Global Cement and Concrete Association

GCCA Policy Document on Making Low Carbon Cement Manufacturing Investable

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Global Cement and Concrete Association (GCCA) is registered in England & Wales, Company No 11191992

Registered office:
Paddington Central, 6th Floor,
2 Kingdom Street, London,
W2 6JP, United Kingdom

T +44 2035 804268

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Introduction

Cement producers are committed to accelerating the elimination of fuel and process emissions, scaling-up advanced low carbon technologies and embedding circularity across our operations. But the sector cannot achieve this on its own. It needs tailored policy support and targeted public finance to lower the financial risks associated with the use of low carbon technologies and spread them more widely. Along with the policies outlined in the following sections, this will make low carbon cement manufacturing investable.

[1] Policy instruments include regulation, planning, codes, standards and project briefs when policy makers are also project clients.

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1. Fuel Emissions

Specifically on fuel emissions, the sector is constantly making progress on two fronts: improving thermal energy efficiency and alternative fuel use.

Thermal efficiency

Overall, the consumption of thermal energy for production of clinker has improved tremendously over past decades[1,2] thanks to the continuous modernisation of kilns, as well as the implementation of state-of-the-art technologies in new installations. Furthermore, the sector is pioneering new ways to drive energy efficiency, based on novel concepts, including hydrogen.

In this direction – although not viable for all kilns – further progress can be achieved by the integration of Waste Heat Recovery (WHR) facilities in cement plants. These can enhance overall energy efficiency, while also helping to alleviate emissions originating from electrical energy consumption. It is important that such initiatives are facilitated with the support of local governments, allowing for fast and efficient permitting, and are incentivised with appropriate tax policies.

Alternative fuels

The cement industry offers one of the best examples of industrial sectors that can realistically contribute towards the circular economy. By utilising waste to recover energy and recycling materials at the same time – a method known as co-processing – producers can substitute fossil fuels with industrial or residential wastes. CO_2 emissions are significantly reduced, by minimising landfilling and incineration and reducing the need to extract virgin fossil fuels. Co-processing offers more than just energy recovery: mineral components of waste-derived fuel are also used in a beneficial way.

In modern installations with adequate streams available, 100% of fossil fuels can be substituted by waste material for co-processing. Unlocking the potential to mitigate the majority of fuel CO_2 emissions with available co-processing technologies is primarily dependent on availability of waste streams, which are, in turn, linked with policies regulating waste management and distribution, at both the local and international level. Wherever regulations allow for increased usage of waste for co-processing, GCCA members quickly support the use of alternative fuel sources and proceed with the appropriate investments.

[1] www.gccassociation.org/gnr/

[2] lowcarboneconomy.cembureau.eu/5-parallel-routes/energy-efficiency/thermal-energy-efficiency/

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2. Process Emissions

Process emissions are those coming directly from the raw material: the decomposition of limestone in clinker production.

Alternative raw materials

Replacing natural minerals used for clinker manufacturing with alternative sources containing less or no carbon, such as processed construction and demolition wastes, industrial ashes and by-products, can lead to lower CO_2 emissions as well as reduce the need for quarrying. Such initiatives further enhance the circular character of cement manufacturing. However, practical and technical challenges often limit the use of alternative raw materials.

Availability and proximity of such streams to cement plants, insufficient storage capacity, high concentrations of process incompatible elements (e.g., sulphur, magnesium or other), in addition to the presence of volatile organic compounds, are among the main reasons why alternative raw materials can currently replace only a relatively small part of natural resources for clinker manufacturing.[3] As in the case of alternative fuels, policy changes can bring forth necessary technological advances and guide waste management practices closer to the circular economy.

Reducing clinker content

Clinker is the essential, and at the same time, the most carbon intensive component of cement. The 'clinker-to-cement ratio' describes the amount of clinker versus other cement ingredients, and defines the properties of cement-based products, namely concrete and mortars. The amount of clinker, as well as the type of materials that can be used for cement production, are regulated by international and local standards everywhere in the world, making cement a highly standardised product that meets demanding specifications to ensure durable construction with a very long service life.

Substituting clinker with less carbon intensive constituents requires that such materials exhibit properties similar to or complementary to clinker, in terms of mechanical performance and durability, while also adhering to strict quality characteristics for use in cement and concrete. Commonly referred to as cementitious materials, these include ground limestone, natural and calcined pozzolans, as well as industrial by-products such as fly ash and ggbs.

The cement sector makes extensive use of such materials, as evidenced by the reduction of clinker-to-cement ratio in the last decades.[4]

Looking ahead, utilising additional volumes of cementitious materials is subject to local availability, standards and regulations, in addition to market acceptance, among other factors. As industrial sectors increasingly decarbonise, certain by-products, such as fly ash and gbbs are likely to become less available for use in construction. Novel approaches on reusing previously untapped industrial wastes, such as landfilled fly ash, can extend the availability of certain cementitious materials, providing additional time to de-risk other carbon-abating methods. In the same context, activating low-grade minerals and quarry wastes to produce calcined clays, can provide a sustainable new stream of cementitious materials with global potential.

[3&4] www.gccassociation.org/gnr/

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3. What do we need?

Deploying advanced technologies requires economy-wide regulation in order to avoid carbon-leakage and ensure the ongoing competitiveness of the sector whilst it is deploying these innovations and technologies. The sector needs:

- policies to prevent unfair competition from imported cement or clinker produced by more carbon-intensive processes
- strategic public funding for the innovation and deployment of advanced low carbon technologies will be needed, targeting R&D as well as CAPEX/OPEX (development, industrial deployment and operation, including transport).

Unprecedented collaboration between governments and industry is needed in order to develop the needed long-term regulatory certainty to enable the sector to meet its carbon reduction potential and to ensure the continued availability of cement (and hence concrete) that are essential for economic and societal development.

The elimination of emissions relating to fuel use is a priority for the cement and concrete sector. To ensure that appropriate actions are taken, policy is needed to:

- prioritise co-processing in the waste treatment hierarchy policies to promote the benefits of dual energy recovery and mineral recycling, also as a means to efficient and environmentally benign industrial [and societal] symbiosis
- ensure waste legislation avoids landfill of residual waste with potential to replace fossil fuels, and/or natural resources
- policies to prevent unfair competition from imported cement or clinker produced by more carbon-intensive processes
- ensure a level playing field for the use of biomass waste by removing subsidies that favour particular industries, while also ensuring that carbon accounting of waste materials does not differ between sectors
- launch and support innovation and R&D initiatives (including the GCCA's Innovandi platforms) to promote increased recovery of materials with calorific potential and/or mineral content from waste, for co-processing.

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