

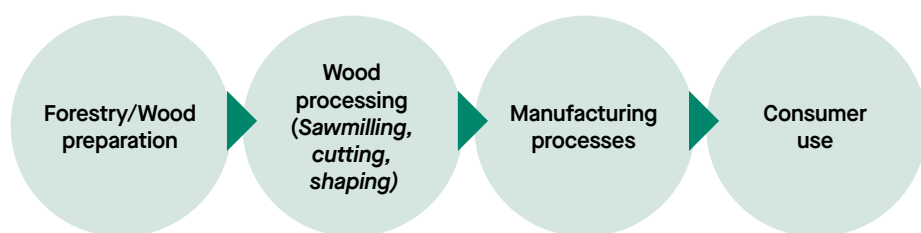
Manufacture of articles of paper and paperboard

CLIMATE & EFFICIENCY INVESTMENTS



Decarbonising paper and paperboard processing: A strategic imperative

By 2050, global roundwood consumption is projected to increase by up to 272 million m³ per year, representing growth of approximately 49% on top of already high production levels.¹ The pulp and paper industry is the largest user of virgin wood, accounting for around 13%-15% of global wood consumption.² Ongoing forest loss drives biodiversity decline, ecosystem disruption, and roughly 13%-21%³ of global greenhouse gas emissions, highlighting the need for better forest management, recycled fibre use, and efficiency across the pulp, paper, and converting value chain. Paper and paperboard processing can play a key role in decarbonisation if sustainable practices are adopted, accelerating the shift to a net-zero future while meeting rising demand for low-carbon materials.



Manufacture of other articles of paper and paperboard

The manufacture of paper and paperboard products transforms paper, corrugated materials, and pulp into boxes, cartons, envelopes, labels, moulded items, and other specialty goods. Production is typically carried

out in batches or on a semi-continuous basis, with high electricity use for equipment, printing, compressors, and dust/fibre extraction, plus thermal energy for the drying, curing, and bonding processes.

From a greenhouse gas perspective, paper and paperboard manufacturing generates **Scope 1 and Scope 2 emissions** from on-site fuel consumption and the electricity used in converting, printing, and finishing operations.

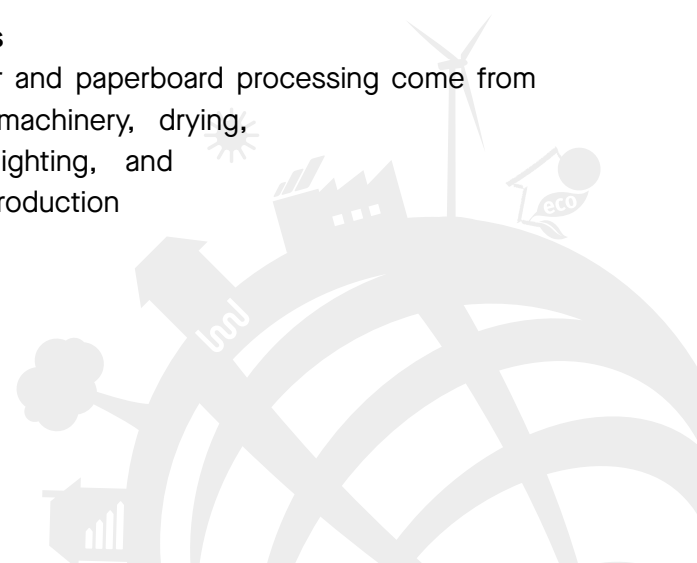
Key emissions drivers in the manufacture of other articles of paper and paperboard

Scope 1 – Direct emissions

Scope 1 emissions in paper and paperboard processing mainly come from on-site fuel combustion for drying, curing, and bonding, with additional contributions from mobile equipment and backup generators.

Scope 2 – Indirect emissions

Scope 2 emissions in paper and paperboard processing come from purchased electricity for machinery, drying, extraction, compressors, lighting, and other systems essential for production and product quality.

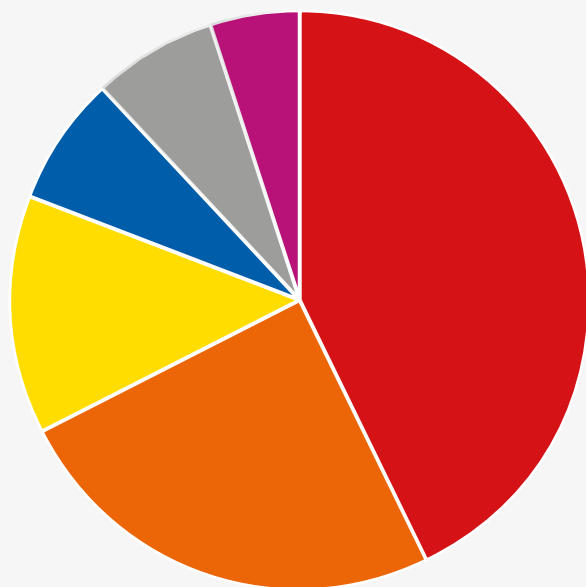


¹ The State of the World's Forests 2024

² Pulp & Paper: Forest Impacts and Consumer Power | World Wildlife Fund

³ Chapter 7: Agriculture, Forestry, and Other Land Uses (AFOLU)

Key CO₂ emissions drivers Manufacture of other articles of paper and paperboard



Key emissions drivers⁴

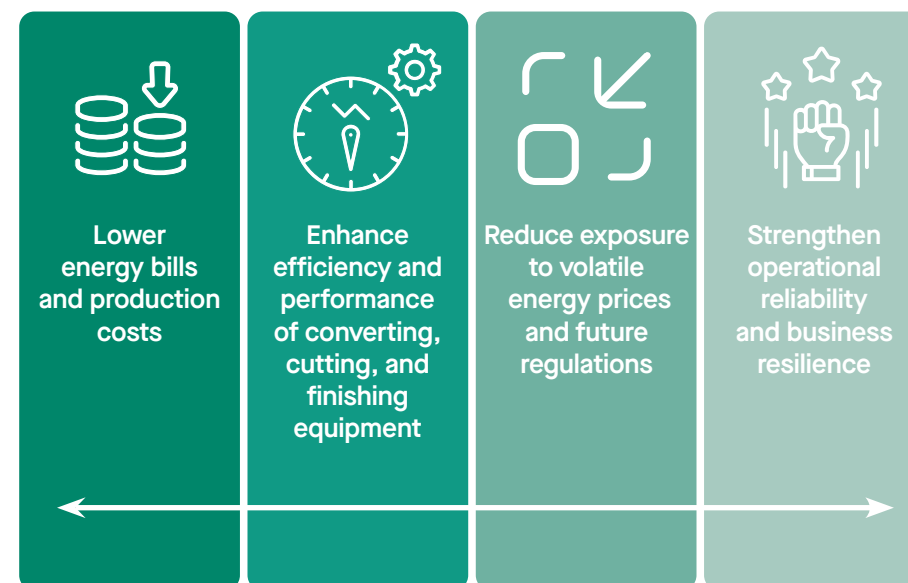
- Machine drive 42.6%
- CHP and/or cogeneration process 24.8%
- Process heating 13.2%
- Others 7.1%*
- Conventional boiler use 6.9%
- Facility HVAC 4.9%

* Facility lighting 2.7%, Process cooling and refrigeration 1.4%, Other facility support 1%, Other non-process use 0.6%, Conventional electricity generation 0.5%, Electro-chemical processes 0.4%, Onsite transportation 0.3%, End use not reported 0%

Why decarbonisation matters

Reducing on-site emissions and optimising energy use allows paper and paperboard processors to cut costs and enhance resilience, as converting and finishing operations rely heavily on electricity and fuel, making energy a major driver of both GHG emissions and production costs.

By reducing Scope 1 and 2 emissions, paper and paperboard manufacturers can:



Decarbonisation Roadmap

Manufacture of other articles of paper and paperboard				
Investment measure	Energy cost savings (%)	Payback period (years)	CO ₂ reduction potential	Benefits
CHP combustion engine	20%	3 - 4	✓	Combined heat and power (CHP) engines generate electricity and heat from a single fuel, boosting efficiency, reducing energy waste, and lowering emissions. When powered by low-carbon fuels like biogas or hydrogen, they further support a cleaner energy system.
CHP gas turbine	20%	3 - 4	✓	CHP gas turbines support net-zero goals by generating electricity and capturing waste heat, boosting efficiency. Powered by low-carbon fuels like biogas or hydrogen, they reduce emissions while providing reliable power and heat.
CHP fuel cell	20%	3 - 4	✓	CHP fuel cells support net-zero goals by generating electricity with high efficiency and supplying useful heat. Their low carbon intensity, quiet operation, and low maintenance enhance energy efficiency compared to conventional combustion systems.
Industrial process chiller	20% - 30%	Over 10 years	✓	Industrial process chillers provide precise temperature control to maintain product quality and protect equipment. Their efficient operation reduces energy consumption, promoting more sustainable operations.
Packaging machine	20% - 30%	No estimates	●	Packaging machines ensure precise, hygienic, and consistent filling and sealing of goods. They maintain product quality and safety while minimising material waste. Their energy-efficient operation reduces electricity use, promoting sustainable production.
Battery electric vehicles (BEVs)	50%	5 - 6	●	Electric vehicles offer higher energy efficiency through advanced battery systems and regenerative braking, reducing overall energy consumption during operation. They offer a clean solution for transporting products, reducing fuel costs, and improving operational sustainability.
Electric forklifts	50%	2 - 3	●	Electric forklifts are battery-powered material-handling vehicles used to move ingredients and finished products within bakery facilities. They offer high energy efficiency by converting stored electrical energy directly into motion with minimal losses. This efficiency reduces fossil fuel costs and CO ₂ emissions.
Loaders	25% - 45%	4 - 5	●	Energy-efficient loaders contribute to lower greenhouse gas emissions, reduced noise pollution, compliance with stricter emissions regulations, and overall cost reduction through lower fuel and maintenance expenses.

CO₂ reduction potential ● Very low ● Low ● Medium ✓ High

Decarbonisation Roadmap

Investment measure	Energy cost savings (%)	Payback period (years)	CO ₂ reduction potential	Benefits
PV self-consumption	Up to 100% based on the system capacity and electricity demand	6 - 7	●	A PV (photovoltaic) system converts sunlight into electricity for on-site use. It provides clean, renewable energy to power production, refrigeration, and other operations, reducing reliance on grid electricity and lowering operational costs. Pairing a PV system with battery storage enables multi-shift companies to rely on renewable electricity while reducing exposure to electricity price volatility.
Li-ion batteries	No estimates	4 - 8	No estimates	Lithium-ion (Li-ion) batteries are energy storage systems that store electricity and release it when needed. Their energy-saving potential comes from maximising the use of on-site renewable electricity, reducing reliance on grid power during peak periods. This delivers tangible cost savings through improved energy management and lower operating expenses.
Water source heat pumps	20% - 30%	Over 10 years	●	Water source heat pumps are systems that use water as a medium to efficiently transfer heat for heating and cooling. They help companies reduce energy consumption and operational costs while lowering greenhouse gas emissions.
Air-to-air heat pumps	15% - 25%	Over 10 years	●	Air-to-air heat pumps provide efficient heating and cooling by transferring energy rather than generating it. Their high efficiency reduces electricity consumption, contributing to more sustainable building operations.
Air-to-water heat pumps	10% - 20%	Over 10 years	●	Air-to-water heat pumps are systems that extract heat from the air to provide efficient heating and hot water. They help companies reduce energy use, cut costs, and lower emissions.
Ground source heat pumps	15% - 25%	Over 10 years	●	Ground source heat pumps are systems that use the stable temperature of the ground to provide efficient heating and cooling. They help companies reduce energy consumption, lower costs, and cut greenhouse gas emissions.
Ventilation system	10% - 20%	Over 10 years	●	A ventilation system manages the flow of air by bringing in fresh air and expelling stale or contaminated air to maintain a healthy indoor environment. By reducing energy use and improving air quality, efficient ventilation systems support lowering a facility's overall carbon footprint.
Building insulation materials	50%	4 - 5	✓	Building insulation reduces heating and cooling costs, boosts energy efficiency, and supports decarbonisation by lowering emissions and environmental impact.
LED lighting	5% - 10%	5 - 6	●	LED lighting provides high-efficiency illumination with lower energy consumption compared to conventional lighting solutions. Its reduced electricity demand supports decarbonisation and enhances building performance.

For more detailed information on how to reduce costs and lower your CO₂ footprint, along with additional measures tailored for your business, contact the bank.

