



J.D. IRVING, LIMITED



**ISO 14068-1**  
**Carbon Neutrality Report**  
**For Irving Tissue Products**

2023



*Bathroom tissue, Macon, GA*

## 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. The Carbon Footprint of a Product Report (CFP Report) will describe 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.



<sup>1</sup> 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 Licence 7). All forest lands are independently certified to recognized third-party forest management standards.

**Sawmills Division (Sawmills)** - Sawmills operate 10 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

### Pulp & Paper Division (Pulp & Paper)

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

- 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.



**Softwood Kraft Pulp,  
Saint John, New Brunswick**

# 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](http://www.jdirvingsustainability.com). GHG emissions and removals are a material topic because 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<sub>2</sub> 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, or in the annual PAS2060 Declaration of Carbon Neutrality Qualifying Explanatory Statements of the Carbon Footprint of the Irving Forest Supply Chain at [www.jdirvingsustainability.com](http://www.jdirvingsustainability.com). In the future, this reporting will adopt the ISO14068-1 standard as the PAS2060:2014 standard is to be replaced.

## 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

The 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. The report includes emissions and removals from both Tissue Products and packaging.

## Sales and Marketing

ICPL/ICPI produced 369,020 tonnes and sold 366,509 tonnes of Tissue Products in 2023. Sales are both branded and private label products sold in Canada and the United States.

## Tissue Product Life Cycle Cradle-to-Grave

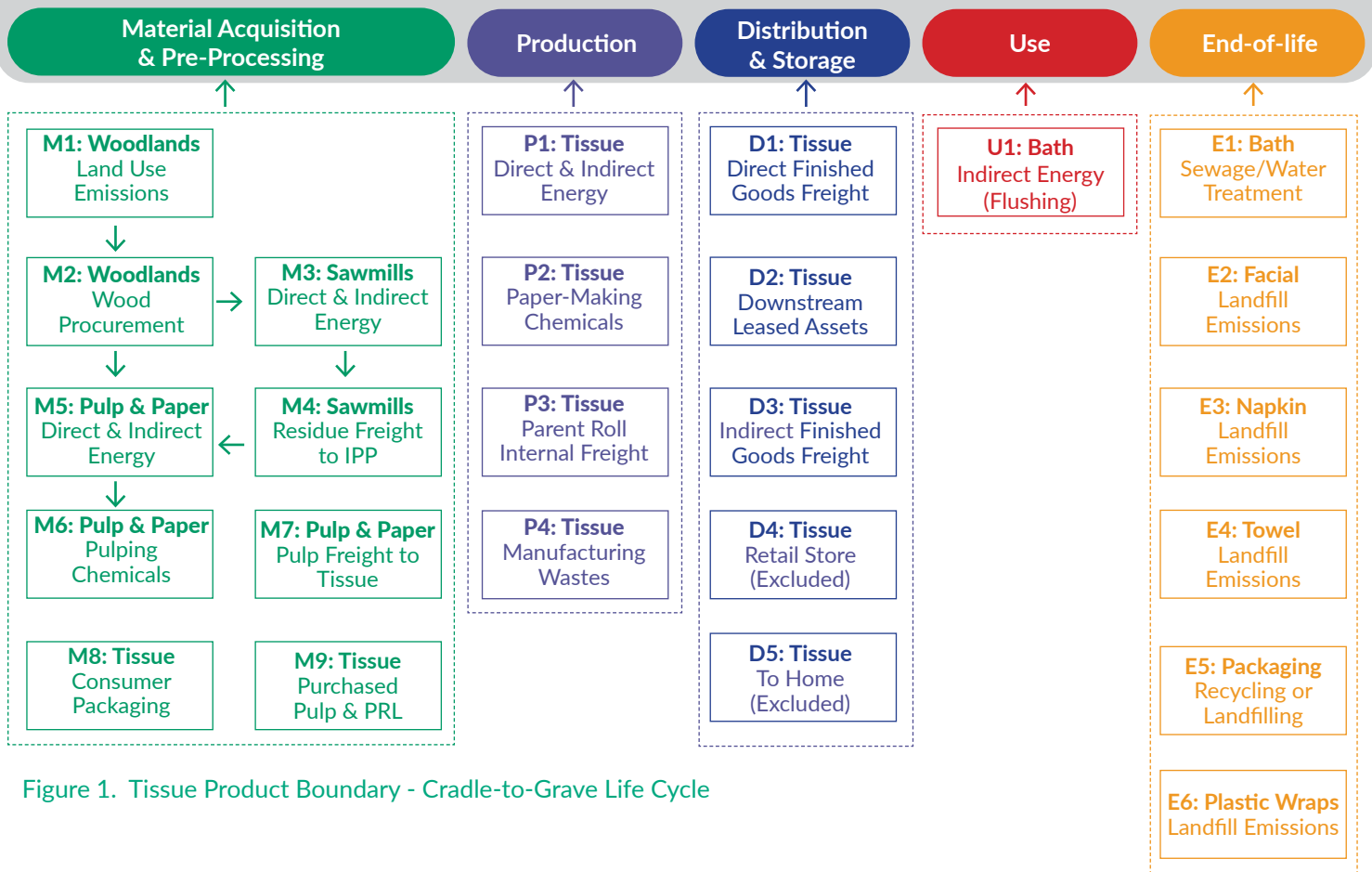


Figure 1. Tissue Product Boundary - Cradle-to-Grave Life Cycle

### Manufacturing

Tissue Products are manufactured in two stages: the production of Tissue Parent Rolls (Parent Rolls) and then the 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 the 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-



*Tissue Parent Roll, Irving Tissue  
Saint John, NB*



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 & 2 emissions in the Production phase, and the Distribution emissions that occur in the Tissue Product life cycle.

The converting of Parent Rolls into differentiated Tissue Products includes combining like Parent Rolls to create multiple plies; 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 no 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 a 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 369,020 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 366,509 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 of 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 pulp mill. 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 relative to manufacturing and distributing each of the range of other products produced by the Forest Supply Chain.



*Planted Softwood Forest,  
Northern New Brunswick*

# CARBON FOOTPRINT OF A PRODUCT REPORT

Table 1: Carbon Footprint of a Product Summary Table

CFP Requirement	Description
Functional unit and reference flow	Kg CO <sub>2</sub> e/ tonne (Tissue Product sales)
List of GHG accounted for	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
Timing of GHG emissions and removals	January 2023 to December 2023 for the GHG emissions and removals 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 2023 and December 2023.
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 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 per cent representing 95 per cent of total emissions or removals.
Limitations	The CFP is limited by its focus on GHG emissions 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.

# GREENHOUSE GAS EMISSIONS AND REMOVALS

Table 2: Greenhouse Gas Emissions and Removals by Life Cycle Stage

Source	Tonnes CO <sub>2</sub> e	Kg CO <sub>2</sub> e /tonne	%
Material Acquisition & Pre-Processing	255,368	697	28%
Production	477,083	1,302	54%
Distribution & Storage	70,214	192	8%
Use	2,773	19	0%
End-of-Life	91,208	249	10%
Aircraft Transportation	0	0	0%
Net Fossil Fuel Emissions & Removals	896,646	2,459	100%
Land Use	(1,154,441)	(3,150)	
Direct Land Use Change (dLUC)	0	0	0%
Carbon Footprint of the Product	(257,795)	(703)	

## GUIDING METHODOLOGIES

The guiding methodology used is the ISO 14067:2018 International Standard (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, 2023. This method was chosen as it provides an internationally recognized approach to the calculation of representative product CO<sub>2</sub>e footprints and meets the requirements of ISO14068-1 for the substantiation of GHG emissions.

The carbon footprint was based on 95 per cent 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 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). 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<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O).

Where GHG emissions have been estimated, these have been determined based on a conservative approach that precludes underestimation. GHG emissions have been estimated for the Use

and Retail 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 the ISO14067:2018, emissions and removals directly attributable to Tissue Products are included.

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

# 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: Gross GHG emission/removal from annual net forest growth and depletion modelled using the Carbon Budget Model for the Canadian Forest Sector (CBM-CFS3) for Freehold lands and Crown Licence 7.	Allocated to Tissue Products based on the mass balance of primary forest products harvested from Freehold lands and Crown Licence 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.
	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 to 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.	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
	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.	Allocated based on the mass balance of IPP kraft pulp that flows 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.	100% to Tissue Products
	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

Life Cycle Stage	Emission/Removal with Description	Allocation Procedure
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 emissions from municipal solid waste generated by ICPL/ICPI.	100% to Tissue Products
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 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	2023 Production	Fibre Destination	Allocated Tonnes	Flow to Downstream	Flow to Tissue
Woodlands	Logs	6,556,294	Sawmills	4,276,936	65.23 %	14.08 %
Woodlands	Chips		IPP	328,315	5.01 %	
Sawmills	Residuals	4,659,147	IPP	1,221,767	26.22 %	16.70 %
IPP	Kraft Pulp	323,272	ICP	205,875	63.68 %	63.68 %

### Woodlands Emissions Allocated to Tissue

Woodlands -> Sawmills -> IPP -> Tissue = (65.23% X 26.22% X 63.68%) = 10.89%

Woodlands -> IPP -> Tissue = (5.01% X 63.68%) = 3.19%

Total Woodlands Emissions attributable to Tissue = 14.08%

### Sawmills Emissions Allocated to Tissue

Sawmills -> IPP -> Tissue (26.22% X 63.68%) = 16.70%

### IPP Emissions Allocated to Tissue

IPP -> Tissue = 63.68%



## 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 Licence 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 because 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 Licence 7 to IPP**

Mill	Direct from Woods	Indirect via Yards	First Nation	Total	% Sawmill Residual	% Residual to IPP	% of Sawmill Input to IPP	Allocated Tonnes to IPP
Ashland	250,459	-	-	250,459	64.50	48.53	31.30	78,394
Dixfield	568	6,300	-	6,868	64.76	0.00	0.00	-
Chipman	489,790	64,439	6,180	560,410	64.13	34.99	22.44	125,730
Doaktown	75,026	3,276	138	78,440	66.10	56.41	37.29	29,249
Kedgwick	41,601	917	-	42,518	58.92	0.66	0.39	166
St. Leonard	506,989	85,797	-	592,786	65.26	30.18	19.69	116,749
Sussex	288,893	41,933	5,882	336,708	63.19	51.83	32.75	110,286
Truro	23,324	-	-	23,324	60.13	13.25	7.97	1,859
Veneer	73,404	20,109	-	93,513	58.60	0.00	0.00	-
STL Chip Plant	99,294	-	-	99,294	100.00	48.27	48.87	47,929
SX Chip Plant	354,871	17,413	6,162	378,445	100.00	99.83	99.76	376,654
Sub-total	2,204,218	240,185	18,362	2,462,765				887,016
Direct to IPP	70,194	119,381	-	189,575				189,575
Total	2,274,412	359,566	18,362	2,652,340				1,076,591
Percentage of Freehold and Crown Licence 7 Harvest to IPP								27.68%
Percentage of Freehold and Crown Licence 7 Harvest to ICPL/ICPI								17.63%

## EXCLUSIONS

Exclusions from the carbon footprint were limited to those where the data would be difficult to obtain and whose emissions would be immaterial. 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.

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 per cent) to the footprint.

## 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<sub>2</sub>e EMISSIONS FROM LAND USE ON FREEHOLD AND CROWN LICENCE 7

Freehold lands and Crown Licence 7 remove CO<sub>2</sub> from the atmosphere with growth and store carbon in above and below ground biomass. All forests also emit CO<sub>2</sub>e with natural mortality and working forests emit CO<sub>2</sub>e with harvesting. Net changes in land use emissions and removals of CO<sub>2</sub>e are modeled. All forest areas in Maine, New Brunswick, and Nova Scotia 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<sub>2</sub>e from Freehold and Crown Licence 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 the National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada (ECCC 2020).

The ISO 14067 standard requires that the emissions and removals for the full rotation of the crop of growing trees is reported. To simplify the accounting for the full rotation of the crop of growing trees, the annual stock-change from the entire working forest landscape is assumed to be an appropriate estimate of the average rotation emissions and removals.

Annually approximately 1.5 per cent of the working forest area is harvested, from a range of different

stand origins with different rotation lengths. For example, a portion of the annual supply comes from natural stands with an 80-year rotation, a portion from planted origin with a 40-year rotation, a portion from selection harvesting in riparian zones or tolerant hardwoods with a 25-year re-entry rotation, etc. Using the landscape approach, the emissions from harvesting in the current year are matched with the average removals from growth on the remaining working forest lands, depending on their stand origin and the planned management strategy. This is appropriate given the long-term management strategy of these forests which produces an increasing growing stock of biomass over the next 80 years with a non-declining harvest level over that same period. The forest is forecasted to continue to grow more wood than is harvested and therefore should continue to remove more carbon than is emitted. Any emissions from natural disturbance and mortality are also reported with this approach. 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. Data from airborne scanning LiDAR, referred to as Airborne Laser Scanning (ALS), 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 and 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 m<sup>2</sup>) 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 (e.g. 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 m<sup>2</sup> 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. Three species 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 each year are collected digitally via harvesting “crumb trails” which outline where harvest occurred, and these 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) 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-CFS3). 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).

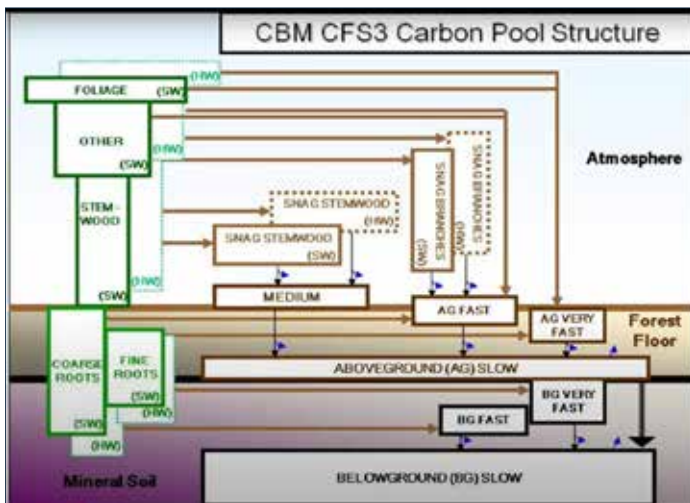
The CBM-CFS3 requires a spatial forest inventory data, including the following:

- 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

- Forest inventory at the end of 2022
- Annual growth to the end of 2023
- Depletion (harvest) to the end of 2023

a) Forest inventory at the end of 2022 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 2022.

**Figure 3. CBM-CFS3 Carbon Pools and Flow**



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.

#### 4) Calculating Annual Carbon Stock Change

To calculate the change in carbon stocks from T-0 (end of 2022) to T-1 (end of 2023) requires three calculations:

b) Annual growth to the end of 2023 requires incrementing the age for each cell by one year. This moves each development type along its corresponding CBM yield curve by one year. The growth in carbon stocks by pool to the end of 2023 can now be summed across all development types.

c) To determine depletion, each cell in our forest inventory that was harvested during the 2023 calendar year, either clear cut or partial cut, is identified through our satellite change detection process. This change detection was validated through GPS (Global Positioning System) data and scale data from our woodlands information system. Harvested cells were then transitioned depending on the type of harvest activity.

After harvested cells have been identified and transitioned, the depletion of carbon stocks by pool to the end of 2023 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 2022 to the end of 2023.

### 5) 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<sub>2</sub> to the atmosphere. The Freehold and Crown Licence 7 emissions from merchantable harvest depletion in 2023 was estimated to be 4,795,800 tonnes of CO<sub>2</sub>. 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<sub>2</sub> 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 8,970,500 tonnes of CO<sub>2</sub> 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 Licence 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 exclude biogenic CO<sub>2</sub> emissions from aerobic decay and flaring of CH<sub>4</sub>. For the portion of Tissue Products sourced from Freehold and Licence 7, CO<sub>2</sub> 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 Licence 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

**Table 8. 2023 Emissions/(Removals) of the CBM-CFS3 Model (Tonnes CO<sub>2</sub>)**

Land Base	Merchantable Biomass	Other Biomass	Dead Organic Matter	Total
Freehold	(1,234,900)	(1,545,100)	957,200	(1,822,800)
Crown Licence 7	(1,491,400)	(1,620,800)	760,500	(2,351,700)
Net Land Use Emissions	(2,726,300)	(3,165,900)	1,717,700	(4,174,500)
Harvest Depletion Emissions	4,795,800			
Gross Land Use Removal (before Harvest Depletion)				(8,970,300)

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<sub>2</sub> 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<sub>2</sub> that is emitted to the atmosphere matched to the timeframe of forest harvest.

These actual biogenic CO<sub>2</sub> 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. Deducting these biogenic CO<sub>2</sub> 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 965,553 tonnes of biogenic CO<sub>2</sub> in 2023.

The gross forest removal allocated to the Tissue Products is based on the mass balance of the primary forest products harvested that flows to Tissue Products (17.63 per cent of the 2023 Freehold and Crown Licence 7 harvest) from above (Table 10).

**Table 11. Forest Removals Attributable to Tissue Products**

Emissions/(Removals)	Tonnes CO <sub>2</sub>
Gross Forest Emission/(Removal)	(8,970,300)
Attributable Fibre from Freehold and Crown Licence 7 to Tissue	17.63%
Attributable Forest Emission/(Removal) to Tissue Products	(1,581,463)
Total Biogenic Emissions at IPP	965,553
IPP Wood Fibre from Freehold and Crown Licence 7	69.45%
Biogenic Emissions from Freehold and Crown Licence 7	670,577
IPP Kraft Pulp to ICPL/ICPI	63.68%
Biogenic Emissions to ICPL/ICPI	427,023
Net Forest Emission/(Removal) Attributable to Tissue	(1,154,441)

### **Additional Wood Fibre Procured by Woodlands**

Woodlands procured an additional 41.51 per cent 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 31 per cent of the wood supply from Other Crown lands and Private Lands in New Brunswick, two per cent from private lands in Maine, and two per cent 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<sub>2</sub> (Ward 2021 re: New Brunswick and Steenberg, 2022: re Nova Scotia). The remaining 9.23 per cent of the wood supply comes from other private lands in Maine. 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). While these forest lands are highly likely net removers of CO<sub>2</sub>, this assumption has not been confirmed from a detailed model by Irving. Therefore, a conservative assumption is that emissions from these forest lands, associated with 41.51 per cent 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 154,667 tonnes of eucalyptus pulp from South American producers in 2023. This represents 39.3 per cent 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 2023.

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 End-of-Life (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 2023. 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 per cent
- Incineration (with energy recovery) – 18 per cent

All bathroom tissue was assumed to be flushed in toilets and processed through a municipal wastewater treatment (WWT) 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 per cent
- Incineration (with energy recovery) – 16 per cent

- Composting followed by land application – 29 per cent
- Anaerobic digestion followed by land application – 28 per cent

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 was determined using data from the United States Environmental Protection Agency's (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 per cent
- Incineration (with energy recovery) – 19 per cent
- Recycling – 3 per cent

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 United States 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<sub>2</sub> released from aerobic decomposition and methane flaring to CO<sub>2</sub> for the wood fibre sourced from the Freehold and Licence 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 was 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 United States and Canada.

Incineration with energy recovery leads to an EOL removals. These removals are not counted in the

CFP as EOL removals in from energy recovery are a benefit of the user of this recovered energy.

### 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

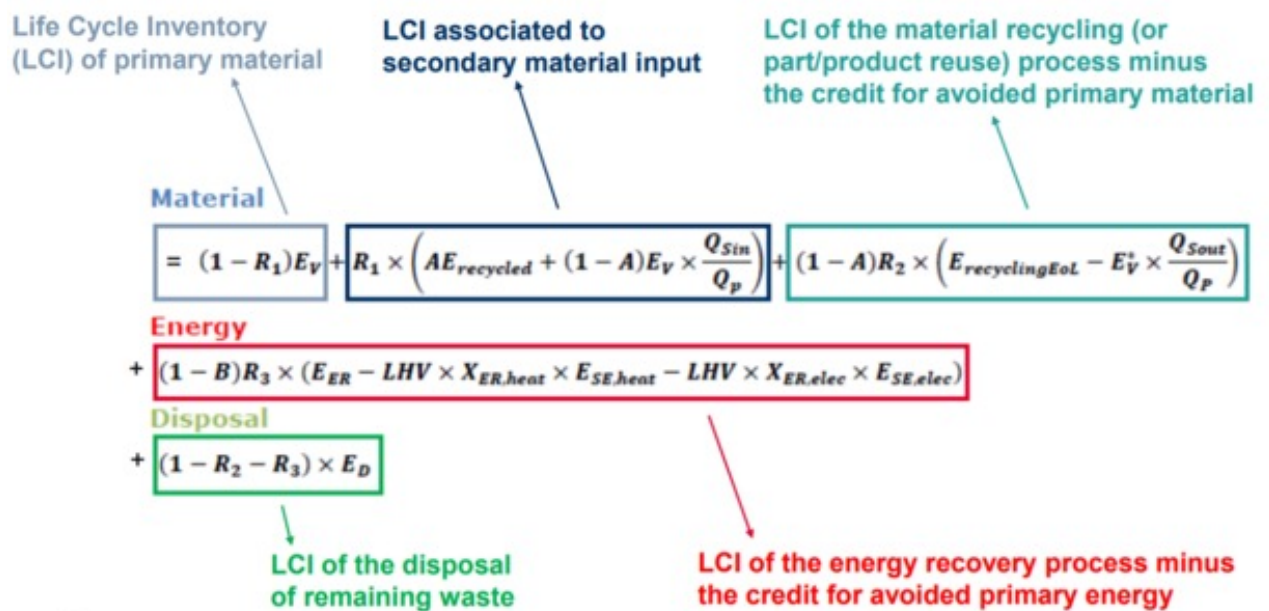


Figure 4: Circular Footprint Formula

### 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 and is presented in Table 12.

**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
Facial cartons	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 EOL, 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 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 was determined using data from the United States Environmental Protection Agency's (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”
    - o Landfill – 15 per cent
    - o Incineration (with energy recovery) – 64 per cent
    - o Recycling – 21 per cent
- Corrugate – “Corrugated board”
  - o Landfill – 3 per cent
  - o Incineration (with energy recovery) – 1 per cent
  - o Recycling – 96 per cent
- Poly overwrap – “Other plastics packaging”
  - o Landfill – 19 per cent
  - o Incineration (with energy recovery) – 78 per cent
  - o Recycling – 3 per cent

### 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<sub>2</sub>e 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<sub>2</sub>e 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 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.

### 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 per cent 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 five years old. Factors derived from actual data. Would not expect greater than 10 per cent variance in results.
Good	National factor, factor between five and ten 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 because of the range of activity and emissions factor data quality outlined above as well as 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 following is the process to evaluate the uncertainty of the Tissue Product carbon footprint:

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 a Monte Carlo simulation to determine the proportion of outcomes where the result is carbon neutral.

### Results

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

**Table 14. GHG Emission and Removal with Estimated +/- Range**

	Reported Emission or Removal	Minimum Range	Maximum Range
Material Acquisition & Pre-Processing	682,381*	586,140	833,454
Production	468,218	422,981	518,860
Distribution & Storage	76,042	30,834	194,044
Use	2,773	1,570	4,897
End-of-Life	91,208	78,291	106,256
Land Use Removal	(1,581,463)	(1,243,168)	(2,011,906)

*\*Includes biogenic emissions from Kraft pulping, modeled 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 236 iterations. Reversing this, the outcome of this analysis is that the CFP is carbon neutral in 99.98 per cent of iterations.

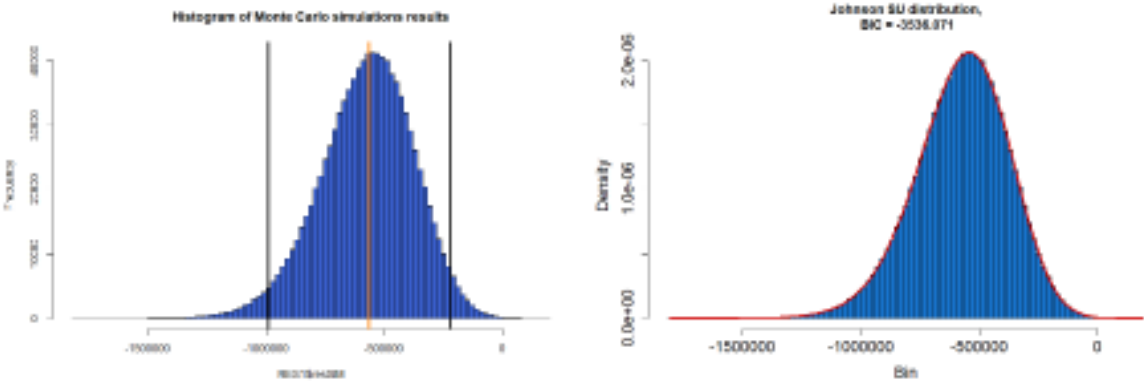


Figure 6: Uncertainty Analysis – Monte Carlo Simulation Output

## 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 15 to 19 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 2020 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.)	Third-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 2020 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.)	Third-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 Licence 7, other Crown lands, private lands) multiplied by the estimated JDI litres per metric tonne factor calculated based on 2020 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.	Third-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 2020 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.	Third-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 Licence 7, other Crown lands, private lands) multiplied by the estimated JDI litres per metric tonne factor calculated based on 2020 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.	Third-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 <sub>2</sub> e. 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 <sub>2</sub> e using kgCO <sub>2</sub> /kwh by jurisdiction, following the guidance in ECCC 2022 for Canadian operations and EPA 2023 for US operations.	ECCC 2022 EPA 2023

Category	Emission/Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
M3	Sawmill Site Emissions	Very Good	Very Good	Electricity consumption for Sawmill sites from the Sawmill financial records and invoices converted to CO <sub>2</sub> e using kgCO <sub>2</sub> /kwh by jurisdiction, following the guidance in ECCC 2022 for Canadian operations and EPA 2023 for US operations. Electricity emissions are allocated to tissue following a mass balance approach.	ECCC 2022 EPA 2023
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/CO <sub>2</sub> e by tonne-km factor referenced.	EPA 2023
M5	Irving Pulp & Paper Site Emissions	Very Good	Very Good	In accordance with GHGRP reporting, electricity consumption for IPP from invoiced electricity converted to CO <sub>2</sub> e using kgCO <sub>2</sub> /kwh by jurisdiction, following the guidance in ECCC 2022 for Canadian operations. IPP Scope 2 emissions are allocated to tissue following a mass balance approach.	ECCC 2022
M5	Irving Pulp & Paper Site Emissions	Very Good	Very Good	In accordance with GHGRP reporting, IPP site emissions from burning fossil fuels and biogenic fuels are recorded and converted to CO <sub>2</sub> e. CO <sub>2</sub> from biogenic fuels are excluded, but CH <sub>4</sub> and N <sub>2</sub> O are included. Fossil fuel consumption by invoice converted to CO <sub>2</sub> e using kgCO <sub>2</sub> /kwh by jurisdiction, following the guidance in ECCC 2022 for Canadian operations. IPP Scope 1 emissions are allocated to tissue following a mass balance approach.	ECCC 2022
M6	Irving Pulp & Paper Chemical Use	Good	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 2020 to calculate a CO <sub>2</sub> e/kg of chemicals used factor. Chemical use reported as purchased chemicals converted to dry kilograms and converted to GHG using the 2020 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

Category	Emission/ Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
M7	IPP Pulp Freight to ICP	Good	Fair	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 CO <sub>2</sub> e/tonne- km. Intermodal assumed to be the same as rail. As only tissue freight is included, no allocation of emissions is required.	EPA 2023
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/CO <sub>2</sub> e 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 per cent closed-loop recycling process and 30 per cent based on an open-loop recycling process. For corrugated containers 100 per cent of recovered materials are retained in the recovery stage. Therefore, it is assumed that biogenic carbon released because of EOL 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
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 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.	Third-party reviewed internally derived factor
M9	Consumer Products Pulp and Parent Roll Purchases	Very Good	Good	Emissions form 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

Category	Emission/ Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
P1		Very Good	Very Good	Electricity consumption for Sawmill sites from the Sawmill financial records and invoices converted to CO <sub>2</sub> e using kgCO <sub>2</sub> /kwh by jurisdiction, following the guidance in ECCC 2022 for Canadian operations and EPA 2023 for US operations. Electricity emissions are allocated to tissue following a mass balance approach.	ECCC 2022 EPA 2023
P1	Consumer Products Emissions	Very Good	Very Good	Electricity consumption for Consumer Products sites from the Consumer Products financial records and invoices converted to CO <sub>2</sub> e using kgCO <sub>2</sub> /kwh by jurisdiction, following the guidance in ECCC 2022 for Canadian operations and EPA 2023 for US operations.	ECCC 2022 EPA 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 2020, to calculate a CO <sub>2</sub> e/kg of chemicals used factor. Chemical use reported as purchased chemicals converted to dry kilograms and converted to GHG using the 2020 factor for emissions per kg for tissue mills.	Tomberlin et al., 2020
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 2023
P4	Waste Disposal	Good	Good	Tonnes of commercial/industrial waste disposed of from ICP in a landfill.	EPA 2023
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 CO <sub>2</sub> e/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 2023

Category	Emission/ Removal	Activity Data Quality	Emission Factor Quality	Reporting or Calculation Methodology	References
D2	Upstream and Downstream Leased Assets	Very Good	Fair	Cradle to gate emissions from upstream (office space) and downstream (warehousing) assets. Using annual spending from financial statements spending and referenced kg/CO <sub>2</sub> e per USD spent (2018) factor for sector 493 "Warehousing and Storage" and sector 531 rental of "Other Real Estate." Includes additional heating and electricity emissions where required in the lease.	EPA 2022 USCB 2022 BOC 2022 USBLS 2022
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 CO <sub>2</sub> e/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 2022 Consumer Ecology 2023
D4	Retail Emissions	N/A	N/A	Excluded	Ingwersen et al. 2016
D5	Transport to Home	N/A	N/A	Excluded	Ingwersen et al. 2016
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 the government reports referenced.	(End-of-Life) USEPA 2020a USEPA 2020b USEPA2022
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 [www.jdirvingsustainability.com/globalassets/footer/carbon-neutrality-aug16\\_web.pdf](http://www.jdirvingsustainability.com/globalassets/footer/carbon-neutrality-aug16_web.pdf). This disclosure follows the PAS2060:2014 standard for carbon neutrality for 2023, with disclosure to follow the ISO 14068-1:2023 standard for the 2024 reporting year, as the PAS2060:2014 standard is to be replaced.

Note: The organizational footprint is based on an equity control boundary 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 Licence 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 maintaining 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 2023 Climate, Conservation & Community Impact Report found at [www.jdirvingsustainability.com](http://www.jdirvingsustainability.com).

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

- 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 transfer 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 Licence 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 the 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.

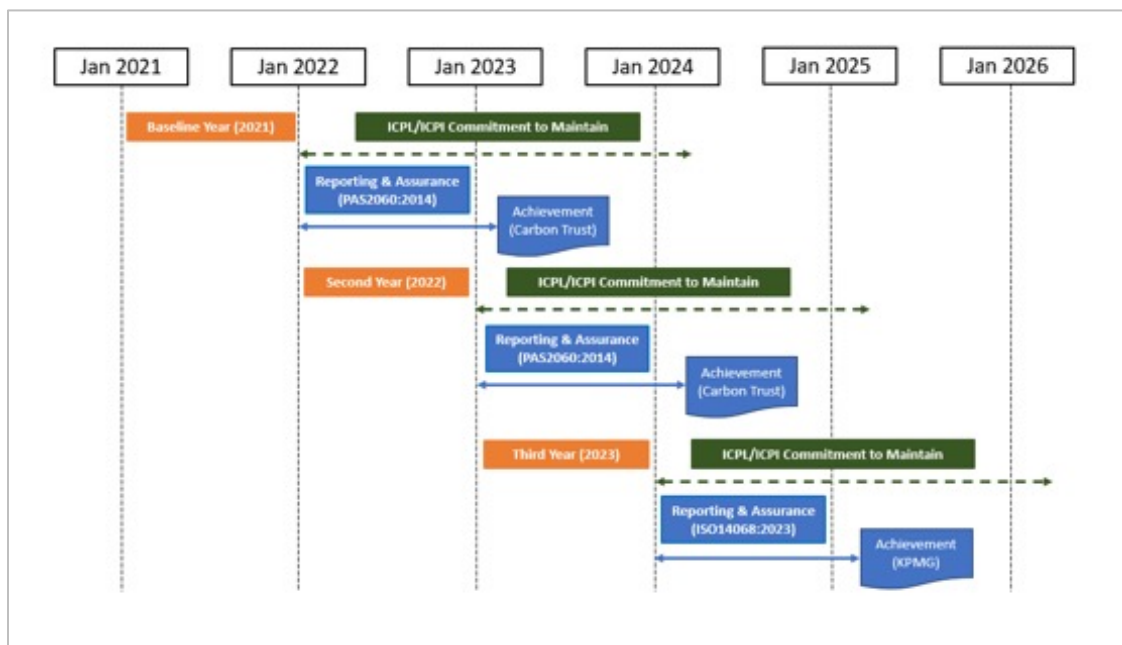


Figure 7. Annual Carbon Neutrality Baseline and Verification Periods and Commitment to Maintain

## 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 Carbon Neutrality 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 CO<sub>2</sub>e 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 per cent 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 forecast are:

1. Planned expansion of Tissue Product manufacturing in Macon, GA.
2. Major capital investments in green energy within the control of Irving that have received appropriate regulatory approvals:
  - a. Project NextGen (IPP Modernization) in Saint John, NB. Construction and operation of a new recovery boiler and 120 MW turbine.
  - 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 so 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.

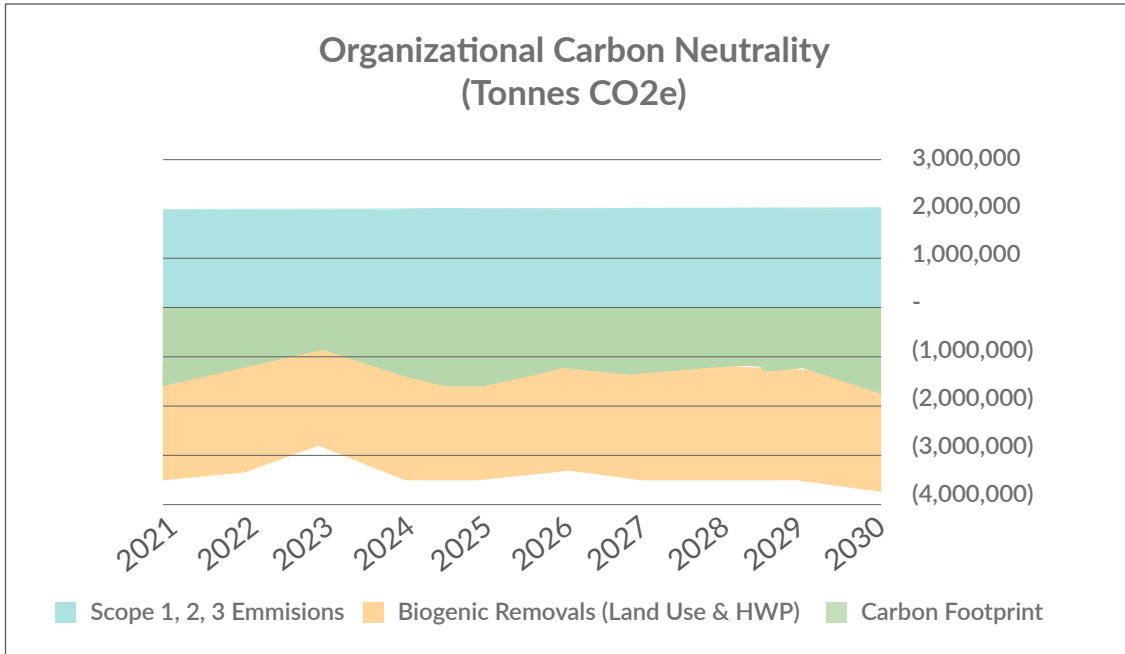


Figure 8. Organizational Carbon Neutrality for the Irving Forest Supply Chain

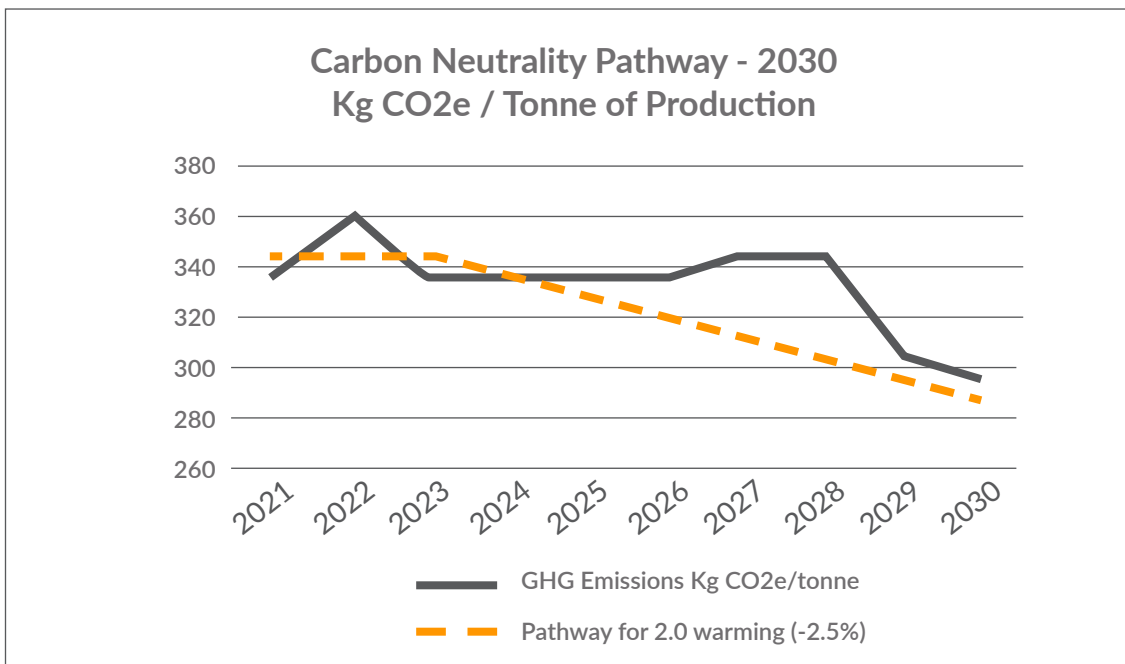


Figure 9. Intensity-based Carbon Neutrality Pathway

## APPENDIX - REFERENCES

Bank of Canada (BOC). 2022 <https://www.bankofcanada.ca/rates/exchange/annual-average-exchange-rates/>

Byers et al. 2022. AR6 Scenarios Database, hosted by the International Institute for Applied Systems Analysis (IIASA). Accessed via <https://interactive.carbonbrief.org/one-point-five-pathways/index.html>

Cameron R.E., Hennigar, C.R., MacLean, D.A., Adams, G.W., Erdle, T.A. 2013. A Comprehensive Greenhouse Gas Balance for a Forest Company Operating in Northeast North America. Journal of Forestry. <http://dx.doi.org/10.5849/jof.12-043>

Consumer Ecology. 2023. Carbon Footprint From the Regional Distribution Center to Retail <https://consumerecology.com/carbon-footprint-from-the-regional-distribution-center-to-retail/>

Domke, Grant M.; Walters, Brian F.; Nowak, David J.; Smith, James, E.; Ogle, Stephen M.; Coulston, J.W.; Wirth, T.C. (2020). Greenhouse gas emissions and removals from forest land, woodlands, and urban trees in the United States, 1990-2018. Resource Update FS-227. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station. 5 p. <https://doi.org/10.2737/FS-RU-227>

Environment and Climate Change Canada (2021). Canada's Greenhouse Gas Quantification Requirements Greenhouse Gas Reporting Program December 2021 Version 5.0 <https://publications.gc.ca/site/eng/9.866467/publication.html>

Environment and Climate Change Canada (2021). National Inventory Report 1990–2020: Greenhouse Gas Sources and Sinks in Canada [https://publications.gc.ca/collections/collection\\_2021/eccc/En81-4-2019-2-eng.pdf](https://publications.gc.ca/collections/collection_2021/eccc/En81-4-2019-2-eng.pdf)

Environmental Protection Agency. AP 42, Fifth Edition, Volume I Chapter 1: External Combustion Sources <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-fifth-edition-volume-i-chapter-1-external-0> Section 1.4 Supplement D Table 1.4-1 and 1.4-2

Environmental Protection Agency. 2020. eGRID Summary Tables. [www.epa.gov/system/files/documents/2022-01/egrid2020\\_summary\\_tables.pdf](http://www.epa.gov/system/files/documents/2022-01/egrid2020_summary_tables.pdf)

Environmental Protection Agency (2021). Emissions Factors for Greenhouse Gas Inventories. [https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors\\_apr2021.pdf](https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf)

FAO, ITTO and United Nations. 2020. Forest product conversion factors. Rome. <https://doi.org/10.4060/ca7952en>

Forest Stewardship Council. 2015. FSC Principles and Criteria for Forest Stewardship. Document reference code: FSC-STD-01-001 V5-2

Gonzalez, J.S. 1990. Wood Density of Canadian Tree Species. For. Can., Northwest Reg., North For. Cent., Edmonton, Alberta. In£. Rep. NOR-X-31 5.

Wesley Ingwersen, Maria Gausman, Annie Weisbrod, Debalina Sengupta, Seung-Jin Lee, Jane Bare, Ed Zanolli, Gurbakash S. Bhandar, Manuel Ceja. (2016) Detailed life cycle assessment of Bounty® paper towel operations in the United States. Journal of Cleaner Production 131 (2016) 509-522.

Hennigar, C.R. Open Stand Model Acadian Forest Region variant (OSM-ACD).

<https://forusresearch.com/downloads/osm/index.html>

International Panel on Climate Change. 2019: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)].

<https://www.ipcc.ch/site/assets/uploads/2019/11/SRCCL-Full-Report-Compiled-191128.pdf>

International Panel on Climate Change. 2003. Good Practice Guidance for Land Use, Land-Use Change and Forestry IPCC National Greenhouse Gas Inventories Programme UNEP Edited by Jim Penman, Michael Gytarsky, Taka Hiraishi, Thelma Krug, Dina Kruger, Riitta Pipatti, Leandro Buendia, Kyoko Miwa, Todd Ngara, Kiyoto Tanabe and Fabian Wagner [https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf\\_files/Chp3/Chp3\\_1\\_Introduction.pdf](https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Chp3_1_Introduction.pdf)

IPCC 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan.

[https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4\\_Volume4/V4\\_01\\_Ch1\\_Introduction.pdf](https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_01_Ch1_Introduction.pdf)

IPCC 2014, The Fifth Assessment Report of the IPCC. <https://www.ipcc.ch/report/ar5/syr/>

Ingwersen, W., Gausman, M., Weisbrod, A., Sengupta, SJL., Bare, J., Zanolli, E., Bhandar, GS., Ceja, M.

(2016) Detailed life cycle assessment of Bounty® paper towel operations in the United States. Journal of Cleaner Production.

International Panel on Climate Change. 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 12: Harvested Wood Products. [https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4\\_Volume4/V4\\_12\\_Ch12\\_HWP.pdf](https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_12_Ch12_HWP.pdf)

J.D. Irving, Limited. 2023. 2022. 2021 J.D. Irving, Limited Forest Supply Chain Environment, Social, and Governance Report. [www.jdirvingsustainability.com](http://www.jdirvingsustainability.com)

National Archives and Records Administration's Office of the Federal Register (OFR) - Electronic Code of Federal Regulations (e-CFR) (2021). [https://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=be77ce6e756f0befaa0dd95743e3342e&tpl=/ecfrbrowse/Title40/40cfr98\\_main\\_02.tpl](https://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=be77ce6e756f0befaa0dd95743e3342e&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl)

Greenhouse Gas Protocol. 2011. Quantitative Inventory Uncertainty. <https://ghgprotocol.org/calculation-tools>

Greenhouse Gas Protocol. 2011. Calculation Tools. <https://ghgprotocol.org/calculation-tools>

Steenberg, James. 2022. Personal Communication. Resource Analyst, Nova Scotia Department of Natural Resources and Renewables.

Tomberlin, K.E., Venditti, R., Yuan, Y. (2020). "Life Cycle Carbon Footprint Analysis of Pulp and Paper Grades in the United States Using Production-line-based Data and Integration. BioResources 15(2) 3899-3914. <https://bioresources.cnr.ncsu.edu/resources/life-cycle-carbon-footprint-analysis-of-pulp-and-paper-grades-in-the-united-states-using-production-line-based-data-and-integration/>

United States of America. 2021. National Inventory Report. Annexes to the Inventory of U.S. GHG Emissions and Sinks. (Accessed September 9, 2021) <https://unfccc.int/documents/272415>

U.S. Bureau of Labor Statistics (USBLS). Change in CPI December 2018-December 2021. [https://www.bls.gov/data/inflation\\_calculator.htm](https://www.bls.gov/data/inflation_calculator.htm)

United States Census Bureau. North American Industry Classification System. <https://www.census.gov/naics/?input=4238&year=2017&details=4238>, <https://www.census.gov/naics/?input=3332&year=2012&details=33324>, <https://www.census.gov/naics/?input=3365&year=2017&details=3365>, <https://www.census.gov/naics/?input=23&year=2017&details=2373>, <https://www.census.gov/naics/?input=8113&year=2017>

United States Department of Agriculture (2020). “Status and Trends for the U.S. Forest Products Sector” [https://www.srs.fs.usda.gov/pubs/gtr/gtr\\_srs258.pdf](https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs258.pdf)

U.S. EPA Office of Research and Development Supply Chain Emissions Factors for US Industries and Commodities. Supply Chain GHG Emission Factors for US Commodities and Industries v1.1 (epa.gov) <https://pasteur.epa.gov/uploads/10.23719/1524524/SupplyChainEmissionFactorsforUSIndustriesCommodities%20v1.1.xlsx>

Ward, Chris (2021). Personal Communication. Assistant Deputy Minister, New Brunswick Department of Natural Resources and Energy Development.

World Resources Institute (2005). Base year recalculation methodologies for structural changes. Appendix E to the GHG Protocol Corporate Accounting and Reporting Standard – Revised Edition. [https://ghgprotocol.org/sites/default/files/ghgp/standards\\_supporting/Base%20Year%20Adjustments.pdf](https://ghgprotocol.org/sites/default/files/ghgp/standards_supporting/Base%20Year%20Adjustments.pdf)

World Resources Institute (2011). Corporate Value Chain (Scope 3) Accounting and Reporting Standard. Supplement to the GHG Protocol Corporate Accounting and Reporting Standard. [https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporting-Standard\\_041613\\_2.pdf](https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporting-Standard_041613_2.pdf)

World Resources Institute (2015). GHG Protocol Scope 2 Guidance. An amendment to the GHG Protocol Corporate Standard. [https://ghgprotocol.org/sites/default/files/standards/Scope%202%20Guidance\\_Final\\_Sept26.pdf](https://ghgprotocol.org/sites/default/files/standards/Scope%202%20Guidance_Final_Sept26.pdf)

## REFERENCES: END-OF-LIFE

Asaleo Care. 2019. Environmental Product Declaration for Tork, Purex, and Sorbent Toilet Tissue. Version 2.0 of 30/09/2019. Produced under EPD Australasia in accordance with ISO 14025. EPD Registration number: S-P-00852

ECCC (Environment and Climate Change Canada). 2022a. Greenhouse Gas Calculator for Organic Waste Management: Methodology Report. Cat. No. EN14-493/1-2022E-PDF. Available at: <https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/municipal-solid/waste-greenhouse-gases-canada-actions/calculator.html>

USEIA (United States Energy Information Administration). 2021. U.S. Energy-Related Carbon Dioxide Emissions, 2020. U.S. Department of Energy. December 2021. Available at: <https://www.eia.gov/environment/emissions/carbon/>

USEPA (United States Environmental Protection Agency). 2020a. Advancing Sustainable Materials Management: 2018 Tables and Figures. December 2020. Available at: <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/advancing-sustainable-materials-management>

USEPA (United States Environmental Protection Agency). 2020b. Documentation for Greenhouse Gas Emission and Energy Factors used in the Waste Reduction Model (WARM). Management Practices Chapters. November 2020. Available at: <https://www.epa.gov/warm/documentation-waste-reduction-model-warm>

USEPA (United States Environmental Protection Agency). 2022. Basic Information About Biosolids. Biosolids Uses. Available at: <https://www.epa.gov/biosolids/basic-information-about-biosolids#uses>

### REFERENCES: CIRCULAR FOOTPRINT FORMULA

USEPA (United States Environmental Protection Agency). 2020a. Advancing Sustainable Materials Management: 2018 Tables and Figures. December 2020. Available at: <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/advancing-sustainable-materials-management>

USEPA (United States Environmental Protection Agency). 2020b. Documentation for Greenhouse Gas Emission and Energy Factors used in the Waste Reduction Model (WARM). Management Practices Chapters. November 2020. Available at: <https://www.epa.gov/warm/documentation-waste-reduction-model-warm>

Wolf, M.-A., Hofstra, U., Vroege, G.-J., De Schryver, A., & Zamperi, L. (2019). Circular Footprint Formula -Environmental Footprint (EF) transition phase. European Commission.

Zamperi, & Pant. (2019). PEF method, Annex C. European commission.

# APPENDIX – INDEPENDENT PRACTITIONERS’ LIMITED ASSURANCE REPORT



ISO 14064-3 Third Party Verification Report  
J.D. Irving, Limited  
December 23, 2024  
Page 10

## E. Verification Statement

To J.D. Irving, Limited,

We have been engaged by J.D. Irving, Limited (the “Company”) to examine the Company’s 2023 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, 2023 to December 31, 2023 (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.

KPMG PRI

KPMG Performance Registrar Inc.  
Vancouver, BC  
December 23, 2024



PO Box 5777  
300 Union Street  
Saint John, New Brunswick  
E2L 4M3 Canada

Toll Free:  
1-800-518-7999  
Main Switchboard:  
1-506-632-7777

[www.jdirving.com](http://www.jdirving.com)  
[info@jdirving.com](mailto:info@jdirving.com)