

# CEMENT: A BUILDING BLOCK OF CLIMATE CHANGE

**No house, hospital, road, school or bridge would be built without it. Cement is ubiquitous. Its production process is also one of the largest sources of greenhouse gas emissions, especially in the developing world. NEF visits a plant in Uganda and asks what can be done to clean up the industry.**

**- By Mike Scott**

Making cement is a dirty, fuel-intensive, carbon-emitting business – there's no getting away from it. The industry is responsible for about 5% of man-made CO<sub>2</sub> emissions but, like that other key indicator of development, aviation, demand is growing fast, particularly in the developing world.

Indeed, cement sales can be seen as a proxy for development, with sales in emerging markets generally growing at about twice the rate of GDP as countries put in place basic infrastructure such as roads that more developed economies take for granted. Global demand for cement is predicted to rise 80% by 2020, with that growth being five times faster in emerging economies than in the developed world – indeed four fifths of global cement produced is consumed in the developing world.

Couple this explosive growth with the polluting cement production process and you have a serious emissions issue. Not only does cement-making call for kilns to be heated to 1,482°C, often by burning coal, this is not even the main source of the industry's emissions. Such heat is needed to remove the CO<sub>2</sub> from the limestone. It is this treatment of the limestone itself that contributes the bulk of the emissions.

The sector is further constrained by logistics. Cement plants have to be

near limestone supplies – limestone is not only central to the process, it is bulky and heavy. Cement is equally bulky and heavy, so it has to be made near to its intended market otherwise the cost of transporting it makes it unprofitable. As a rough rule of thumb, for every 200km the cement travels from the plant, the cost doubles, according to French cement company Lafarge. Add in the problems of doing business in emerging markets, which is where most demand now is and companies in the sector face a number of challenges.

The issues that Lafarge, one of the global leaders in the sector, faces in East Africa are typical. The company's Hima cement plant in western Uganda serves the domestic market, as well as the neighbouring countries of Rwanda, Burundi and Democratic Republic of Congo. However, the plant is isolated – it is 300km from the capital Kampala – and the power supply is unreliable. Uganda gets a large proportion of its electricity from hydro-electric power, but has been hit recently by shortages of supply caused by drought. As a result, the company has installed a 2MW generator, powered by fuel oil – however, this has to be trucked in from the nearest port, Mombasa, which is 1,500km away.

This is one reason that cement prices in Uganda are 2-3 times the world average, according to the

country's president, Yoweri Musaveni. Average fuel costs for Lafarge's Mombasa plant are USD 9.25 per tonne while in Uganda, they are almost four times as high, at USD 28 per tonne.

In order to cut costs and emissions, the company has taken a number of steps. It uses an alternative to limestone, pozzolan, a rock of volcanic origin widely available in Uganda that has the same hydraulic binding qualities but contains less CO<sub>2</sub> than limestone.

As part of a group-wide initiative to increase the use of alternative fuels, the Hima plant has started using coffee husks and rice husks to help power the kiln. Coffee residues, in particular, are widely available as the sector is responsible for 50% of the country's exports. Using coffee husks has cut fossil fuel use by 30% and the project is in line to receive carbon credits under the Clean Development Mechanism. Lafarge plans to lift the proportion of biomass to 40%. The programme has cut emissions by 78,000 tonnes per year and in 2006 saved the company USD 2.4m. The company also has CDM projects under way in Malaysia, Brazil, the Philippines and India.

The company's Mombasa plant also uses biomass, but the problem is less urgent – the same fuel oil that has to travel 1,500km to reach Hima has to travel only 5km to get to the Mombasa plant. The company is planting hundreds of thousands of trees every year on land that it has set aside for quarrying limestone in the future. The trees will be harvested and burnt in its kilns, but even so, the proportion of biomass used in Mombasa will reach only 9%, illustrating that its use is primarily a cost and social matter.

The tree planting programme will not only reduce emissions and fuel

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costs, it also provides work for the local community and discourages them from encroaching on the land because they can see it is being put to good use. However, with the price of oil tipping USD 100 a barrel, the use of biomass is a trend that is set to continue throughout the industry.

Lafarge is on track to reduce its CO2 emissions by 20% per tonne of cement produced by 2010, and its absolute emissions are slightly down in industrialised countries. However, the company is growing so fast in emerging markets that its overall emissions are climbing – in 2006, they were 94.4m tonnes compared with 79.2m tonnes in 1990. “The company should now develop a strategy for reducing its dependence on fossil fuels, while setting challenging targets to increase the share of biomass,” says Jean-Paul Jeanrenaud of WWF.

“Cutting our emissions by half in Europe does not deal with the problem of emissions from cement,” acknowledges Vincent Mages, the company’s vice-president for climate change initiatives. The EU makes up 10% of world demand, a figure matched by the US, Canada and Australia combined, says Mages. Emerging markets excluding China

account for another 30% “and the other 50% is China,” he adds.

Lafarge, one of the founders of the World Business Council for Sustainable Development’s Cement Sustainability Initiative, takes a two-step approach to the problem. “We are working on R&D to come up with low CO2 products and we believe that ultimately, carbon capture and storage will have to be part of the solution,” says Mages. An example of its attempts to develop lower-carbon products is Ductal, an ‘ultra high-performance’ concrete that has 6-8 times the mechanical strength of traditional concrete, meaning the amount of raw materials and energy involved in any particular structure is reduced.

The other approach is to look at the entire life cycle of a building from design to demolition – Lafarge is also involved in the WBCSD’s Energy Efficient Buildings (EEB) initiative – and attempt to improve energy performance at every stage. “We have to work with other players in the construction sector, such as architects, developers and governments,” says Mages. “The cement industry is responsible for 5% of the world’s man-made CO2 emissions, while buildings account for 40%, throughout their active lives. This is why we must all work

together on improving the energy efficiency of buildings.”

Launched by the WBCSD in 2006, EEB’s ambitious aim is to create buildings that consume no net energy from external power supplies and produce no CO2 emissions while remaining economically viable. It is likely to provide a boost to companies in the NEX’s energy-smart buildings sector, in energy demand-side management, in distributed generation, renewables and energy efficiency.

Mages is adamant that simply mandating emissions cuts is not the way forward, given cement’s role in development. “The climate challenge is to provide a model for emerging markets that is a combination of growth and emissions performance,” he says. However, he sees emissions trading as one way of cutting emissions. “The EU ETS is a constraint, but we support this kind of mechanism – it is a good way to stimulate solutions. I think there will be a global scheme eventually, but I don’t know when,” Mages concludes. “There is no doubt that cement is part of the problem, but we want to be part of the solution as well – we believe concrete will have a big role to play in making energy efficient buildings.”

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