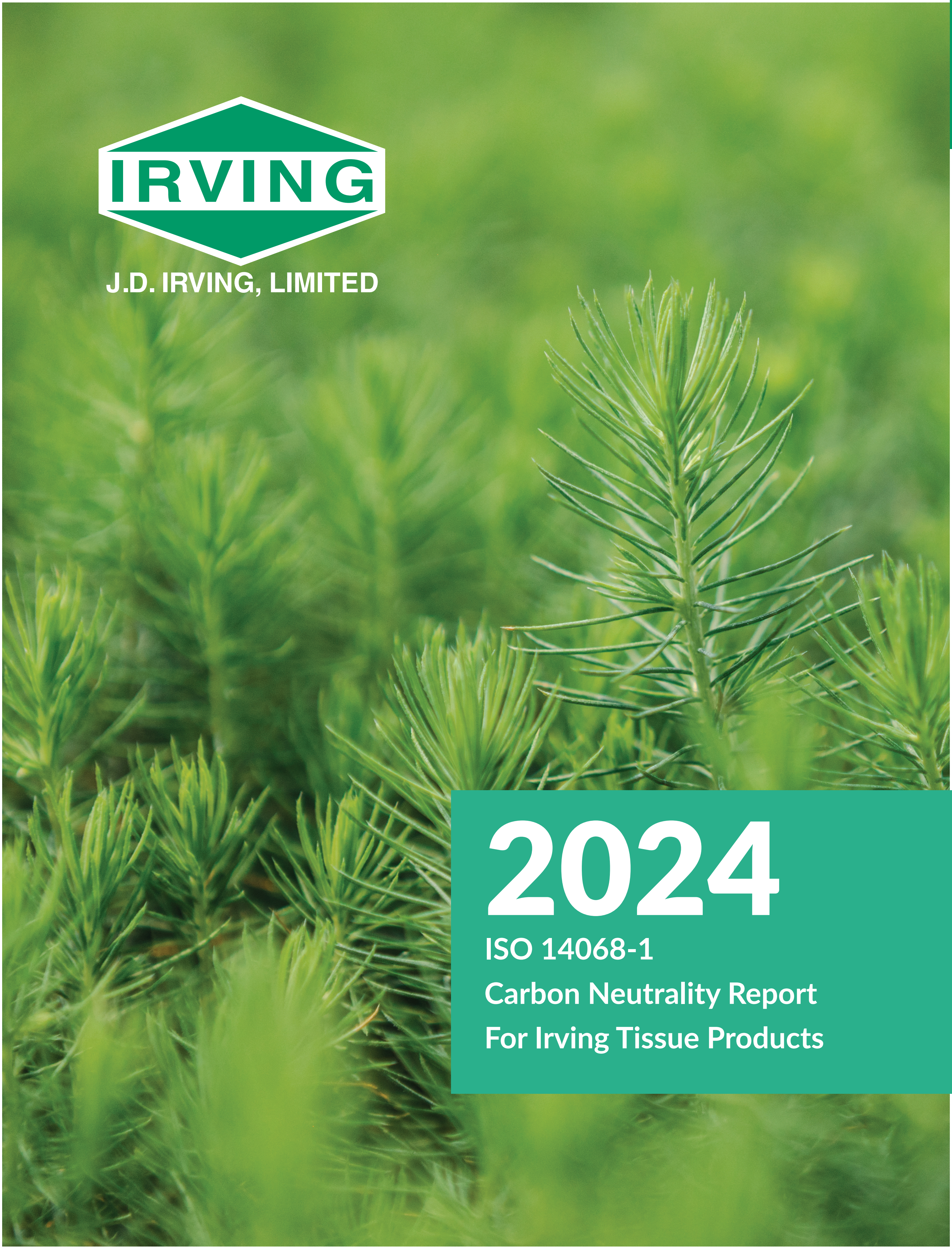

J.D. IRVING, LIMITED

2024

ISO 14068-1 Carbon Neutrality Report For Irving Tissue Products


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SCOPE AND BOUNDARY OF THE SUBJECT

This Carbon Neutrality Report is being issued by J.D. Irving, Limited ("Irving") to describe the cradle-to-grave carbon footprint of all bathroom tissue, household towel, facial tissue, and napkin products ("Tissue Products") manufactured by Irving's affiliates Irving Consumer Products Limited ("ICPL") and Irving Consumer Products Inc. ("ICPI"), including Royale®, Scotties®, and private label branded tissue products for the at-home market. This Carbon Footprint of a Product Report ("CFP Report") describes the greenhouse gas ("GHG") emissions and removals in the material acquisition & pre-processing, production, distribution & storage, use, and end-of-life phases of the Tissue Products.

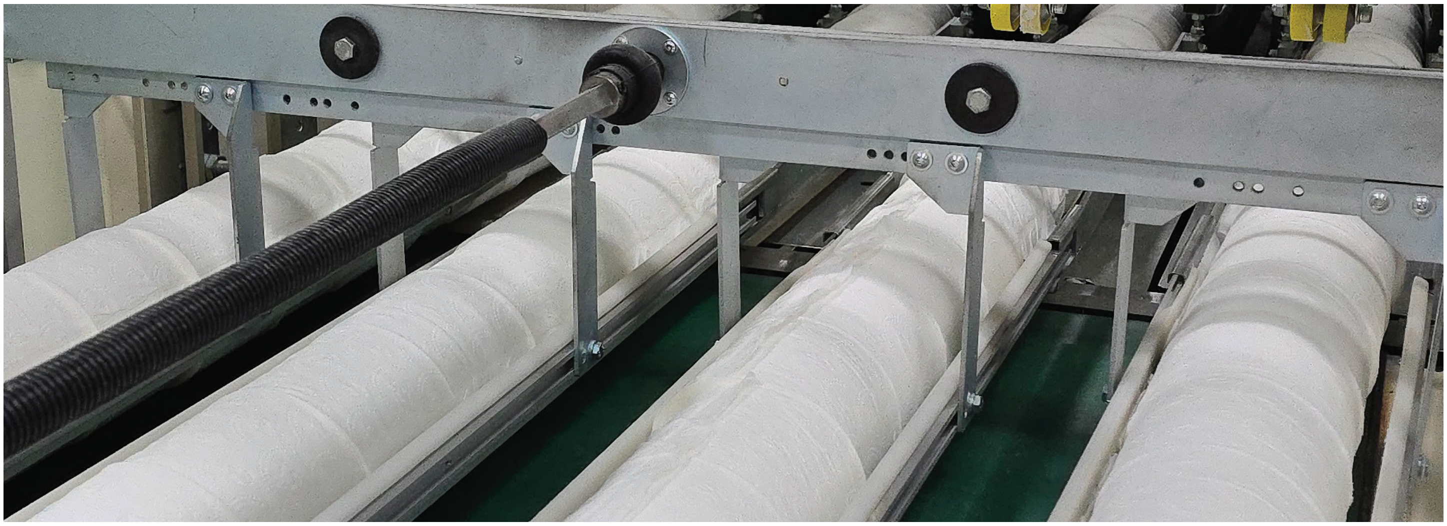
ICPL and ICPI are part of the Irving affiliated corporations included within the "Forest Supply Chain" referred to throughout this report.

Irving

Since 1882, J.D. Irving, Limited and its affiliates ("Irving") have been committed to quality products and service. With headquarters in Saint John and Moncton, New Brunswick and 19,000 employees across the diverse family-owned operations in both Canada and the United States, Irving contributes to eight business sectors, including:

- Forestry and Forest Products
- Shipbuilding and Industrial Manufacturing
- Transportation and Logistics
- Retail and Distribution
- Construction and Equipment
- Consumer Products
- Food and Agriculture

The core of the Irving strategy is vertical integration which enables the organization to add value from working forests by producing a range of renewable consumer products such as lumber, wood pellets, Kraft pulp, paper, corrugating medium, tissue products, diaper products, and renewable energy. Irving's commitment to responsible management of its Forest Supply Chain is rooted in family values from long-term forest ownership.



1] Includes operations wholly or partially in various Irving entities, including J.D. Irving, Limited, Irving Pulp & Paper, Limited, Irving Paper Limited, Irving Consumer Products Limited, Irving Consumer Products, Inc., The New Brunswick Railway Company, Rothesay Paper Holdings Ltd., St. George Pulp & Paper Limited, St. George Power LP, Charlotte Pulp and Paper Co. Ltd., Miramichi Timber Holdings Limited, Allagash Timberlands LLC, Aroostook Timberlands LLC, Maine Woodlands Realty Company, and Irving Forest Products, Inc.

The Irving Forest Supply Chain

Woodlands Division (Woodlands) - Woodlands manages all aspects of harvesting and delivery of roundwood logs, pulpwood, and chips to internal and external customers. Woodlands is also responsible for all aspects of forest land management on 1.3 million hectares (3.3 million acres) of Freehold land and 1.0 million hectares (2.6 million acres) of New Brunswick provincial lands (Crown License 7). All forest lands are independently certified to recognized third-party forest management standards.

Sawmills Division (Sawmills) - Sawmills operate ten manufacturing facilities in New Brunswick, Nova Scotia, and Maine, producing spruce/fir dimensional lumber, white pine products, hardwood products, and wood pellets. While lumber is the primary output of Sawmills, the production of lumber creates a variety of residual products that are sold externally or consumed in the downstream operations of the Forest Supply Chain. These residual products include wood chips, bark (hog fuel), sawdust, and wood shavings.

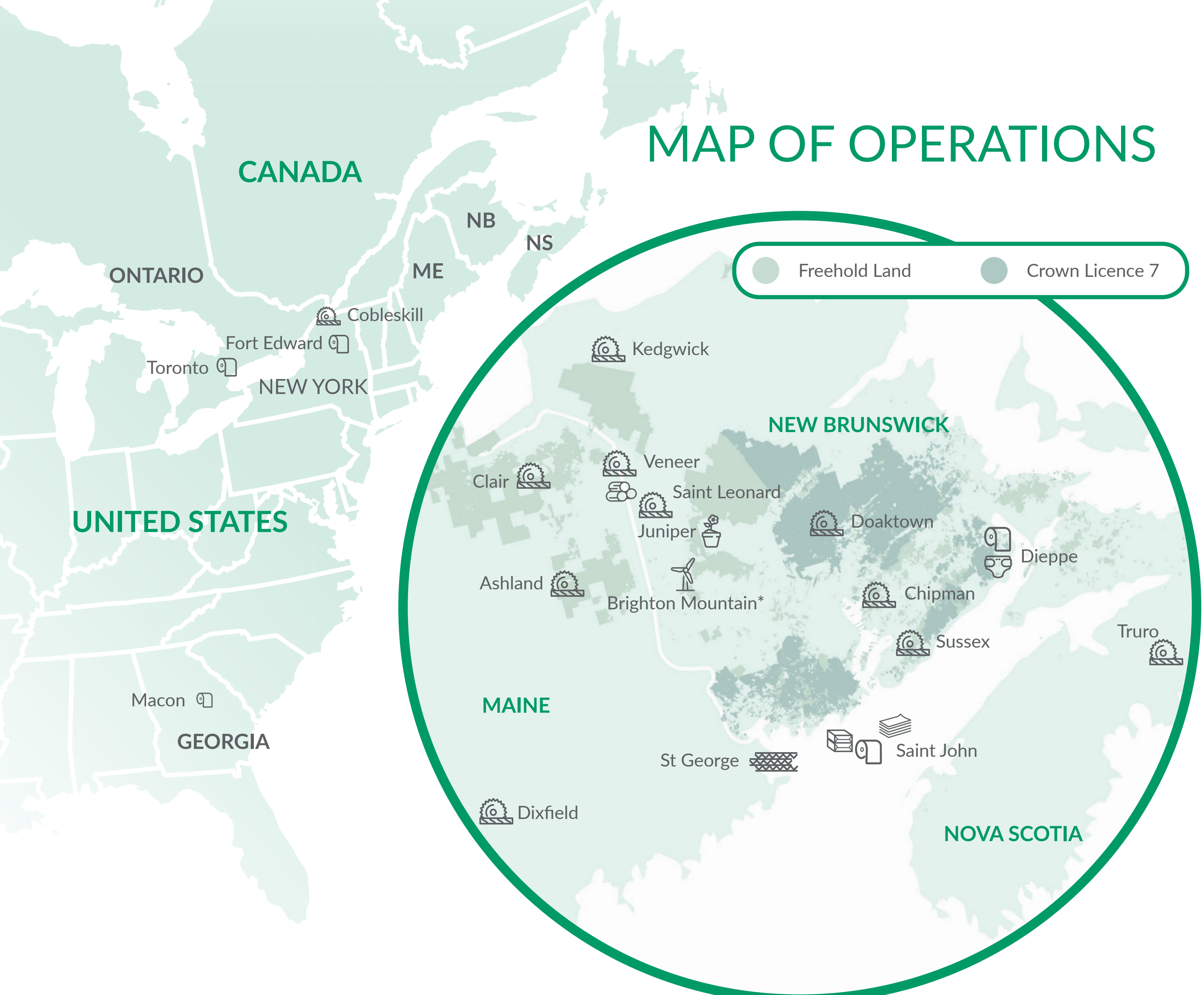


FIGURE 1. Irving Forest Supply Chain Operations

*Brighton Mountain Wind Farm announced in 2024.


30=60
Royale
Original
soft tout doux

Pulp & Paper Division (Pulp & Paper) - Pulp & Paper operates four manufacturing facilities in NB.

- Irving Pulp & Paper Limited (IPP), a Kraft pulp mill.
- Irving Paper Limited (IPL), a thermo-mechanical paper mill.
- Lake Utopia Paper (LUP), a facility producing corrugating medium.
- Irving Tissue, Saint John, a mill producing tissue Parent Rolls.

IPP produces softwood Kraft pulp from the residual products (wood chips) generated by Sawmills and wood chips direct from Woodlands. Softwood Kraft pulp is one of the primary inputs for tissue making.

Irving Consumer Products Division (Consumer Products) - Consumer Products produces Tissue Products at four manufacturing facilities and Irving Personal Care produces baby diapers and pants.

- Irving Tissue Dieppe, NB, produces converted Tissue Products.
- Irving Tissue Toronto, ON, produces tissue Parent Rolls and converted Tissue Products.
- Irving Tissue Fort Edward, NY, produces tissue Parent Rolls and converted Tissue Products.
- Irving Tissue Macon, GA, produces tissue Parent Rolls and converted Tissue Products.
- Irving Personal Care Dieppe, NB, a diaper manufacturing facility.

THE IRVING FOREST SUPPLY CHAIN ORGANIZATIONAL GHG FOOTPRINT

The Irving Forest Supply Chain annually discloses on a range of material impacts in its Climate, Conservation & Community Impact Report, which can be found at www.jdirvingsustainability.com. GHG emissions and removals are a material topic as forest products manufacturing is energy intensive, most forest products produced in the Supply Chain are exported resulting in significant freight-related emissions, and working forests are sources of both GHG emissions and removals. Therefore, a complete accounting of the GHG emissions and removals has been completed for the Forest Supply Chain organization and publicly disclosed since 2020.

The Forest Supply Chain organization has a negative carbon footprint because of GHG removals by the private forest lands and transfers of CO_2 into harvested wood products manufactured by the Supply Chain. These removals and transfers are greater than the aggregate Scope 1, 2, and 3 GHG emissions within the organizational boundary from seed-to-sale. The details of this organizational footprint can be found in the Climate, Conservation & Community Impact report and in the Technical Supporting Document at www.jdirvingsustainability.com.

Tissue Products

Tissue products are sold in two main categories: "at-home" and "away-from-home" use. Away-from-home tissue products are typically used in hotels, restaurants, schools, and other public or private institutions. At-home tissue products are for use in private homes and dwellings.

Irving's affiliates Irving Consumer Products Limited (**"ICPL"**) and Irving Consumer Products Inc. (**"ICPI"**) produce and sell bathroom tissue (**"Bath"**), household towel (**"HHT"**), facial tissue (**"Facial"**), and napkin products (**"Napkin"**), collectively referred to as "Tissue Products", including Royale®, Scotties®, and private label branded tissue products for the "at-home" use market.

System Boundary – Cradle-to-Grave

This report outlines the Cradle-to-Grave boundary of Tissue Products in accordance with the ISO14067:2018. A full description of each phase, methodology, assumptions, exclusions, data quality, uncertainty, and references are detailed in this report. This report includes emissions and removals from both Tissue Products and packaging.

TISSUE PRODUCT BOUNDARY - CRADLE-TO-GRAVE LIFE CYCLE

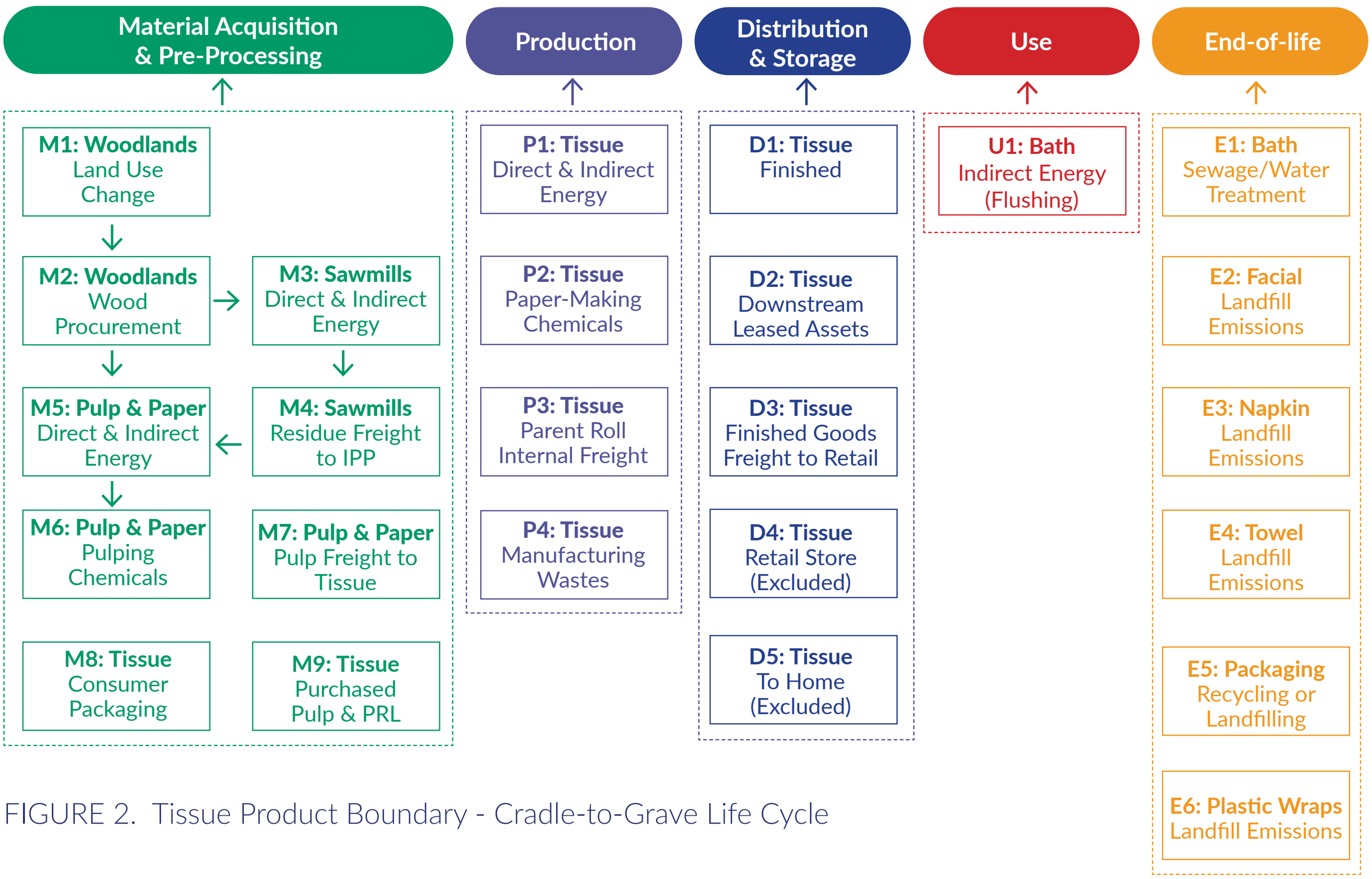


FIGURE 2. Tissue Product Boundary - Cradle-to-Grave Life Cycle

Sales and Marketing

ICPL/ICPI produced 380,105 tonnes and sold 373,594 tonnes of Tissue Products in 2024. Sales are both branded and private label products sold in Canada and the United States.

- Fourteen per cent of sales were branded Royale® Tissue Products sold in Canada
- Three per cent of sales were branded Scotties® Tissue Products sold in the United States of America
- Twenty-two per cent private label products sold in Canada
- Sixty-one per cent private label products sold in the United States of America.

ICPL/ICPI produce approximately 656 unique stock-keeping units ("SKUs") of Tissue Products broken down by the following percentages:

- Bath - thirty-six per cent
- HHT - fifteen per cent
- Facial – forty-six per cent
- Napkin - three per cent

MANUFACTURING

Tissue Products are manufactured in two stages: the production of Tissue Parent Rolls ("Parent Rolls") and then Converting of Parent Rolls into Tissue Products.

Four Converting mills are in Dieppe NB, Toronto ON, Fort Edward NY, and Macon GA. Saint John, NB only produces Parent Rolls that are shipped to Dieppe, Toronto, and Fort Edward for Converting.

Parent Rolls of tissue are produced using various mixtures of softwood and hardwood Kraft pulp, and re-pulping of "broke" or waste tissue from the internal manufacturing process. Each of these fibre types are mixed with water and deposited as individual layers onto a wire forming sheet. This sheet of fibres is then progressively dried and wound into a Parent Roll of tissue.

Softwood fibres are used to add strength to Tissue Products. Softwood Kraft pulp is sourced from IPP. Hardwood fibres are used to add softness to Tissue Products. Hardwood Kraft pulp (eucalyptus) is sourced from South American Kraft pulp suppliers. The amount and arrangement of the three fibre types are varied to create different Tissue Product qualities that are desired by the customer. Parent Rolls can be produced in two distinct manufacturing processes; light-dry crepe (LDC) or through-air-dried (TAD). TAD products have lower bulk and improved softness or absorbency properties and are usually used in Bath or HHT products. LDC Parent Rolls are manufactured into Facial or Napkin products. The TAD process is more energy intensive per tonne of tissue produced. Parent Roll sheets could also vary in terms of basis weights (grams per square metre), strength, or softness. For instance, HHT products are used for their strength, therefore contain more softwood fibres. Alternatively, Bath products are produced to be soft, and therefore contain more hardwood fibres. In addition to known differences in various mixtures and amounts of pulp fibres, there are also differences in energy used in different Tissue Products (e.g., more energy in higher basis weight sheets).

As a simplifying assumption, Tissue Product emissions are not differentiated beyond the average Parent Roll produced in each mill. While differences between Parent Rolls to produce different Tissue Products are known to exist, these variations are expected to be insignificant considering the scale of the upstream Material Acquisition and Pre-Processing emissions, Scope 1 and 2 emissions in the Production phase and the Distribution emissions that occur in the Tissue Product life-cycle.

Converting of Parent Rolls into differentiated Tissue Products includes combining like Parent Rolls to create multiple plys, cutting, folding, wrapping on cores (Bath and HHT), or placing in paperboard boxes (Facial). This phase also involves wrapping Tissue Products in poly packaging placed into corrugated containers for shipping. Containers are palletized and wrapped again with poly packaging to protect products during shipping.

Tissue Products are then shipped to ICP warehouses, customer distribution centres (DC), or direct to retail stores.

There are not emissions in the Use phase of Tissue Products, except for Bath products. Electricity is used to pump water that is used to flush Bath products to their End-of-Life fate.

Depending on the Tissue Product, the End-of-Life fate differs and could be wastewater treatment plant, landfilling, composting or incineration.

Differences between Production and Sales

The emissions for Material Acquisition & Pre-Processing, Production, and Distribution & Storage phases are based on total manufacturing production of 380,105 tonnes of Tissue Products. This approach accurately reflects these life cycle stage emissions in the current year. The Use and End-of-Life emissions are based on the total sales of 373,594 tonnes of Tissue Products, as the sales basis accurately reflects these life-cycle stage emissions in the current year. There is an expected difference between production and sales because of the nature of this continuous process and work-in-progress inventory changes. We have calculated the functional unit emissions based on sales volume attributed to the product groups for the verification and will monitor the differences between production and sales for material differences in future years.

The Cradle-to-Grave product carbon footprint Tissue Products is reported using a Parent Roll mill grouped SKU methodology with four unique groupings. All grouped SKUs have the equivalent functional unit, all SKUs are under the same level of organizational control and all SKUs are within the same defined geographical sales region.

Rationale for the Selection of the Subject – Tissue Products

A Carbon Footprint of a Product ("CFP") report has been prepared since 2021. Tissue Products have been selected for a CFP report because:

- Tissue Products are the most consumer-focused product manufactured in the Forest Supply Chain. Other products such as lumber, wood pellets, corrugating medium, paper and Kraft pulp are business-to-business focused.
- Retail customers and end-use consumers are the intended audience of this information as they have a higher level of engagement in understanding the GHG footprint of the products they are purchasing.
- Tissue Products represent the deepest level of vertical integration in the Forest Supply Chain. Forests owned or managed by Irving are the source of a sizable portion of the wood fibre used to make Tissue Products. These wood fibres are processed in Irving Sawmills and sent to the IPP Kraft pulpmill. ICPL and ICPI purchase the softwood Kraft pulp portion of Tissue Products from IPP. In addition, a portion of the cardboard packaging that Tissue Products are shipped in is produced in Irving corrugating medium operations and a significant portion of the freight activities are performed by Irving owned transportation assets.
- Manufacturing and distributing Tissue Products are expected to be the most significant source of GHG emissions across the range of other forest products produced by the Forest Supply Chain.

GREENHOUSE GAS EMISSIONS AND REMOVALS

TABLE 1: CARBON FOOTPRINT OF A PRODUCT SUMMARY TABLE

CFP Requirement	Description
Functional unit and reference flow	Kg CO_2e/ tonne (Tissue Product sales)
List of GHG accounted for	CO_2, CH4, N_2O
Timing of GHG emissions and removals	January 2024 to December 2024 for the GHG emissions and removals[2] in the Material Acquisition & Pre-Processing, Production, Distribution & Storage and Use stages. End-of-Life emissions extend beyond the reporting period but relate to products sold between January 2024 and December 2024.
Methodology	ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification.
Treatment of electricity use	Location-based approach
Allocation procedures	Mass balance of primary forest products and semi-finished wood products that flow through the supply chain to Tissue Products
Time period CFP is representative	CFP accounting and verification is for the previous years' emissions and removals and is considered representative for two years after the year of verification with the assumption that there are no material changes in production over the two-year period following verification.
Materiality Criteria (cutoffs)	Emissions or removals greater than 1% representing 95% of total emissions or removals
Limitations	The CFP is limited by its focus on climate change (i.e., not a full LCA) and the inherent uncertainty in reporting GHG emissions and removals, which is affected by the methodologies, including limitations of the CBM-CFS3 forest carbon model, US EPA WARM model, assumptions, data quality, and exclusions referenced in this report. Refer to the "Uncertainty" section of the report for assessment of how data quality affects the CFP.

2] The methodology for calculating removals changed in 2024 to a 5-year rolling average. Please see section on Methodology Change.

GREENHOUSE GAS EMISSIONS AND REMOVALS

TABLE 2: GREENHOUSE GAS EMISSIONS AND REMOVALS BY LIFE CYCLE STAGE

Source	Tonnes CO_2e	Kg CO2e /tonne	%
Material Acquisition & Pre-Processing	282,136	755	29%
Production	482,695	1,292	50%
Distribution & Storage	68,224	183	7%
Use	2,732	18	0%
End-of-Life	131,029	351	14%
Aircraft Transportation	0	0	0%
Net Fossil Fuel Emissions & Removals	966,816	2,599	100%
Land Use	(1,130,975)	(3,027)	
Direct Land Use Change (dLUC)	0	0	0%
Carbon Footprint of the Product	(164,159)	(439)	

Guiding Methodologies

The guiding methodology used is the ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification. This methodology was consistently applied to data representing operations between January 1, 2023 and December 31, 2024. This method was chosen as it provides an internationally recognized approach to the calculation of representative product CO2e footprints and meets the requirements of ISO14068-1:2023 Climate change management — Transition to net zero — Part 1:Carbon neutrality for the substantiation of GHG emissions.

The carbon footprint was based on 95% of likely greenhouse gas emissions; primary sources are subject to variation over time; footprint is best estimate based on reasonable costs of evaluation.

Irving has internal controls deemed necessary to avoid double counting of emissions and/or removals. The CFP has been prepared with principles of conservatism in assumptions, exclusions and data quality and includes a robust uncertainty analysis and third-party verification of the CFP in accordance with ISO14067:2018. Forest land use removals directly attributable to Tissue Products included within the footprint are only associated with lands owned or managed by Irving and therefore double claiming has been avoided. Irving is not aware of any other product claims or carbon offsets that may be using these land use removals.

The carbon footprint was modelled using primary data and completed, where needed by secondary data. Scope 3 emissions are calculated using either primary production, spend, or other invoice generated data in combination with various published emissions intensity factors. Net Forest Growth removals have been quantified using the Carbon Budget Model for the Canadian Forest Sector, version 3 (CBM-CFS3[3]). A Circular Footprint Formula ("CFF") was used to determine the emissions from the Tissue Products paper-based packaging. The CFF accounts for the recycled content of the paper-based packaging and will be used to include recycled plastic-based packaging in future years. The US EPA WARM model was used to model End-of-Life emissions.

GHG emissions that are accounted for in the study are based on the 100-year Global Warming Potential figures published in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report, 2014 (AR5 2014) and include those required by the GHGP Product Standard, which specifies emissions to and removals from the atmosphere of: carbon dioxide (CO_2); methane (CH_4) and nitrous oxide (N_2O).

Where GHG emissions have been estimated, these have been determined based on a conservative approach that precludes underestimation. GHG emissions have been estimated for customer DC to retail freight, use phase, and end-of-life phase. In the absence of data, emissions have been estimated based on conservative assumptions (e.g. for end-of-life, fate of retail waste has been considered the same as domestic waste whereas waste recycling may be greater at retail areas).

Allocating Emissions and Removals

Following guidance from ISO14067:2018, emissions and removals directly attributable to Tissue Products are included.

This approach excludes many indirect emissions sources included in the organizational footprint, related to overhead, such as employee commuting, capital expenditures, upstream extraction and distribution of fuels, selling general and administrative expenses, air travel and other activities not directly required to manufacture or sell Tissue Products (e.g., tree nurseries, harvesting contractor travel).

CRADLE-TO-GRAVE LIFE CYCLE DESCRIPTIONS AND ALLOCATIONS

TABLE 3: DESCRIPTION OF GHG EMISSIONS BY LIFE CYCLE STAGE

Life Cycle Stage	Emission/Removal with Description	Allocation Procedure
Material Acquisition & Pre-Processing	**M1: Woodlands – Land Use/Net Forest Removal [4]:** Gross GHG emission/removal from annual net forest growth and depletion modelled using the Carbon Budget Model for the Canadian Forest Sector (CBM-CFS[3]) for Freehold lands and Crown License 7.	Allocated to Tissue Products based on the mass balance of primary forest products harvested from Freehold lands and Crown License 7 that flow to through Sawmills to IPP to ICPL/ICPI
	M2: Woodlands Wood Procurement: GHG emissions from the harvesting and transportation of roundwood logs, pulpwood and chips (primary forest products) from the forest to Sawmills or IPP.	Allocated to Tissue Products based on the mass balance of forest products harvested that flow through Sawmills to IPP to ICPL/ICPI from all fibre sources

3] Carbon curves from CBM-CFS3 supplemented by internally developed criteria for forest sequestration and emissions.
4] The methodology for calculating removals changed in 2024 to a 5-year rolling average. Please see section on Methodology Change.

Life Cycle Stage	Emission/Removal with Description	Allocation Procedure
	M3: Sawmills Direct & Indirect Energy: Scope 1 & 2 GHG emissions from the manufacturing of wood chips and hog fuel by Sawmills.	Allocation of attributable emissions to Tissue Products based on the mass balance of wood chips and bark flowing from Sawmills to IPP to ICPL/ICPI. GHG emissions for drying and shipping lumber are not attributable to Tissue Products.
	M4: Sawmills Residue Freight to Pulp & Paper: Transportation emissions for the delivery of wood chips and hog fuel from Sawmills to IPP. Transportation is by truck or rail.	Allocation of attributable emissions to Tissue Products based on the mass balance of wood chips and bark flowing from Sawmills to IPP to ICPL/ICPI. GHG emissions for drying and shipping lumber are not attributable to Tissue Products.
	M5: Pulp & Paper Direct & Indirect Energy: Scope 1 & 2 emissions in the manufacturing of Kraft pulp at IPP. This includes CH4 and N2O from biogenic fuel sources.	Emissions from Sawmill residual freight to IPP. Allocated to Tissue Products based on the mass balance of Kraft pulp flowing from IPP to ICPL/ICPI
	M6: Pulp & Paper Chemicals: Scope 3 emissions from chemicals used to process wood chips into Kraft pulp.	Allocated based on the mass balance of IPP Kraft pulp that flows to ICPL/ICPI
	M7: Pulp & Paper – Pulp freight to Tissue: Transportation emissions for the delivery Kraft pulp to ICPL/ICPI mills by truck or by rail.	Allocated based on the mass balance of IPP Kraft pulp that flows to ICPL/ICPI
	M8: Tissue Consumer Packaging: Scope 3 emission for corrugated packaging, cores, paperboard containers, and poly wraps.	100% to Tissue Products
	M9: Tissue Purchased Pulp & Parent Rolls: Scope 3 emissions for purchased hardwood pulp (bleached eucalyptus Kraft or northern bleached hardwood Kraft) or Parent Rolls produced by other tissue manufacturers.	100% to Tissue Products
Production	**P1: Tissue Direct & Indirect Energy:** Scope 1 & 2 GHG emissions in ICPL/ICPI mills.	100% to Tissue Products
	P2: Tissue paper-making Chemicals: Scope 3 emissions from chemicals used to manufacture Tissue Products	100% to Tissue Products
	P3: Purchased Parent Roll Internal Freight: Transportation emissions for the delivery of Parent Rolls from one ICPL/ICPI mill to another.	100% to Tissue Products
	P4: Tissue Manufacturing Wastes: Scope 3 emission from municipal solid waste generated by ICPL/ICPI.	100% to Tissue Products

Life Cycle Stage	Emission/Removal with Description	Allocation Procedure
Distribution & Storage	**Direct Finished Goods Freight:** Scope 3 GHG emissions for finished Tissue Products transportation within the control of ICPL/ICPI from the ICPL/ICPI mill direct to retail, ICPL/ICPI warehouse, ICPL/ICPI warehouse then to retail, or to customer distribution centre.	100% to Tissue Products
	Downstream Leased Assets: Scope 3 GHG emissions from leased warehousing by ICPL/ICPI.	100% to Tissue Products
	Indirect Finished Goods Freight to Retail: Scope 3 GHG emissions estimate for transportation from customer distribution centre to the retail store.	100% to Tissue Products
	Retail Store: Scope 1 & 2 GHG emissions of a retail store.	Excluded
	Transportation to Home: GHG emissions for transporting Tissue Products from the retail store to home.	Excluded
Use	**Indirect energy (from flushing of bathroom tissue):** Estimate of GHG emissions to pump water used in flushing the bath tissue product portion in toilets.	100% to Bath products
End-of-Life	**Bathroom Tissue – Wastewater treatment (WWT):** GHG emissions from disposal into a wastewater treatment facility.	100% to Bath products
	Facial Tissue – Landfill Emissions: GHG emissions and removals from disposal in a landfill.	100% to Facial products
	Household Towel – Landfill Emissions: GHG emissions and removals from disposal in a landfill.	100% to HHT products
	Napkin – Landfill Emissions: GHG emissions and removals from disposal in a landfill.	100% to Napkin products
	Packaging - Corrugated containers, cores & paper wrap: GHG emissions and removals of all packaging in Converted products, including packaging for shipping products. A circular footprint formula is used to account for recycled packaging products.	100% to Tissue Products
	Packaging Plastic Wraps – Landfill Emissions: GHG emissions from disposal of plastic based packaging products in a landfill.	100% to Tissue Products

A complete listing of each emission source and its respective reporting or calculation methodology is presented in the Methodology section.

Allocation Assumptions

There are two significant allocations in the Tissue Product carbon footprint:

1. Allocation of upstream attributable emissions in the Irving Forest Supply Chain to Tissue Products (e.g., activities in the Material Acquisition & Pre-Processing phase such as primary forest product harvesting & delivery, wood chips & hog fuel manufacturing & delivery, and IPP Kraft pulp production).
2. Allocation of forest removals to the Parent Rolls delivered to the Converting mills.

Allocation of Emissions from the Irving Forest Supply Chain

Upstream emissions from the Irving Forest Supply Chain are allocated using a mass balance approach from the primary forest products harvested in Woodlands and shipped directly to IPP or to Sawmills, processed by Sawmills into wood chips and hog fuel (including chip plants), manufactured by IPP, and then sold to ICP to make Tissue Products. The mass of these transfers is captured and stored in Irving enterprise management systems. Table 4 below describes the mass balance and percentages that flow through the Irving Forest Supply Chain.

TABLE 4. ALLOCATIONS OF UPSTREAM EMISSIONS TO TISSUE PRODUCTS

Fibre Origin	Product	2024 Production	Fibre Destination	Allocated tonnes	Flow to Downstream	Flow to Tissue
Woodlands	Logs	6,809,265	Sawmills	4,617,400	67.81%	16.70%
Woodlands	Chips		IPP	253,577	3.72%	
Sawmills	Residuals	4,127,949	IPP	1,374,493	33.30%	21.14%
IPP	Kraft Pulp	328,001	ICP	208,240	63.49%	63.49%

Woodlands Emissions Allocated to Tissue

Woodlands -> Sawmills -> IPP -> Tissue = (67.81% X 33.30% X 63.49%) = 14.34%

Woodlands -> IPP -> Tissue = (3.72% X 63.49%) = 2.36%

Total Woodlands Emissions attributable to Tissue = 16.70%

Sawmills Emissions Allocated to Tissue

Sawmills -> IPP -> Tissue (33.30% * 63.49%) = 21.14%

IPP Emissions Allocated to Tissue

IPP -> Tissue = 63.49%

Allocation of Removals from the Irving Forest Supply Chain

Unlike allocating emissions from the Irving Forest Supply Chain where emissions occur upstream regardless of the source of the primary forest products, forest land use removals are allocated based on the mass balance of primary forest products that originate from JDI Freehold lands and Crown License 7. Therefore, to allocate forest land use removals to Parent Rolls, additional steps are taken to allocate land use removals based on the origin of the primary forest products that flow into softwood Kraft pulp, and how that Kraft pulp flows to the individual mills that produce Parent Rolls. A mass balance approach is appropriate given the mass of primary, secondary and semi-finished forest products is measured throughout the process and is used for financial reporting purposes. Therefore, mass of products is reliable and verifiable in all phases and is highly relatable to the various activities within the supply chain. Calculation of forest land use removals is detailed in the next section of this report.

TABLE 5. TONNES FROM FREEHOLD & CROWN LICENSE 7 TO IPP

Mill	Direct from Woods	Indirect via Yards	First Nation	Total	% Sawmill Residual	% Residual to IPP	% of Sawmill Input to IPP	Forest Land Use Removal Allocation to Parent Rolls
Ashland	243,258	-	-	243,258	62.92	46.43	29.22	71,069
Dixfield	333	4,727	-	5,060	59.11	0.00	0.00	-
Chipman	487,921	82,946	6,109	576,976	63.91	27.55	17.61	101,583
Doaktown	99,581	5,309	194	105,084	65.50	52.67	34.49	36,249
Kedgwick	4,870	77	-	4,947	60.58	3.70	2.24	111
St. Leonard	508,785	65,608	-	574,393	65.82	41.02	27.00	155,081
Sussex	334,909	6,986	8,427	350,322	57.88	56.00	32.41	113,538
Truro	60,136	91	-	60,227	61.52	11.14	6.85	4,127
Veneer	98,575	2,769	-	101,344	55.54	0.00	0.00	-
STL Chip Plant	90,169	-	-	90,169	100.00	64.77	64.77	58,399
SX Chip Plant	438,868	3,115	5,121	447,104	100.00	100.00	100.00	447,104
Sub-total	**2,367,405**	**171,628**	**19,851**	**2,558,884**				**987,261**
Direct to IPP	28,254	142,225	-	170,479				170,479
Total								**1,157,740**
Percentage of Freehold and Crown License 7 Harvest to IPP								**28.13%**
Percentage of Freehold and Crown License 7 Harvest to ICPL/ICPI								**17.86%**

TABLE 6. TONNES OF KRAFT PULP & ALLOCATION OF FOREST LAND USE REMOVALS TO PARENT ROLLS

Parent Roll Mill	Tonnes of IPP Kraft Pulp to Tissue	% IPP Consumption	Forest Land Use Removal Allocation to Parent Rolls
Toronto	54,471	26.55%	4.74%
Saint John	35,133	17.13%	3.06%
Fort Edward	32,083	15.64%	2.79%
Macon	83,437	40.68%	7.27%
Total	**201,125**	**100.00%**	**17.86%**

TABLE 7. FOREST LAND USE REMOVAL ALLOCATION TO TISSUE CONVERTING MILL

Parent Roll Mill	Tissue Converting Mill			
	Toronto	Fort Edward	Macon	Dieppe
Toronto	69.34%	30.64%	0.00%	0.02%
Saint John	0.92%	20.95%	0.00%	78.13%
Fort Edward	0.00%	100.00%	0.00%	0.00%
Macon	0.00%	0.00%	100.00%	0.00%
Forest Removal Allocated by Converting Mill	**3.32%**	**4.89%**	**7.26%**	**2.39%**

Exclusions

Exclusions from the carbon footprint were limited to those where the data would be difficult to obtain and whose emissions would be immaterial. Upstream emissions from the electricity supply system; including extraction, transportation and other upstream emissions, for Tissue Products have been quantified and do not meet a threshold which would change the conclusion on the carbon neutrality of Tissue Products. For these reasons these emissions have been excluded. Retail store emissions and the emissions associated with transportation from retail to home have been excluded. These emissions are very difficult to attribute to Tissue Products. Retail stores carry multiple SKUs, ranging from 4,000 to 140,000 per store. Attributing emissions to Tissue Product SKUs would be challenging and non-material, especially if these emissions were attributed based on mass. Further, retail to home emissions would also be difficult to attribute directly to Tissue Products. Did the consumer travel to the store only for Tissue Products or did they purchase a range of SKUs from a retail store? Were there multiple stops on the trip or direct from retail to home? If emissions were attributed based on mass of Tissue Products, these emissions would be immaterial. Given these challenges, emissions from these two life-cycle phases have been assumed to be immaterial and have been excluded from the footprint. Similar exclusions have been made in other recent life-cycle analysis of tissue products (Ingwersen et. al. 2016).

Fugitive gases have not been reported outside the End-of-Life stage: any fugitive gases would be impossible to measure directly and attribute to Tissue Products. Emissions from fugitive gases would not be material (i.e. less than 0.1%) to the footprint. Upstream emissions from fuel (extraction, processing, and transportation) have been quantified and also do not meet the threshold which would change the conclusion and carbon neutrality of Tissue Products and have been excluded.

Biogenic Carbon Flow from the Forest to the End-of-Life

ISO 14067 requires reporting of biogenic removals and emissions in the carbon footprint of a product. Tissue Products are made of wood fibres from forests of growing trees which transform carbon dioxide from the atmosphere and converts it to carbon. The carbon in wood fibres transfers from living biomass into roundwood logs, wood chips, Kraft pulp, then into Tissue Products through the production process and is distributed to customers for their at-home use. There are no changes in the carbon stored in wood as the wood fibres pass through this process. As Tissue Products are short-lived, the simplifying assumption is that Tissue Products are produced, used, and disposed of over the course of one year, so they do not form a new carbon pool themselves. However, when Tissue Products are disposed at the End-of-Life carbon is either converted back to carbon dioxide, remains stored as carbon long-term in landfills, or undergoes a process of anaerobic decay, resulting in its conversion from carbon to methane depending on the method of disposal (landfilling, wastewater treatment, incineration).

CO_2e Emissions from Land Use on Freehold and Crown License 7

Freehold lands and Crown License 7 remove CO_2 from the atmosphere with growth and store carbon in above and below ground biomass. All forests also emit CO_2e with natural mortality and working forests emit CO_2e with harvesting. Net changes in land use emissions and removals of CO_2e are modeled. All forest areas in ME, NB, and NS are considered managed, aligned with the definition of managed forests by the International Panel on Climate Change (IPCC 2019).

For the organizational carbon footprint of the Supply Chain, the annual net change in land use CO_2e from Freehold and Crown License 7 is calculated using the Carbon Budget Model for the Canadian Forest Sector (CBM-CFS3). This is the method used by Environment and Climate Change Canada reporting in annual National Inventory Reports. Carbon curves from CBM-CFS3 were supplemented by internally developed criteria for forest sequestration and emissions. This configuration to the pre-2023 CBM-CFS3 model improves the accuracy of emissions and sequestration. These changes are outlined in sections 4 (d) and (f) below and the accuracy was supported by testing and analysis.

The process to define the annual stock change in carbon from net forest growth is described below:

1. Producing an Enhanced Forest Inventory (EFI)
2. Updating the Forest Inventory
3. Producing Carbon Yields Using CBM-CFS3
4. Calculating Annual Carbon Stock Change

1) Producing an Enhanced Forest Inventory

Light Detection and Ranging (LiDAR) has been transformative technology for forest inventory. Airborne scanning LiDAR, referred to as Airborne Laser Scanning (ALS) data has become a valuable source of information for enhanced forest inventories (EFIs), providing accurate measurements of tree heights and detailed characterizations of forest vertical structure. This ALS-derived information is subsequently used in conjunction with spatially accurate ground plot measurements in an Area-Based Approach (ABA) to model forest inventory attributes such as mean height, basal area, and volume. Not all required inventory attributes (e.g., tree species, age) can be derived from ALS data, however ALS-based EFIs enable greater detail, accuracy, and precision for a range of attributes when compared to conventional inventory systems.

Irving acquired its first ALS data set in 2013. Irving produced its first wall-to-wall area-based inventory at a 20 m x 20 m (400 m2) resolution in 2017.

EFI was produced based on a network of spatially accurate ground plots known as Continuous Land Inventory (CLI) plots. Plots are distributed to be representative of the landscape and sample a range of conditions. Once the plot measurements are completed, the data is summarized to describe standing forest inventory (tree height, basal area, live crown, merchantable volume, tree size, etc.) using the Open Stand Model (OSM).

Model training data is produced by matching the calibration plot summaries with their associated LiDAR statistics. Machine learning algorithms (Random Forest Models) are produced using this training data. Percent variance is reported as an indicator of model performance.

Once the computer algorithms are produced, LiDAR statistics are extracted for each 400 m2 cell across the forest land base. The algorithms are then applied across the entire land base to produce wall-to-wall forest metric predictions.

2) Updating The Forest Inventory

While LiDAR-derived EFI provides a wealth of forest inventory metrics, it does not provide species or age. The former is addressed through more conventional inventory methods based on interpretation of aerial photography. This interpretation is on a 10-year refresh cycle. Age or, more specifically, change due to harvesting and silviculture activity between refresh cycles is addressed through annual updates. The footprint of harvest and silviculture operations occurring throughout each year are collected digitally via satellite imagery and their attributes and spatial configurations are used to update the GIS-hosted forest inventory.

How the forest changes over time through growth and mortality is determined by creating projections (yield curves) which use today's forest inventory description as a starting point. Specifically, Irving uses the Open Stand Model (OSM) and based on the US Forest Service Forest Vegetation Simulator (FVS).

OSM is an individual tree growth simulation model calibrated for the Acadian Forest using an extensive library of sample plots and individual tree measurements.

3) Producing Carbon Yields Using CBM-CFS3

Carbon yields were produced using the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS32). This is an operational scale aspatial modeling framework that simulates the dynamics of the forest sector carbon stocks: above and below ground biomass, litter and dead wood, soil, and organic carbon. The model applies carbon estimation methods outlined in the Intergovernmental Panel on Climate Change (IPCC).

The CBM-CFS3 requires aspatial forest inventory data including the following:

- Inventory of key development types by leading species and average age
- Merchantable growth and yield curves for each key development type
- Land use change information
- Transition matrices
- Natural disturbance information

The carbon pools modeled in CBM-CFS3 are outlined below. Arrows show the direction of transfer from one pool to another including the atmosphere, starting with softwood (SW) and hardwood (HW) trees. The general rate of decay is indicated (from very fast to slow) for the pool.

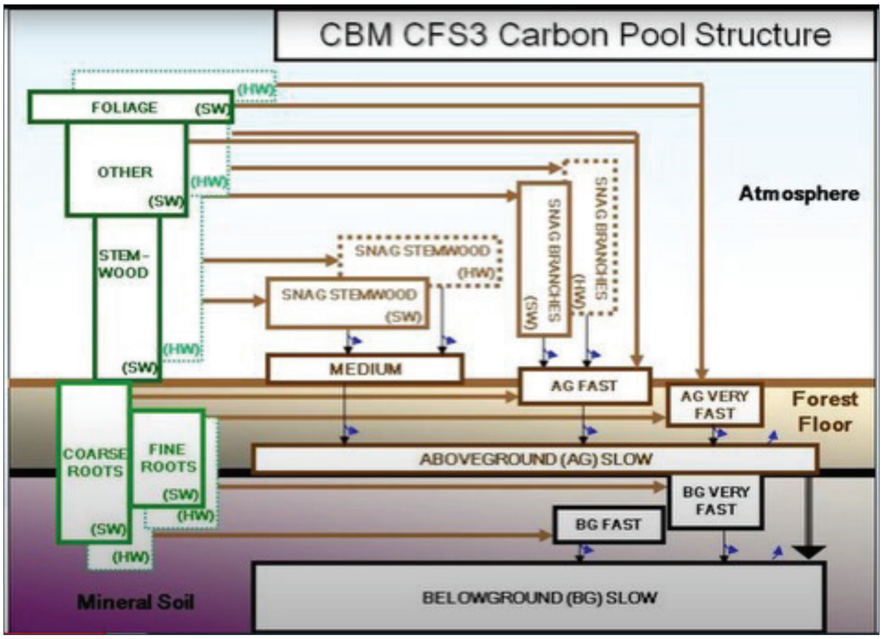


FIGURE 3. CBM-CFS3 CARBON POOLS AND FLOW

4) Calculating Annual Carbon Stock Change

To calculate the change in carbon stocks from T-0 (end of 2023) to T-1 (end of 2024) requires three calculations:

a) Forest inventory at the end of 2023

b) Annual growth to the end of 2024

c) Depletion (harvest) to the end of 2024

a) Forest inventory at the end of 2023 is calculated by summing up the CBM yield curve estimates for each development type at the assigned age. Once all transitions and age assignments are applied, the carbon stocks by pool from the CBM model are summed across all development types to produce the inventory at the end of 2023.

b) Annual growth to the end of 2024 requires incrementing the age for each cell by one year. This moves each development type along its corresponding CBM yield curve one year. The growth in carbon stocks by pool to the end of 2024 can now be summed across all development types.

c) To determine depletion, each cell in our forest inventory that was harvested during the 2024 calendar year, either clear cut or partial cut, is identified via GPS (Global Positioning System) data mounted on harvesting equipment. This GPS data is validated by foresters on the ground and via satellite imagery. Scale data from our woodlands information system provides additional validation.

d) Harvested cells were then transitioned depending on the type of harvest activity:

- Commercial thinning cells stayed on their original development type but had a multiplier applied to net down the yields. The multiplier was determined by running representative cells through the CBM-CFS3 model and applying the commercial thinning action. Changes in yields were then averaged to produce a suitable multiplier – in general this is similar to the approach applied to clearcut areas.

- Other partial cut cells also stayed on their original development type and had a multiplier applied to net down their yields. The multiplier was determined in CBM-CFS3 like commercial thinning but using the CBM partial cut action instead.

- Post-clearcut DOM levels were netted down as a function of pre-harvest DOM, i.e. the adjustment is simply resetting carbon curve to time zero with a correct time-based value rather than using a different carbon curve to achieve this effect. A multiplier was derived via CBM-CFS3 simulations that scheduled clearcut actions at appropriate ages in representative LiDAR cells. Within the simulations, post-harvest DOM pool fluxes were monitored and proportionalized. Changes in yield between pre- and post-harvest conditions were averaged to produce a suitable multiplier. The approach was applied due to the tendency of the CBM-CFS3 to overestimate DOM at time zero. Overestimates occur because of the regional default disturbance age during the MAKELIST process.
- Cells harvested pre-2020 that received a harvest activity post the year of LiDAR – i.e. 'Compromised cells' – were identified and transitioned depending on the type of harvest activity that occurred. The primary depletion of these cells occurred pre-2020.
- Unharvested cells increment along their assigned carbon curve on an annual basis.

e) After harvested cells have been identified and transitioned, the depletion of carbon stocks by pool to the end of 2024 can now be summed across all development types. The final step is to subtract depletion from growth to produce the change in carbon stocks by pool from the end of 2023 to the end of 2024.

f) Prior to 2023 the CBM-CFS3 only had the ability to support one "last disturbance" event per stand in the MAKELIST initialization routine at a single stand-replacing disturbance interval when initializing stand conditions at the start of a CBM-CFS3 simulation. The timing of this event was defined by default based on the ecozone identified for the stand – 125 years in this region. This timing parameter tended to overestimate DOM at time 0 of the forecast. As of 2023 the stand initialization process supported customizable stand-replacing disturbance intervals. A review indicated that these changes did not lead to a net reduction in uncertainty. Rather, it moved the uncertainty through time.

5) Creating a five-year rolling average

Following the creation of the annual stock change, the current year is added to the previous four years of land use removals and averaged.

TABLE 8. 5-YEAR AVERAGE EMISSIONS/(REMOVALS) OF THE CBM-CFS3 MODEL (TONNES CO_2)

Land Base	Merchantable Biomass	Other Biomass	Dead Organic Matter	Total
Freehold	(1,445,542)	(1,445,870)	922,188	(1,969,224)
Crown License 7	(1,507,521)	(1,621,254)	993,186	(2,135,589)
Net Land Use Emissions	(2,953,063)	(3,067,124)	1,915,374	(4,104,813)
Harvest Depletion Emissions				4,673,733
Gross Land Use Removal (before Harvest Depletion)				**(8,778,546)**

TABLE 9. 5-YEAR AVERAGE EMISSIONS/(REMOVALS) OF THE CBM-CFS3 MODEL (TONNES CO_2)

Land Base	2020	2021	2022	2023	2024	5-year average
Freehold						
Merchantable Biomass	(1,463,102)	(1,553,785)	(1,636,500)	(1,234,900)	(1,339,421)	**(1,445,542)**
Other Biomass	(1,509,566)	(1,603,129)	(1,853,450)	(1,545,100)	(718,106)	**(1,445,870)**
Dead Organic Matter	637,385	676,890	1,125,850	957,200	1,213,613	**922,188**
Net Land Use Emissions	**(2,335,283)**	**(2,480,023)**	**(2,364,100)**	**(1,822,800)**	**(843,914)**	**(1,969,224)**
Crown License 7						
Merchantable Biomass	(1,756,779)	(1,245,740)	(1,711,500)	(1,491,400)	(1,332,190)	**(1,507,521)**
Other Biomass	(1,920,718)	(1,321,467)	(1,873,600)	(1,620,800)	(1,369,684)	**(1,621,254)**
Dead Organic Matter	1,228,829	1,001,115	1,037,700	760,500	937,787	**993,186**
Net Land Use Emissions	**(2,448,668)**	**(1,566,092)**	**(2,547,400)**	**(2,351,700)**	**(1,764,086)**	**(2,135,589)**
Harvest Depletion Emissions (Freehold and Crown)	4,541,937	4,519,944	4,096,000	4,795,800	5,414,983	**4,673,733**
Gross Land Use Removal Before Harvest Depletion	**(9,325,888)**	**(8,566,050)**	**(9,007,500)**	**(8,970,300)**	**(8,022,983)**	**(8,778,546)**

6) Limitations of the CBM-CFS3 Model – Merchantable Harvest Assumption

The CBM-CFS3 model used to calculate the net forest removal for the organizational carbon footprint of the Supply Chain assumes that all merchantable volume harvested immediately emits all CO_2 to the atmosphere. The Freehold and Crown License 7 emission from merchantable harvest depletion in 2024 was estimated to be 5,414,983 tonnes of CO_2. This assumption creates the following outputs:

a) clarity on the accounting for biogenic energy emissions and,

b) an overstatement of the emissions from the forest in the current year that needs to be corrected by describing the CO_2 emissions transferred from living biomass to Harvested Wood Products (HWP).

The gross forest removal before annual harvesting depletion is determined by adding the harvesting emissions back into the net forest removal. This gross forest removal of 8,778,546 tonnes of CO_2 is an appropriate starting point for product specific removal accounting.

Net Forest Land Use Removals Attributable to Tissue Products

The approach outlined above is well suited to describe the biogenic emissions, removals, and transfers at the organizational level of the Supply Chain. For CFP accounting for Tissue Products, the net biogenic forest land use removal for Freehold and License 7 is calculated specifically by attributing the gross forest removal associated with the mass balance of the forest directly attributable to Tissue Products, less the estimated biogenic emissions directly attributable to the harvesting and manufacturing of Tissue Products. End-of-Life models for products containing biomass estimate carbon stored permanently in landfills and they exclude biogenic CO_2 emissions from aerobic decay and flaring of CH4. For the portion of Tissue Products sourced from Freehold and License 7, CO_2 is removed in the land use stage and converted to C in biomass. Therefore, End-of-Life calculations need to be modified for the portion of Tissue Products sourced from Freehold and License 7 to ensure the carbon removed in the land use stage is not double counted in the landfill fate.

Biogenic Emissions In Tissue Products

The primary forest input for manufacturing Tissue Products is the residual wood chips that come from sawmills, chip plants, or mobile in-woods chipping operations. Wood chips are manufactured into Kraft pulp at IPP using a chemical pulping process that separates the wood fibres from lignin. Wood fibres are the portion of the wood chip that makes up Kraft pulp, while lignin acts as a "glue" that holds wood fibres together in the wood chip.

Wood chips are "cooked" with a combination of cooking chemicals (white pulping liquor), heat, and pressure that separates wood fibres from lignin, along with pulping liquor and water. The wood fibres are further processed with washing, bleaching, and drying to become Kraft pulp. The lignin, pulping liquor and water are further processed in the chemical recovery process. This slurry (known as black pulping liquor) is condensed by evaporating excess water so that it can be burned in a boiler, known as a recovery boiler. The inorganic chemicals (now known as green pulping liquor) are recovered and then recycled with the addition of lime to become white pulping liquor again so that it can be used in the cooking process. The heat produced from burning the organic lignin is used to create steam for mill operations. Burning of lignin creates biogenic CO_2 that is emitted to the atmosphere, matched to the timeframe of forest harvesting. In addition, waste bark from sawmills and chip plants is also burned at the pulp mill to create heat and steam for the Kraft pulping process. Burning bark also produces biogenic CO_2 that is emitted to the atmosphere matched to the timeframe of forest harvest.

These actual biogenic CO_2 emissions from the lignin in the black pulping liquor and waste bark are what is assumed to be immediately emitted in the CBM-CFS3 model. Therefore, deducting these biogenic CO_2 emissions from the gross forest removal attributable to Tissue Products can be used to determine the specific net forest removal attributable to Tissue Products. IPP emitted 983,418 tonnes of biogenic CO_2 in 2024.

The gross forest removal from allocated to the Tissue Products are based on the mass balance of the primary forest products harvested that flows to Tissue Products (17.86% of the 2024 Freehold and Crown License 7 harvest) from above (Table 5).

TABLE 11. FOREST REMOVALS ATTRIBUTABLE TO TISSUE PRODUCTS

Emissions/(Removals)	Tonnes CO_2
Gross Forest Emission/(Removal)	(8,778,546)
Attributable Fibre from Freehold and Crown License 7 to Tissue	17.86%
Attributable Forest Emission/(Removal) to Tissue Products	**(1,567,848)**
Total Biogenic Emissions at IPP	983,418
IPP Wood Fibre from Freehold and Crown License 7	69.97%
Biogenic Emissions from Freehold and Crown License 7	688,098
IPP Kraft Pulp to ICPL/ICPI	63.49%
Biogenic Emissions to ICPL/ICPI	**436,873**
Net Forest Emission/(Removal) Attributable to Tissue	**(1,130,975)**

Additional Wood Fibre Procured by Woodlands

Woodlands procured an additional 41.01% of the annual wood supply from forest lands not managed by Irving and therefore detailed CBM-CFS3 models were not created for these forest lands. These other lands include 28.19% of the wood supply from Other Crown lands and Private Lands in New Brunswick, 7.61% from private lands in Maine, and 4.65% from private lands in Nova Scotia. Emissions from these lands are reported in this manner to Environment and Climate Change Canada annually for preparation of Canada's National Inventory Report by the Province of New Brunswick and Nova Scotia. Each of these sources is not a net emitter of CO_2 (Ward 2021 re: New Brunswick and Steenberg, 2022: re Nova Scotia). The most recently available published information for Maine from 2018 shows that Maine forests are a net remover of carbon dioxide (Domke et. al. 2020). The remaining 0.56% of the wood supply comes from other private lands in Quebec and Prince Edward Island. While these forest lands are highly likely net removers of CO_2, this assumption has not been confirmed from a detailed model by Irving. Therefore, a conservative assumption is that emissions from these forest lands that are associated with 41.01% of the Woodlands fibre supply are assumed to be zero.

Wood Fibre Procured by Irving Tissue

In addition to the local fibre supplied by Woodlands, Irving Consumer Products sourced 176,990 tonnes of eucalyptus pulp from South American producers in 2024. This represents 43.72% of the mass balance of converted Tissue Products.

The eucalyptus pulp supply sources are Forest Stewardship Council (FSC) certified, indicating that no natural forest conversion to plantation has occurred since 1994 (FSC 2015). Following the International Panel on Climate Change guidance (IPCC 2003), emissions from land conversion reach an equilibrium after 20 years, therefore emissions from land conversion from the pulp purchased by Irving Tissue do not occur within the product life cycle.

To balance production and inventory requirements of the Converting mills, ICPL/ICPI may procure Parent Rolls from other tissue suppliers. There were no outside purchases of Parent Rolls in 2024.

These additional sources of fibre did not have removals estimated at the land use stage, therefore standard End-of-Life calculations are used.

Direct and Indirect Land Use Change

The sole purpose of the forest lands is to provide wood fibres for downstream operations. Key to maintaining this supply is long-term management of the forest, and as such there has been no conversion of Irving forests over the last 20 years. Therefore, there are no direct land use change emissions within the Tissue Product life cycle.

END-OF-LIFE

Summary of Product End-of-Life Calculations - Methodology prepared by Nathan Ayer, PhD, Senior Sustainability Advisor – Earthshift Global

Estimation of GHG Emissions for Tissue Products EOL

To estimate the GHG emissions associated with EOL disposal for Irving Tissue Products, the total amounts of Tissue Products shipped to the United States and Canada (in metric tonnes) were split according to most likely EOL fate, and the mass of material going to each EOL fate was multiplied by corresponding GHG emissions factors. Data on the mass of each Tissue Product and the amount of each product going to US and Canadian markets were obtained from Irving financial records for 2024. The mass of tissue products was disaggregated between eucalyptus pulp, softwood kraft pulp from Irving managed forest, and softwood kraft pulp from non-Irving managed forest. Data used to determine the EOL fate and corresponding GHG emissions factors were obtained from government reports as described in the following sections. Tissue Products are assumed to behave as corrugated medium, as noted in the WARM model. Corrugated products are produced using a chemical pulping process, so like Tissue Products that use a Kraft pulping process do not contain lignin.

Fate of Tissue Products at EOL

The EOL fate of facial tissue, napkins, and paper towels in United States markets were determined using data from the United States Environmental Protection Agency (USEPA) annual data report on solid waste management. The most recent issue provides reported data from 2018 on the amounts of different material types going to different EOL fates. The most appropriate material type was selected to represent each type of tissue product, and the data for each material type were used to estimate the percentage of Tissue Products going to each EOL fate, as follows (USEPA, 2020a):

- Landfilling – 82%
- Incineration (with energy recovery) – 18%

All bathroom tissue was assumed to be flushed in toilets and processed through a municipal wastewater treatment system. Once entering a WWT system, it was assumed that Tissue Products would be removed from the wastewater via primary screening and would become part of the collected biosolids at the plant. WWT biosolids were assumed to be treated in one of four different ways based on data from the USEPA as follows (USEPA, 2022):

- Landfill – 27%
- Incineration (with energy recovery) – 16%
- Composting followed by land application – 29%
- Anaerobic digestion followed by land application – 28%

The USEPA data did not specify the percentage of land applied biosolids that came from composting or from anaerobic digestion, so it was assumed that half of land applied biosolids were composted first, and half were put through anaerobic digestion first.

Since data of comparable resolution and accuracy on tissue paper EOL were not available for Canada, the USEPA data for tissue paper were assumed to apply in Canadian markets as well.

Fate of Product Packaging at EOL

The EOL fate of product packaging components in

United States markets were determined using data from the United States Environmental Protection Agency (USEPA) annual data report on solid waste management. The most recent issue provides reported data from 2018 on the amounts of different material types going to different EOL fates

- Poly overwrap – "Other plastics packaging"
- Landfill – 78%
- Incineration (with energy recovery) – 19%
- Recycling – 3%

Since data of comparable resolution and accuracy on packaging material EOL were not available for Canada, the USEPA data for tissue paper were assumed to apply in Canadian markets as well.

Greenhouse Gas Emissions Factors for Tissue Product and Packaging EOL

Paper-based packaging EOL emissions are calculated using the CFF methodology, so the only the plastic-based packaging emissions are modeled here. All Tissue Products are wrapped in poly overwrap; the same assumptions about proportion have been made here as well. Given the size of these emissions relative to the overall carbon footprint, the variation by Tissue Product type is assumed to be insignificant.

Landfill

GHG emissions from landfilling of Tissue Products and packaging were estimated using emissions factors from Exhibit 6-17 in the USEPA Waste Reduction Model (WARM) background report for a national average landfill (USEPA, 2020b).

The WARM model estimates of net GHG emissions for national average landfilling include the following:

- Transport of MSW to the landfill
- Emissions of methane from decomposition of organic matter in the landfill

National average landfill emissions factors were calculated by the USEPA in considering the percentage of landfills with different conditions that would influence decay rates for organic materials, and the percentage of landfills with different levels of landfill gas capture and utilization. Emissions factors are provided by material type, and the emissions factors for "corrugated products" were used for all landfilled Tissue Products. In addition, the landfilling emissions factor for corrugated products was used to characterize the emissions from landfilling of WWT biosolids derived from bathroom tissue disposal. For packaging, emissions factors for the following material types were used:

- Core stock, facial cartons, facial wrappers – "Mixed paper (residential)"
- Corrugate – "Corrugated containers"
- Poly overwrap – "PP" (polypropylene)

Since GHG emissions factors of a similar level of resolution and data quality were not available for Canada, the USEPA Warm emissions factors for landfilling were assumed to apply in both the US and Canada.

Limitation of the WARM Model

To avoid the issue of double counting land use removals with EOL storage and emissions, the WARM model factors were modified to reverse carbon stored in the landfill and estimate biogenic CO_2 released from aerobic decomposition and methane flaring to CO_2 for the wood fibre sourced from the Freehold and License 7 land use. Land use removals were not included in the CFP from other fibre sources (non-JDI in the softwood Kraft pulp and the bleached eucalyptus Kraft pulp), therefore the standard WARM model was used for that portion of the Tissue Products disposed. Similarly, biogenic removals from packaging were not counted in the land use stage so the standard approach in the US EPA WARM model were used.

Incineration

GHG emissions from incineration of Tissue Products and packaging were estimated using emissions factors from Exhibit 5-7 in the USEPA WARM background report for a national average incineration process (USEPA, 2020b). The WARM model estimates of net GHG emissions for national average incineration include the following:

- Emissions from combustion of materials

National average incineration emissions factors were calculated by the USEPA in considering the national average combustion efficiency and rate of energy recovery, as well as the avoided GHG emissions for a national average electricity grid mix. Emissions factors are provided by material type, and the emissions factors for "corrugated products" were used for all incinerated Tissue Products. For packaging, emissions factors for the following material types were used:

- Poly overwrap – "PP" (polypropylene)

Since GHG emissions factors of a similar level of resolution and data quality were not available for Canada, the USEPA Warm emissions factors for incineration were assumed to apply in both the US and Canada.

The USEPA WARM factor for incineration with energy recovery includes a credit for avoided utilities. We have excluded this credit from our EOL calculation of incineration with energy recovery because the removal in energy recovery are a benefit to the user of the recovered energy. We have included the emission associated with the combustion.

Incineration of WWT Biosolids

Emissions factors for incineration of WWT biosolids were obtained from a Canadian government study on the GHG emissions associated with municipal waste management pathways for organic wastes.

As described in Section 5.3 of the report, the activities captured in the emissions factors include (ECCC, 2022a):

- Emissions from electricity generation for electricity used for incineration
- Emissions from natural gas production and consumption used for incineration
- Fugitive emissions from WWT biosolids during storage
- Avoided electricity emissions from energy recovery due to incineration

Emissions from electricity generation were estimated using average grid mix factors of 138 g CO_2 eq./kWh for Canada and 479 g CO_2 eq./kWh for the United States (USEIA, 2023). Emissions for the production and combustion of natural gas were estimated as 2.31 kg CO_2 eq./m3.

Anaerobic Digestion and Land Application of WWT Biosolids

Emissions factors for anaerobic digestion and land application of WWT biosolids were obtained from a Canadian government study on the GHG emissions associated with municipal waste management pathways for organic wastes. As described in Section 3.4 of the report, the activities captured in the emissions factors include (ECCC, 2022a):

- Emissions from electricity generation for electricity used in shredding and grinding of organic materials
- Emissions from diesel production and consumption used in shredding and grinding of organic materials
- Fugitive emissions from compost associated with WWT biosolids
- Avoided emissions from the offset of fertilizer due to land application

Emissions from electricity generation were estimated using average grid mix factors of 138 g CO_2 eq./kWh for Canada and 479 g CO_2 eq./kWh for the United States (USEIA, 2023). Emissions for the production and combustion of diesel fuel were estimated as 3.59 kg CO_2 eq./l.

Composting and Land Application of WWT Biosolids

Emissions factors for composting and land application of WWT biosolids were obtained from a Canadian government study on the GHG emissions associated with municipal waste management pathways for organic wastes. As described in Section 4.3 of the report, the activities captured in the emissions factors include (ECCC, 2022a):

- Emissions from electricity generation to power the digester facility and for dewatering
- Emissions from natural gas production and consumption to operate the digester
- Fugitive emissions from the land application of cured and uncured material
- Avoided emissions from the offset of fertilizer due to land application

Emissions from electricity generation were estimated using average grid mix factors of 138 g CO_2 eq./kWh for Canada and 479 g CO_2 eq./kWh for the United States (USEIA, 2023). Emissions for the production and combustion of natural gas were estimated as 2.31 kg CO_2 eq./m3.

Modifications to USEPA WARM Emissions Factors for Solid Waste Incineration

A portion of JDI tissue products is assumed to be sent to municipal incineration at end-of-life. Greenhouse gas (GHG) emissions factors for average municipal incineration were obtained from the USEPA WARM model version 16 (December 2024).

It is noted that CO_2 emissions generated from the combustion of biogenic carbon during incineration are not included in WARM emissions factors, and as such, there is potential for underestimation of the total GHG emissions from incineration of tissue products.

EarthShift Global has developed an approach to modify the GHG emissions factors in WARM to include the combustion of biogenic carbon and limit the potential for underestimating life cycle GHG emissions. This modification is a simple procedure based on the estimated carbon content of the tissue products, and the estimated combustion efficiency of the incineration process.

Using the WARM emissions factors requires the user to select the closest material type available in the calculation tool that is as representative of the JDI tissue products as possible. It was determined that the "corrugated containers" material type was most appropriate for JDI tissue.

According to data in the WARM calculation approach, corrugated containers have a carbon content of approximately 47% on a mass basis, such that every tonne of tissue products contains 470 kg of carbon (see Exhibit 6-4 from USEPA in Figure 1 below).

Combustion Efficiency of Incineration

The USEPA WARM model calculations for GHG emissions from municipal incineration are based on an average of typical "mass burn" combustion systems in the United States, which are facilities that generate electricity to be sold to the grid during incineration. The model assumes that combustion of solid waste results in emissions of biogenic CO_2 emissions (which are not counted) as well as N_2O emissions. In reviewing the values for CO_2 emissions from materials that do not contain biogenic carbon, it is noted that the WARM model assumes full combustion and release of CO_2 emissions. Although some carbon may end up in ash produced during incineration, this is assumed to be negligible, and a more conservative approach of full combustion is assumed.

Based on the assumption of full combustion and a carbon content of 47%, it is estimated that incineration of 1 tonne of JDI tissue products would result in the emission of 470 kg of biogenic carbon. This amount of biogenic carbon was converted to CO_2 emissions using the following calculation based on their ration of atomic weights:

0.47 tonnes carbon * 44/12 = 1.72 tonnes CO_2 per metric tonne of JDI tissue products

This biogenic emission applies to the mass of tissue products from Irving owned or managed forest whose fate was incineration.

Modifications to USEPA WARM Emissions Factors for WWT Emissions Factors

All JDI bathroom tissue was assumed to be flushed and sent to municipal wastewater treatment at EOL. Emissions factors for the treatment of municipal wastewater, in particular the handling of biosolids, were obtained from the Canada Greenhouse Gas Calculator for Organic Waste Management. In this calculator, a portion of WWT solids are assumed to be incinerated, and the biogenic carbon released during incineration is not included in the GHG emissions factors for this EOL fate.

Similar to the adjustment of WARM emissions factors for municipal incineration of solid waste, EarthShift Global has adjusted the emissions factors for incineration of WWT biosolids to account for biogenic carbon emissions to avoid the potential underestimation of GHG emissions.

Based on the assumption of 47% carbon content, it is assumed that one metric tonne of JDI bathroom tissue contains 470 kg of carbon, or 0.47 tonnes of biogenic carbon. Assuming that all of the biogenic carbon in bathroom tissue is present in the WWT biosolids, and assuming perfect combustion during incineration of biosolids, this would result in the release of 0.47*44/12 = 1.72 tonnes of CO_2 per tonne of bathroom tissue.

The organic waste GHG calculator assumes that a portion of the carbon contained in WWT biosolids is emitted as methane at a rate of 0.0016 tonnes of methane per tonne of dry biosolids. Although this means that a portion of the biogenic carbon content of the bathroom tissue is released as methane, this amount is assumed to be negligible, and as a conservative approach it is assumed that all of the biogenic carbon content of the bathroom tissue will be released to the atmosphere during incineration of WWT biosolids.

As such, it is assumed that for every metric tonne of bathroom tissue that goes through WWT and then incineration, there is a release of 1.72 tonnes of CO2e to the atmosphere.

Summary of Packaging Carbon Footprint Calculations - Prepared by Juanita Barrera and Nathan Ayer, PhD – Earthshift Global

To estimate the GHG emissions associated to the packaging of the Tissue Products, the Circular Footprint Formula (**"CFF"**) was applied. The CFF formula defines a rule to allocate the environmental burdens and benefits of recycling and recovering energy, between the first and the second life of the product or material. This formula considers the end-of-life impacts of materials accounting for the percentage of the material being recycled, landfilled, and incinerated (generating or not energy). It has be divided into 5 different sections: environmental impacts associated with the use of virgin material, impacts associated to the use of recycled material, impacts associated with recycling at EOL, impacts associates with energy recovery at EOL and impacts associated with the final disposal (landfilling) of the material at EOL (Wolf, et al., 2019). The mathematical expression is shown in Figure 5.

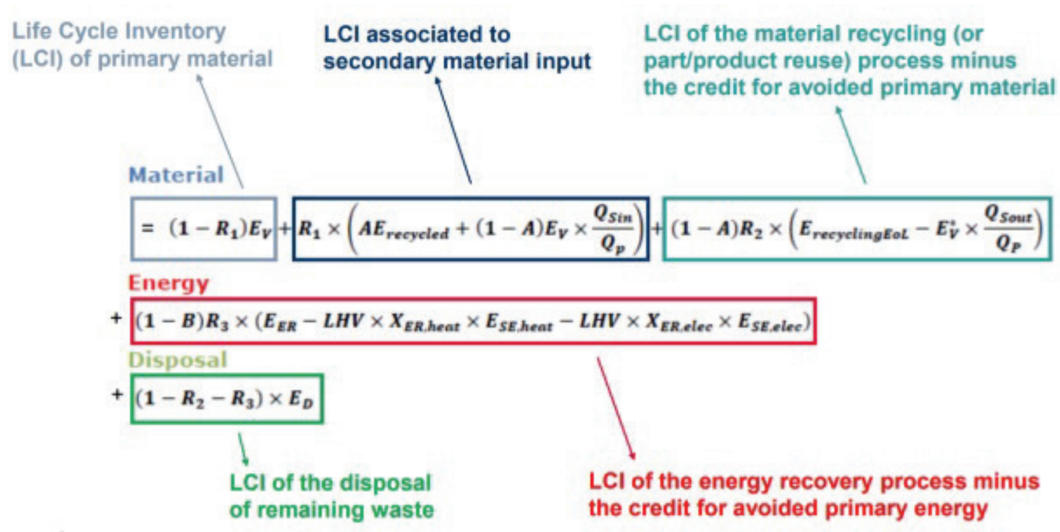


FIGURE 4: CIRCULAR FOOTPRINT FORMULA

Material section

For the first two sections of the formula, allocation of burdens from recycling and virgin material production are defined by the R1 parameter. R1 represents the proportion of material in the input to the production that has been recycled from a previous system (Wolf, et al., 2019), this data was provided by JDI as is presented in the Table 12 below.

TABLE 12. RECYCLED CONTENT OF PACKAGING

Packaging category	% recycled material
Core Stock	100
Corrugate (1)	57
Corrugate (2)	92
Paper Wrappers	0
Facial carton window	100

R2 (the third section of the formula) represents the amount of material that will be recycled at the EOL. When considering recovery process at EOL, the formula assigns credits for the avoided use of the materials in a potential second life. For example, when considering recycling at EOL, the formula includes a calculation of credits for the avoided use of primary material in the economic system, thanks to the introduction of a secondary material (recycling rates at EOL are defined by the factor R2 - proportion of the material in the product that will be recycled or reused in a subsequent system).

"A" parameter is intended to split the burdens between the material with recycled content (going in), and the material to be recycled at the end of life (going out), An A factor equal to 1 would allocate all impacts to the recycling process in the input side, and none to the recycling at the end of life, while an A factor equal to 0 would account for recycling impacts at EOL and would not consider any impacts related to the input side. Based on the PEF parameters provided by the UE, the A factor must be a range between 0.2 and 0.8, in order to assure the capture of the impacts of both recyclability at EOL and recycled content of any given material. In this case the A factor considered is 0.2, as is suggested in the PEF parameters.

Energy section

When considering recovery process at EOL, the formula assigns credits for the avoided use of energy, due to the use of materials as an energy source in a potential second life. R3 is the amount of material that is transformed into energy.

Furthermore, the energy recovery section considers credit for the avoided use of primary energy in any subsequent system (energy recovery rates are defined by the factor R3) (Wolf, et al., 2019).

Parameters used for the CFF calculation are retrieved from the Guidance for the development of Product Environmental Footprint Category Rule (Zamperi & Pant, 2019).

Disposal Section

The amount of material that is not going into recycling or energy recovery, will be destined for disposal.

End of Life Management for Packaging

The EOL fate of product packaging components in United States markets were determined using data from the United States Environmental Protection Agency (USEPA) annual data report on solid waste management. The most recent issue provides reported data from 2018 on the amounts of different material types going to different EOL fates. As was mentioned before, R2 represents the amount of material that will be recycled at the EOL, so, it is presented below as the recycling rate. R3 is the amount of material that will be incinerated for energy production, values used in this study are reported below.

The most appropriate material type was selected to represent each type of packaging component, and the data for each material type were used to estimate the percentage of packaging products going to each EOL fate, as follows (USEPA, 2020a):

- Core stock, facial cartons, facial wrappers – "Other paper/paperboard"
    - Landfill – 15%
    - Incineration (with energy recovery) – 64%
    - Recycling – 21%
- Corrugate – "Corrugated board"
    - Landfill – 3%
    - Incineration (with energy recovery) – 1%
    - Recycling – 96%
- Poly overwrap – "Other plastics packaging"
    - Landfill – 19%
    - Incineration (with energy recovery) – 78%
    - Recycling – 3%

Packaging EOL Landfill

For calculating the net GHG emissions from landfilling of packaging the Ecoinvent dataset "Waste paperboard {RoW}| treatment of waste paperboard, sanitary landfill | Cut-off, U" was used. This dataset includes the following:

- Emissions of methane from decomposition of organic matter in the landfill.
- Emissions from the landfill are released to the environment (air due to landfill gas, water due to landfill leachate, and subsequent into groundwater).
- Collection and transportation of the waste

Emission factors were taken from IPCC 2021 method. This method was developed by the Intergovernmental Panel on Climate Change. It contains the Global Warming Potential (GWP) climate change factors of IPCC with a timeframe of 100 years.

Incineration (with energy recovery)

For calculating the net GHG emissions from Incineration of packaging the Ecoinvent dataset "Heat, district or industrial, natural gas {CA-QC} | market for heat, district or industrial, natural gas | Cut-off, U", "Electricity, medium voltage {CA}| market group for electricity, medium voltage | Cut-off, U" and "Waste paperboard {CH}| treatment of waste paperboard, municipal incineration | Cut-off, U" were used. Those datasets include the following:

- Emissions from combustion of materials
- Avoided emissions from electricity and heat generation due to energy recovery.

Emission factors were taken from IPCC 2021 method. This method was developed by the Intergovernmental Panel on Climate Change. It contains the Global Warming Potential (GWP) climate change factors of IPCC with a timeframe of 100 years.

Recycling

For calculating the net GHG emissions from Incineration of packaging the Ecoinvent dataset "Containerboard, linerboard {CA-QC}| containerboard production, linerboard, testliner | Cut-off, U", and "Containerboard, fluting medium {RoW}| containerboard production, fluting medium, recycled | Cut-off, U" were used. Those datasets include the following:

- Emissions from transportation
- Emissions from the recycling process of carton and cardboard

Emission factors were taken from IPCC 2021 method. This method was developed by the Intergovernmental Panel on Climate Change. It contains the Global Warming Potential (GWP) climate change factors of IPCC with a timeframe of 100 years.

DATA QUALITY AND METHODOLOGY

Activity and Emissions Factor Data Quality

All CO_2e emissions and removals are estimates taken from both direct and indirect sources using the best available factors to convert activity data to emissions. To improve the quality of estimates, activity data is based on financial and enterprise reporting systems.

Primary and secondary data sources have been used to estimate emissions at each life cycle stage. Wherever possible, primary data sources are linked to financial reporting and audited financial statements; secondary data sources have been used when no primary data were available.

Primary data sources include:

- Invoiced fuel purchases including the volume of diesel, gasoline, natural gas, propane, and heating fuels.
- Invoiced electricity usage by manufacturing facilities, offices, buildings, and garages.
- Mass of forest products including residues sold, volume of lumber sold, Kraft pulp, corrugating medium, and tissue products sold reported in internal management systems.
- For Scope 3 emissions, the mass of wood harvested, delivered, or purchased from internal management systems, tonnes of pulp and parent rolls purchased, kilograms of chemicals and packaging purchased, and waste from invoiced data.
- For freight-based emissions, distances come from third party invoiced distances or from calculating distances from publicly available mapping systems, tonnes and loads delivered are sourced from internal management systems.

Secondary data sources include:

- Emissions factors sourced from published government sources, published papers, or following life-cycle analysis best practices.
- For wood harvesting and delivery, factors are estimated at the machine level by Irving and are tied to the piece work rates paid to contractors.

CO_2e emissions and removals from Net Forest Growth are also generated from enterprise systems that facilitate long term forest management. These systems include geographic information systems (GIS), enhanced forest inventory, growth, and yield models (G&Y), and forest management planning software. The same systems that calculate forest inventory, growing stock, and calculate annual allowable harvest levels, are used to estimate the net forest carbon emissions.

Emissions and removals were calculated using the CBM-CFS3 model. This model is the current standard in reporting emissions from Net Forest Growth and it is based on the best available science. There is inherent uncertainty in model inputs and forecasts of forest inventory, forest growth and depletion. To reduce uncertainty in the inventory and forest growth, modern technology and modern techniques following current scientific guidance are used to determine forest inventory.

There is also inherent uncertainty in the calculated transfers to and from Harvested Wood Products (HWP). To reduce this uncertainty, the following steps were taken with the data:

- Woodlands forest inventory to determine the tree species distribution.
- Regionally based and published tree density factors by species.

METHODOLOGY CHANGE FOR 2024 REPORTING YEAR – FIVE YEAR ROLLING AVERAGE

Prior to the 2024 reporting year, the land use forest removal was calculated using a calendar year stock change approach. In 2024, Irving has moved to a five-year rolling average of the annual land use emissions/(removals). The methodology has changed in 2024 to better align with how Irving governs harvest sustainable levels and the goal stated in the Climate, Conservation and Community Impact Reports to "Maintain a five-year average of forest growth at or above harvest". 2024 is the first year where five years of land use removals exist to be averaged and is therefore the first possible year for this change in methodology.

The Annual Allowable Cut (AAC) determines the sustainable volume of wood by species and product that can be harvested each year. The AAC is determined for each forest land base using an optimization model with the objective function to achieve a non-declining softwood yield for the eighty-year management plan, expressed in five-year planning periods. The long-term model is re-run approximately every five years for another eighty years in an adaptive planning approach.

Within a five-year period, the actual harvest cannot exceed the five-year AAC. However, it is normal that within the five-year period, that harvest levels fluctuate due to factors such as commodity market conditions, weather, work force availability, or other reasons. Similarly, the forest growth over that period also fluctuates from the model for weather and other biological reasons. Actual harvest levels are determined by mass or volume scaling of forest products as they are delivered to customer mills in the calendar or operating year. The measurement of most forest products is done by mass scale and then the mass is converted to volume using regionally determined mass-to-volume factors.

The AAC may go up in future management plan periods. While the AAC changes with the date of the period, it is a result of accumulated growth over previous periods. Without a rolling average, previously accumulated biological growth is not accounted for.

The AAC is carefully balanced with the organization's industrial plan to ensure sufficient wood supply exists to make long-term investments and enable future growth. Compliance to the AAC is reported annually as part of independent third-party forest certification.

There are two distinct measurement systems in place: modeled outputs for estimating land use emissions/(removals), and delivered scaled outputs to control the actual harvest levels. While comparing modeled outputs to delivered scale should be directionally similar, direct comparison is not possible. For example, not all operating areas have viable markets for pulpwood (the portion of the tree too small, crooked, or rotten to make lumber). Therefore, pulpwood is left in the woods where it is harvested. The carbon modeling accounts for the emissions from the harvested pulpwood, but the wood it is not ever scaled by delivery. Estimates of un-utilized products like pulpwood are included in setting the AAC where necessary.

Data Quality & Uncertainty

Data quality assessment has been performed on emissions and removal data from each life cycle stage (see assessment criteria outlined in the tables below). The quality of activity data and most emissions factors are in the very good to good range. Tables 5 and 6 outline criteria for the assessment of activity or emission factor data quality.

TABLE 13. PRIMARY ACTIVITY DATA QUALITY ASSESSMENT

Activity Data Quality	Assessment Criteria
Very Good	From audited financial statements, or enterprise management systems. Invoice based. Measured. Very complete. Third-party audited or regulatory compliance related. Would not expect greater than 10% variance in results.
Good	From enterprise management systems. Invoice based. Mostly complete. May involve secondary conversions or estimates. Not subject to third party or regulatory audit.
Fair	Estimated or incomplete data sources, sampled. Not tied to financial reporting. No audit trail available.
Poor	Incomplete or missing information.

TABLE 14. SECONDARY EMISSIONS FACTOR DATA QUALITY ASSESSMENT

Emissions Factor Quality	Assessment Criteria
Very Good	Factor specific to a region, process, and less than 5 years old. Factors derived from actual data. Would not expect greater than 10% variance in results.
Good	National factor, factor between 5-10 years. Factor for a general process.
Fair	Global factor or national factor with significant uncertainty expressed in documentation, or national factor not specific to a process.
Poor	Global factor estimated older than 10 years. Back up documentation incomplete.

UNCERTAINTY

The very nature of GHG emissions and removals accounting is inherently uncertain given the range of activity and emissions factor data quality outlined above in addition to the required assumptions and allocations to produce a CFP. Even with Very Good activity data and emissions factors some variation is to be expected, with lower quality data having increasing variability. The process to evaluate the uncertainty of the Tissue Product carbon footprint is to:

1. Assign qualitative uncertainty to each GHG emission and removal source within each of the Life Cycle stages using the GHG Protocol Qualitative Uncertainty Tool.
2. Model the sum of GHG emissions and removals independently with the associated variation, using Monte Carlo simulation to determine the proportion outcomes where the result is carbon neutral.

Results

The GHG Protocol Qualitative Uncertainty Tool generates a variability to a 95% level of confidence for the pool of GHG emissions and removals as summarized in the table below.

TABLE 15. GHG EMISSION AND REMOVAL WITH ESTIMATED +/- RANGE

	Reported Emission or Removal	Minimum Range	Maximum Range
Material Acquisition & Pre-Processing	719,009[5]	209,124	414,071
Production	482,695	431,792	546,597
Distribution & Storage	68,224	26,237	180,237
Use	2,732	1,547	4,825
End-of-Life	131,029	112,473	152,648
Land Use Removal	(1,567,848)	(1,166,526)	(2,107,237)

5] Includes biogenic emissions from Kraft pulping disclosed in Table 11, modelled as direct energy and a positive emission matched to the gross forest land use removal.

The output of the Monte Carlo simulation is presented below in Figure 6. The sum of the GHG emissions and removals in the footprint modeled randomly with one million iterations yields a result where the CFP is not carbon neutral in 2,596 iterations. Reversing this, the outcome of this analysis is that the CFP is carbon neutral in 99.74% of iterations.

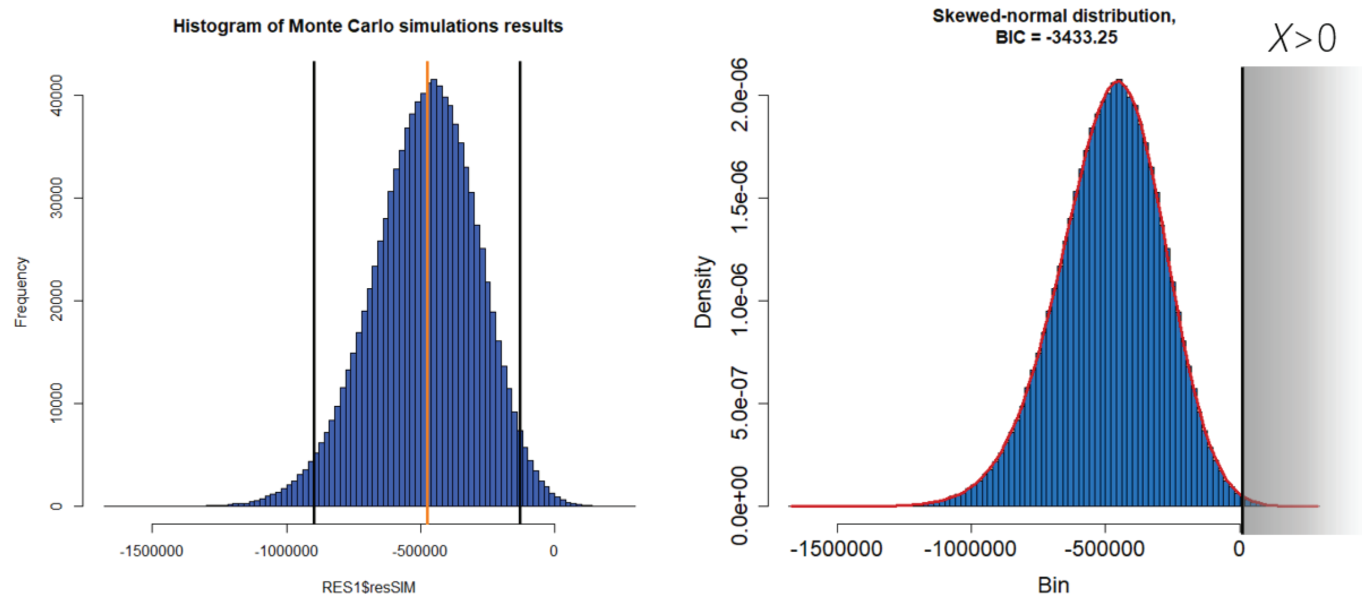


FIGURE 6: UNCERTAINTY ANALYSIS - MONTE CARLO SIMULATION OUTPUT

DESCRIPTION OF THE DATA

TABLE 15. METHODOLOGY AND PROCEDURES FOR DATA COLLECTION AND QUANTIFICATION

Category	Emission/ Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
M1	Land Use Emissions/ Removals	Very Good	Very Good	See Pages 16 to 22 in this Report for a detailed discussion of forest land use emissions and removals methodology.	
M2	Limit harvesting emissions	Very Good	Good	Annual production of roundwood in metric tonnes delivered to all Customer destinations multiplied by the estimated JDI litres per metric tonne factor for the mix of harvesting systems. Hardwood roundwood stratified as converted by a flail chipper or chip plant. Fuel consumption information from detailed machine cost analysis and productivity information from Irving's management system which is tied to contractor per-tonne payment calculated based on 2023 data. (Note these internally derived factors will be reviewed periodically to account for changes in logging machinery and/or logging systems, but they are not expected to change year-over-year).	3rd Party Reviewed Internally Derived Factor
M2	Limit flail chipping emissions	Very Good	Good	Annual production of flail chips in metric tonnes delivered to Customers multiplied by the estimated JDI litres per metric tonne factor for the mix of flail chipping systems. Fuel consumption information from detailed machine cost analysis and productivity information from Irving's management system which is tied to contractor per-tonne payment calculated based on 2023 data. (Note these internally derived factors will be reviewed periodically to account for changes in logging machinery and/or logging systems, but they are not expected to change year-over-year).	3rd Party Reviewed Internally Derived Factor
M2	Purchased roundwood emissions	Very Good	Good	Annual purchased volume of roundwood in metric tonnes from all sources (Freehold, Crown License 7, Other Crown lands, Private lands) multiplied by the estimated JDI litres per metric tonne factor calculated based on 2023 data for the estimated mix of harvesting systems. (Note these internally derived factors will be reviewed periodically to account for changes in logging machinery and/or logging systems, but they are not expected to change year-over-year). Purchased wood systems are assumed to be consistent with the average Irving harvesting systems.	3rd Party Reviewed Internally Derived Factor

Category	Emission/ Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
M2	Limit roundwood and chip delivery emissions (trucking)	Very Good	Good	Annual pro forma fuel consumption calculated based on 2023 data in estimated JDI litres of roundwood and flail chip trucking from the trucking rate management system. (Note these internally derived factors will be reviewed periodically to account for changes in trucking systems and/or average haul distances, but they are not expected to change year-over-year). This system calculates the litres consumed (and paid to contractors) on each two-way trip by calculating the distance by road class and the fuel burn by road class (speed) by truck type for each trip for each tonne. Litres per metric tonne factor developed. Includes transportation from yards.	3rd Party Reviewed Internally Derived Factor
M2	Purchased roundwood delivery emissions (trucking)	Very Good	Good	Annual purchased roundwood production in metric tonnes from all sources (Freehold, Crown License 7, Other Crown lands, Private lands) multiplied by the estimated JDI litres per metric tonne factor calculated based on 2023 data from the Irving roundwood trucking. (Note these internally derived factors will be reviewed periodically to account for changes in trucking systems and/or average haul distances, but they are not expected to change year-over-year). This factor will be created by dividing the Irving roundwood proforma litres by the delivered Irving roundwood metric tonnes.	3rd Party Reviewed Internally Derived Factor
M3	Sawmill Site Emissions	Very Good	Good	In accordance with NIR reporting, all sawmill site emissions from burning fossil fuels attributable to Tissue Products are recorded and converted to CO_2e. Fuels used in kilns to dry lumber are not included as this activity is not attributable to tissue. Woodlands log loaders are included with the Sawmills loaders in this reporting. Fossil fuel consumption by invoice converted to CO_2e using $kgCO_2$/kwh by jurisdiction, following the guidance in ECCC 2023 for Canadian operations and EPA 2025 for US operations.	ECCC 2023 EPA 2025

Category	Emission/ Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
M3	Sawmill Site Electricity	Very Good	Good	Electricity consumption for Sawmill sites from the Sawmill financial records and invoices converted to CO2e using kgCO2/kwh by jurisdiction, following the guidance in ECCC 2023 for Canadian operations and EPA 2025 for US operations. Electricity emissions are allocated to tissue following a mass balance approach.	ECCC 2023 EPA 2025
M4	Sawmill Residual Freight	Very Good	Fair	Emissions from truck freight for residual chips and hog fuel to IPP by truck or rail. Data source is tonnes of product from Irving internal accounting system and route kilometers converted to tonnes of GHG and using the kg/CO2e by tonne-km factor referenced.	EPA 2025
M5	Irving Pulp & Paper Site Emissions	Very Good	Very Good to Good	In accordance with GHGRP reporting, IPP site emissions from burning fossil fuels and Biogenic fuels are recorded and converted to CO2e. CO2 from Biogenic fuels are excluded, but CH4 and N2O are included. Fossil fuel consumption by invoice converted to CO2e using kgCO2/kwh by jurisdiction, following the guidance in ECCC 2023 for Canadian operations. IPP Scope 1 emissions are allocated to tissue following a mass balance approach.	ECCC 2023
M5	Irving Pulp & Paper Site Electricity	Very Good	Very Good	In accordance with GHGRP reporting, electricity consumption for IPP from invoiced electricity converted to CO2e using kgCO2/kwh by jurisdiction, following the guidance in ECCC 2023 for Canadian operations. IPP Scope 2 emissions are allocated to tissue following a mass balance approach.	ECCC 2023

Category	Emission/ Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
M6	Irving Pulp & Paper Chemical Use	Very Good	Good to Fair	Cradle to gate GHG emissions from chemical purchases for IPP for the chemicals referenced are recorded and converted to GHG using the factors provided in 2024, to calculate a CO2e/kg of chemicals used factor. Chemical use reported as purchased chemicals converted to dry kilograms and converted to GHG using the 2024 factor for emissions per kg for pulp and paper mills. IPP Scope 3 emissions are allocated to tissue following a mass balance approach.	Tomberlin et al 2020
M7	IPP Pulp Freight to ICP	Very Good	Good to Very Good	GHG emissions from freight of Kraft pulp, corrugated medium to ICP. ADMT of Kraft pulp, corrugated medium via rail, truck, and ship by distance. Calculate emissions from factors referenced kg CO2e/tonne-km. Intermodal assumed to be the same as rail. As only tissue freight is included, no allocation of emissions is required.	EPA 2025
M8	Consumer Packaging	Very Good	Fair	A circular footprint formula (CFF) was used to create cradle-to-gate emissions from upstream supply chain purchases packaging materials to account for the proportion of recycled products included in packaging materials. Cardboard packaging, cores and paperboard are calculated from the tonnes purchased and emission factors from Tomberlin et al (2020). Adhesives and plastic wraps (326110), using annual spending and referenced kg/CO2e per USD spent (2018) factor for sectors referenced (EPA 2021). Excluded from the product footprint is end-of-life biogenic emissions from recycled packaging. In WARM corrugated containers are modeled based on a 70% closed-loop recycling process and 30% based on an open-loop recycling process. For corrugated containers 100% of recovered materials are retained in the recovery stage. Therefore it is assumed that biogenic carbon released as a result of end-of-life recycling of corrugated containers would be negligible to the overall product footprint.	Tomberlin et al 2020 EPA 2021 USCB 2022 BOC 2022 USBLS 2022 USEPA2020a USEPA2020b Wolf et al 2019 Zamperi & Pant 2019

Category	Emission/ Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
M9	Consumer Products Pulp purchases	Very Good	Fair	Emissions from purchases of eucalyptus pulp (EUC) from external suppliers in tonnes, calculated using emissions from two of three EUC suppliers (77% of EUC consumed) to create a weighted average EUC pulp factor EUC suppliers provided emission detail delivered to US ports, then rail freight emissions were estimated to each ICP mill, for a weighted average factor unique to each mill. EUC pulp from internal accounting systems.	Internally derived factor from 3rd party reviewed supplier emissions
M9	Consumer Products Pulp and Parent Roll purchases	Very Good	Good	Emissions from purchases of Parent Rolls from external suppliers in tonnes, using published emissions factors. Pulp and Parent Roll purchases from the internal accounting systems. Emissions factors for Parent Roll purchases from Table 7 referenced.	Tomberlin et al 2020
P1	Consumer Products Emissions	Very Good	Very Good to Good	In accordance with GHGRP reporting, all Consumer Products site emissions from burning fossil fuels converted to CO_2e. Fossil fuel consumption by invoice converted to CO_2e using $kgCO_2/kwh$ by jurisdiction, following the guidance in ECCC 2023 for Canadian operations and EPA 2025 for US operations.	ECCC 2023 EPA 2025
P1	Consumer Products Electricity	Very Good	Very Good	Electricity consumption for Consumer Products sites from the Consumer Products financial records and invoices converted to CO_2e using $kgCO_2/kwh$ by jurisdiction, following the guidance in ECCC 2023 for Canadian operations and EPA 2025 for US operations.	ECCC 2023
P2	Consumer Products Chemical Use	Good	Fair	Cradle to gate GHG emissions from chemical purchases in Consumer Products for the chemicals listed in Tomberlin et al (2020) are recorded and converted to GHG using the factors provided in 2024, to calculate a CO2e/kg of chemicals used factor. Chemical use reported as purchased chemicals converted to dry kilograms and converted to GHG using the 2024 factor for emissions per kg for tissue mills.	Tomberlin et al 2020

Category	Emission/ Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
P3	Consumer Products Freight to Customers (internal)	Very Good	Fair	Parent Roll transportation between tissue mills. Parent Roll usage from internal accounting systems reporting. Calculate emissions from factors referenced. Freight is by truck.	EPA 2025
P4	Waste Disposal	Good	Good	Tonnes of commercial/industrial waste disposed of from ICP in a landfill.	EPA 2025
D1	Direct Consumer Products Freight to Customers	Very Good	Fair	GHG emissions from freight of finished Tissue Products via rail or truck by distance from mill to Customer (direct to retail, to ICPL/ICPI warehouse, then to retail or customer DC, or to customer DC) . Calculate emissions from factors referenced kg CO2e/tonne- km. Intermodal assumed to be the same as rail. Tonnes moved includes the product and the packaging. For clarity, there is no freight carried by aircraft.	EPA 2025
D2	Upstream and Downstream Leased Assets	Good	Fair	Cradle to gate emissions from upstream (office space) and downstream (warehousing) assets. Using annual spending from financial statements spending and referenced kg/ CO2e per USD spent (2022) factor for sector 493 “Warehousing and Storage” and sector 531 rental of “Other Real Estate.” Includes additional heating and electricity emissions where required in lease.	EPA 2025 USCB 2024 BOC 2024 USBLS 2024
D3	Indirect Finished Goods Freight to Retail	Very Good	Fair	GHG emissions from freight of finished Tissue Products by truck by distance assumed between distribution centre/warehouse to retail customer. Calculate emissions from factors referenced kg CO2e/tonne- km. Tonnes moved includes the product and the packaging. Distance derived published data of average DC/warehouse to retail kilometers, assumed to be applicable to tissue distribution network.	EPA 2025 Consumer Ecology 2023
D4	Retail Emissions	N/A	N/A	Excluded	
D5	Transport to Home	N/A	N/A	Excluded	

Category	Emission/ Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
E1-6	End-of-Life	Good	Fair	To estimate the GHG emissions associated with EOL disposal for Irving Tissue Products, the total amounts of Tissue Products shipped to the United States and Canada (in metric tonnes) were split according to most likely EOL fate, and the mass of material going to each EOL fate was multiplied by corresponding GHG emissions factors. Data on the mass of each type of tissue product and the amount of each product going to US and Canadian markets were obtained from Irving financial records for 2022. Data used to determine the EOL fate and corresponding GHG emissions factors were obtained from government reports referenced.	(End-of-Life) USEPA 2020a USEPA 2020b USEPA 2022
E1	End-of-Life	Good	Fair	Emissions factors for incineration, anaerobic digestion and composting of WWT biosolids were obtained from a Canadian government study on the GHG emissions associated with municipal waste management pathways for organic wastes.	USEIA2021 ECCC2022a

CARBON NEUTRALITY MANAGEMENT PLAN

The organizational Carbon Neutrality Management plan has a high level of ambition extending beyond the carbon neutrality of Tissue Products with a commitment to maintain carbon neutrality for the entire Irving Forest Supply Chain. The organization is unique as the carbon footprint is already carbon negative without the use of offsets. Therefore, a standard approach to a target year for carbon neutrality and for residual emissions is not relevant in this instance. Carbon neutrality is achieved from forest removals from Irving private forest lands and the transfer of carbon from living trees into harvested wood products. More information on the scope and boundary, methodology, assumptions, exclusions, and independent assurance can be found at https://www.jdirvingsustainability.com/globalassets/esg/pdfs/2024-technical-supplement-to-carbon-footprint-disclosure-for-irving-forest-supply-chain.pdf. This technical supplement describes in detail the assumptions and methodology for accounting of the Carbon Footprint in Accordance with ISO 14068-1:2023, the GHG Protocol Corporate Accounting and Reporting Standard, the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, the GHG Protocol Scope 2 Guidance, and the Carbon Budget Model for the Canadian Forest Sector (CBM-CFS3).

Note: The organizational footprint is based on an financial control method and only land use emissions from Irving private forest lands are accounted for. The CFP includes both land use emissions from Irving private lands and Crown License 7 as product footprint accounting requires all attributable emissions regardless of ownership to be included in the CFP.

The senior management of the Irving Forest Supply Chain organization is committed to maintain carbon neutrality at the organizational level. In addition to maintaining carbon neutrality, senior management recognizes the importance of continuing to reduce emissions on an intensity basis. This commitment is governed by the ESG Steering Committee for the Irving Forest Supply Chain. Annual carbon footprint disclosure is led by a senior executive in the Forest Supply Chain with a cross-functional team that includes engineering, accounting, communications, and data management. The Carbon Neutrality Management Plan will be reviewed annually by the ESG Steering Committee to ensure sufficient initiatives and capital are deployed to meet the plan and/or adjust as necessary.

For more information, please refer to the 2024 Climate, Conservation & Community Impact Report found at www.jdirvingsustainability.com.

The objective is for organizational carbon neutrality to be maintained by continuing with:

- Responsible, long-term management of the forest in a way that ensures that growth exceeds harvest and carbon removal exceeds emissions. This includes efficient harvesting and processing of wood products which transfers carbon from living biomass into harvested wood products that store carbon for an additional period of time. Responsible long-term forest management includes forest inventory, forest growth and yield modeling, control of annual harvest levels, production of genetically improved and well adapted local seedlings, reforestation activities such as tree planting and tending, and forest protection activities.
- Continuous improvement initiatives focused on productivity and energy efficiency in manufacturing and transportation.
- Major capital investments to reduce energy costs and GHG emissions.

Forests will continue to be independently certified to third-party forest management standards and major projects could be subject to environmental impact assessment processes and regulatory approval. Annual disclosure of material environmental impacts will continue in the Climate, Conservation & Community Impact Report. Freehold and License 7 managed forests have long-term management plans, currently forecasting growing stock and non-declining harvest levels to 2094. The forest is managed with a strategy to grow more wood than is harvested, which is reflected with a forecasted increase in the growing stock. Maintaining a healthy forest that is growing more wood than is harvested ensures that the forest removes more carbon than is emitted. Forest management plans are redone on a five-to-ten-year interval, which provides the opportunity to update the plan with the latest forest inventory information and any new climate change related research that could impact forest growth and yield, genetic improvement (adaptability), pests, wildfire, or other disturbances.

The demand for forest products from responsibly managed forests continues to grow with population. The forest products business, including Tissue Products, is expected to continue to grow with this increasing demand. Major capital investments will slow the rate of absolute increases in emissions; however absolute emissions are expected to continue to increase with business growth. Therefore, both absolute and intensity-based tracking are used to ensure that energy use efficiency and productivity gains are measured on an emissions per tonne basis.

Carbon Neutrality and Product Labeling

The nature of accounting for the carbon footprint of a product ("CFP") and product labeling results in a mismatch of reporting and labeling years. The CFP is disclosed for previous years' emissions. However, products labeled and sold in the current year as having environmental attributes (such as carbon neutrality) do not necessarily reflect the CFP of the product sold in the current year, but rather rely on the CFP of previous years' emissions. To the extent that the major assumptions in the CFP remain similar (total manufacturing capacity, raw material inputs, fuels, electricity, customer mix, etc.) the short-term assumption that previous years' emissions represent current year's products should remain valid. To address uncertainty about this mismatch the following processes are in effect:

1. Transparent disclosure of the baseline period, verification period, and a short-term commitment to maintain carbon neutrality that overlaps with the next reporting and verification period (Figure 7).
2. A Carbon Management Plan and Carbon Neutrality Pathway that describes longer-term commitment to maintaining organizational carbon neutrality (Figure 8, 9).
3. Additional diligence when business plans forecast material year-over-year changes to total manufacturing capacity, raw material inputs, fuels, electricity, customer mix, etc., that have the potential to impact the CFP results during the overlapping commitment period of carbon neutrality.
4. Tracking of the mass of labeled Tissue Products sold and ensuring that the mass of labeled Tissue Products sold at no time exceeds the total mass of Tissue Products produced with an independently verified CFP and declaration of carbon neutrality.

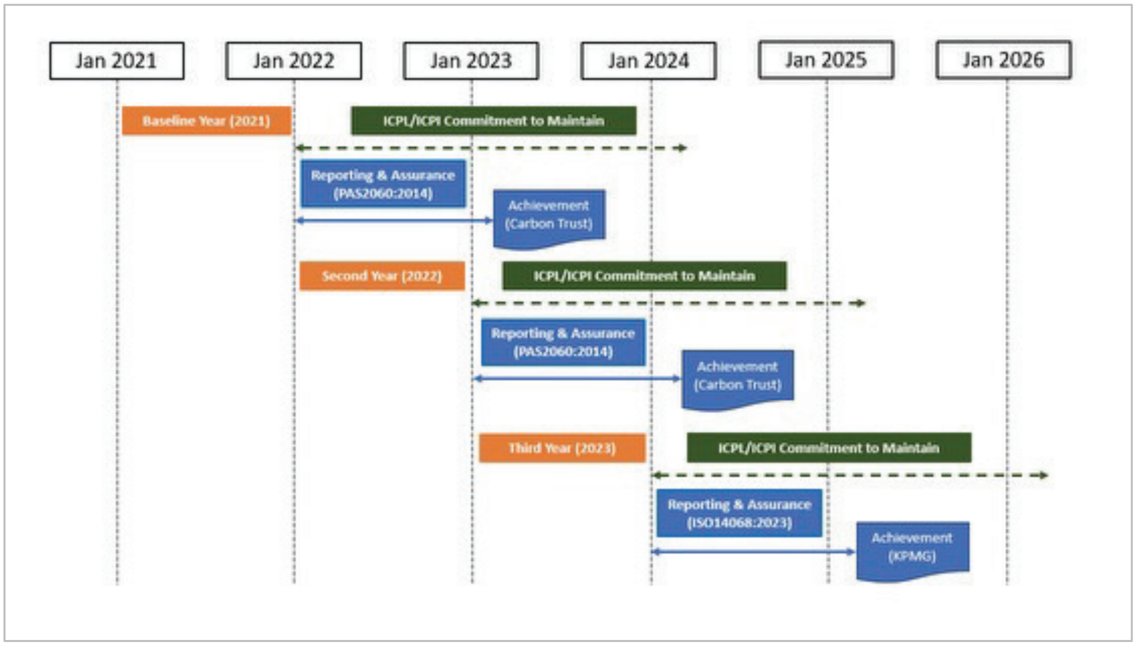


FIGURE 7. ANNUAL CARBON NEUTRALITY BASELINE AND VERIFICATION PERIODS AND COMMITMENT TO MAINTAIN

CARBON NEUTRALITY PATHWAY

To be the most useful for the intended end users, the organizational Carbon Management Plan results in a Carbon Neutrality Pathway that maintains carbon neutrality and has been forecasted until 2030. This commitment to carbon neutrality is expected to continue beyond 2030 due to the organization's long-term focus on increasing forest growth above the rate of harvest. Rather than an aspirational Pathway that relies on technology or economic conditions that are not yet known, the Pathway focuses on more certain, executable actions with planned capital allocation and regulatory approvals that the end user can trust and verify from public sources.

The Carbon Neutrality Pathway is based on maintaining organizational carbon neutrality and reducing GHG emissions on an emissions intensity basis (Kg CO2e per tonne of output). The forecasted emissions intensity is compared to an internationally recognized pathway of less than 2°C warming following the IPCC AR6 WG3 methodology. This pathway requires a 2.5% emissions intensity reduction per year (Byers et al 2022). From current business plans, the major factors that are in the control of Irving in the forecasted are:

1. Planned expansion of Tissue Product manufacturing in Macon, GA

2. Major capital investments renewable energy:

    a. Project NextGen (IPP Modernization) in Saint John, NB. Construction and operation of a new black liquor recovery boiler and 120 MW turbine (biomass).

    b. Brighton Mountain Wind Farm near Juniper, NB. Construction and operation of a 350 MW wind farm on JDI owned working forest lands.

3. Increased Kraft pulp, Tissue Product, and lumber production.

4. Continued commitment to responsible long-term forest management such that land use removals exceed emissions.

The forecasted GHG emissions reductions are subject to government policy, regulatory, and macroeconomic conditions, as well as project financing and construction schedules and are subject to change due to factors both within and outside the control of Irving. Additional GHG reductions outside Irving control should positively impact the intensity but are not being relied upon to achieve the Pathway.

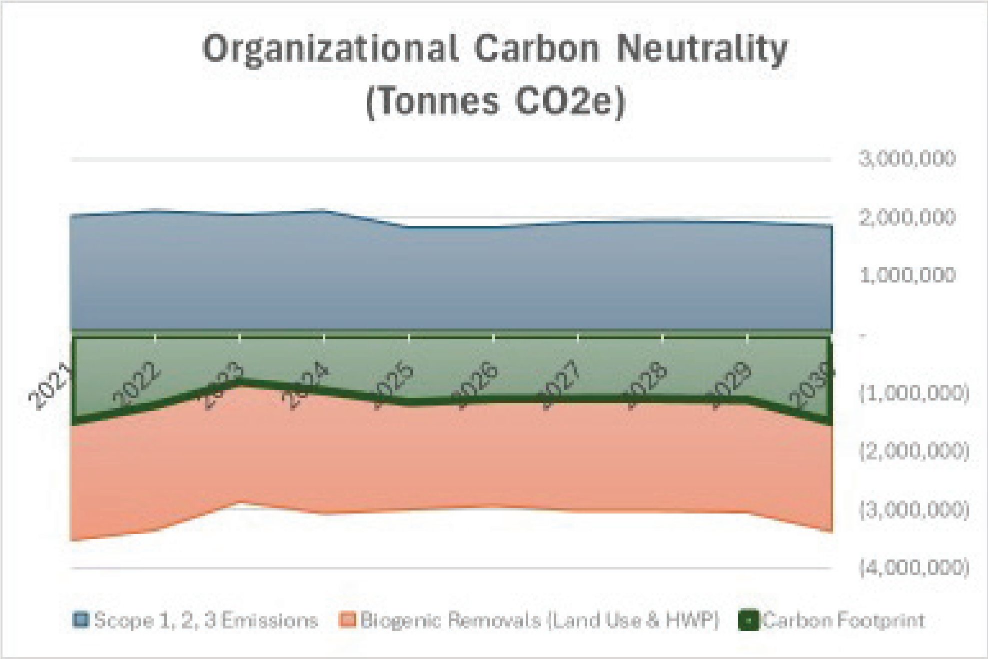


FIGURE 8. ORGANIZATIONAL CARBON NEUTRALITY FOR THE IRVING FOREST SUPPLY CHAIN

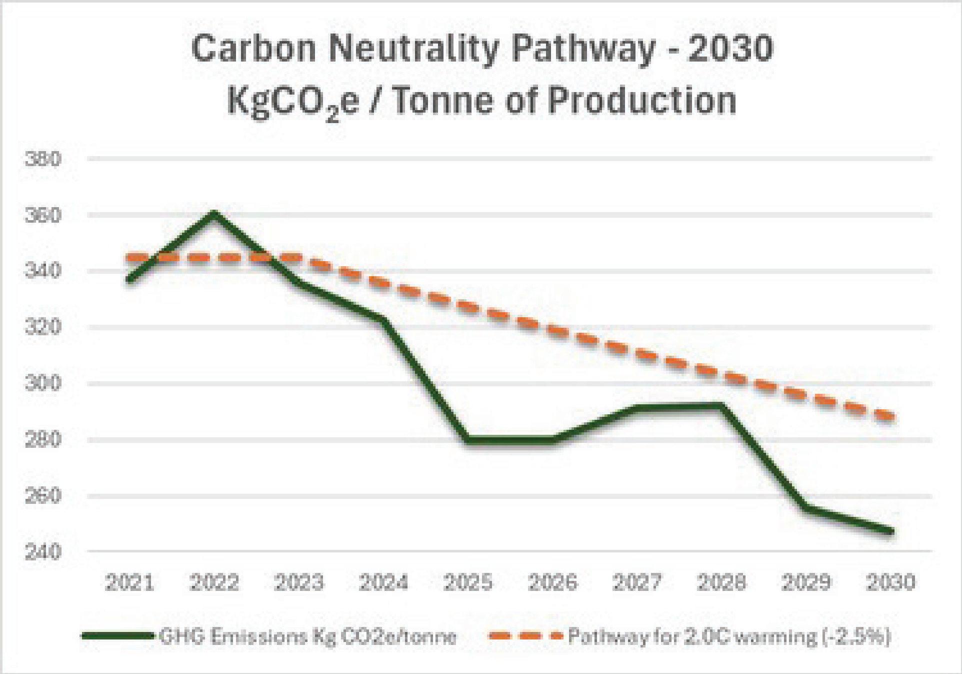


FIGURE 9. INTENSITY-BASED CARBON NEUTRALITY PATHWAY

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APPENDIX – LIMITED ASSURANCE VERIFICATION STATEMENT

KPMG

E. Verification Statement

To J.D. Irving, Limited,

We have been engaged by J.D. Irving, Limited (the "Company") to examine the Company's 2024 carbon neutrality claim in relation to specified tissue products (the "Assertion"), as set out in the *ISO 14068-1 Carbon Neutrality Report for Irving Tissue Products* for the period January 1, 2024 to December 31, 2024 (the "Report").

The Company is responsible for the preparation and fair presentation of the information within the Report in accordance with the criteria, which comprise:

- ISO 14068-1: 2023 *Climate change management - Transition to net zero - Part 1: Carbon neutrality*
- ISO 14067 Greenhouse gases: 2018 — *Carbon footprint of products — Requirements and guidelines for quantification*

  (together, the "Criteria")

Our responsibility is to express a conclusion as to whether anything has come to our attention to suggest that the Assertion is not presented fairly in accordance with the Criteria. Our duties in relation to this report are owed solely to the report addressees. Accordingly, we do not accept any responsibility for any loss occasioned to any third party acting or refraining from action as a result of this report.

We completed our examination in accordance with ISO 14064-3:2019 *Specification with Guidance for the validation and verification of greenhouse gas assertions*. As such, we planned and performed our work in order to provide limited, rather than absolute assurance with respect to the Assertion. We believe our work provides a reasonable basis for our conclusion.

The extent of evidence gathering procedures performed in a limited assurance engagement is less than that for a reasonable assurance engagement, and therefore a lower level of assurance is obtained.

Based on our examination, nothing has come to our attention that causes us to believe that the Assertion presented in the Report is not, in all material respects, presented fairly in accordance with the Criteria.

Greenhouse gas and energy use data are subject to inherent limitations. A number of different measurement techniques may be utilized in accordance with the requirements of the verification criteria which may vary in precision and/or outcome, resulting in different greenhouse gas emissions estimates, which may be material.

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