Build Ahead
WITH xynteo

GREEN PREMIUMS ON CEMENT CONSUMPTION

THOUGHT STARTERS FOR THE CONSUMERS
OF GREEN MATERIALS

1.1 EXECUTIVE SUMMARY

This is the decade of climate action and large-scale green markets for construction materials are expected to become a reality. To help consumers prepare for this reality, Xynteo has dug into the cement manufacturing process, analysed potential premiums associated with ‘greening’ cement, and explored how this impact can be passed through to end users. Although green premiums are likely unavoidable over the next 10 years, we believe that clearly establishing a link between climate action and costs will allow stakeholders like real estate developers, financiers and building occupiers take preparatory measures and even help them thrive in a new market. Real estate developers and financiers who are developing a green offering or preparing go-to-market strategies look poised to benefit.

Cement manufacturers should align their emission intensity goals to science-based targets or carbon intensity benchmarks. The Government of India will soon require the cement sector, among 3 others, to not only declare emission intensity but also participate in the Indian Carbon Markets (ICM). This will mean adhering to carbon intensity benchmarks by 2024-25 and trading credits in the ICM by 2026. Manufacturers whose intensities are above the benchmarks will be required to purchase credits, while those performing better than the benchmarks, can sell the credits.

Significant emissions reduction is possible without cost increase. The cement industry has the potential to reduce 30% of Scope 1 and Scope 2 emissions in the near term with solutions that are readily available, and which may not lead to price increases . However, efforts may be required to set up new supply chains or seek regulatory support to implement some of these measures.

Willingness to pay a ‘green premium’ is growing. Our analysis suggests that net-zero[1] cement will attract between 10-27% premiums, it would only result in a 1-3% increase in construction costs while helping abate 40-70% of embodied carbon in buildings. Moreover, Xynteo analysis of consumer sentiment indicates a willingness to pay a premium between 5-10% for sustainable construction. This means that it is possible for consumers to pay for these extra costs if they can be shown a clear benefit to opting for green buildings and construction.

1.2 INTRODUCTION TO THE INDIAN CEMENT INDUSTRY

The Indian cement industry underwent a period of de-consolidation between 2008-2014, in which several regional players added new production capacity. Since 2014, the industry has reconsolidated and was accompanied by entry to new players like JSW Cement, Nirma, Emami and Adani.

---

[1] Net Zero across this document is used with respect to the industry and its products and relates to reduction of CO2 emissions from cradle-to-gate, to zero. Carbon capture is amongst the actions included to reduce emissions to zero however, offsetting measures such as nature-based solutions or tree planting are not included.

[2] Blended cement – Green, durable and sustainable: GCCA (2022)

However, the combined capacity of these new players represents around 10% of the total market. Limited resources and high land acquisition costs makes the entry of new players prohibitive, meaning the market is envisaged to remain fragmented in the future. Barriers to new entrants are also high due to limestone being now available only through auction processes.

Today, India is the second largest cement producer in the world, after China[2] and it has evolved to become one of the best in terms of energy efficiency, quality control and environmental improvement. In line with a projected increase in the development of infrastructure and 'smart' cities in India, cement production in the country is expected to reach 725 million tonnes by 2028[3].

The production of cement accounts for 5% of India's greenhouse gas emissions[4]. In modern cement plants, the production of one tonne of cement on average leads to 0.64 tonnes[5] of CO2 being emitted.

Almost 50% of India's cement plants are under 10 years old and therefore use modern technology[6]. Emissions intensity per tonne of cement produced decreased by 5% between 2010 and 2017, mainly due to increased adoption of energy efficient technologies, increased use of alternative fuels, reduction in clinker factor, and an increase in the production of blended cements[7]. Major alternative fuels used include tyre chips, sludge, biomass including animal wastes and rice husk, plastic bags, and municipal solid waste[7].

1.3 WHAT IS A GREEN PREMIUM AND WHY SHOULD WE EXPECT IT?

> *"What is the difference in cost between a product that involves emitting carbon and an alternative that doesn't? This difference in cost is what I call the Green Premium, and understanding it is key to making progress on climate change."*
> *-Bill Gates*

Traditional industrial processes have not factored the true economic and environmental costs of options like fossil fuels and therefore do not reflect in the price we pay for them. In most cases, clean solutions are more expensive than high-emissions ones, in part because they involve moving away from existing fossil-fuel supply chains, investing in new assets, re-skilling people, and importantly, gaining the trust of end consumer markets on the performance of the green product.

In the cement industry, it is however possible to continue 'greening' cement by various cost-effective levers such as transitioning to lower clinker content cements, adopting various energy efficiency measures, using cleaner kiln fuels or using renewable power and still incur

---

3 IBEF: Indian cement industry (https://www.ibef.org/industry/cement-india)
4 Decarbonising India: McKinsey Sustainability
5 Xynteo analysis of Blended cement GCCA report
6 https://www.keralaenergy.gov.in/files/Resources/Cement_Sector_Report_2018.pdf
7 http://www.ciiwasteexchange.org/doc/afr2018.pdf

no premiums. Beyond this point, a manufacturer must resort to capital intensive levers like carbon capture to remove the residual GHG emissions. This will significantly add to the green premium as and when implemented.

An overview of the assumptions around these technology levers[8] required for production of net-zero cement are:

- **Adoption of blended cements:**

  The calcination of limestone in the clinker production process emits around 56%[9] of carbon dioxide, which is inherent to the process and hence, hard to abate. Therefore, strategies to reduce the overall clinker factor should directly address process emissions. Xynteo's analysis suggests that the use of blended cements[2] like Portland Pozzolana Cement (PPC), Portland Slag Cement (PSC), composite cements, and more recently, LC3, will move the needle away from Ordinary Portland Cement (OPC) production and help reduce the average industry clinker ratio from ~69%[10] at present to 50% by 2050. These measures would result in ~12-13% emission reduction over entire life cycle.

- **Best Available Technology (BAT):**

  These are a bouquet of low-cost, low-carbon solutions that are commercially available today that focus on:

  - reducing clinker use through modifying product specifications,
  - reducing electrical and thermal energy consumption through efficiency measures
  - replacing fossil fuel burning with cleaner fuels (e.g., biomass, Refuse Derived Fuels)
  - replacing coal-based power consumption with renewable energy
  - These levers combined would result in ~16-17% emission reduction over entire life cycle.

- **Carbon capture solutions:**

  CO_2 capture technologies separate carbon dioxide from gas streams that are released from industrial processes such as during oil refining, iron and steel manufacturing, and cement production. Since the cement process releases low purity CO_2, separation along with cooling and compression is required for the CO_2 stream. The capture efficiency in such process can go up to 90%. It is expected that the residual process emissions of up to ~70% would need to be managed by such carbon capture systems. It is expected that the residual process emissions of up to ~70% would need to be managed by such carbon capture systems.

---

8 Low Carbon Technology Roadmap for the Indian Cement Sector, WBSCD-CSI (2018)

9 Evaluating Net-zero for the Indian cement industry: CEEW (2023)

10 Cement Manufacturer's Association: https://www.cmaindia.org/indian-cement-sector-hallmark-of-energy-efficient-operations. This represents top 5 manufacturers by capacity totalling 45% of manufacturing capacity

1.4 WHEN WILL WE START SEEING GREEN PREMIUMS AND WHAT ARE CONTRIBUTING FACTORS?

Xynteo conducted an analysis of the Indian cement sector where it looked at the average sector emissions, potential decarbonisation pathways and associated costs for implementing various technology levers while following SBTi 1.5^{0}C targets. It was recognised that while every organisation would have a unique path to decarbonise, it was equally important to track overall sector progress and devise a sectoral pathway that would help frame policy. This sectoral pathway considers existing types of cement available in the market and uses the timing and scale of low carbon technology implementation to compute long-term costs and determine expected premiums at every point in time through NPV analysis. The analysis does not consider the introduction of newer types of cements in the future since they would if anything be low-carbon and only reflect a potential upside for the sector. The premiums would also depend on the cost of finance when implementing capex intensive solutions like carbon capture. For this analysis, the effect of carbon taxes (which can add to premiums) was ignored assuming that a cement production that is following SBTi trajectory is not required to pay it.

Exhibit 1 depicts various technology implementation scenarios up to 2050. Except for carbon capture, every other lever follows a cost reduction curve. The expected premium is plotted on a timeline to understand potential inflection points. We observe 2033 as the year from which it is no longer possible to stay within SBTi thresholds with only a blended cement production strategy or BATs but requires compulsory use of carbon capture solutions.

%PREMIUMS (Unless Otherwise Specified)	2023	2032	2033	2043	2050
Adoption of blended cements	-4.3%	-5.2%	-5.3%	-6.5%	-7.0%
Best Available Technology	-8.5%	-10.4%	-10.6%	-12.9%	-14%
Carbon capture solutions*	-%	-%	26% to 43%	26% to 43%	26% to 43%
Expected premiums	-12.8%	-15.6%	10.1% to 27.1%	6.6% to 23.6%	5.0% to 22.0%
Sector intensity achieved (kg CO_2/kg cement)	616**	436	166 to 0	116 to 0	93 to 0
SBTi pathway (kg CO_2/kg cement)	616**	438	413	169	93

* Carbon capture entails significant capex and is expected to be funded through concessional finance. The premiums are net of such concessions. The indicated range depends on the decarbonisation pathway chosen and scale of CCS implemented.
** The figures are based on last available figures from GCCA report. Updates in this figure (possible lower values) is unlikely to change the materiality of the outcome

Exhibit 1: Xynteo analysis on contributing factors towards green premiums for cement

Summary of results:

Adoption of blended cements and BATs leads to cost savings when implemented. It is possible to therefore reduce up to ~30% emission intensity by 2032 while theoretically incurring negative premiums. This insight is very useful for manufacturers looking for ways to achieve their short-term emission goals. However, frontier solutions like carbon capture solutions (CCS), which are key to eliminating emissions are not expected before the early part of the next decade (~2033) due to high technology costs, lack of storage facilities, transport infrastructure, and undeveloped public policy. Even if all these challenges are resolved, CCS will still add between 26-43% (net of concessional finance), depending upon the decarbonisation pathway chosen.

The analysis suggests that it could be several years before the entire industry is able to produce net-zero emission cement, but greener cement varieties can certainly be expected in the near-term some of which may even be cost effective.

Implication of results:

- The analysis can support efforts to establish green cement definitions, which will evolve over time as they follow a science-based industry decarbonization pathway. For example, in 2032, cements that have an intensity in the ballpark of 400 - 480 kgCO_2/kg cement may be considered green but would require intensities of 100 - 127 kgCO_2/kg or lower to be considered green in 2043.
- Since the cost of producing green cements in the near-term would not require any premiums, this can be a cue for manufacturers to prepare themselves for regulatory oversight on emission reduction.

1.5 WHAT HAS BEEN THE MARKET RESPONSE TO ADOPTION OF GREEN OR SUSTAINABLE PRODUCTS

- Consumer Awareness:

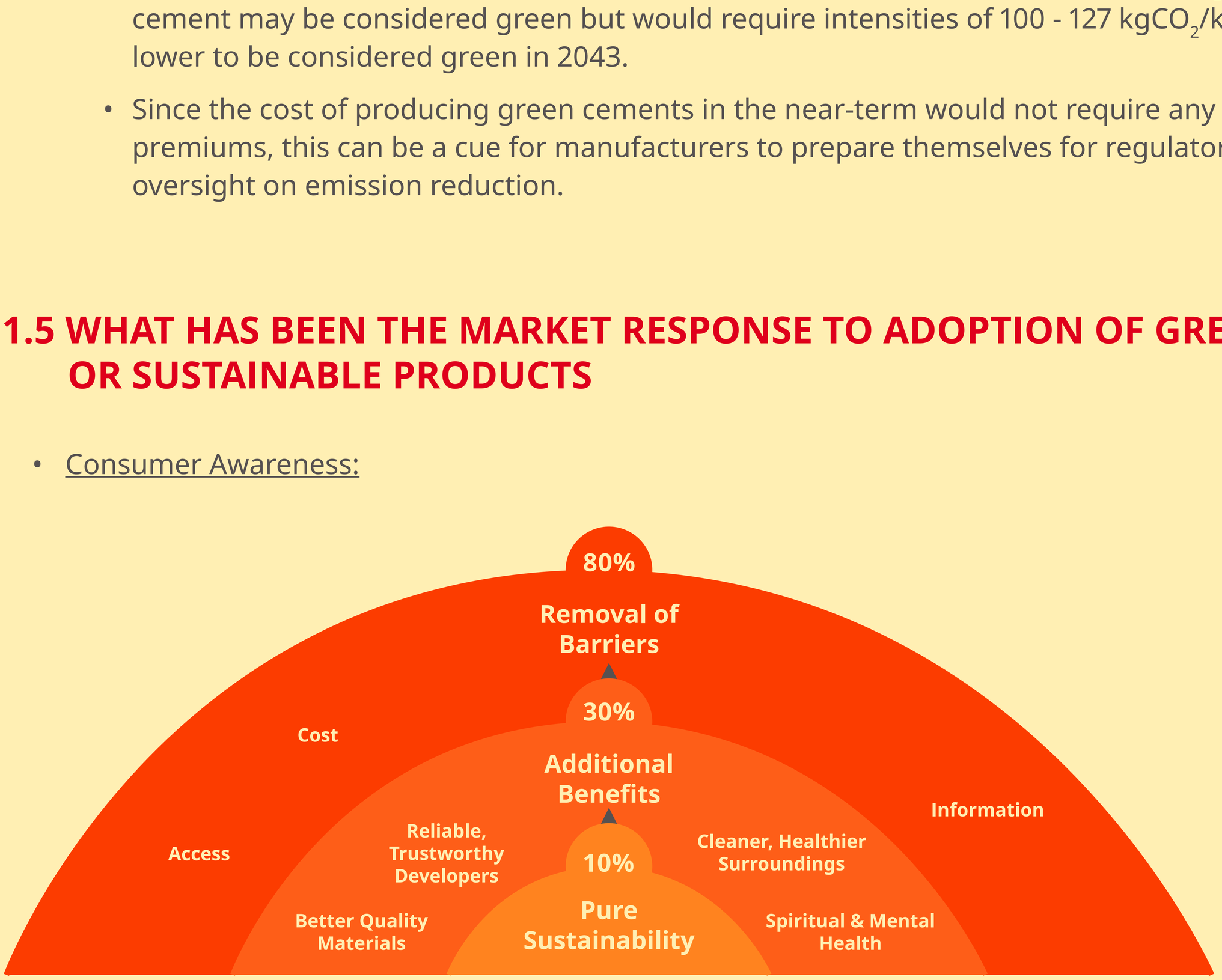

Exhibit 2: Consumer Survey Analysis

Various consumer surveys[11] have indicated that the target consumer group for sustainable products can be expanded to include a wider consumer base if fundamental consumer needs are addressed. While only 10% of consumers are likely to adopt a product based purely on sustainability claims, adoption rises to 30% when sustainability is linked to additional consumer benefits like health, safety, and quality. Adoption climbs up to 80% when barriers around access, cost, and information are removed. Targeted consumer marketing can be a powerful tool to systematically communicate benefits and remove barriers to adopting green cements. Refer to our consumer survey report to learn more.

- Corporate Awareness:

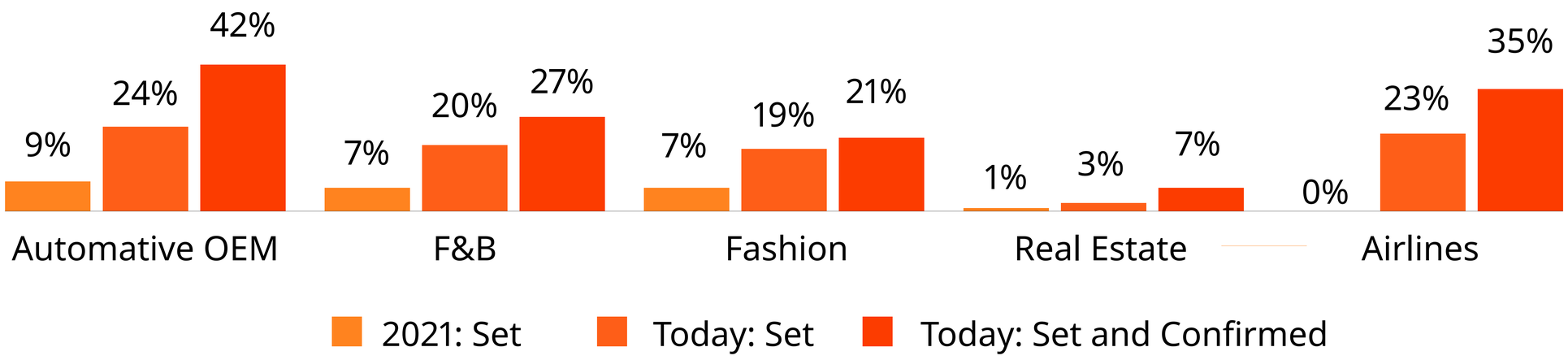

Exhibit 3: Market share of companies with upstream scope 3 SBTi commitments across sectors[2]

Leading corporates across various industries that control significant portions of global supply chains have taken a proactive stance in setting scope 3 targets. Despite cement contributing up to 7%[12] of global emissions, only 7% of real estate sector companies have committed to SBTi targets. A higher level of commitment can help drive demand for green cements and may even reduce costs.

1.6 WHAT IS THE IMPACT OF GREEN PREMIUMS ON END-USERS?

Studies estimate that 68%[13] of all cement consumption in the country is for real estate, 22%[3] for infrastructure and only 10%[3] for industrial projects. Therefore, it is crucial for real estate and infrastructure developers to adopt green cement and understand the cost implications to determine go-to-market strategy. Xynteo conducted an independent analysis to assess the impact of green cement premiums on construction costs.

Exhibit 4 demonstrates the impact of replacing OPC cement in these construction projects with a net-zero cement and studying its impact on embodied carbon reduction in the entire asset. The cost impact of this change is factored into the total construction costs to determine the premium to construction companies and cost of carbon abatement for end users.

---

11 Winning in Green Markets: Scaling Products for a Net Zero World: World Economic Forum (2023); Xynteo analysis

12 Transition to Net Zero Cement, McKinsey (2022)

13 Research and Markets, “India Building Construction India Databook Series” (2020)

	Asset Class	Description	Assumptions	Embodied Carbon Savings	Construction Premiums	Effective Carbon Price
REAL ESTATE INFRASTRUCTURE	**Residential – Multi-storey**	Housing Society in Andhra Pradesh	a. Analysis of specific sample projects (costs and quantities from their Bill of Quantity) b. Substitution of current Indian cement (0.616 tCO2/t cement) with net-zero cement c. 10% price premium for net-zero cement	~19 Kg CO_2/ sq. ft (- 48%)	~$0.17/sq. ft OR ~₹14/sq.ft (+ 1.0%)	$9/ton CO_2 ₹747/ton CO_2
	Office Space	Office Project in Pune		~ 39 Kg CO_2/ sq. ft (- 66%)	~$0.22/sq. ft OR ~₹18/sq.ft (+ 1.0%)	$6/ton CO_2 ₹498/ton CO_2
	Cement Concrete Roads	Typical four-lane cement concrete roads in urban area		~1.05 tCO_2/m (-72%)	~$16/m OR ~₹1,330/m (+ 3.4%)	$15/ton CO_2 ₹1,245/ton CO2
	Flyover	Typical two-lane flyover in urban area		~12 tCO_2/m (- 42%)	~$176/m OR ~₹14,600/m (+ 1.2%)	$15/ton CO_2 ₹1,245/ton CO_2

Exhibit 4: Xynteo analysis on emission savings and construction premiums in a cross-section of assets

Summary of results:

- Use of net-zero cement can reduce embodied carbon between ~40-70% across major asset classes while only impacting construction costs by 1-3.5%. These construction premiums appear in line with global assessments by the World Economic Forum[14]
- Real estate assets typically see much lower cement use compared to infrastructure assets, which is reflected in the form of lower end user price.

Implication of results:

- There are a few regulatory levers that can be used to offset the impact of net-zero cement premiums, for example, an additional ~3.5% of the investment outlay for roads can be funded from capital pool created from carbon tax collection from the sector.
- The additional costs ($6-$9/ton) can easily be passed on to end users in the form of sustainability premiums through targeted consumer marketing by creating sufficient end user awareness as indicated in section 1.4.

[14] https://www.weforum.org/publications/net-zero-industry-tracker-2023/in-full/cement-industry-net-zero-tracker/

1.6 THE WAY FORWARD

There is an undeniable opportunity to construct more than 50%[15] of the current built environment in a green manner over the next decade in India. While the prospect of green premiums can appear daunting to begin with, concerted action amongst different stakeholder groups can significantly push the needle in terms of increasing use of green construction materials and reducing costs. Programs like Build Ahead enable such action by intelligently designing collaborative engagements to solve challenges that are too complex for any one stakeholder to take on alone. Based on insights from such coalitions, various stakeholders can take the following steps:

- By private procurers:
    - Join forces with peers to announce procurement targets (like Build Ahead, ConcreteZero, First Movers Coalition). This will signal strong demand and encourage manufacturers to make large investments and reduce end-user price
    - Showcase early success through pilots projects and demonstrate the value proposition of their projects to peers and end users. This would help clearly communicate how green procurement is directly translating into green construction. Some interesting project archetypes can be as below:
        - » Net-zero buildings/infrastructure: Demonstrate through multi-stakeholder collaboration and focus on impact measurement, how buildings and infrastructure of the future can create demand for green materials.
        - » Low-carbon material/technology catalogue: Create a catalogue of technology interventions suitable for the Indian built environment with a focus on emission impact measurement and comparability with current techniques.
    - Explore ways of aligning project environmental benefits with public sustainability initiatives like Green Credits
- By public procurers:
    - Announce public green procurement programs that encourage suppliers to:
        - » declare emission data, and
        - » avail preferential treatment for greener products. The cost of such benefits maybe recovered from carbon management programs like Indian Carbon Markets or through differential taxation.
    - Join programs like Industrial Deep Decarbonisation Initiative by Clean

---

15 Building Stock Modelling: AEEE

Energy Ministerial to commit to buying programs or The Asia Pacific Green Public Procurement Network to benefit from knowledge sharing from programs in other economies.

- By investors:
    - Develop financial products that align incentives with the sustainability impact of green construction material claimed by developers
    - Introduce knowledge of global markets to align or raise ambition levels of borrowers. This could be done through partnerships with multilaterals or global financial institutions.

AUTHOR

Satyaki Dey, *Manager, Xynteo*

ACKNOWLEDGEMENTS

We are grateful to the Build Ahead coalition partners
for the guidance and inputs that helped to shape this paper.

Build Ahead

WITH xynteo

xynteo.com

MUMBAI
WeWork, C-20, G Block,
Bandra Kurla Complex,
Bandra East Mumbai,
Maharashtra 400051, India

LONDON
17-18 Britton Street,
London, EC1M 5NZ,
United Kingdom

GURUGRAM
The Executive Center,
Level 6, DLF Down Town,
Block - II, DLF City Phase III,
Sector 25 A, Gurugram, 122002