

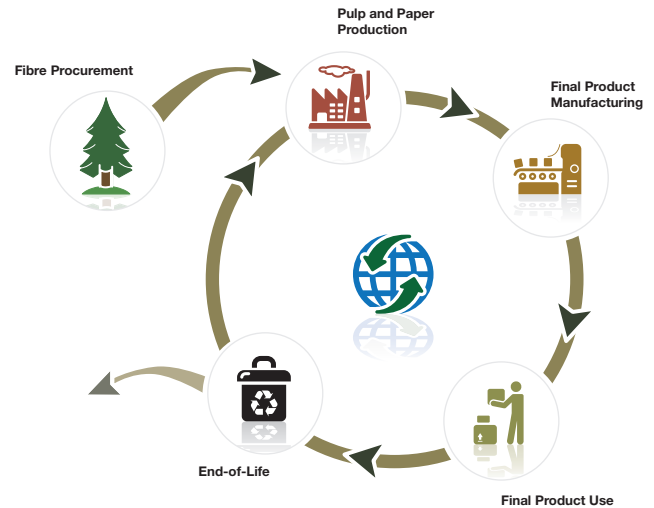
Printing and Writing Papers Life-Cycle Assessment

Frequently Asked Questions

1. What is LCA?

Life-cycle assessment (LCA) is a comprehensive environmental accounting tool with well-established procedures and methods that are governed by specific rules and standards, most notably those developed by the International Organization for Standardization (ISO). LCA use continues to increase, and there are now many experienced LCA practitioners worldwide who have successfully applied LCA across a broad range of industry sectors.

As illustrated in the diagram, LCA is an approach that analyzes the flows associated with the whole life cycle of a product or a service, usually “from cradle-to-grave,” i.e., from raw material extraction, to manufacturing, use, recovery and end-of-life (EoL). Process steps are identified for each stage in the life cycle. The inputs (materials and energy) and outputs (releases to air, water, soil, etc.) are determined for each step. The inputs and outputs are then grouped into impact categories, which are evaluated for environmental impact potential, and summarized as the basis for drawing conclusions and improving future results.



2. What types of environmental impacts does the LCA look at?

The LCA assessed environmental and health impacts in each life-cycle stage of the products studied, including global warming, smog potential, acidification, eutrophication, ozone depletion, respiratory effects and fossil fuel depletion.

3. Why did FPAC and the AF&PA conduct an LCA for printing and writing papers?

The objective was to develop the most current and comprehensive LCA representing printing and writing papers manufactured in North America. The LCA provides credible research and transparency that sets a benchmark for future studies. It will assist Forest Products Association of Canada (FPAC) and American Forest & Paper Association (AF&PA) member companies and stakeholders in making informed choices about paper and identifying opportunities for improvement. The LCA studied environmental impacts of products made from four paper grades:

- 1) A ream of office paper made of uncoated freesheet
- 2) A telephone directory made primarily of uncoated mechanical paper
- 3) A catalogue made primarily of coated freesheet
- 4) A magazine made primarily of coated mechanical paper

4. Who conducted the LCA?

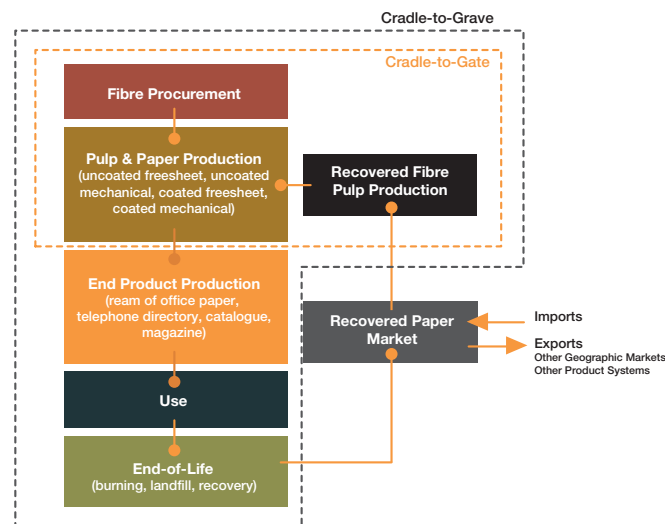
The National Council for Air and Stream Improvement, Inc. (NCASI), an independent, nonprofit research institute with technical expertise spanning the spectrum of environmental challenges facing the forest products industry. NCASI is recognized as the leading source of reliable data on environmental issues affecting this industry.

5. What was the methodology of the LCA?

The data in this study was collected from 72 mills in the U.S. and Canada, representing 77 percent of North American capacity for printing and writing papers produced in 2006-07. The LCA was conducted in conformance with the ISO 14040 series of standards for LCA and received validation by a third-party critical review panel.

6. What do “cradle-to-grave” and “cradle-to-gate” mean?

While the entire life-cycle impact of a product is captured in the “cradle-to-grave” system boundary (raw material extraction through final disposal), “cradle-to-gate” analysis isolates the impacts from raw material extraction through production of the paper, but not including the end product production. The “cradle-to-gate” data is included in the study for those who are interested just in the paper component (e.g., those who want to add their own data for printing and end product production).



7. What were the key conclusions of the study?

The LCA study concluded:

- The most significant life-cycle impacts for printing and writing papers results from the production of the paper and disposal of used paper at the end-of-life.
- The environmental impacts of paper production are largely driven by the use of fossil fuels in the pulp and paper manufacturing process.
- Increasing the use of bio-based energy sources at paper mills would reduce climate change impacts.
- Increasing the recovery rate, particularly of products that decompose readily in a landfill’s anaerobic environment (e.g., freesheet papers), would have a significant positive effect on global warming impacts.
- Avoiding landfilling of nonrecoverable paper fibre by burning with energy recovery would have a very significant positive impact on results, particularly for products that decompose readily in a landfill’s anaerobic environment.
- Transportation is not very significant in overall life-cycle impacts.



8. What is the carbon footprint for printing and writing papers?

The carbon footprint is a measure of all greenhouse gases (GHGs) produced in a product life cycle, and is measured in units of tonnes (or kg) of carbon dioxide (CO₂) equivalents. It is the impact indicator of primary interest to many stakeholders as it quantifies the global warming potential. Since most of the GHGs are produced through burning fossil fuels, the carbon footprint is primarily related to energy consumption. The LCA identifies the cradle-to-grave footprint for each of the four end products analyzed, as well as the cradle-to-gate carbon footprint for each of the four paper types.

Paper Type	Cradle-to-Gate Carbon Footprint* (kg CO ₂ eq per bone-dry short tonne)	End Product (functional unit)	Cradle-to-Grave Carbon Footprint (kg CO ₂ eq per functional unit)
Uncoated freesheet	1,194	Ream of office paper	4.25
Coated freesheet	1,469	Catalogue	4.89E-01
Uncoated mechanical	1,176	Telephone directory	2.24
Coated mechanical	1,393	Magazine	0.459

*See Printing and Writing Papers LCA Summary Report

9. What is the paper industry doing to improve its carbon footprint?

The forest products industry provides valuable solutions to climate change concerns by carefully managing private forests that absorb carbon dioxide, reducing greenhouse (GHG) emissions from manufacturing processes, manufacturing products that store carbon and are made from renewable and recyclable raw materials, as well as generating and using renewable energy. For example, the combined direct and indirect AF&PA member pulp and paper mill GHG emissions intensity (per tonne of product) has decreased 14.1 percent since 2000. Members also have reduced the amount of purchased energy and fossil fuel use per tonne of production since 1990 by 26 percent and increased the amount of energy demand met through renewable energy (mostly biomass) to over 65 percent. In 2008, the forest products industry became the leader among all manufacturing sectors in the use of highly efficient cogeneration technology. Over the last few years, despite the challenging economic climate, members have announced new multimillion dollar projects to increase the use of biofuels and cogeneration, which will contribute to even greater GHG reductions in the future.

Increasing recycling reduces emissions of methane — a powerful “greenhouse gas” — by keeping paper out of landfills where it would otherwise decay, and since 1990, paper recovery for recycling has doubled and in 2009, 63.4 percent of U.S. paper consumed was recovered — surpassing AF&PA’s 60 percent recovery goal three years ahead of schedule.

Finally, U.S. forests and forest products store enough carbon each year to offset approximately 10 percent of U.S. CO₂ emissions from all sources. The U.S. Environmental Protection Agency (EPA) estimates that the amount of carbon stored annually in U.S. forest products equates to removing more than 100 million tonnes of CO₂ from the air every year. As part of the Department of Energy’s Climate VISION program, AF&PA member companies have reduced their GHG emissions per tonne of product by 14 percent from 2000 to 2006.

The Canadian forest products industry is committed to doing its part as the world continues to address climate change. Since 1990, pulp and paper facilities have reduced their absolute (total) GHG emissions by 57 percent and their emissions intensity by 61 percent. FPAC members continue to decrease their consumption of fossil fuels by substituting renewable energy sources such as biomass-based fuels. Between 1990 and 2007, Canadian pulp and paper facilities decreased their reliance on fossil fuels from 30 percent to 15 percent, and increased their use of biomass-based fuels (including pulping byproducts and wood residuals such as bark) from 49 percent to 58 percent of overall energy requirements. In October 2007, FPAC announced that the industry would set a new bar for environmental responsibility and action on climate change: industry-wide carbon neutrality by 2015, without the purchase of carbon offset credits.





10. How does increasing the amount of recycled content change the LCA results?

The LCA study modeled industry average recycled content for each of the products analyzed. Both recycled fibre and fresh fibre from sustainably managed forests provide environmental benefits as well as potential impacts.

In the specific case of increasing recycled content beyond industry average levels, results are highly dependent on the individual production and logistics circumstances at each facility using recovered fibre. Variables include amount of recovered fibre that replaces fresh fibre, whether recovered fibre has to be transported long distances, what kind of energy is being used, and how much processing is required to achieve the end product specifications. For these reasons, it is not feasible to draw broad industry-wide conclusions about the life cycle impacts increasing recovered content in printing papers, and is outside the scope of this LCA study.

The paper fibre cycle actually depends on both fresh fibre from well-managed forests and recycled fibre from a strong recovery network. Recycled fibre alone cannot meet all the fibre supply needs since recycled fibre breaks down with each use and about 15 percent of paper products, such as tissues and documents stored for extended periods of time, cannot be recycled.

11. How does increasing paper recovery make a difference?

Paper recovery provides key benefits:

- Avoids landfilling, which saves landfill space and reduces emissions from decomposition.
- Allows valuable fibre to be reused for new products or energy production.

The LCA studied in detail how avoiding paper disposal in landfills has a large beneficial impact on global warming indicator results. The results vary depending on paper grade type. The anaerobic decomposition of paper in landfills produces methane and carbon monoxide in addition to CO₂. Paper products that are most susceptible to anaerobic decomposition are called “low carbon storage” products (e.g., products made of freesheet). These products benefit most from landfill avoidance. Increasing recovery of office paper (e.g., from 72 percent to 85 percent), decreases global warming indicator results by 25 percent. Similarly, increasing recovery of catalogues from 33 percent to 50 percent decreases global warming indicator results by about 15 percent.

Burning with energy recovery at EoL instead of landfilling can be as beneficial as recycling into new paper products. Again, low carbon storage products have the most to gain. For office paper and catalogues made of freesheet, the global warming indicator results are reduced by about 40 percent when landfilling is replaced by burning and energy recovery at EoL.

12. What is carbon sequestration?

Carbon sequestration is absorption and capture of carbon from the atmosphere. Managed forests are one of the most efficient systems for carbon sequestration. Trees capture carbon out of the atmosphere as long as they are growing, and they store the carbon for long periods, even after harvest, through product storage and paper recovery for reuse. Burning wood products as fuel releases that same carbon back into the atmosphere, resulting in a net zero carbon impact. Landfills, on the other hand, result in anaerobic decomposition, which releases methane in addition to CO₂.

13. Based on this LCA, is one paper grade better for me to use than another?

The objective of this LCA was to identify the environmental impacts associated with specific products and to make the data available for decision-makers and for future studies. It was intended to inform decision-makers where in the life cycle the most significant impacts occur and to identify opportunities for improvement. For comparative studies, the end-use requirements and comparable functional units would have to be included in the analysis.





14. How does the environmental impact of printing and writing papers compare with other communication vehicles?

This study was conducted specifically to identify the environmental impacts of four specific paper-based communication products, and does not compare impacts of other communication forms, such as electronic media. Strategies and methods for conducting such comparative evaluations could be the subjects of future research, which would be able to leverage the data from this LCA.

No matter which communication vehicle is chosen, buyers wanting to make sustainable choices should:

- Ask questions of suppliers to ensure they meet their sustainability criteria.
- Make responsible choices about product design and use to minimize potential environmental impacts (e.g., by minimizing waste and energy use).
- Make responsible choices at EoL to maximize recovery and reuse, keep useful resources out of landfills and manage toxic impacts.

15. Who are FPAC and AF&PA?

The Forest Products Association of Canada (FPAC) provides a voice for Canada's wood, pulp and paper producers nationally and internationally in government, trade and environmental affairs. The \$54 billion-per-year forest products industry represents almost 2 percent of Canada's GDP and is one of Canada's largest employers, operating in hundreds of communities and providing hundreds of thousands of direct and indirect jobs across the country.

The American Forest & Paper Association (AF&PA) is the national trade association of the forest products industry, representing pulp, paper, packaging and wood products manufacturers, and forest landowners. Member companies make products essential for everyday life from renewable and recyclable resources that sustain the environment. The forest products industry accounts for approximately 5 percent of the total U.S. manufacturing gross domestic product. Industry companies produce about \$175 billion in products annually and employ nearly 900,000 men and women, exceeding employment levels in the automotive, chemicals and plastics industries. The industry meets a payroll of approximately \$50 billion and is among the top 10 manufacturing sector employers in 48 states.