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## Policy Briefs

### Title

Industrial Decarbonization: Policy Pathwaysfor the Cement & Concrete Sector

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# Industrial Decarbonization: Policy Pathways for the Cement & Concrete Sector

## Summary

Globally, cement production is one of the key contributors to anthropogenic CO<sub>2</sub> emissions from the industrial sector. Cement is a key constituent in the production of concrete and mortar, which are critical infrastructure materials used worldwide. A consensus exists on the main technical measures to decarbonize the cement and concrete industry, **but further policy actions are required to overcome associated barriers and promote the adoption of these measures.**

The main recommendations for policy makers in each jurisdiction are: **1) to recognize that a package of policies is needed to overcome the associated barriers; and 2) to take action via market, regulatory or information mechanisms** to promote the adoption of technical decarbonization measures in the industry.

## Recommendations

Decision makers should recognize that there is not a silver bullet solution to decarbonize the sector. **Reducing GHG emissions from the cement industry will require action at multiple levels and across different actors.** Policy actions should adapt to specific local characteristics, policy framework, and availability of resources with the goal to overcome identified barriers. For policy actions multiple interventions are available:

- (a) **Foster partnerships** to increase coordination and data-sharing among the multiple stakeholders.
- (b) **Reduce activities that generate externalities** such as fossil fuel combustion, via stringent carbon pricing or elimination of fuel subsidies.
- (c) **Increase the demand** for low-carbon cement and concrete via public procurement mechanisms.
- (d) **Promote circularity in materials**, by adopting a life cycle mindset and setting certification systems.
- (e) **Increase information sharing** to overcome asymmetries of information.
- (f) **Promote research**, development, and implementation of new technologies at a larger scale.

**Figure 1. Synthesis of potential policy actions** to promote decarbonization in the cement and concrete sector

POLICY STRATEGY	POTENTIAL MECHANISM
Market Development	Public procurement
	Carbon pricing
	Tax credits
Incentives	Financial incentives
	Eliminate subsidies for fossil fuel
Investment	Financial support for R&D and infrastructure
Regulations	Close old or inefficient plants
	Accelerate permitting process and technical assistance
Standards & Codes	Review and update existing regulations and codes
Set Guidelines	Develop protocols/guidelines for best practices
	Develop rating/certification systems for low-carbon cement
Education	Education and training program
	Communication campaign
Analysis	Transparency- data reporting and sharing
	Roadmap planning
	Adopt life-cycle mindset
Cooperation	Foster public-private partnerships
R&D	Identification of geographical clusters for CCUS
	Develop or refine models
	Run accelerator for development of new technologies
	Conduct pilot projects at scale

■ MARKET    
 ■ REGULATORY    
 ■ INFORMATION

## Background

The production of cement contributes around 7% of global anthropogenic CO<sub>2</sub> emissions. Annually, over 4 billion metric tons of cement are produced to support development, and demand for this material is accelerating at a rate that exceeds population growth by 10-fold. The two main factors that drive the greenhouse gas (GHG) emissions from the sector are: sheer quantity of material required; and the intensive energy-derived and chemical-derived CO<sub>2</sub> emissions from the production process. In fact, over 50% of the emissions from the cement production come from carbonate decomposition alone, a key chemical reaction needed to produce Portland clinker, which is the main ingredient of cement.

An analysis was made on 37 peer-review studies and technical reports on cement and concrete decarbonization to identify the most common proposed measures along their level of action, stakeholders, barriers to implementation, and recommended policy actions.

## Technological Measures

A major consensus exists on the main technical measures to decarbonize the cement and concrete industry, which span across the whole material supply chain. The strategies could be classified as: **(1)** energy efficiency, **(2)** fuel switching and **(3)** carbon capture, utilization and/or storage (CCUS) at the clinker production stage; **(4)** reducing the clinker-to-cement ratio; **(5)** use of alternative binders at the cement stage; **(6)** material and construction efficiency at the concrete and structure stage and **(7)** enhanced CO<sub>2</sub> uptake by concrete at the end-of-life stage. Even with clear technical measures, many which are ready to be adopted, barriers to adoption remain, **requiring strong policy action to overcome them.**

## Potential Policy Actions

Policy actions are required to promote transition to lower GHG emissions from human activity, especially to overcome

the complex barriers that the sector faces. **Figure 1** contains a summary of potential policy actions that could be taken to promote decarbonization of the cement industry (*note: this is not an exhaustive list*). Along carbon pricing and public procurement to stimulate the market, there are other important policies such as adoption of performance standards, promote information sharing platforms, foster public-private partnerships and support for research and development (R&D).

## Key Challenges

To promote the adoption of technological measures to reduce GHG emissions from the cement and concrete industry is important to identify the main challenges and barriers that the industry faces. We present a list of barriers to overcome, classified along four dimensions: economic, technical, regulatory, and social (see **Figure 2**). Key barriers are higher cost of alternatives, lack of demand, availability of raw materials and a fragmented supply chain making coordination difficult. Further detail on each measure-barrier link is provided on more information section.

## More Information

This policy brief is drawn from the following peer-review article: Busch, P., Kendal I, A., Murphy, C. W., & Miller, S. A. (2022). Literature review on policies to mitigate GHG emissions for cement and concrete. *Resources, Conservation and Recycling*, 182, 106278 <https://www.sciencedirect.com/science/article/pii/S0921344922001264>.

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**Figure 2. Main Barriers** to implement GHG emissions reduction measures in the cement and concrete sector

