CareEdge-ESG's Research

India's Cement Emissions: Trends, Challenges, and Transition Paths

September, 2025

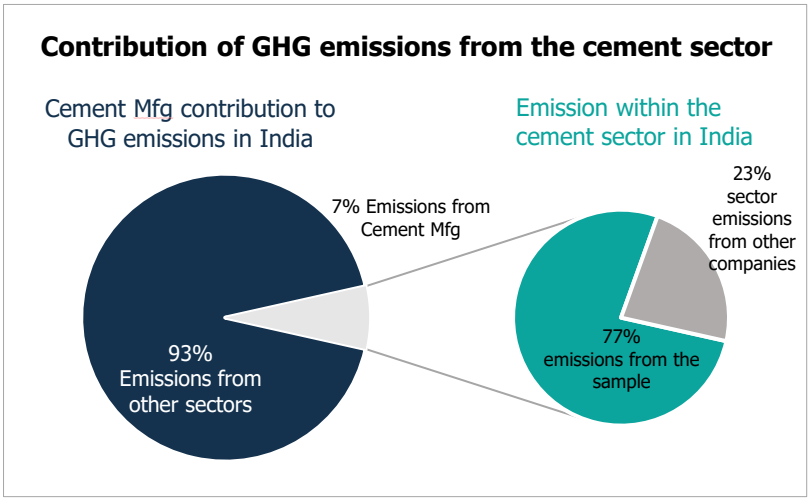
Cement plays a foundational role in India's infrastructure-led growth trajectory, underpinning critical sectors such as housing, transportation, and industry. As the second-largest producer of cement globally, India accounts for approximately 8% of the world's total installed cement capacity. The sector not only supports large-scale construction and urbanisation but also generates substantial employment, creating nearly 20,000 downstream jobs per million tonnes of cement produced (GCCA and TERI, 2025)[1]. With the government's continued focus on infrastructure development and affordable housing, cement demand is projected to rise steadily, pushing national production from 334 million tonnes in 2019–20 to an estimated 1546 million tonnes by 2070. However, this anticipated growth must be reconciled with the imperatives of environmental sustainability.

The cement industry significantly impacts the country's carbon footprint, accounting for 7% of India's total GHG emissions in 2024 (GCCA and TERI, 2025). While Indian cement producers have made considerable progress in improving energy efficiency and reducing emission intensity, they still face the pressing need for decarbonization. Key strategies include increasing the use of alternative fuels and raw materials, boosting thermal substitution rates (TSR), decreasing clinker-to-cement ratios, and shifting to renewable electricity sources pathways.

This article aims to examine the current state of greenhouse gas (GHG) emissions from the top 20 cement-producing companies—by market capitalisation—listed among the top 1000 firms on the National Stock Exchange (NSE). The analysis is based on self-reported emissions data disclosed through the Business Responsibility and Sustainability Report (BRSR) framework for the years 2022, 2023, and 2024.

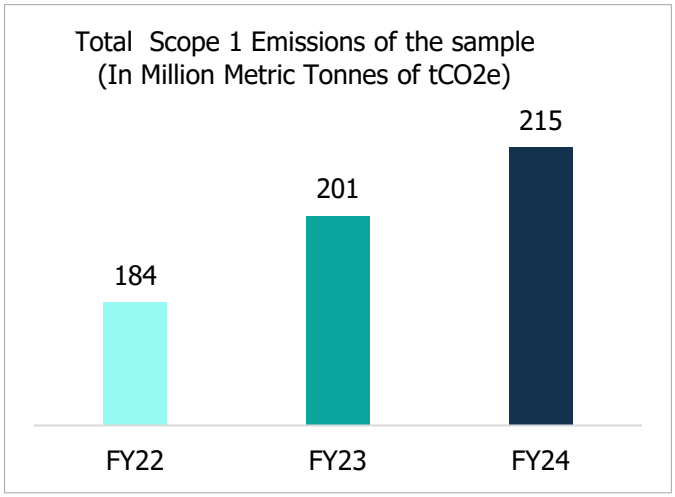
Overview of India's Emissions from Cement Manufacturing

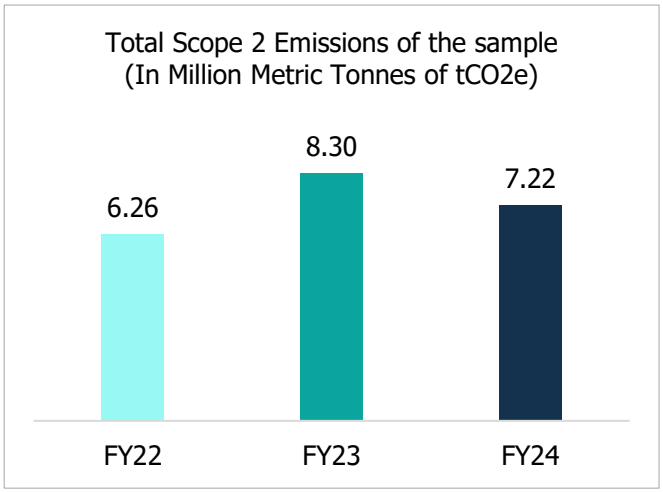
India's greenhouse gas emissions in 2024 reached 4.13 $GtCO_2e$, with the cement sector estimated to contribute about 6% to 7%. This analysis examines a sample of 20 leading cement companies, which together represent roughly 77% of the sector's emissions. Significantly, only five of these companies account for about half of the total emissions, indicating a high level of concentration within the industry.

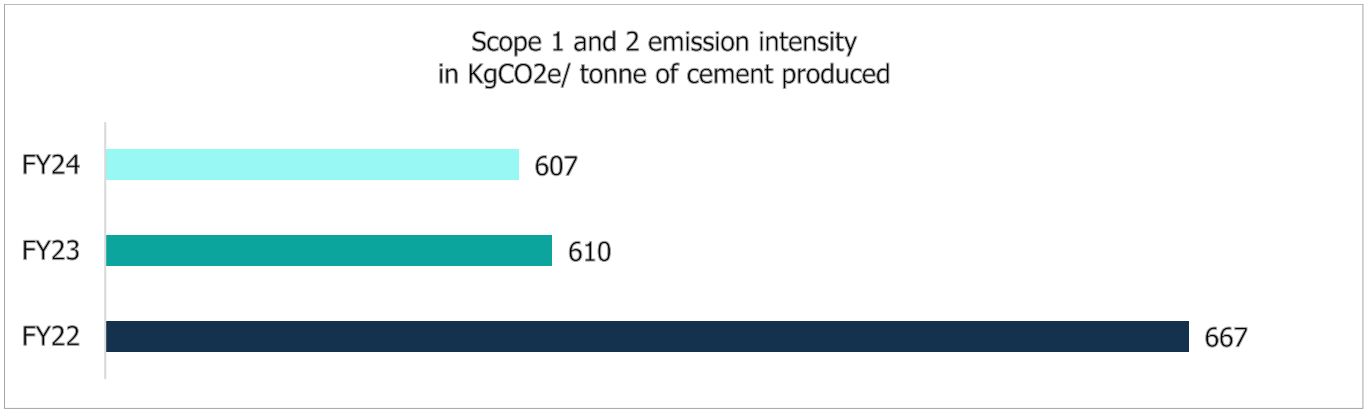


An analysis of Scope 1 and 2 emissions from the sample reveals that 97% of total emissions are attributed to Scope 1, while only 3% fall under Scope 2. This is a result of the fact that cement manufacturing is a highly energy-intensive process, resulting in reliance on captive power generation to meet energy requirements and run economically viable operations. Hence, the bulk of Scope 1 emissions in cement manufacturing arises from the combustion of fossil fuels in kilns and other high-temperature processes.

[1] GCCA and TERI (2025), "Decarbonization Roadmap for the Indian Cement Sector", Link



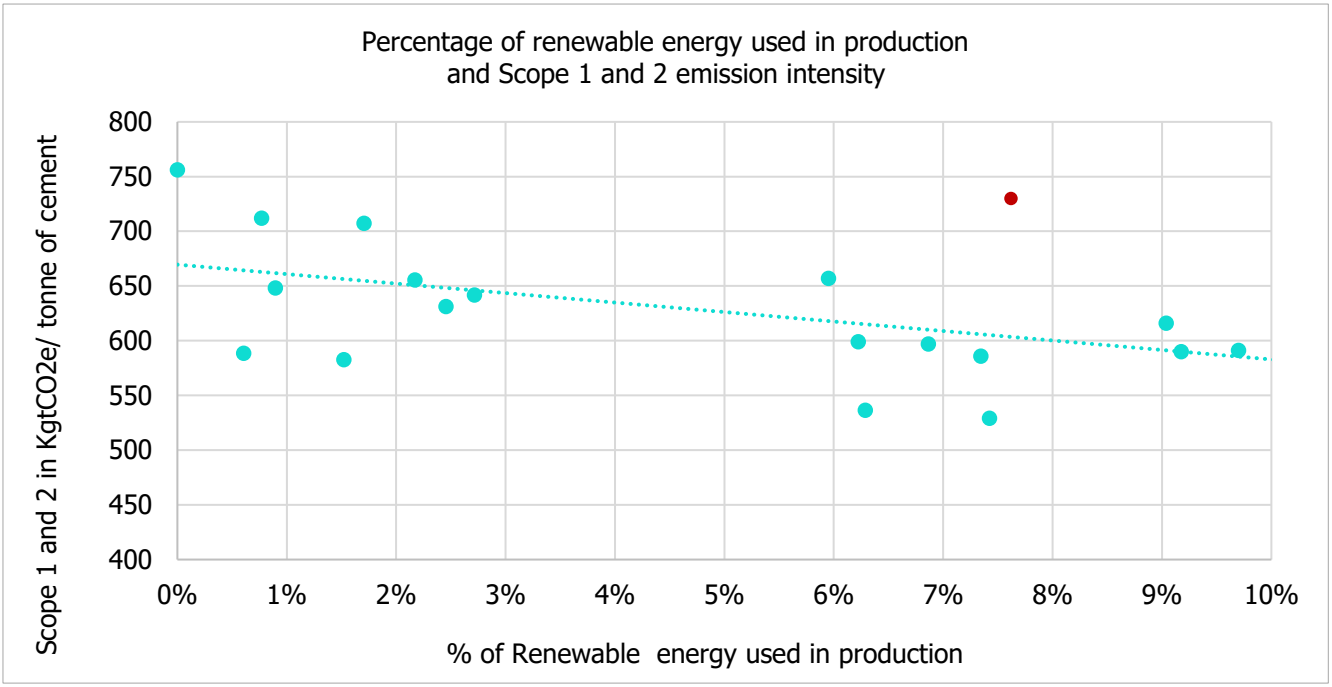




Within Scope 1, absolute emissions from the sample increased from 184 million metric tonnes (MMT) of CO_2e in FY22 to 215 MMT in FY24. Scope-2 emissions also grew during this period. However, despite the rise in total emissions, the emission intensity per tonne of cement produced has decreased, reflecting the sector's responsible initiatives. The combined Scope 1 and 2 emission intensity dropped by 9% from FY22 to FY24, driven by improvements in production efficiency and emission reduction efforts measures.

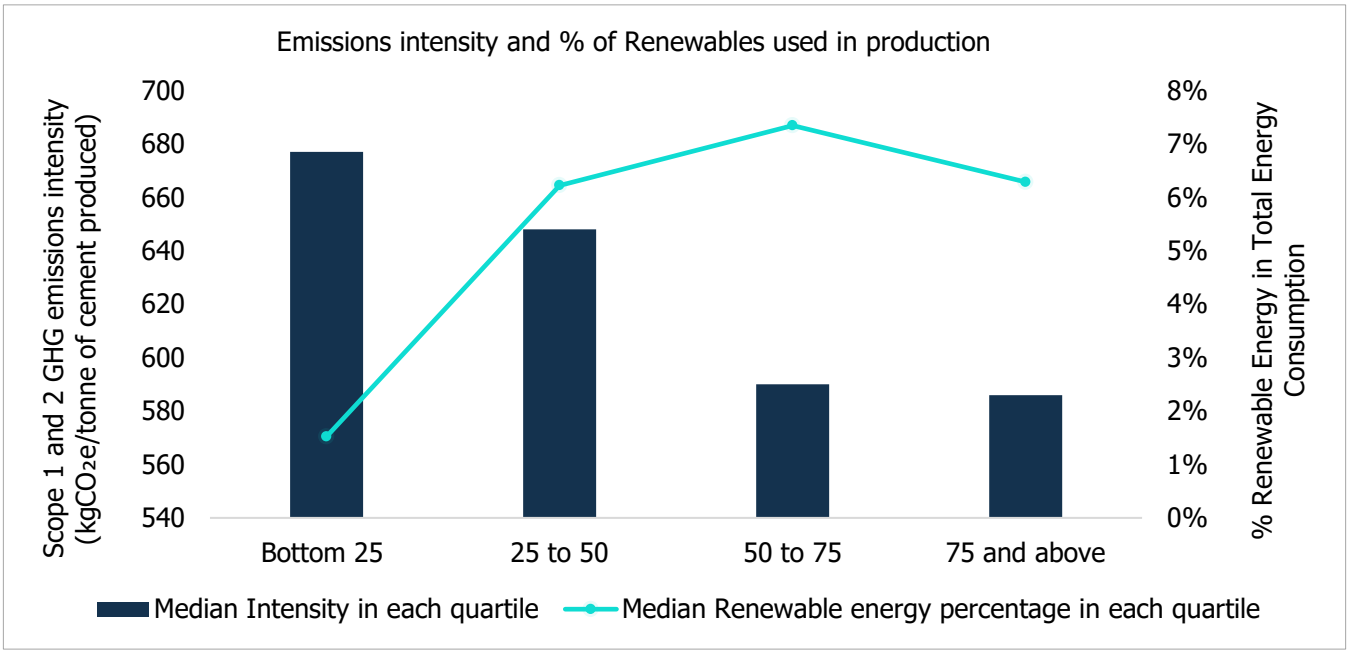
Renewable Energy incorporation in Production

One of the key factors contributing to the decline in emission intensity could be the increased adoption of renewable energy within the sector. The median contribution of renewable energy usage rose from 5.70% in FY23 to 6.26% in FY24. The charts below illustrate a consistent inverse relationship between the share of renewable energy in total energy consumption and emission intensity (measured in Kg CO_2e per tonne of cement produced). It demonstrates that with increasing use of renewable energy, the emissions intensity of cement produced decreases.



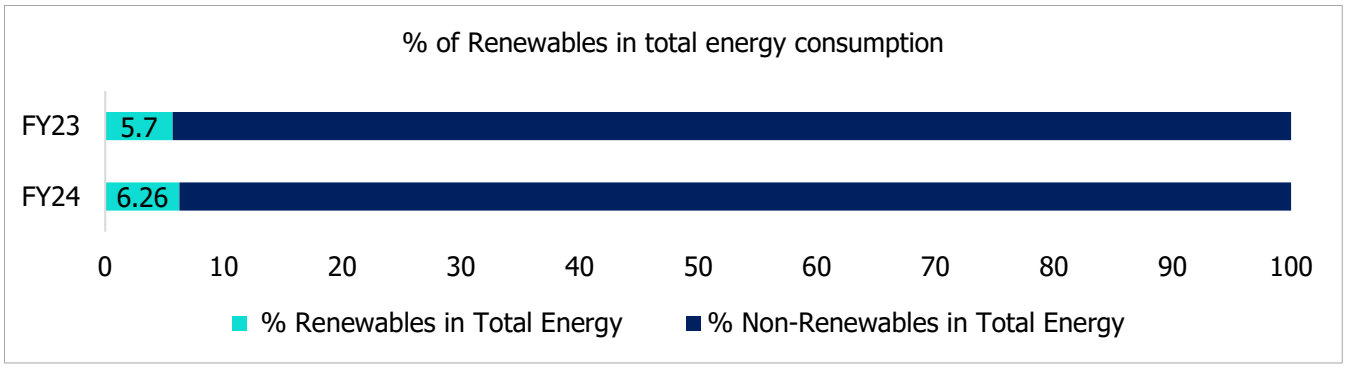
The red dot represents an outlier entity. The data appears inconsistent with the analysis

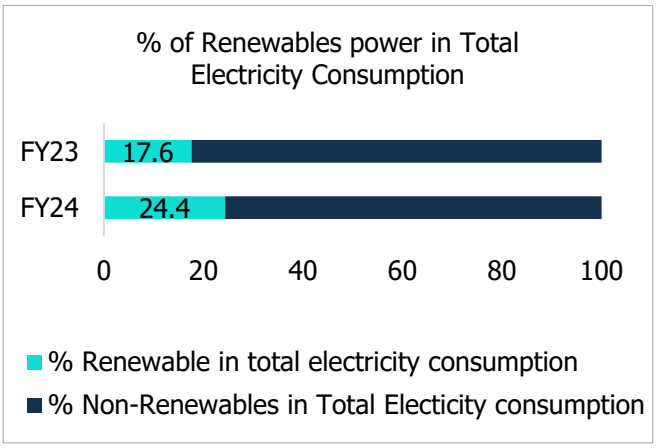
The analysis below segments companies into production-based quartiles (N=20), revealing that those with above-median production tend to use more renewable energy and exhibit lower emission intensities.

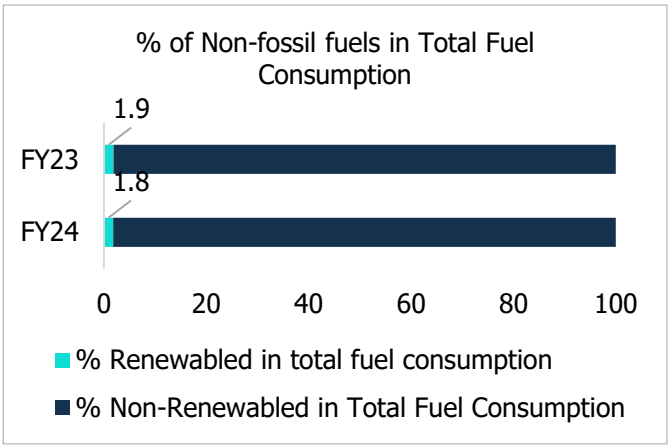


Interestingly, although the highest-producing companies make up about 50% of total output in the sample, their use of renewable energy is still lower than that of companies in the third quartile. Since the top five companies alone represent nearly half of the country's cement production—and a large portion of sector emissions—it is essential for them to boost their adoption of renewable energy to reduce overall emissions.

Data demonstrates that the adoption of renewable energy in the Indian cement sector has progressed more in electricity use than in fuel. The share of renewables in electricity consumption has increased significantly, supported by solar power and waste heat recovery systems (WHRS).





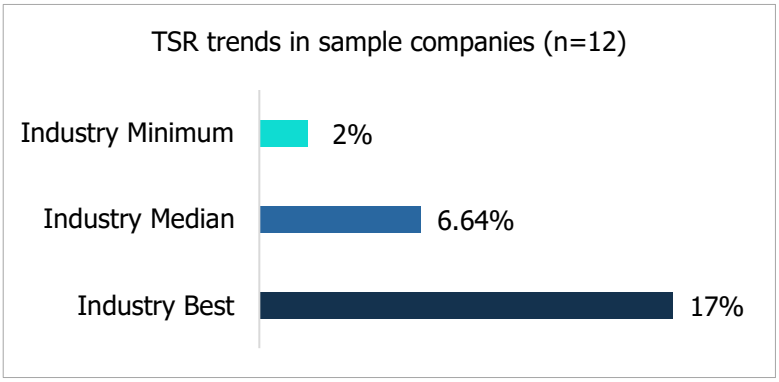


In contrast, fuel consumption remains predominantly fossil-based, with coal and pet-coke continuing as the primary fuels for clinker production. Hence, the transition to renewable alternatives has been limited.

Thermal Substitution Rate

Although many cement companies have begun using alternative fuels—such as municipal solid waste (MSW), industrial waste, used tyres, and biomass—for thermal substitution in kilns and pre-calciners, overall adoption remains limited. This is mainly due to challenges related to availability, cost, logistical constraints, and the need for pre-processing before these fuels can be utilised effectively.

The extent of thermal power replacement through alternative fuels is measured by the Thermal Substitution Rate (TSR). In the study sample of 20 companies, 12 reported their TSR, based on which the following observations have been made.



CareEdge-ESG sees India's cement industry at a pivotal stage, poised for rapid growth while sharing the burden of the country's decarbonisation efforts. Analysing leading cement firms shows notable advancements in lowering emission intensity, mainly through better energy efficiency and more renewable electricity adoption. However, despite progress in reducing emissions per tonne of cement and increasing renewable energy use, there is still a long path ahead. The industry remains largely reliant on fossil fuels, with minimal adoption of cleaner options like biomass or waste-based fuels. A few companies account for most production and emissions, and their decisions will significantly influence the industry's efforts at decarbonizing itself.

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