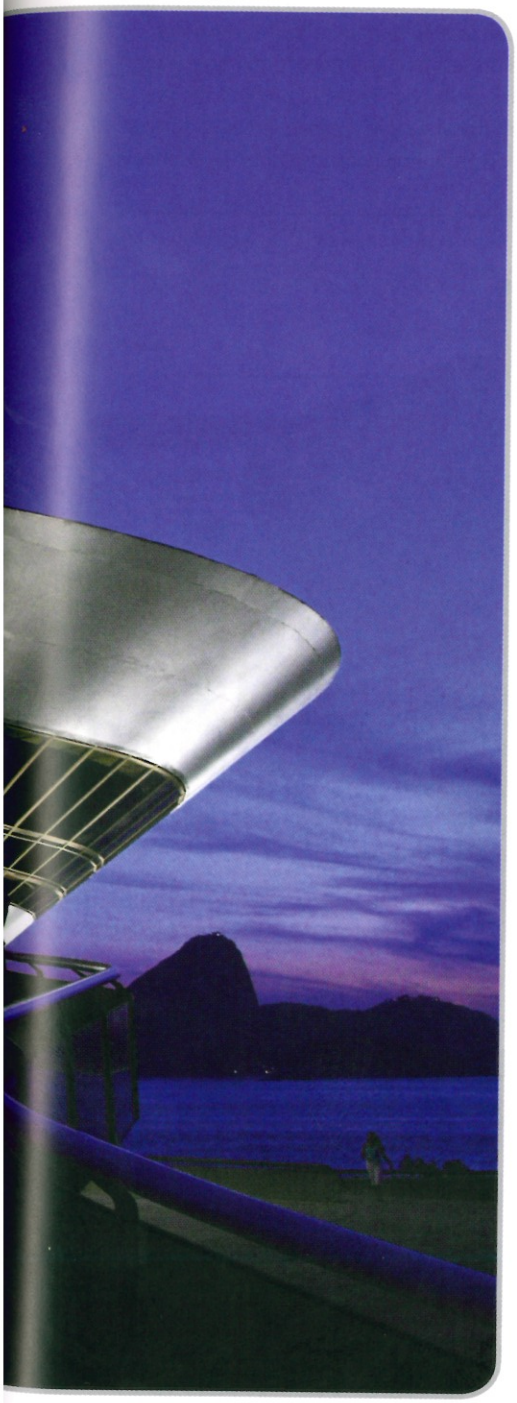
The debate around climate change and lowering CO_2 emissions has been a part of the Brazilian cement industry for some time and today, the sector has made great strides towards reducing its carbon footprint. A modern production base, increasing use of alternative fuels and the development of blended cements with a lower clinker factor have all contributed to making the industry more sustainable.

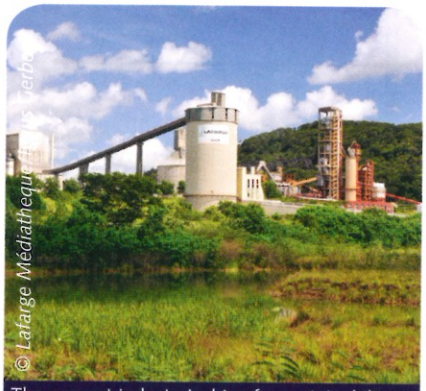
Building on past technological achievements, Brazil's cement industry can look forward to more sustainable production in the future

Brazil is a country with continental dimensions, with more than 11,000km of coastline, borders on 10 countries and a landmass of 8.5mkm^2. The Brazilian cement industry began in São Paulo in 1926, and then in Rio de Janeiro. With a slow start in the early 20th century, domestic production exceeded imports after 1933 and the Brazilian industry began a steady process of consolidation and growth.

It was only in the 1970s that the so-called "economic miracle" boosted the cement industry, stimulated by numerous housing and infrastructure projects of the time. In just 10 years, per capita consumption increased from 100kg to 227kg. In the same period, cement production tripled, jumping from 9Mt to 27Mt, and 24 new plants were built to supply this growing demand.

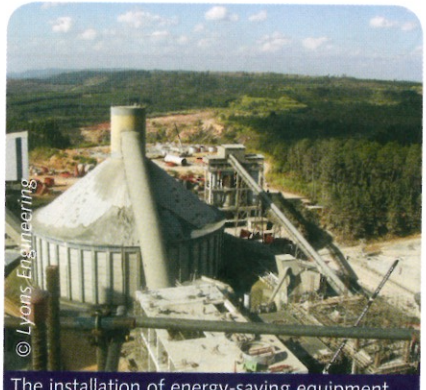
Today the country is experiencing a new growth cycle, which started in 2006. Brazil now has 85 cement manufacturing plants, controlled by 15 industry groups. These plants have an installed capacity of 82Mta and produced 69.3Mt in 2012, making Brazil the sixth-largest producer and fourth-largest consumer of cement in the world.





The cement industry's drive for sustainability was initiated decades ago and today it is at the forefront of reducing carbon emissions

Over the years, Brazilian cement producers have built a modern production base



The installation of energy-saving equipment has helped to reduce CO_2 emissions

The Oil Crisis & industry modernisation

The Brazilian cement industry currently stands on the international scene as one of the best positioned in terms of a low carbon footprint and energy efficiency. This position, recognised by the International Energy Agency, has been achieved thanks to actions initiated decades ago, which have expanded and consolidated over several years.

The way to achieve this production in an economically and environmentally sustainable manner was marked by many challenges. In the late 1970s, the rise in international oil prices led to an energy crisis in the highly oil import-dependent country and encouraged the federal government to seek solutions to curb the import of oil and oil products, replacing them with nationally-sourced alternatives.

Among the proposed solutions, the Coal Protocol, signed in 1979 between the government, the cement and coal extraction industries, saw the challenge of reducing fuel oil usage in cement production, replacing it with domestic coal in the shortest possible term.

Commitments made then by the cement industry resulted in the modernisation of its production base with the conversion from wet- to dry-process technology in several plants, leading to a halving of fuel consumption.

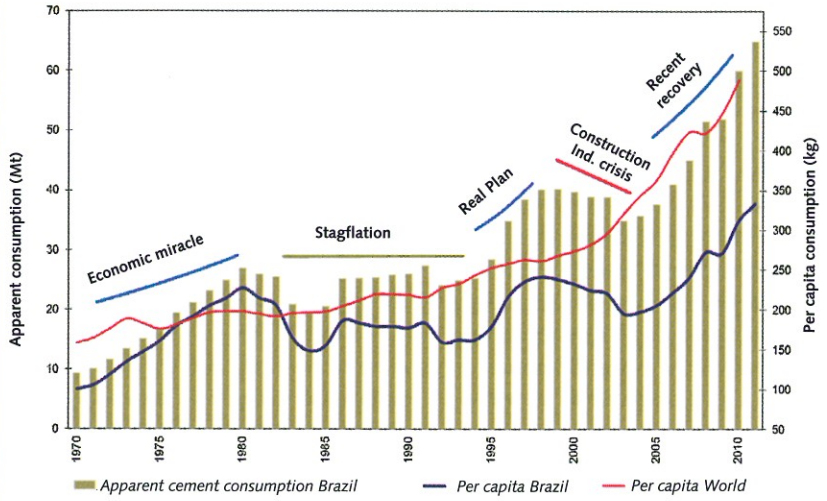
Furthermore, the installation of energy saving equipment, a drive to use additions to cement such as blast furnace slag, fly ash from power plants and calcined clays, the search for other sources of alternative energy such as biomass, and the development of burners for various types of fuels, using entirely Brazilian technology, also contributed to improving energy use.

In turn, the government pledged and developed several programmes to support these initiatives.

While at the time, CO_2 emissions were not the main concern, actions taken since have played a key role in refocussing Brazil's cement industry toward lowering pollution and working toward a more sustainable world.

The problem today is no longer fuel oil, the use of which has virtually ceased. Coal has not become the replacement, as its high CO_2 emissions make large-scale use detrimental to lowering the industry's carbon footprint. nstead, a search for

Figure 1: economic growth vs apparent and per capita cement consumption in Brazil, 1970-2011



other alternative sources with waste co-processing and biomass has increased.

Cement & climate debate

Nowadays, thankfully, the environmental discussion is already a reality and climate change, its causes and consequences, has been a dominant theme of the cement industry's agenda in recent years. CO_2 emissions are intrinsic to the industry's production, either through the chemical transformation of raw materials into cement, or by the burning of fuels to enable this transformation.

International studies indicate that around five per cent of anthropogenic CO_2 emissions in the world come from cement production (in Brazil the figure is 1.4 per cent, according to the 2010 National Inventory of Greenhouse Gases). In turn, estimated cement demand, especially in emerging economies such as Brazil, will increase substantially in the coming decades, making carbon management a priority for the sector.

This issue has also gained strength in recent years in Brazil. At federal level, the National Policy on Climate Change was approved in 2009, which established a commitment to reduce Brazil's total emissions by 26-39 per cent by 2020.

The regulation of this policy in 2011 established several sectorial plans, including the Industry Plan, with the goal of a five per cent reduction in CO_2 emissions across the entire industrial sector.

At a state level, the climate debate has also spread quickly. To date, 14 of the 26 states have already had a State Policy on Climate Change, three with specific reduction targets, as illustrated in Figure 2.

Pillars of sustainability

The Brazilian cement industry today is a model in the fight against greenhouse gases, thanks to a number of characteristics of the 1970s oil crisis and more recent ones.

Energy efficiency

Today the Brazilian cement industry has a modern and efficient production base with facilities that operate with low energy consumption and consequently lower CO_2 emissions compared to other countries.

Virtually all cement in the country is produced by dry-process technology, ensuring a significant reduction in fuel use relative to less efficient processes. Furthermore, preheaters and precalciners reuse the hot gases to preheat the raw material before it enters the kiln, further lowering fuel consumption. Dry preheater

Figure 2: Brazil's state policy for climate change

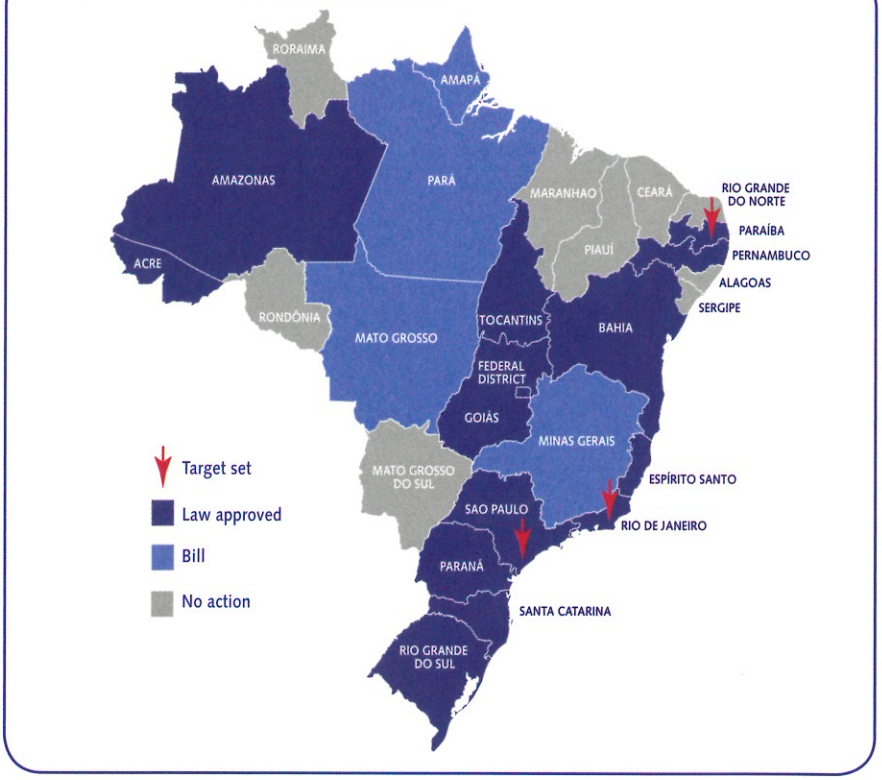
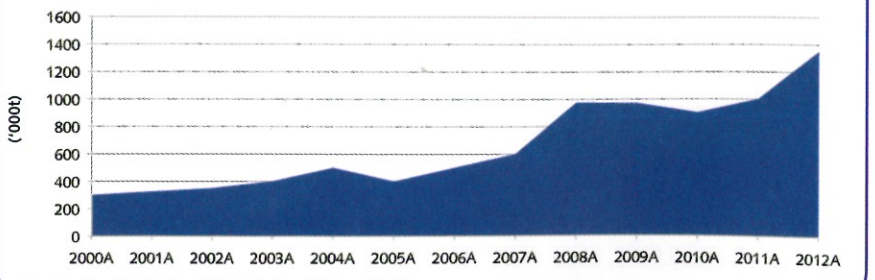


Figure 3: evolution of co-processing waste in Brazil, 2000-12



Source: Brazilian Portland Cement Association – ABCP

kilns, are responsible for about 99 per cent of cement production in Brazil compared to the world average of 87 per cent, according to latest survey by the Cement Sustainability Initiative (CSI).

Alternative fuels

Besides the traditional fuels used in the cement industry, such as petcoke, fuel oil and coal, the use of alternative fuels through waste co-processing and biomass use is increasing in Brazil.

Burning waste through co-processing has increased significantly since the 2000s (see Figure 3). Currently, over 1.3Mta of waste, representing about eight per cent of the fuel matrix, is co-processed in Brazil's cement industry. However, the sector has the potential to dispose of around 2.5Mt of waste, offering much potential for CO_2 mitigation.

Brazil has also been increasing the use of biomass, which today accounts for 12 per cent of the energy mix, as shown Figure 4. This biomass comprises mainly charcoal and, secondly, agricultural waste.

Figure 4: thermal energy fuel mix of selected countries and regions, 1990-2011

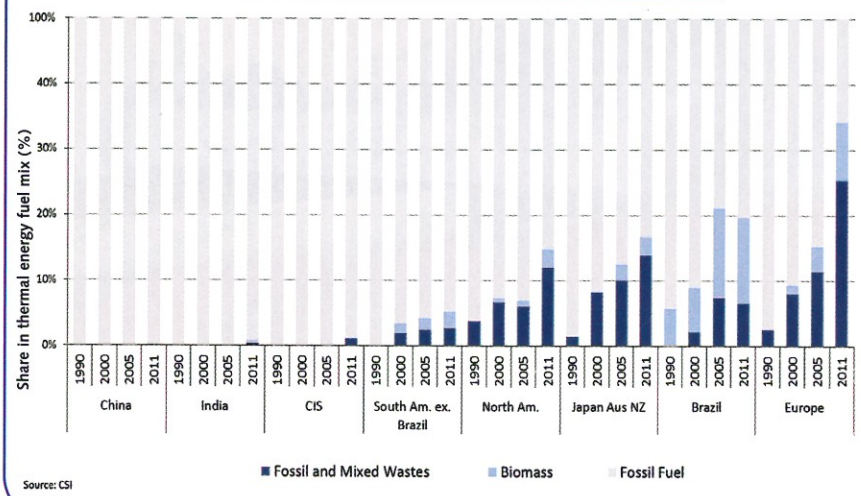


Figure 5: clinker-to-cement ratio (all GNR participants), 1990-2011

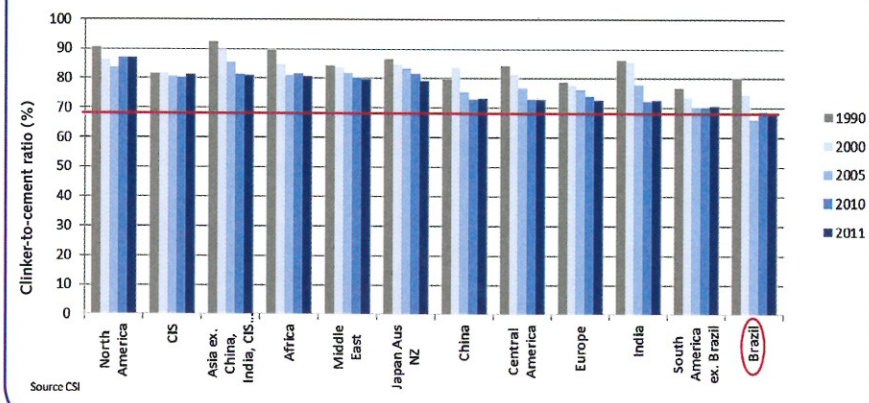
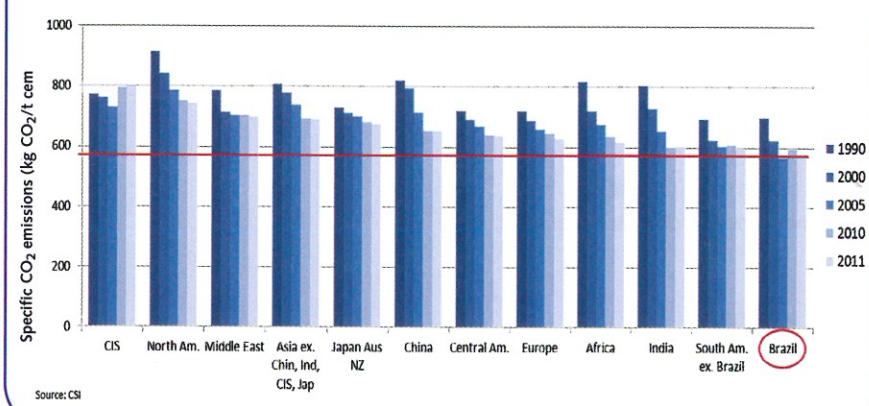


Figure 6: specific CO_2 emissions in selected countries and regions, 1990-2011



Blended cements

Brazil has a long tradition in the production of blended cements. The use of by-products of other industries and alternative raw materials has been carried out for over 50 years in the country, a practice which has only recently been adopted throughout the world on a large scale.

The production of blended cement with materials such as blast furnace slag, fly ash, limestone fillers and artificial pozzolans, as well as diversifying applications and specific characteristics of the cement, also reduces CO_2 emissions, since it lowers the need for clinker production and, therefore, reduces fuel combustion and emissions from raw material decarbonation.

Moreover, blended cements represent an environmentally-friendly solution to dispose of waste from other industries, such as steel slag and thermal power plant ashes. The adherence to Brazil's Technical Standards is key to producing such cements.

The increasing use of additions in Brazil has represented one of the most effective measures to control and reduce CO_2 emissions from the industry. The country has the lowest clinker-to-cement ratio in the world (see Figure 5) and, therefore, the highest percentage of additions, once again making Brazil an international model in the search for low-carbon cements.

Challenges ahead

The Brazilian cement industry is among the most effective in the world in terms of controlling its CO_2 emissions, resulting in one of the lowest CO_2 emissions per tonne of cement produced. However, this also limits the potential for further reductions. Brazil's savings potential is 0.1t CO_2/t cement produced while in the rest of the world it is 0.2-0.3t CO_2/t, according to CSI figures. But this challenge fuels the motivation of the Brazilian cement industry to search for alternatives to continue mitigating its emissions.

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