



● METHODOLOGY · VERSION 1.0

Animation Calculator Methodology

How greenhouse gas emissions are quantified for animation productions and animation studios in the Canadian film and television industry.

STANDARDS

GHG Protocol Corporate
Standard & Corporate Value
Chain (Scope 3) Standard

COVERAGE

Scope 1, Scope 2, and
upstream Scope 3
Categories 1–7



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This methodology sets out the boundaries, calculation approaches, emission factor sources, and data quality expectations that sit behind the Animation Calculator.

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Methodology Overview

This methodology describes the approach used to quantify greenhouse gas (GHG) emissions associated with animation productions and animation studios operating within the Canadian film and television industry. The calculator is designed to primarily align with the Greenhouse Gas Protocol and the Greenhouse Gas Protocol Corporate Value Chain (Scope 3) Standard, while reflecting the operational characteristics of animation production environments.

A category or emission source is treated as material to this methodology if it is reasonably expected to represent a significant share of a production's or studio's total footprint, or if its omission could meaningfully change the conclusions drawn from the results. Categories excluded on materiality grounds are documented in the relevant section below.

- **This calculator is a self-assessment tool. P4P does not review, verify, or validate user-submitted inputs or outputs.**

The methodology prioritizes consistency, transparency, and practicality, enabling animation productions and studios to measure emissions using available operational data while maintaining methodological alignment with internationally recognized GHG accounting standards.

The calculator quantifies emissions across Scope 1, Scope 2, and the most relevant upstream Scope 3 categories (Categories 1–7).

The methodology recognizes that the GHG Protocol does not currently prescribe a fixed list of mandatory Scope 3 categories. Downstream categories (Scope 3 Categories 9–15) and Scope 3 Category 8 (upstream leased assets) are excluded from this methodology because animation productions are service-based operations and these categories are generally not applicable or meaningful at the production or studio level.

Organizational and Operational Boundaries

Organizational boundaries follow the operational control approach defined by the Greenhouse Gas Protocol Corporate Standard. Emissions sources are included where the reporting entity has operational control over activities or where emissions are generated through activities required to deliver animation production services.

Production-level assessments may differ from corporate-level footprints where equipment, facilities, or infrastructure are owned by a parent company rather than the production entity itself. In such cases, emissions associated with assets not purchased or controlled by the production entity are excluded from the production-level footprint and the exclusion is documented.

The reporting period corresponds to the studio's operational year or the lifecycle of a specific animation production project.

Where emissions data is available only at the studio level, a full-time equivalent (FTE) or time-based allocation approach may be used to estimate the production's share of the relevant emissions. This approach can be applied to an entire studio-level footprint or to specific emission categories for which production-level data is not available, such as studio-wide utility consumption.

Under an FTE approach, the share of total studio personnel attributable to a given production is calculated relative to the total studio workforce during the relevant reporting period. Alternatively, a time-based approach may be used, based on factors such as labour hours or production hours, where the proportion of activity attributable to the production is calculated relative to overall studio activity. The resulting proportional share is then applied to the relevant studio-level emissions to estimate the portion attributable to the production.

DO NOT DOUBLE COUNT

FTE or time-based allocation should be used instead of, not alongside, direct assignment or exclusion for the same emission source or category. Where a production has direct, production-specific data for a category, that data should be used rather than allocating the same category from studio-level data. Similarly, where a category is subject to a “report zero” provision, an FTE- or time-based allocation should not also be applied to that category. Applying both mechanisms to the same source could result in emissions being double counted or incorrectly excluded—for example, combining production-specific travel data with an FTE-based allocation of studio-wide travel emissions.

This proportional allocation approach provides a practical method for estimating production-level emissions where shared studio data is available but cannot be directly attributed to individual productions. It allows shared emissions to be distributed according to the production’s relative use of studio resources or activity while avoiding double counting.

General Calculation Approach

Emissions are calculated using the following general formula:

$$\text{Emissions (kg CO}_2\text{e)} = \text{Activity Data} \times \text{Emission Factor}$$

Where:

- Activity data represents a quantified unit of activity (e.g., kWh of electricity, km travelled, CAD spent) with the specific data type varying by scope and category. Further detail on the required data types for each scope and category is provided in the sections below.
- Emission factors represent greenhouse gas emissions per unit of activity

All calculations are performed using consistent units. Where necessary, unit conversions are applied prior to emissions calculations.

Global warming potentials (GWPs) are applied consistently across the full inventory from Intergovernmental Panel on Climate Change (IPCC).

Emission Factor Selection Approach

Emission factors are selected based on geographic relevance, methodological credibility, and alignment with recognized governmental or peer-reviewed datasets.

Preference is given to Canadian datasets where available. The emission factor selection hierarchy is as follows:

01	Canadian National Inventory Report
02	Provincial Data sets
03	Canadian based EF databases (e.g., stats Canada, Open IO etc)
04	US EPA Factors
05	US EPA spend based supply chain factors
06	International Government databases

Figure 1. Emission factor selection hierarchy, highest preference first.

Where no Canadian dataset exists for a given category, the following named substitutions apply ahead of the general hierarchy above: purchased goods and services (Scope 3.1), waste (Scope 3.5), and air travel (3.6) use UK Government GHG Conversion Factors, selected for their category-specific granularity, in preference to the US EPA tiers. Any other substitution made outside this hierarchy is documented at the point of use.

Canadian emission factors are primarily sourced from Environment and Climate Change Canada (ECCC). Where Canadian emission factors are not available or do not provide sufficient methodological detail, internationally recognized government datasets are used.

Emission factor sources should be maintained within the calculator documentation to allow annual updates. Emission factors should be reviewed annually and updated when new datasets are released by the relevant sources.

Sources and Licensing

Emission factors used in this methodology are drawn from publicly available datasets and are attributed to their respective publishing sources. The source and, where applicable, licence for each emission factor dataset are identified in the emission factor table in section ten.

SECTION FOUR

Emission Factor Update Process

Emission factors are reviewed on an annual basis to ensure alignment with the most recent datasets published by primary sources. Detailed information on emission factor datasets, including dataset names, table locations within source documents, and links for annual updates, is provided in Table 2: Emission Factor Sources (section ten).

When new emission factors are released, updated versions of the calculator will be issued to users. Reporting entities will be required to transition their data into the updated version to ensure the most current emission factors are applied. Future versions of the calculator will include functionality to capture emissions across multiple years, allowing productions that span more than one reporting year to input and track data accordingly.

Data Quality Hierarchy

The calculator prioritizes higher-quality activity data wherever available. Data sources follow a hierarchy consistent with the Greenhouse Gas Protocol guidance.

TIER 1	Supplier-specific or measured activity data
TIER 2	Primary operational data such as invoices, or internal travel records
TIER 3	Distance-based or weight-based estimates using known operational parameters
TIER 4	Spend-based estimates using economic input-output emission factors

Where higher-tier data is unavailable, lower-tier estimation approaches may be used. All assumptions and estimation methods must be documented.

Scope and Category Summary

SCOPE	WHAT IT COVERS	CALCULATION METHOD
Scope 1	Natural gas, company vehicle fuel, on-site generators, fugitive refrigerants, fire suppression leakage	Activity-based
Scope 2	Purchased electricity for offices, studios, render facilities, and server infrastructure	Activity-based; location-based and market-based
Scope 3.1	Purchased goods and services, including cloud compute and outsourced animation	Spend-based for services; mass-based for goods
Scope 3.2	Capital goods: computers, monitors, furniture	Spend-based
Scope 3.3	Upstream extraction, production, and transport of fuels and electricity	Activity-based
Scope 3.4	Inbound and outbound transport of purchased goods, courier and freight	Spend-based by mode
Scope 3.5	Treatment and disposal of waste from office or studio operations	Activity-based
Scope 3.6	Business travel: flights, rail, taxis, rental vehicles, hotel accommodation	Activity-based
Scope 3.7	Employee commuting and work from home	Survey-based activity data

Table 1. Scopes and categories in the calculator. Scope 3 Category 8 and Categories 9–15 are excluded, as described in Section One.



SECTION SIX

Scope 1 — Direct Emissions

Scope 1 includes direct greenhouse gas emissions from sources owned or controlled by the production or studio.

Typical Scope 1 sources in animation production include natural gas used for office or space heating, fuel used in company-owned or leased vehicles, and fuel used in on-site generators, fugitive refrigerant emissions from HVAC and chiller systems, and fire suppression system leakage.

Calculation method: activity-based.

Required data inputs include fuel consumption quantities such as litres of gasoline or diesel and cubic metres of natural gas from third-party invoices or receipts. Natural gas consumption may also be reported in gigajoules (GJ) as provided on energy invoices and converted to cubic metres where necessary.

SECTION SEVEN

Scope 2 — Purchased Electricity

Scope 2 includes indirect emissions from the generation of purchased electricity consumed by the production or studio.

Electricity consumption typically occurs in offices, animation studios, render facilities, and server infrastructure.

Calculation method: activity-based using electricity consumption data.

Required data inputs include electricity consumption measured in kilowatt-hours (kWh) and the province or territory where electricity is consumed. The calculator maintains emission factors for all thirteen Canadian provinces and territories.

Location-Based Calculation

The location-based method reflects the average emissions intensity of the electricity grid in the province or territory where electricity is consumed.

Location-based emissions are calculated as:

$$\text{Electricity consumption (kWh)} \times \text{provincial grid emission factor (kg CO}_2\text{e/kWh)}$$

Market-Based Calculation

In alignment with the Greenhouse Gas Protocol Scope 2 Guidance, Scope 2 emissions are also calculated using the market-based method where applicable.

The market-based method reflects emissions associated with electricity that the reporting entity has purposefully chosen through contractual instruments such as supplier-specific emission factors or renewable energy certificates (RECs).

Market-based emissions are calculated using the following hierarchy:

- Where a supplier-specific emission factor is available, emissions are calculated using: Electricity consumption (kWh) × supplier-specific emission factor (for example, a supplier-specific factor obtained from an Alberta electricity retailer, or Ontario I-RECs applied to a portion of consumption)
- Where renewable energy certificates are purchased, emissions are calculated by applying zero emissions to the portion of electricity covered by RECs and applying the provincial grid emission factor to the remaining electricity consumption
- Where no contractual instruments or supplier-specific emission factors are available, market-based emissions default to the location-based result

Province-Specific Application

The applicability of market-based calculations varies across Canadian provinces due to differences in electricity market structures and the availability of contractual instruments.

In provinces with predominantly regulated and low-emission electricity grids and limited access to contractual instruments (e.g., British Columbia, Manitoba, Quebec, and Newfoundland and Labrador), market-based emissions are assumed to be equal to location-based emissions. In provinces where electricity markets allow for supplier differentiation or the use of contractual instruments (e.g., Alberta and Ontario), it is consistent with GHG Protocol Scope 2 Guidance for users to report both location-based and market-based emissions. Where no contractual instruments are reported in these provinces, the market-based result defaults to the location-based result.

Scope 3 — Upstream Indirect Emissions (Categories 1–7)

Scope 3.1 Purchased Goods and Services

This category includes emissions associated with goods and services purchased by the production or studio, including software subscriptions, cloud services, outsourced animation services, professional services such as legal and accounting services, and other operational expenditures.

Cloud computing and render-farm compute, together with outsourced animation services, can represent a significant share of a production's Scope 3.1 footprint. For these two sub-categories, the calculator applies a dedicated data hierarchy: supplier-reported, customer-level emissions data (for example, from a cloud provider's own carbon reporting tools) is used where available, with the spend-based EEIO calculation described below used only as the default where supplier-reported data cannot be obtained.

Emissions from services are calculated using a spend-based approach due to limited availability of lifecycle emissions data for service-based purchases (measured in Canadian dollars). While purchased goods emissions such as paper, plastics, and sheet metal are calculated using mass data (kg).

Scope 3.2 Capital Goods

Capital goods include long-life assets purchased by the production or studio during the reporting period such as computers, monitors, servers, storage equipment, furniture, and specialized animation hardware.

Calculation method: spend-based using capital expenditure data.

Required data inputs include the purchase cost of capital equipment in Canadian dollars. Where supplier- or vendor-specific greenhouse gas emissions data is available, this data may be used in place of the default spend-based calculation. Supplier-specific emissions data may include product-level lifecycle emissions data, supplier-reported emissions associated with the purchased service, or other verified emissions information provided by the vendor. When supplier-specific data is used, it should correspond to the purchased quantity and reporting period and the data source should be documented. Supplier-specific data is considered a higher-quality data source within the calculator's data quality hierarchy. Where such data is unavailable, the default spend-based calculation using Statistics Canada emissions intensity factors should be applied.

If emissions are calculated at the production level and the production entity does not purchase capital goods specifically for the project, Scope 3.2 emissions are reported as zero. This direct-assignment rule applies only where Scope 3.2 has not already been captured through the studio-level allocation approach described above.

Scope 3.3 Fuel- and Energy-Related Activities

This category includes upstream emissions associated with the extraction, production, and transportation of fuels and electricity already reported under Scope 1 and Scope 2.

Calculation method: activity-based using energy consumption quantities already collected for Scope 1 and Scope 2.

No input is necessary besides confirming the province used in Scope 1 and Scope 2 tabs.

Scope 3.4 Upstream Transportation and Distribution

This category includes emissions from inbound and outbound transportation of purchased goods and equipment including courier and freight shipping.

Calculation method: Spend-based by mode of transportation (rail, water, road, air).

A spend-based estimate is used to determine greenhouse gas emissions.

Freight and courier costs invoiced directly to the production or studio (for example, courier or freight invoices) are reported here, in Scope 3.4. Freight and shipping costs that are already embedded in a supplier's price for purchased goods are captured within the Scope 3.1 economic input-output (EIO) factors and should not be reported again in Scope 3.4; each freight cost should be assigned to one category only to avoid double counting.

Scope 3.5 Waste Generated in Operations

This category includes emissions from treatment and disposal of waste generated during office or studio operations.

Calculation method: activity-based using waste quantities.

Required data inputs include waste quantities measured in kilograms and waste treatment type (landfill, recycling, compost).

Waste generation in animation production environments is typically small compared with other sectors but is included for completeness and transparency.

Scope 3.6 Business Travel

This category includes emissions from employee travel for business purposes.

Travel modes include flights, taxis, and hotel accommodations.

Calculation method: activity-based.

Required data inputs include travel distance, travel mode, and number of nights for accommodation.

Flights

Flight emissions are categorized as short-haul flights (up to 3,700 km) and long-haul flights (greater than 3,700 km). Emission calculations are split up by class, if class is unknown use “average passenger” class.

If emissions are calculated at the production level and the production entity does not undertake or fund any business travel specifically for the project, Scope 3.6 emissions are reported as zero. As with Scope 3.2, this direct-assignment rule applies only where Scope 3.6 has not already been captured through the studio-level allocation approach described above.

Accommodation

Accommodation emissions are calculated as Scope 3, Category 6 (Business Travel), based on the number of rooms and nights booked per trip, multiplied by an emissions factor specific to the accommodation type and location.

Because Canada does not currently publish nationally representative energy-intensity data segmented by hotel class, this methodology applies a global set of energy-intensity benchmarks by accommodation type (Economy, Midscale, Upscale, Luxury Hotel, Apartment, Average House, and Large House) derived from ENERGY STAR data supplemented by the Cornell Hotel Sustainability Benchmarking Index, multiplied by the relevant country (USA or UK) or province-specific electricity emission factor.

Taxis

This methodology distinguishes between gasoline and electric vehicle trips, since their emissions sources differ substantially. For gasoline trips, a single national emission factor is applied regardless of location, reflecting the relatively consistent carbon intensity of gasoline combustion across Canada. For electric vehicle trips, the emission factor is calculated on a province-specific basis, since the emissions associated with charging an electric vehicle depend on the carbon intensity of the electricity grid where the trip took place — which varies significantly across Canadian provinces and territories, from largely hydro- or nuclear-powered grids to those still reliant on fossil fuels.

Scope 3.7 Employee Commuting and Work From Home

This category includes emissions associated with employee travel between home and the workplace as well as emissions from remote work.

Calculation method: survey-based activity data combined with mode-specific emission factors.

Required data inputs include commuting distance, commuting frequency, transportation mode, and province.

For work-from-home emissions, required data inputs include the number of remote working days and the province of residence.

Work-from-home emissions include estimated electricity and heating energy used during working hours from Statistics Canada.

WORK-FROM-HOME ALLOCATION

Assumptions include an eight-hour workday and a proportional allocation of household electricity and heating consumption attributable to working hours. An eight-hour workday represents one-third of a 24-hour day. To account for baseline household energy use that would occur regardless of working from home, it is assumed that 50% of energy consumed during working hours is attributable to work-from-home activities. As a result, approximately 17% of total daily household electricity and heating energy is allocated to work-from-home emissions.

Work-from-home emissions are calculated by applying this proportional allocation to estimated daily household energy consumption and multiplying by the number of reported work-from-home days and the applicable province-specific emission factors.

Commuting emissions are split out into train, car, and bus emissions using activity data (commuting distance in km) to determine the emissions. A sample commuter survey is provided to help collect commuting and work-from-home data.

SECTION NINE

Governance and versioning

Every calculation the tool produces should carry the calculator's own tool version (for example, v1.2). Because the underlying emission factors come from multiple sources (e.g. electricity by province, natural gas, flights) that don't refresh on the same schedule, the source and release year for every individual factor is recorded directly on the EF tabs, next to the factor itself.

A production that completed its reporting under a given tool version and set of factor vintages should stay reported under that combination; updated factors apply only to work going forward. This ensures that a result calculated in one year and revisited the next isn't misread as a methodology change when it simply reflects an updated or a revised factor for one or more categories.

Emission Factor Sources

Table 2

Scope 1 — Direct Emissions

Category	Coverage	Source
Natural Gas	By province	Environment and Climate Change Canada, National Inventory Report 1990–2023: Greenhouse Gas Sources and Sinks in Canada, Part 2 Table A6-1, A6-3
Other Fuels	Diesel, propane, motor gasoline, heating oil	Environment and Climate Change Canada, National Inventory Report 1990–2023: Greenhouse Gas Sources and Sinks in Canada, Part 2 Table A6-6

Scope 2 — Purchased Energy

Category	Coverage	Source
Electricity	Consumption & generation, by province	Environment and Climate Change Canada, National Inventory Report 1990–2023: Greenhouse Gas Sources and Sinks in Canada, Part 3 Table A13

Scope 3 — Value Chain

Category	Coverage	Source
Cat. 1&2 — Purchased Goods	Paper, plastics (pens, highlighters), steel (staples)	UK Government GHG gas reporting: conversion factors 2026 — Department for Energy Security and Net Zero Material Use

Category	Coverage	Source
Cat. 1&2 — Purchased Services	Motion picture/sound recording, legal/accounting/engineering, computer manufacturing, furniture manufacturing, insurance	Statistics Canada, Table 38-10-0098-01 — Direct plus indirect energy and GHG emissions intensity, by industry
Cat. 1&2 — Data Processing / AI Services	By province	Reference Factor: OpenIO-Canada Emission Factors v2.11 – Agez, Maxime, “OpenIO-Canada emission factors,” Zenodo dataset, reference year 2022, published 19 January 2026. DOI: 10.5281/zenodo.18304088.
Cat. 3 — Upstream Fuel	Upstream electricity factor, by province	Environment and Climate Change Canada, National Inventory Report 1990–2023: Greenhouse Gas Sources and Sinks in Canada, Part 3 Table A13
Cat. 4 — Freight	Road, water, rail, air freight, by province	Reference Factor: OpenIO-Canada Emission Factors v2.11 – Agez, Maxime, “OpenIO-Canada emission factors,” Zenodo dataset, reference year 2022, published 19 January 2026. DOI: 10.5281/zenodo.18304088.
Cat. 5 — Waste	Plastics, organics, paper, mixed waste, batteries (recycled vs. landfill)	UK Government GHG gas reporting: conversion factors 2026 — Department for Energy Security and Net Zero Waste Disposal
Cat. 6 — Accommodations (International Hotels)	Economy/Midscale/Upscale/Luxury benchmarks × country electricity factor	Jagarajan, R. and Ricaurte, E. (2021) Hotel Sustainability Benchmarking Index 2020: Carbon, Energy and Water, Cornell Center for Hospitality Research, Cornell Hospitality Indices, 1(1) ENERGY STAR (2008) Facility Type: Hotels and Motels Methodology follows the BAFTA albert carbon calculator. USA EF - US EPA, eGRID2023 Rev 2 (released 12 June 2025) . UK EF - UK Government GHG gas reporting: conversion factors 2026 — Department for Energy Security and Net Zero UK electricity

Category	Coverage	Source
Cat. 6 & 7— Business travel (taxis), commuting (bus/car)	Taxis/rideshares, commuting (bus/car)	U.S. EPA, Emission Factors for Greenhouse Gas Inventories, GHG Emission Factors Hub 2025 Table 10
Cat. 6 — Business travel (air travel)	Air travel by class type and distance	UK Government GHG gas reporting: conversion factors 2026 — Department for Energy Security and Net Zero, Business Travel - air
Cat. 7 — Commuting (Personal Vehicle / EV)	Per km, by province	Natural Resources Canada, "Choosing the right vehicle," Personal Vehicles – Transportation Energy Efficiency (modified 2024-12-23)
Cat. 7 — Commuting (Train)	Rail passenger travel	Reference Factor: Railway Association of Canada, "Locomotive Emissions Monitoring Report 2023," prepared under the 2023–2030 Memorandum of Understanding between Transport Canada and the Railway Association of Canada for reducing locomotive emissions.

Global Warming Potentials (GWP100) sourced from the IPCC Sixth Assessment Report (AR6).