

Low Carbon Technology Roadmap for Paper Sector



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Introduction

Paper sector is one of the fast-growing industrial sectors in India. Increasing population and literacy rate, growth in GDP, improvement in manufacturing sector and lifestyle of individuals account for the growth in the paper industry of India. Indian Paper industry plays a key role in the Indian economy, with a contribution of around Rs. 500 billion to the GDP and its contribution to the exchequer is around Rs. 45 billion. The paper production in India is likely to grow at 6% CAGR and the expected paper production in India by year 2030 will be around 39 million tonnes.

As the sector has significant impact on the environment, the future growth of paper industry is intrinsically related to the issue of global warming and energy security. Indian paper mills by year 2030 is likely to have CO₂ emission of 70 million tonne which contributes nearly 1.2% of total CO₂ emitted by the country. Globally there are many initiatives being undertaken by governments, association and other key stakeholders to address the environment and social concern for the industrial sectors. One such initiative taken by Cement Industry with support of all stakeholder is development of “Low Carbon Technology Roadmap 2050.”

This roadmap outlines an action plan for specific stakeholders to show the short and longer term priorities to reach at pre-set emission reduction. It also establishes a strategy to support industry in decoupling its expected future growth rates from growth in CO₂ emissions, primarily through the implementation of energy efficiency measures and equipment, switching to less CO₂ intensive energy sources, change in raw material ratio and applying new technologies (where possible).

Objective of Low Carbon Technology Roadmap

Low Carbon Technology Roadmap for the Cement industry, jointly developed by International Energy Agency (IEA) and the Cement Sustainability Initiative (CSI) of World Business Council for Sustainable Development (WBCSD) in consultation with Confederation of Indian Industry (CII) & National Council of Cement & Building Materials (NCBM) and supported by International Finance Corporation (IFC).

This roadmap aims to identify technologies (especially those with particular relevance to India), supportive policy frameworks and investment needs that could lead to direct emission reduction of about 0.28 tCO₂/t cement produced – i.e. from 0.63 tCO₂/t cement in 2010 to 0.35 tCO₂/t cement in 2050. Such a reduction in emission intensity would limit the growth in CO₂ emissions from the cement industry to between 100% and 240% compared to the current level.

This roadmap sets a strategy for the cement sector to achieve the decoupling of expected cement production growth from related direct CO₂ emissions through the use of four levers: improving energy efficiency, switching to fuels that are less carbon intensive, reducing the clinker to cement ratio, and implementing emerging and innovative technologies such as carbon capture.

Carbon Emission Reduction Levers

Improving energy efficiency: deploying existing state-of-the-art technologies in new cement plants and retrofitting existing facilities to improve energy performance levels when economically viable.

Switching to alternative fuels (fuels that are less carbon intensive than

conventional fuels): promoting the use of biomass and waste materials as fuels in cement kilns to offset the consumption of carbon-intensive fossil fuels. Wastes include biogenic and non-biogenic waste sources, which would otherwise be sent to a landfill site, burnt in incinerators or improperly destroyed.

Reducing the clinker to cement ratio: increasing the use of blended materials and the market deployment of blended cements, to decrease the amount of clinker required per tonne of cement or per cubic meter of concrete produced.

Using emerging and innovative technologies: that contribute to the decarbonisation of electricity generation by adopting EHR technologies to generate electricity from recovered thermal energy, which would otherwise be wasted, and support the adoption of renewable-based power generation technologies, such as solar thermal power. Integrate carbon capture into the cement manufacturing process for long-lasting storage or sequestration.

To support these four carbon emission reduction lever – A set of technical papers produced for the Indian Cement Industry titled as “Existing & Potential Technologies for Carbon Emissions Reductions in the Indian Cement industry”. It consists of 27 technical papers which outlines the current status of the technology, the impact on energy consumption, anticipated benefits from implementation, the CO₂ reduction potential, main parameters influencing implementation, cost estimation, and the conditions, barriers and constraints of implementation. For the more futuristic technologies, where quantification is difficult, a qualitative summary is provided instead, indicating those technologies felt to be promising for future implementation and emissions

reductions potential. Few of them are listed below:

1. Electrical & Thermal Energy Efficiency Improvement
2. Energy Efficiency Improvement in Power Plant
3. Increased Renewable Energy Used
4. Utilization of Advanced Automation System
5. Alternative de-carbonated raw materials
6. Fuel Cell Technology
7. Waste Heat Recovery
8. Futuristic Communication Technologies

Roadmap Action Plan & Milestone (Years indicated in bracket)

<p>Alternative Fuel & Raw Material</p>	<p>Implement appropriate policies and practices to facilitate increased use of AFR, and address public and market barriers for co-processing of AFR (2012-2023)</p> <p>Identify and classify suitable materials for AFR use (2012-2020)</p> <p>Disseminate information on existing AFR best practices and R&D already undertaken, including identification and mitigation of risks (2012-2050)</p>	<p>Further analysis to identify the right feed point for any specific AFR material and enforce quality control systems for AFR materials used (2020-2030)</p>
<p>Thermal & Electrical Energy Efficiency</p>	<p>Ensure financial support and incentives are in place to enable major retrofits in older cement plants. Eliminate energy subsidies that can act as barriers to implementation (2012-2040)</p> <p>Sustain funding to move from pilot to demonstration for fuel cell technologies, futuristic communication technologies and new types of low-carbon cement (2012-2035)</p> <p>Gather reliable industry-level energy and emissions data to track performance, identify benchmarks and set targets (2012-2050)</p>	
<p>Clinker Substitution</p>	<p>Develop standards and implement regulation for clinker substitutes, composite cement and Portland Limestone Cement (2012-2025)</p> <p>Continuous R&D to allow increased availability, and ensure quality of blending materials and clinker substitutes (2012-2050)</p> <p>Conduct R&D to enhance lime reactivity of dump ash/pond ash, activation of granulated slag, and to prove viability of blending materials from non-ferrous industries and mineral processing industries (2012-2045)</p>	<p>Update and revise standards to account for new blending sources (2025-2050)</p>
<p>Waste Heat Recovery</p>	<p>Further R&D to support the maximization of power generation from WHR systems (2012-2025)</p> <p>Ensure attractive financial incentives to enable widespread implementation of WHR (2012-2050)</p>	<p>R&D to decrease investment costs and promote the use of appropriate technology (2025-2050)</p>
<p>Carbon Use & CCS</p>	<p>R&D to support the use of CO₂ for algal growth at cement plants (2012-2030)</p> <p>Oversee a near-term approach to facilitate development and finance for demonstration of carbon capture and storage technologies (2012-2050)</p> <p>Participate in the demonstration of a full-scale post-combustion cement plant and development of a pilot oxy-fueled cement plant (2012-2025)</p>	<p>Commercialization of CO₂ use for algae growth (2030-2050)</p> <p>Participate in the demonstration of a full-scale oxy-fueled cement plant (2025-2035)</p> <p>Continue to accelerate commercial deployment of CCS (2035-2050)</p>

Policy Regulatory & Frameworks, Finance and International Collaboration

National and international policy frameworks, as well as close co-operation between private and public stakeholders, are needed to achieve the carbon emissions reductions outlined in the vision for this roadmap. These efforts involve multiple levels of action including those of municipal bodies, regional authorities, national governments, supranational bodies and global institutions.

- Promote the adoption of state-of-the-art energy efficiency technologies for new and retrofit plants
- Encourage and facilitate increased use of alternative fuels and alternative raw materials
- Support development and deployment of emerging and innovative low-carbon technologies for cement production including carbon capture, storage and utilisation
- Enhance research and development capabilities, skills, expertise and innovation
- Encourage international collaboration and public private partnership

Conclusion

Low Carbon Technology Roadmap for Cement sector is one of the largest industry/private led initiative for greenhouse gas mitigation close to 0.5 billion tonne of CO₂. This initiative is very well recognized by Government & International agencies. Similar opportunity exists for Paper Industry in India to Develop Low Carbon Technology for the sector collaborative with all stakeholders. It will set example for other countries to follow on similar path to make paper production more sustainable.

Low Carbon Technology Roadmap will help sector in various ways

- Key policy intervention necessary for the sector to accelerate the use of low carbon technologies
- Evaluating the financial requirements and carbon emission reduction potential of the sector in implementing various technologies
- Identifying various challenges and barriers to accelerate the implementation of technologies from technical, financial & policy perspective
- Identifying the scalability potential of the technology in context to Indian scenario and assessing the impact of carbon emission reductions (including GHG benefits)
- Development of sectoral benchmark based on best practices adopted by companies
- Become Cost Competitive
- Enhance research & development capabilities, skills, expertise & Innovation
- Encourage International collaboration and public private partnerships

Source: Low Carbon Technology Roadmap for the Indian Cement Sector by WBCSD.

