

Decarbonisation of Indian Pulp and Paper Industry



Ecopreneure

This report presents a strategic roadmap for transforming India's pulp and paper sector in alignment with the nation's ambitious climate goals.

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Founder's Note



At Ecopreneure, we believe that industrial decarbonisation is not just a climate imperative but also a strategic lever for economic resilience and global competitiveness. This report on the decarbonisation of the Indian pulp and paper sector underscores our commitment to catalyzing low-carbon transitions in traditionally hard-to-abate industries. The sector, with its deep linkages to forestry, agriculture, and manufacturing, holds immense potential to lead India's net-zero ambition through innovation, circularity, and sustainable value chains. Our roadmap highlights both the urgency and the opportunity—calling for targeted policy reform, green finance mobilisation, and technology adoption at scale. We hope this work inspires action among policymakers, industry leaders, financiers, and innovators alike. Together, we can co-create a cleaner, more efficient, and future-ready pulp and paper ecosystem that contributes meaningfully to India's climate goals and industrial growth. We look forward to continued collaboration in driving this vision forward.

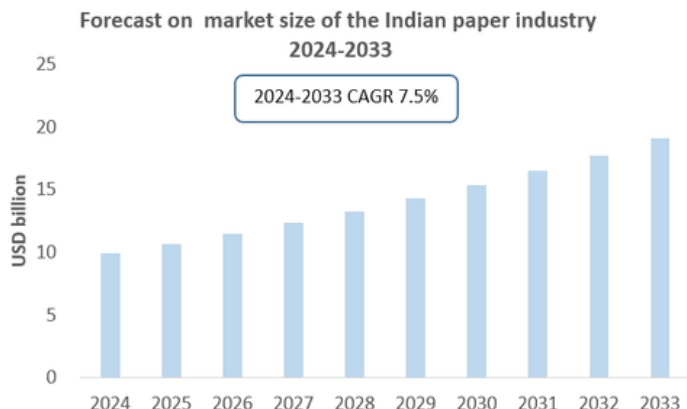
Rajiv Ranjan

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Industry Overview

As of 2025, India's pulp and paper industry is one of the largest in Asia, comprising over 550 mills across wood-based, agro-residue-based, and recycled fibre segments. The sector produces approximately 25 million tonnes of paper annually, with demand expected to grow at a CAGR of 6–8%, driven by rising consumption in packaging, hygiene products, and education. Major clusters are located in Gujarat, Maharashtra, Tamil Nadu, and Uttar Pradesh. Large integrated mills contribute nearly 30% of national output, while small and medium enterprises (SMEs) dominate in volume but face technological and environmental challenges. The sector is energy- and water-intensive, and contributes around 1% of India's total greenhouse gas emissions. However, it has made strides in energy efficiency through the PAT Scheme and increased use of biomass and wastepaper. With growing sustainability mandates and the onset of India's carbon trading framework (CCTS), the sector is poised for structural transformation toward low-carbon production.

According to CRI's forecast, the market value of the Indian paper industry will be USD 19.1 billion in 2033 and is expected to grow strongly from 2024 to 2033 at a CAGR of around 7.5%.



Here are 5 key points summarizing the Indian Pulp and Paper (P&P) Industry:

- Fragmented Structure & Raw Material Dependence:** The Indian P&P industry is highly fragmented with 550 out of 850-900 mills operational, mostly small and medium-scale. It heavily relies on recycled fiber (47%), followed by wood/bamboo (31%) and agro-residues (22%). Raw material costs are substantial (45-50% of revenue), and the industry's conventional technologies lead to high consumption of resources and significant effluent loads.
- Significant Economic Contributor Facing Challenges:** India is the 5th largest producer globally, contributing 5% to world production, with a turnover of Rs. 70,000 crores. However, it faces closures and disruptions due to raw material scarcity, intense import competition (imports doubled in four years to 2.05 million tonnes in FY25), especially from China and ASEAN, which offer lower prices and superior quality, making domestic mills uncompetitive.

- Robust Market Growth Driven by Packaging:** The Indian paper market is one of the fastest-growing globally, with per capita consumption projected to rise by 10.6% from 2025-2032. This growth is primarily driven by the increasing demand for packaging solutions from e-commerce, food delivery, and FMCG sectors, further propelled by government regulations against single-use plastics. Education sector expansion and rising hygiene awareness also contribute to demand.

- Decarbonization Challenges and Opportunities:** The fragmented nature, coupled with economic pressures from imports, significantly hinders industry-wide decarbonization efforts. Small and medium mills often lack capital and expertise for expensive technological upgrades. While market trends push for sustainability (e.g., eco-friendly packaging), adopting green practices adds operational costs, creating a "green premium" gap that requires tailored policy support and incentives to facilitate a broader green transition.

- Key Players Leading Sustainability Efforts:** Prominent companies like JK Paper Ltd., West Coast Paper Mills Ltd., ITC's Paperboards and Specialty Papers Division, and Century Pulp & Paper are crucial in shaping the industry's response to market demands and sustainability. These major players are investing in capacity expansion and sustainability initiatives, setting benchmarks and driving the overall green transition within the sector.

Baseline Emission

Understanding the current energy consumption patterns and emission sources is fundamental to developing effective decarbonisation strategies for the Indian pulp and paper industry. This section details the sector's environmental footprint, energy profile.



01 Current GHG Emissions Profile

The Indian Pulp & Paper sector is a significant contributor to the nation's greenhouse gas (GHG) emissions. In 2019, the industry was responsible for approximately 30.5 million tonnes of CO₂, constituting 1.09% of India's total net GHG emissions. The average emission intensity for the sector stood at 1.58 MTCO₂e per tonne of paper produced.

Projections indicate a concerning rise in emissions under a Business as Usual (BAU) scenario, with forecasts reaching around 70 million tonnes by 2040—a substantial 129% increase from 2019 levels. However, an ambitious Deep Decarbonisation scenario could significantly limit this increase to just 15% by 2040, capping total emissions at 35 million tonnes, and reducing emission intensity to 0.62 MTCO₂ per tonne (a 61% reduction).

Given India's growing paper demand, the core challenge is to decouple production growth from increasing absolute GHG emissions. This demands transformative changes in fuel mix and core processes, moving beyond mere incremental efficiency gains to ensure the sector contributes positively to India's broader climate goals.

02 Fuel and Energy Consumption Patterns

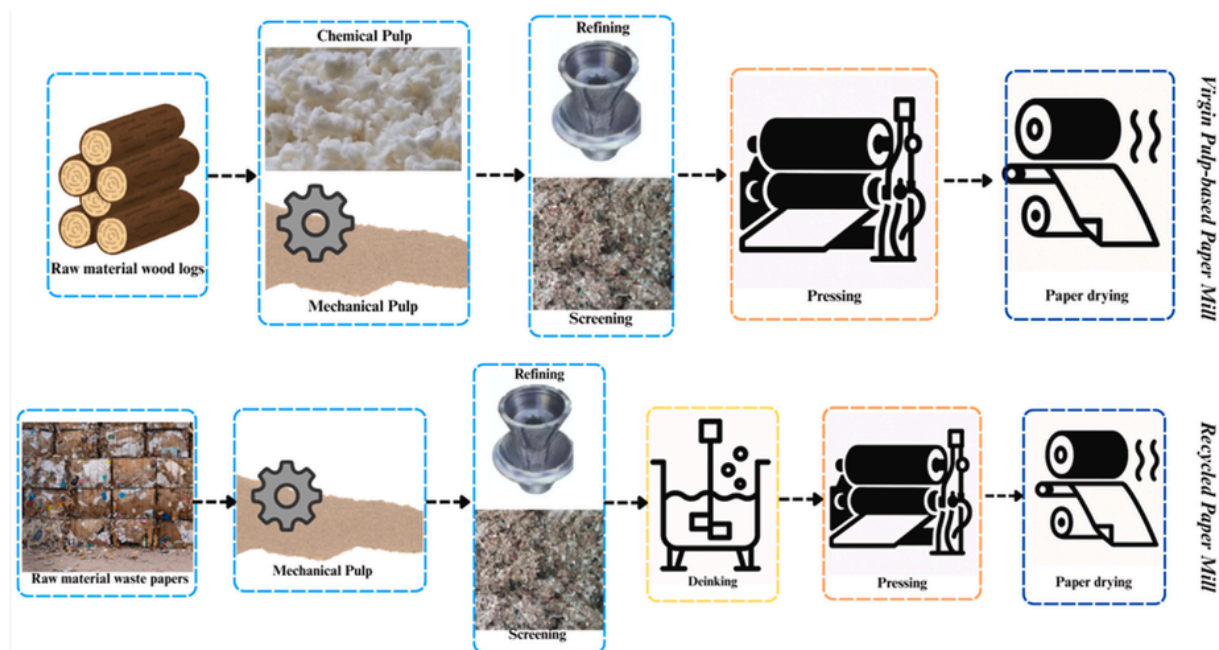
The Indian pulp and paper industry is among the top five most energy-intensive sectors globally. Its energy consumption averages 34.3 to 50 GJ per tonne of paper, nearly double North American and Scandinavian standards, using 11-15 tonnes of steam and 1,300-1,700 kWh of electricity per tonne. The energy mix is heavily reliant on fossil fuels (over 68% coal and petroleum), with 75% used for thermal processes below 250°C, presenting an opportunity for solar thermal adoption.

Energy costs account for 16-25% of production expenses, a figure projected to rise. Total energy consumption is forecast to increase from 730 PJ/annum in 2020 to 1702 PJ/annum by 2030, leading to a rise in GHG emissions from 76 million tCO₂ in 2020 to 164 million tCO₂ in 2030. Despite past reductions (20-25% over a decade), high energy intensity inflates operational costs, impacting competitiveness. Energy efficiency, therefore, offers significant economic and environmental benefits for decarbonization.

03 Process-wise Emission Sources

The pulp and paper industry's environmental footprint extends beyond GHG emissions to significant air and water pollution. Emissions stem from energy-intensive processes like pulping, drying, and bleaching, as well as inherent chemical reactions. Air pollutants include carbon monoxide, SO₂, NO_x, VOCs, and particulate matter. Kraft pulping is a major source of malodorous TRS compounds (0.3–3 kg/tonne ADP).

Wastewater effluent, ranging from 20–250 cubic meters per tonne of dried pulp, contains high levels of BOD, COD, SS, and toxic compounds like chlorinated organics and dioxins (0–4 kg/tonne ADP), severely impacting aquatic life. Decarbonization strategies, such as energy efficiency and cleaner fuels like bio-CNG, offer co-benefits by reducing these local air and water pollutants, enhancing environmental quality and public health. This integrated approach can improve the industry's social license and regulatory compliance.



Major energy-consuming processes that contribute to the sector's emissions profile include:

- Pulp making and processing: The initial stages of breaking down raw materials into pulp.
- Water treatment: Processes involved in managing the large volumes of water used.
- Steam & power generation: On-site generation often relies on fossil fuels.
- Effluent treatment: Managing wastewater.
- Wood chipping and pulping: Mechanical and chemical processes to prepare raw materials.
- Drying: The most energy-intensive step, involving significant water evaporation.
- Bleaching and washing: Chemical treatments to achieve desired pulp brightness.
- Boiler feed water heating: Preparing water for steam generation



Decarbonisation Pathways

Achieving deep decarbonisation in the Indian pulp and paper sector necessitates a multi-faceted approach, integrating proven energy efficiency measures with advanced fuel switching, process innovations, and nascent carbon capture technologies. Each pathway offers distinct benefits and challenges, contributing synergistically to the overall reduction of the industry's carbon footprint.



01

Energy Efficiency Measures

- Optimized equipment (e.g., vacuum blowers, shoe presses)
- Advanced process control and automation
- Comprehensive heat recovery and management
- Boiler and kiln optimization (e.g., micro-turbines, oxy-fuel burning)
- Improved screening and filtering in recycling processes

02

Fuel Switching

- Biomass utilization (black liquor, wood waste, paper sludge)
- Bio-CNG adoption
- Green hydrogen integration

03

CHP

- Steam Turbine Cogeneration (Back Pressure & Extraction)
- Gas Turbine with Heat Recovery Steam Generator (HRSG)
- Biomass-Fired CHP Systems (using black liquor, wood chips, bark)
- Waste Heat Recovery Boilers (WHRBs)
- Organic Rankine Cycle (ORC) Systems
- Combined Cycle Gas Turbine (CCGT) Systems
- Condensate and Flash Steam Recovery Systems
- High-Efficiency Multi-Effect Evaporators (for black liquor concentration)

04

CCUS

- Post-Combustion CO₂ Capture (Amines)
- BECCS (Bioenergy with Carbon Capture and Storage)
- Calcium Looping
- Oxy-Fuel Combustion
- Membrane-Based CO₂ Separation
- Geological CO₂ Storage (Saline aquifers, depleted fields, basalt formations)

05

Process Innovations

- Enzyme-based Bleaching
- Closed-Loop Systems

Decarbonisation Technologies for Indian Pulp and Paper Industry: Cost-Benefit and Emission Reduction Potential

Technology / Pathway	Description	Cost-Effectiveness	Emission Reduction Potential	Technological Readiness Level (TRL)	Key Benefits (Beyond Emissions)	Key Challenges / Barriers to Adoption
Energy Efficiency Measures (EEMs)	Equipment upgrades, heat integration, waste heat recovery, process optimization, EMS	Highly cost-effective; low investment; quick payback (1–5 years)	Up to 62% in BAU; 36% in deep decarbonisation ; 5–45% for specific measures	TRL-5 (Fully Commercial)	Lower OPEX, improved process stability, quality, safety	Technology obsolescence in SMEs, skill gaps
Fuel Switching (Biomass)	Replacing fossil fuels with black liquor, wood waste, sludge	Feasible; dependent on feedstock availability and sustainability	Up to 40% fuel-based; 17–21% sector-wide reduction	TRL-5 (Fully Commercial)	Utilizes waste, reduces fossil dependency, promotes circular economy	Sustainable biomass supply, upfront conversion cost
Fuel Switching (Bio-CNG)	Biogas from anaerobic digestion of organic waste for thermal or motive power	Economical (\$0.65–\$1.15/GGE)	20–95% reduction in GHG and air pollutants (CO ₂ , NO _x , CO)	TRL-5 (Fully Commercial)	Clean energy, better waste management, job creation	Feedstock sourcing, infra, gas storage & grid integration
Fuel Switching (Green Hydrogen)	Use of green hydrogen in boilers or combined heat and power (CHP) systems	Currently expensive (\$4–6/kg); projected \$2–3/kg by 2030	Up to 100% combustion emission reduction (if green H ₂)	TRL-3 to 4 (Emerging)	Enables deep decarbonisation , long-term fuel switch, industrial resilience	High cost, low infra, storage & safety concerns
Enzyme-Based Bleaching	Using biocatalysts to reduce chlorine and chemical bleaching load	Not widely commercial; lower chemical costs in long run	15–17% chlorine reduction; 25–30% AOX reduction	TRL-3 to 4 (Pilot scale)	Improves effluent quality, reduces toxic discharge, improves brightness	Low awareness, limited scale-up in Indian mills
Closed-Loop Water Systems	Recycling and reusing process water; minimal discharge	Moderate; savings from reduced water treatment and civil infra	COD reduction (35–40%); major water & effluent footprint reduction	TRL-5 (Fully Commercial)	Lower water intake, improved chemical efficiency, better compliance	Fouling, microbial issues, corrosion
Carbon Capture & Storage (CCS/BECCS)	Capturing and storing CO ₂ from combustion or recovery boilers	High Capex & Opex (₹2000–3200/tonne CO ₂)	50–90% capture; up to 60% (BECCS in recovery boiler systems)	TRL-3 (Pilot stage in India)	Potential for net-negative emissions (via BECCS), global climate alignment	No mature projects in India, high cost, transport & storage gaps
Waste Heat Recovery & Cogeneration	Combined Heat and Power (CHP) using steam or flue gas recovery	Very cost-effective; 3–10 months payback (case-based)	31,000–35,000 tCO ₂ e/year savings in mill-scale projects	TRL-5 (Fully Commercial)	Up to 85% system efficiency, lower fuel use, economic co-benefits	Retrofit constraints in older mills, maintenance

Policy and Regulatory Landscape

An enabling policy and regulatory environment is crucial for accelerating the decarbonisation of the Indian pulp and paper industry. Such frameworks are essential for addressing market failures, incentivizing private sector investment, and ensuring a structured transition towards a low-carbon future.

India has implemented several national policies aimed at enhancing energy efficiency and promoting renewable energy, which directly impact the pulp and paper sector's decarbonisation efforts.

Perform, Achieve & Trade (PAT) Scheme

The Perform, Achieve, and Trade (PAT) scheme, under India's Ministry of Power, incentivizes energy efficiency in high-consumption industries like pulp and paper. Mills consuming over 30,000 TOE annually are assigned reduction targets, with overachievers earning tradable Energy Saving Certificates (ESCerts). In PAT Cycle 1 (2012–2015), 31 pulp and paper mills surpassed their targets, achieving 0.289 million TOE savings—30% above the goal—resulting in Rs. 95,000 million in cost savings and 31 million tonnes of CO₂ avoided. However, studies indicate PAT drove only initial improvements, without sustaining long-term declines in energy intensity for the sector.

Renewable Energy Certificates (REC)

The Renewable Energy Certificate (REC) mechanism, established by the Central Electricity Regulatory Commission (CERC), promotes renewable electricity generation by enabling producers (with a minimum capacity of 250 kW and no other subsidies) to earn

RECs for each megawatt-hour (MWh) of power generated. These RECs can be traded on Indian power exchanges. The Electricity Act, 2003, supports this by mandating Renewable Purchase Obligations (RPOs), requiring distribution companies to source a specific share of their electricity from renewables.

Carbon Credit Trading Scheme (CCTS)

India is in the process of developing its own carbon market, with the CCTS legislated in 2022. The pulp and paper sector is one of eight heavy industrial sectors included in this compliance mechanism. The scheme assigns GHG Emission Intensity (GEI) reduction targets to individual plants, allowing them to purchase carbon credits if they exceed their targets or earn and sell credits if they achieve reductions beyond their targets. The CCTS is expected to begin trading existing RECs and ESCs by 2025, with these becoming Carbon Credit Certificates by 2026.

Environmental Compliance

India's CPCB and SPCBs enforce strict environmental norms for the pulp and paper industry, covering water, air, and waste pollution. These include effluent limits, emission caps, and mandatory monitoring systems. Compliance challenges, especially for smaller mills, highlight the need for green technologies that align environmental regulation with decarbonisation and sustainability goals.

The following table summarizes the CPCB environmental standards for the industry:

Pollutant Type	Parameter	Standard Limit	Applicable Mill Size/Type
Water Effluent	pH	7.0 – 8.5	Large Pulp & Paper / Newsprint / Rayon Grade (>24,000 MTPA)
	BOD (3 days @ 27°C)	30 mg/l (inland surface water discharge)	Large Pulp & Paper / Newsprint / Rayon Grade (>24,000 MTPA)
		30 mg/l (inland surface water discharge)	Small Pulp and Paper (<24,000 MTPA)
		100 mg/l (disposal on land)	Small Pulp and Paper (<24,000 MTPA)
	COD	350 mg/l	Large Pulp & Paper / Newsprint / Rayon Grade (>24,000 MTPA)
	Suspended Solids (TSS)	500 mg/l	Large Pulp & Paper / Newsprint / Rayon Grade (>24,000 MTPA)
		100 mg/l	Small Pulp and Paper (<24,000 MTPA)
	AOX (Absorbable Organic Halogens)	1.0 kg/ton of product	Large Pulp & Paper / Newsprint / Rayon Grade (>24,000 MTPA)
		1.5 kg/ton (initial), 1.0 kg/ton (from 2008)	Large Pulp & Paper (>24,000 MTPA)
		2.0 kg/ton of paper produced	Small Pulp and Paper (<24,000 MTPA)
	Wastewater Flow	200 m ³ /ton (paper)	Large Pulp & Paper
		150 m ³ /ton	Large Rayon Grade Newsprint
		150 m ³ /ton	Small Agro-based Mills (from Jan 1992)
		50 m ³ /ton	Small Waste Paper-based Mills (from Jan 1992)
Air Emissions	Particulate Matter (PM)	250 mg/m ³ (normal)	Large Pulp & Paper
		150 mg/m ³ (normal)	Large Pulp & Paper
	H ₂ S	10 mg/m ³ (normal)	Large Pulp & Paper
	General Air Pollutants (SO ₂ , NO _x , VOCs, PM)	As per CPCB norms	All Mills

Green Finance outlook

Mechanism / Finance Type	Relevance to Pulp & Paper Industry in India	Key Benefits
Green Bonds (International + India)	Funding clean tech, renewable energy, water treatment	Growing market in India; sovereign and corporate green bonds gaining traction; improving ESG disclosures
Climate Funds (GCF, GEF)	Grants/concessional finance for decarbonisation projects	Indian access to multilateral funds growing but competitive; supports pilot and scale-up projects
Sustainability-linked Loans (SLLs)	Loans linked to emission reduction and resource efficiency	Indian banks increasingly offering SLLs; focus on measurable KPIs and renewable energy adoption
Carbon Markets & Offsets	Selling emission reductions from energy efficiency, afforestation	India's emerging voluntary carbon market; evolving regulatory framework; opportunity for P&P sector to generate credits
Development Finance Institutions (DFIs)	Financing and technical support for green infrastructure	Active presence in India (IFC, ADB, World Bank); co-financing and risk mitigation support available
Export Credit Agencies (ECAs)	Financing imports of clean machinery and technology	Growing ECA support for Indian green tech imports; helps reduce upfront cost barriers
Blended Finance	Combining concessional and commercial funds for projects	Increasing use in India to mobilize private capital; emerging partnerships for industrial decarbonisation
Sustainable Supply Chain Finance	Incentivizing sustainable forestry and raw material sourcing	Still nascent in India but gaining attention; linked to corporate ESG and responsible sourcing initiatives

Best Practices

Best Practices Indian Examples

Energy Efficiency & Heat Recovery

JK Paper Ltd.: Installed heat exchangers to capture thermal energy from effluent, reducing steam use by 25% and saving 31,000 tCO₂/year.

Boiler System Upgrades

Seshasayee Paper and Boards Ltd. (SPB): Converted AFBC boiler to spouted bed combustor, improving steam output and shutting down inefficient units, cutting 35,000 tCO₂/year.

Water Treatment & Closed-loop Systems

Akshera OCC Mill: Adopted anaerobic biological treatment system (BIOPAQ®ICX), enabling zero-discharge operations and odor-free paper without tertiary treatment.

International Best Practices Examples

Fuel Switching to Biomass

Sweden: Replaced fossil fuels with biofuels (e.g., black liquor, bark), reducing emissions by 80% in the sector and integrating district heating.

Carbon Capture Technologies

Canada: Leading BECCS pilots (e.g., CO280, Svante, Mantel) to capture biogenic CO₂ from recovery boilers, aiming for negative emissions.

Innovation in Dry Papermaking

PulPac, Sweden: Developed dry moulded fiber technology that eliminates water use in forming, saving up to 90% of drying energy.

Electrification & Chemical Recovery

Japan: Piloting compact CO₂ capture at pulp mills (Hokuetsu), electrifying dryers, using black liquor for combined heat and power, and promoting sustainable forestry.



Challenges & Enablers

The transition to a low-carbon pulp and paper industry in India is fraught with challenges but also presents significant opportunities. Addressing these aspects systematically is crucial for effective implementation of decarbonisation strategies.

Technical Barriers:

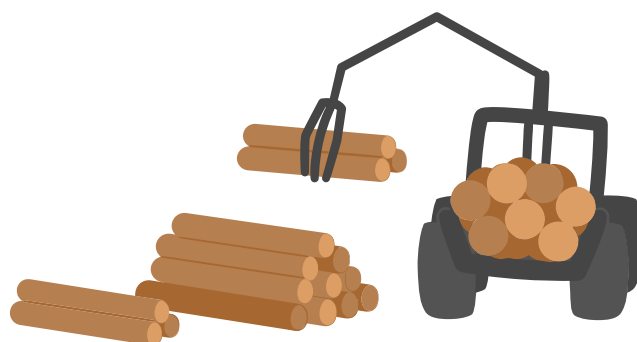
- **Technological Obsolescence:**
 - Many mills, especially small and medium agro- and wastepaper-based units, use outdated technology.
 - Current systems are around 30 years behind global standards, resulting in lower energy efficiency and higher emissions.
- **High Cost of New Technologies:**
 - Advanced methods such as direct electric heating, solar thermal, gas-fired dryers, and CCUS demand high capital outlays.
 - Smaller mills with limited funds find it difficult to justify the investment.
- **Raw Material Variability:**
 - Inconsistent quality and availability of wood, non-wood fibers, and recycled wastepaper hinder process optimization.
 - Variability impacts energy efficiency and final product consistency.
- **Process Complexity:**
 - Multiple stages (pulping, bleaching, drying) require complex integration of new, efficient systems without compromising operations.

- **High-Temperature Heat Needs:**

- There is a lack of breakthrough technologies to efficiently decarbonise high-temperature processes such as those in lime kilns.

Skill and Knowledge Gaps:

- **Training Deficit:**
 - Absence of targeted training programs or ITIs in the pulp and paper domain limits skilled manpower.
- **Operational Inefficiencies:**
 - Inadequate technical know-how leads to poor maintenance practices and higher energy consumption.
- **Limited R&D:**
 - Few in-house R&D efforts and minimal knowledge exchange restrict adoption of innovative practices



Supply Chain Constraints:

- Raw Material Scarcity and Costs:
 - Shortages due to logistical challenges and low domestic recovery rates increase production costs.
- Fragmented Suppliers:
 - Many small suppliers lack decarbonisation expertise and proper data management.
- Logistics Issues:
 - High freight rates and supply disruptions add to overall costs.



- **Institutional & Market Enablers:**

- Supportive Policies & Finance:
 - Fiscal measures, risk mitigation instruments, and initiatives like VGF and CCFC support innovative projects.
- Infrastructure & Regulatory Ease:
 - Improved permitting, long-term contracts, and dedicated infrastructure (for CO₂/hydrogen storage) enhance investor confidence.
- Collaboration & ESG Mandates:
 - Partnerships with research institutions and compliance with ESG frameworks drive sustainability efforts.



Roadmap to Net-Zero

Achieving net-zero emissions for the Indian pulp and paper sector by 2070, in alignment with India's national climate goals, requires a structured and phased roadmap. This roadmap integrates short, medium, and long-term goals.

Short-Term Goals (2025–2030)

Energy Efficiency Upgrades

- Retrofit mills with mature technologies: shoe presses, waste heat recovery, steam trap monitoring.
- Promote best operating practices and digital energy audits.

Biomass and Renewable Fuel Integration

- Scale up use of black liquor and woody biomass.
- Promote Bio-CNG, especially for agro-based mills.

Wastewater & Circular Resource Management

- Pilot closed-loop water systems.
- Introduce enzyme-based bleaching to reduce chemical loads and effluents.

Enhance Recycling Ecosystems

- Improve domestic wastepaper collection/sorting infrastructure.
- Introduce traceability tools and recycled content mandates.

Skill Development and Robust MRV

- Launch ITI-level training for pulp & paper technicians.
- Deploy digital MRV platforms for emissions monitoring.

Medium-Term Goals (2030–2040)

Fuel Switching

- Replace coal and furnace oil with solar thermal, biomass gasifiers, green hydrogen blends.
- Incentivise captive RE + storage solutions.

Process Modernisation

- Adopt low-carbon pulping, enzyme-based bleaching, and high-consistency drying technologies.
- Improve water reuse and zero-liquid discharge systems.

Breakthrough Tech Pilots

- Pilot Carbon Capture, Utilisation & Storage (CCUS) and BECCS in kraft-based mills.
- Explore electric boilers, hydrogen combustion, and superheated steam drying.

Scope 3 Emission Reductions

- Engage suppliers and transporters on decarbonisation.
- Launch supplier disclosure and green procurement frameworks.

Long-Term Goals (2040–2070)

Fossil Fuel Phase-Out

- Transition to 100% renewable or low-carbon fuels (e.g., green hydrogen, biomass pellets, electrification).

Commercial Deployment of BECCS

- Implement BECCS across kraft mills to achieve negative emissions.

Full Circularity & Water Neutrality

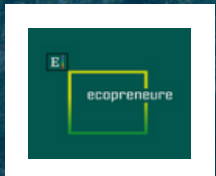
- Zero waste discharge.
- Maximise internal fiber reuse, sludge valorisation, and biorefinery co-products.



Policy Recommendations and Priority Actions

To accelerate decarbonisation in the Indian pulp and paper sector, a robust policy framework is essential. Market-based mechanisms must be strengthened—CCTS should set long-term GEI reduction targets, PAT cycles must incentivise transformative upgrades, and a stable REC market is crucial for renewable adoption. High-capex technologies like green hydrogen and CCUS require tailored Viability Gap Funding (VGF), tax incentives, and public-private partnerships (PPPs) for shared infrastructure. Mobilising green finance through green and carbon bonds is vital. Addressing SME challenges is critical: differentiated policies, technology transfer, and collective infrastructure investment can support small mills. Regulatory enforcement must be rigorous, with mandatory emissions reporting integrated into national dashboards. Strict adherence to CPCB norms and data-driven reporting will enhance environmental compliance. Finally, exporters must be equipped with robust emissions data systems to prepare for EU CBAM and similar international regulations. Together, these actions create a pathway for a low-carbon, globally competitive pulp and paper industry.

Thank You



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