2022 Project Gigaton Accounting Methodology

This methodology is being used to calculate cumulative avoided, sequestered or reduced emissions and land and ocean area reported by Walmart suppliers throughout the global value chain for the purposes of Project Gigaton's 2022 reporting cycle. The contents of this document are intended to establish a calculation approach that is objective, measurable, complete, and relevant. Publication of our methodology for the accounting year is intended to promote transparency in the way Walmart is collecting and compiling information. Walmart may revise its methodology in subsequent years as new science is released, processes are changed, and correction of errors are reconciled.

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Last updated July 2022

Introduction

Walmart has set a goal to work with its suppliers and customers to avoid 1 billion metric tons – a gigaton - of scope 3 greenhouse gas emissions in the global value chain by 2030. Through Project Gigaton, participating suppliers set their own emissions reduction goals and annually report emissions reduced, sequestered and/or avoided toward Walmart's 1 billion metric ton goal.

Greenhouse gas (GHG) accounting and reporting experts suggest that Walmart's value chain emits orders of magnitude more carbon dioxide equivalents (CO_2e) through the manufacture and use of products than Walmart emits selling them (scope 3 is estimated to represent 95% of Walmart's full scope 1, 2, and 3 emissions). Therefore, Walmart's largest potential impact on greenhouse emissions is to engage suppliers and other value chain stakeholders to lower their greenhouse gas impact.

Project Gigaton is the scope 3 component of **Walmart's science-based target (SBT), which also includes reducing its scope 1 and scope 2 absolute emissions by 18% by 2025 from 2015 levels.** This SBT is in alignment with the 2015 Paris Climate Agreement and global effort to limit planetary temperature rise to <2 °C; it has been approved as a SBT by the Science-Based Targets Initiative, a coalition of leading climate NGOs (Carbon Disclosure Project (CDP), World Resources Institute (WRI), World Wildlife Fund (WWF), United Nations Global Compact (UNGC)).

1. Methodology context

This methodology is being used to calculate cumulative emissions avoided, sequestered or reduced and reported by Walmart suppliers throughout the global value chain for the purposes tracking progress toward Project Gigaton. This document establishes the relevant reporting year's definitions for the metric and each of its "pillars" or components, as well as the calculation methodology, including boundaries, timing, and data sources.

The contents of this document are intended to establish a calculation approach that is objective, measurable, and relevant to translate supplier self-reported data into greenhouse gas equivalencies. Publication of this methodology for the Project Gigaton accounting year is intended to promote transparency in the way Walmart is collecting and compiling information. Walmart may revise its methodology in subsequent years as new science is released, processes are changed, and correction of errors are reconciled. Data collected in previous reporting years will not be recalculated using the revised methodology.

2. Metric Definition

This methodology focuses on Project Gigaton's key metric, to avoid one billion metric tons of emissions from the global value chain by 2030.

Project Gigaton suppliers set their own emissions goals and annually report emissions reduced at a project level. Their submissions are organized into six primary program pillars, which encompass many major types of emission reduction activities. **A seventh pillar, Enterprise Emissions, acts as a catchall for goals and emissions that don't fall into the six primary pillars.**

- Energy
- Waste
- Packaging

- Nature
- Transport
- Product Use and Design
- Enterprise Emissions

Walmart has determined specific calculation methodologies for each pillar, which this document describes in detail in the Reporting to Project Gigaton section.

Walmart calculates progress toward the Project Gigaton goal by summing the project-level greenhouse gas emission reductions submitted by suppliers towards all pillars each year. Walmart then sums annual totals to arrive at a cumulative total toward the one billion metric ton goal.

Project-level avoided, sequestered, and absolute emissions reductions self-reported by suppliers to Project Gigaton will be counted toward Project Gigaton equally. At an enterprise level, these submissions constitute avoided emissions for Walmart.

- Absolute emissions reductions occur when the impact of an emissions reduction activity results in a reduction of overall greenhouse gases regardless of economic growth. From an organization's perspective, an absolute reduction occurs when the total emissions within the defined accounting boundary are proven to be lower year-over-year.
- Avoided emissions are emissions that did not occur when compared to a business as usual or baseline scenario because a specific action was taken or an intervention occurred. From an organization's perspective, an avoided emission occurs when the total emissions within the defined accounting boundary are not proven to be lower year-over-year; organizations can still have emissions reductions at a project-level in this scenario provided sufficient evidence has been collected.
- Sequestered emissions reductions occur when emissions are removed from the atmosphere and stored elsewhere, e.g. through GHG storage in soil or forests. For an organization's perspective, a sequestered emission reduction occurs when an asset within the defined accounting boundary removes atmospheric greenhouse gases.

Walmart recognizes the important difference between avoided, sequestered, and absolute emissions reductions. We're committed to inspiring broad action across many industries and issues, which we hope will inspire changes that contribute to both avoided, sequestered, and absolute emissions reductions.

Units and conversions

The 1 Gigaton target is equivalent to 1,000,000,000 metric tons (MT) of CO2 equivalents (CO2e), also known as greenhouse gases (GHGs). Progress toward the 1 Gigaton target is also reported in MT CO2e.

When using conversion factors to translate a supplier's activity level metrics into GHG impact, Walmart uses reputable sources for conversion factors and maintains documentation of the conversion factors and their sources in this document. Where this methodology uses "emissions factors" generally refers to avoided or absolute reductions in emissions as a result of the activities being reported.

Metric objective and rationale

This metric allows us to efficiently communicate progress from many value chain carbon reduction initiatives that Walmart suppliers have underway. It also helps simplify communications by focusing on

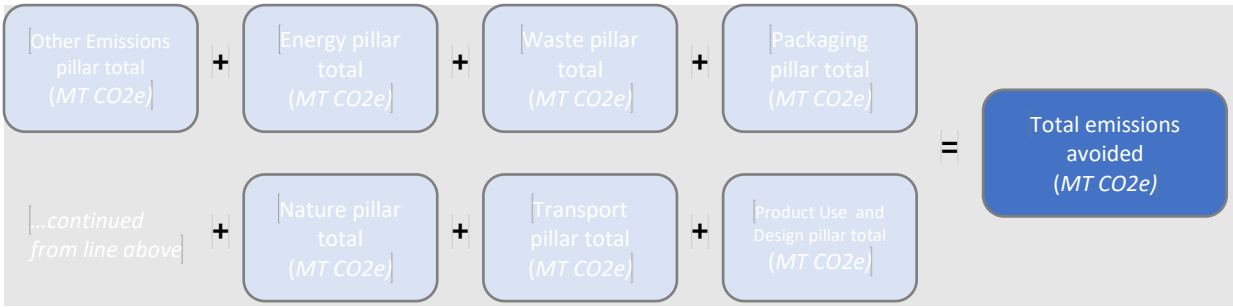
the progress toward a reduction that science tells us we must achieve in order to avoid the worst impacts of climate change.

The 1 gigaton reduction target calculation was based on data from 2015. The metric was estimated using Walmart's Scope 1 and Scope 2 greenhouse gas emissions, and the assumption that these emissions make up only 5% of Walmart's value chain emissions. Any future modification to Walmart's 2015 Scope 1 & 2 emissions (e.g., error, organizational change) should trigger a review of the Gigaton target.

Walmart's approach for calculating progress toward its Gigaton goal does not follow the guidelines set forth in the Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Standard. The primary point of departure from the Standard is Walmart's use of *avoided* emissions to calculate progress toward the Gigaton goal. This is a conscious decision that Walmart made for efficiency and practicality reasons.

As the world's largest retailer, Walmart recognizes its unique position to drive systems changes, and believes that this goal will help to distinguish the company and inspire others.

Metric calculation



In the future, additional data components may be added to this calculation to incorporate the impact from new or expanded programs that Walmart or its suppliers are pursuing to reduce GHG emissions in the value chain. This methodology will be updated in subsequent years to incorporate new methodologies as they are added.

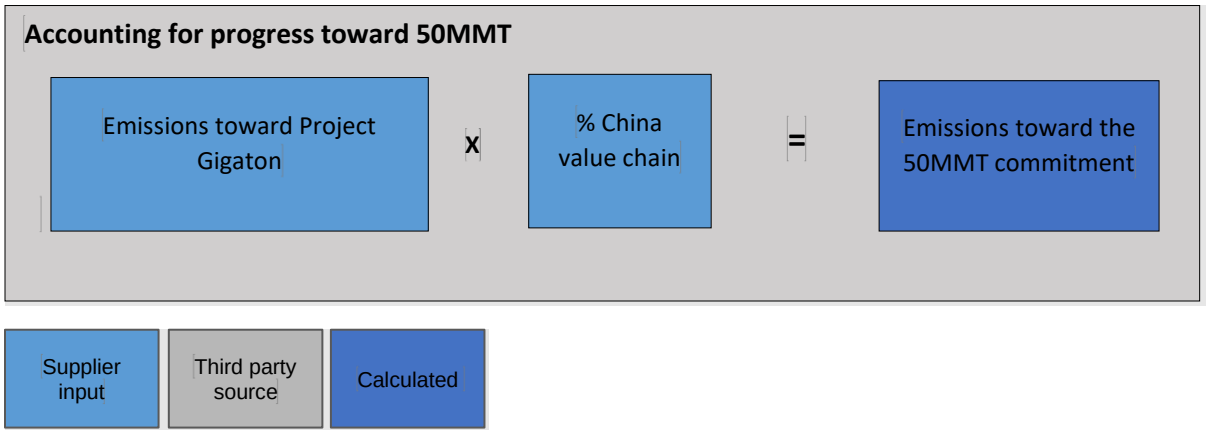
50MMT China value chain commitment

In March 2018 at the Tsinghua Forum in Beijing, Walmart announced sustainability commitments for China. Specifically,

- **Walmart China will reduce the carbon intensity (per revenue) of its own operations in China by an additional 25% by 2025, or 70% from a 2005 baseline.**
- **Through Project Gigaton, Walmart commits to working with suppliers to reduce at least 50 million metric tons (MMT) of C02e by 2030 in the value chain in China.**

China's 50MMT value chain commitment is included in, not additional to, Walmart's one gigaton commitment. To measure progress against this goal, Walmart will ask suppliers to estimate the percentage of reported emissions that are related to the Chinese value chain ("% China value chain") during the annual reporting process, which is defined as all production and consumption within China; "consumption within China" is further defined as any product sold to Chinese consumers regardless of the country of production or source of the raw materials (i.e. if consumers in China purchase products produced abroad which have an associated emissions reduction story, this counts). The only variation to

this guidance relates to methodology *4.2.7.1 Energy efficient products* and *4.2.7.2 Low-GWP refrigerant*. These methodologies calculate emissions avoided during the *use* phase of the product lifecycle and thus only improved products sold inside China count toward this target, regardless of the country where the product was produced (i.e. an efficient lightbulb produced in China, but sold in the United States would not count; an efficient lightbulb produced in China or elsewhere and sold in China would count).



3 Reporting elements

Scope and Boundaries

Organizational boundary conditions define the breadth of the GHG inventory by identifying the locations where Walmart assumes direct responsibility for GHG emissions. Walmart uses the "control approach" to set organizational boundaries for calculating their Scope 1&2 GHG inventory. Value chain emissions are categorized as Scope 3, indirect emissions. Scope 3 is a category of CO2e emissions defined by World Resources Institute (WRI) and the World Business Council for Sustainable Development's Greenhouse Gas Protocol (GHG Protocol). The Project Gigaton metric only covers emissions that occur in Walmart's scope 3 value chain and does not include Walmart's scope 1&2 emissions associated with operations under Walmart's control.

Walmart's Tier 1 (direct) suppliers participating in Project Gigaton are encouraged to report reductions associated with their own Scope 1, 2, and/or 3 emissions to Project Gigaton:

- Scope 1, "Direct Emissions," represent emissions from the combustion of fuels and other sources that occur directly on site (e.g., refrigerants, livestock) and mobile emissions sources
- Scope 2, "Indirect Emissions," represent emissions that occur off-site to produce electricity or steam purchased for use at corporate locations
- Scope 3, "Indirect Emissions," include upstream activities such as production of goods and services purchased by the company, as well as downstream activities such as consumer use and disposal of products sold by the company

Suppliers may choose what portion (up to 100%) of their emissions reductions initiatives to report toward Project Gigaton (e.g. global emissions, sales-based, allocated, etc.). Direct suppliers of Walmart can report all reductions that occur across the supplier's organization, regardless of the percentage of the supplier's operations or products that are directly sold or attributable to Walmart. Although only direct suppliers to Walmart are able to participate in Project Gigaton, overlapping supply chains and business-to-business

relationships between suppliers mean that there is potential for double counting. Rules established in this methodology have been designed to address double counting areas of concern both through reporting design (e.g. prevent a supplier from double reporting the same activity within or between pillars) and calculation-level discount factors and conservative estimations (e.g. 20-year timeframe for deforestation avoided emissions).

Geography

Walmart suppliers from anywhere in the world can participate in Project Gigaton and report emissions reductions from projects implemented anywhere in the world. Walmart began Project Gigaton by focusing primarily on **engaging suppliers to Walmart U.S., and has formally expanded this focus to include suppliers to China (including export suppliers), Mexico, Central America, Global Sourcing, and Canada**. Over time, focused engagement may expand to additional geographies as program methodologies and management develop to be increasingly applicable globally; although focused engagement is currently limited to the markets listed, suppliers serving any retail market and located anywhere may join the initiative. The vision is for Project Gigaton to be a fully global initiative.

Signing up

In order to report their emissions reductions towards Project Gigaton, suppliers must first sign up to participate in Project Gigaton by setting a goal and sharing it with Walmart.

- Suppliers can sign up for Project Gigaton at https://www.walmartsustainabilityhub.com/project-gigaton/join-us; after signing up, suppliers use this same link to sign into their Project Gigaton Account, where they can modify or set new goals, report and manage their participation.
- Suppliers may choose to commit to a goal in one or more of the six primary pillars that are relevant to their business: Energy, Waste, Packaging, Nature, Transportation and Product Use and Design.
- In cases where a supplier's goal does not fall neatly into one of the six primary pillars, or encompasses multiple pillars, suppliers can commit to an Enterprise Emissions goal. One such example is when a supplier submits an enterprise emissions reduction target or sets a company-wide Science-Based Target approved through the Science-Based Targets initiative (www.sciencebasedtargets.org).

Individual supplier participation information, including goals and progress, will not be reported publicly unless specifically approved by the supplier. Aggregate emissions reductions across all suppliers will be reported publicly.

Multi-national suppliers that provide products to Walmart across numerous store formats and retail markets should sign up for Project Gigaton as a single entity. At the time of sign up, suppliers will be asked to provide the Walmart retail markets and vendor numbers associated with their company.

Timing

Once each year during the Project Gigaton reporting cycle, Walmart will calculate the additional progress toward the Project Gigaton goal and will ask suppliers to log into their Project Gigaton Account and report the emissions reduced, avoided, or sequestered. The first annual reporting cycle for Project Gigaton was held in fall 2017 and continues annually every fall.

- During a given reporting cycle, suppliers may report up to two years of data, split into separate 12-month submissions. Over the course of Project Gigaton, no supplier should submit more than 15 years' worth of data.
    - Suppliers reporting during the 2017 reporting cycle, the first year of data collection, were only permitted to submit 12 months of data.
    - The earliest reporting period acceptable for inclusion is from July 1, 2015 through June 30, 2016. The latest reporting period acceptable for inclusion is July 1, 2030 through June 30, 2031.
    - For suppliers reporting to the 2022 reporting cycle, the earliest possible reporting period will shift to July 1, 2019 through June 30, 2020; each 'earliest possible' reporting period will shift accordingly for each future reporting cycle thereafter. This is intended to encourage continuous progress and delivery of more current results to Project Gigaton.
- Whenever a supplier reports to Project Gigaton, it is best practice to use as a reporting period the latest or most recent 12-month period for which it has data available, although there is no requirement that data submitted correspond to the year it was submitted. This may be based on the calendar year, the company's fiscal year, or another convenient 12-month period.
    - Suppliers will specify the starting and ending dates of the reporting period they choose to use. The reporting system accepts date ranges between 360 and 370 days to account for differences in accounting years by company.
    - Each subsequent year's data should use the same reporting period as the initial reporting year to avoid gaps or overlap with the prior year's submissions. The reporting system will not allow for data submissions that overlap by more than 60 days with a previous submission.
- For suppliers new to Walmart, emissions reductions that took place prior to becoming a Walmart supplier cannot be reported.
- Amendments to previously reported data will be handled on a case-by-case basis. To submit a request to amend data, suppliers should reach out to corpsu@wal-mart.com.

Temporal allocation of data

The Project Gigaton reporting cycle corresponds to the year in which suppliers report the data to Walmart, not necessarily the time that the avoided emissions occurred; section 3.4 explains the allowable supplier report dates per reporting cycle. While most data calculated as part of Project Gigaton reflects the emissions reduced or avoided during the supplier report dates in which the initiative is reported, there is some variation in the temporal allocation of emissions across the pillars. Thus, the figure reported in any given Project Gigaton reporting cycle, or individual supplier report, at least partially contains future emissions reductions resulting from current investment and initiatives. For example:

1. Energy Pillar counts emissions saved over the lifetime of some activities in the year in which the supplier reported the activity to Project Gigaton (e.g., capital investments that will continue to save energy over the life of the upgrade)
2. Nature Pillar deforestation conversion factors include a 20-year legacy emissions denominator; restoration emissions are counted in the year of investment from the participating supplier
3. Product Pillar counts estimated emissions saved over the lifetime of a product the year in which the supplier sold the unit

Additional guidance is included in the calculation approach for each pillar.

Note regarding the 2017 reporting cycle: Suppliers that reported emissions reduction initiatives with a lifetime greater than one year via CDP or directly to Walmart via the Energy pillar in the 2017 Project Gigaton reporting cycle will notice that only the annual emissions reduction value is reflected and no lifetime multiplier has been applied at a question level. All "future" emissions above the annual figure for those initiatives - which resulted from application of the lifetime multiplier - were calculated and have been aggregated into a separate "2017 Project Lifetime Emissions" category rather than assigned to the pillar in which they were reported. This situation exists only in reports for the 2017 Project Gigaton reporting cycle (specifically the Energy pillar) and resulted from a lack of clarity around treatment of "future" emissions when data was initially collected. Guidance on the temporal allocation of these "future" emissions has since been clarified in section *4.1*, *4.2.1*, and *4.2.2* and accordingly the "future" emissions reported in the 2017 Project Gigaton reporting cycle have been retroactively added to the initially-published year one aggregate results for Project Gigaton.

Data Validation

Data submitted to Walmart during the Project Gigaton reporting cycle undergoes a validation process designed to help identify outliers and check for inconsistencies in the submission that could lead to an inaccurate calculation. Walmart will exclude from the calculation data identified as inaccurate or incomplete through this process. Walmart may decide whether to contact suppliers to clarify the submission on a case-by-case basis. However, final responsibility lies with our suppliers to report accurate data and flag cases where amendments to previously reported data is needed.

Review of methodologies

Walmart has established a scientific review process to support continual improvement of the methodologies to account for avoided emissions from Project Gigaton. Led by a steering committee comprised of representatives from CDP, Environmental Defense Fund, and World Wildlife Fund, this review process aims to inform Walmart of new science at least (6) months prior to the survey period each year in order to accommodate required changes and associated reviews prior to the annual Project Gigaton reporting cycle. These changes could include creating new calculations or expanding existing calculation methodologies as well as updating emissions factors and other conversions; as well as recommendations for areas for improvement for program pillars (e.g. Energy) where progress may be lagging. Any changes made should are reflected in this Accounting Methodology.

The steering committee is supported by pillar-specific sub-committees led by technical experts from various NGOs and other organizations; additional technical experts are consulted as needed. The sub-committees conduct ongoing review of scientific progress on metrics within the respective pillars and make annual recommendations to the steering committee. The steering committee is then tasked with evaluating suggested edits, blending technical and policy issues to formulate recommendations for Walmart to consider in updating metrics and methodologies.

4. Reporting to Project Gigaton

Walmart prefers that suppliers report all their emissions reductions activities through disclosure to CDP, and share these results publicly and with Walmart through CDP Supply Chain. However, Walmart has

provided multiple pathways for reporting emissions reductions to Project Gigaton. Suppliers can report emissions reductions to Project Gigaton through either or both the:

1. CDP Climate Change Questionnaire (CDP)
   AND/OR
2. Project Gigaton Account (PGA)

It is up to the supplier not to repeat activities entered into CDP and the PGA.

Reporting using a CDP Questionnaire

CDP Climate Change Questionnaire

Data component definition

Each year CDP sends out the CDP Climate Change Questionnaire on behalf of Walmart to select suppliers through the CDP Supply Chain program. Suppliers who complete the annual CDP Climate Change Questionnaire in response to Walmart's Supply Chain request can indicate to Walmart that they would like the data reported there to be counted toward Project Gigaton by logging into their Project Gigaton Account and modifying permissions. CDP will then provide to Walmart the data it has received so long as the supplier has signed up for Project Gigaton and provided permissions for Walmart to use this information prior to the start of the Project Gigaton reporting cycle. When a supplier indicates this choice, CDP data is pre-loaded into a supplier's Project Gigaton Account and available to view during the Project Gigaton reporting cycle. Suppliers can provide or rescind permissions by logging into their Project Gigaton Account and modifying permissions.

CDP's Climate Change questionnaire covers a range of topics including governance, target-setting, communications, climate risks and opportunities and GHG accounting. Specific to Project Gigaton, Walmart utilizes supplier responses to the following question:

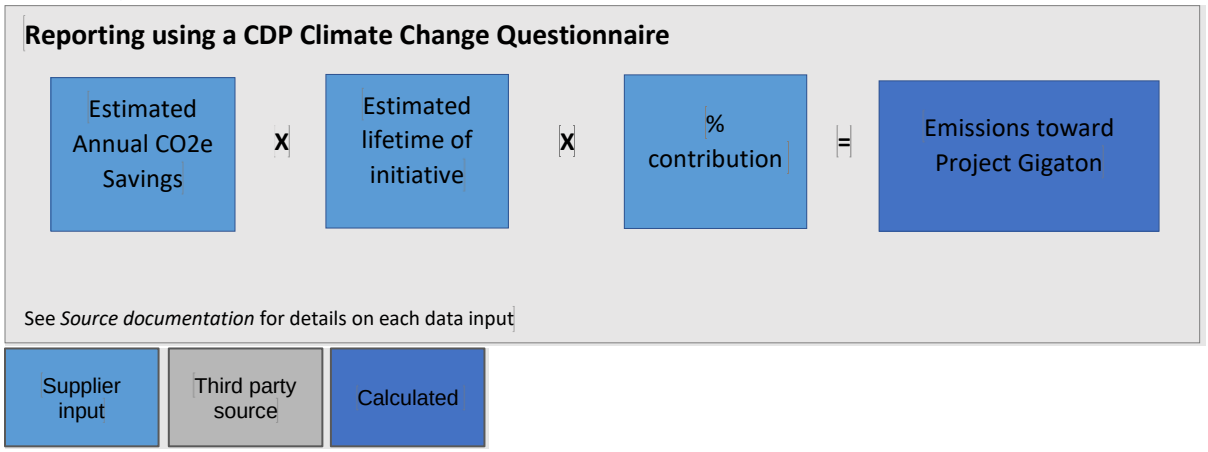
1. CC4.3b – Emissions Reduction Activities implemented in the reporting year (including activity type and description of activity, estimated annual CO2e savings, scope, estimated lifetime of the project, and comment)

Suppliers are all highly encouraged to report emissions reduction data annually through the CDP Climate Change Questionnaire; this includes across all emissions reduction activities including energy, transportation, nature, waste, etc. For suppliers electing to use their CDP disclosure to report to Project Gigaton, Walmart first pulls all data in question C4.3b from the supplier's disclosure (formerly question CC3.3b in 2017). Each emissions reduction activity is mapped by CDP and added to the appropriate Project Gigaton pillar based on the activity type and description provided in the CDP response (See *Appendix 4.1.1 – CDP Climate Change Questionnaire*). Certain projects with an 'estimated lifetime' greater than one year (as recorded in the CDP disclosure) will be multiplied by the lifetime reported and counted in the reporting cycle year that the supplier reported the activity to Project Gigaton (e.g., capital investments that will continue to save energy over the life of the upgrade).

The supplier can elect not to use all of the emissions reduction activities reported through CDP to Project Gigaton and instead indicate which CDP activities it would like counted toward Project Gigaton. This option is available in a supplier's Project Gigaton account during the annual Project Gigaton reporting cycle.

Last updated July 2022

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated	Metric tons CO2e	Suppliers may also report emissions via their PGA, but should not repeat activities.
Estimated Annual CO2e Savings	Supplier's CDP Climate Change Questionnaire question CC4.3b	Metric tons CO2e	CC4.3b is equivalent to CC3.3b in the 2017 and prior years' CDP Climate Change Questionnaire
Description of activity	Supplier's CDP Climate Change Questionnaire question CC4.3b	Selected from dropdown	See *Appendix 4.1.1 – CDP Climate Change Questionnaire* for list of all activity type and description of activity dropdown options, and mapping to relevant Project Gigaton pillar
Activity type	Supplier's CDP Climate Change Questionnaire question CC4.3b		
Estimated lifetime of the initiative	Supplier's CDP Climate Change Questionnaire question CC4.3b	Selected from dropdown	See *Appendix 4.1.1 – CDP Climate Change Questionnaire* for rules surrounding application of lifetime multiplier. Possible dropdown selections: • <1 year • 1-2 years • 3-5 years • 6-10 years • 11-15 years • 16-20 years

			• 21-30 years • >30 years • Ongoing The lower threshold of each date range is used when multiplying the annual CO2e savings. Activities marked as <1 year, 1-2 years or "ongoing" are only counted for one year. The maximum "estimated lifetime" multiplier is the number of reporting years left in Project Gigaton (2017-2031). For example, if a supplier reports an activity with a lifetime of 21-30 years to Project Gigaton in 2020, the maximum multiplier is 12 years (not 20 years).
Comment	Supplier's CDP Climate Change Questionnaire question CC4.3b	Free text	1500 characters maximum
Scope	Supplier's CDP Climate Change Questionnaire question CC4.3b	Selected from dropdown	Possible dropdown selections: • Scope 1 • Scope 2 (location-based) • Scope 2 (market-based) • Scope 3
% contribution	Supplier input	%	This value is assumed to be 100% unless modified by the supplier during the Project Gigaton reporting cycle. The supplier can elect not to use all of the emissions reduction activities reported through CDP to Project Gigaton and instead indicate which CDP activities, and proportion of emissions, it would like counted toward Project Gigaton. If a supplier has provided permission for Walmart to use their data to report to Project Gigaton and does not log-into their Project Gigaton Account during the Project Gigaton reporting

			cycle to modify the contribution, data from the most recently available CDP reporting year will be included at 100% toward that year's Project Gigaton reporting cycle.

CDP Forests Questionnaire

While data from the CDP Climate Change questionnaire has been established as a reporting pathway for Project Gigaton, some suppliers report data relevant to select Project Gigaton Calculators via their CDP Forests survey. As a convenience for suppliers, CDP and Walmart have worked together to make a report available for download that summarizes data points from a supplier's CDP Forests survey response that are relevant to select Project Gigaton Calculators. This report can be found while completing the relevant Calculator during the annual reporting period so long as a supplier has responded to the CDP Forests survey with the relevant data points, and the supplier has logged into their Project Gigaton Account and provided permissions for Walmart to use this information prior to the start of the Project Gigaton reporting cycle. Because the data reported to CDP Forests does not align exactly with the data required to complete a Project Gigaton Calculator, suppliers should use their CDP data as a reference and ensure any data entered into the Project Gigaton Calculator is consistent with the Project Gigaton Accounting Methodology guidance for that Calculator. See *Appendix – 4.1.2 CDP Forests Questionnaire* for a table describing the CDP Forests Questionnaire summary reports available by Project Gigaton Calculator.

Reporting through the Project Gigaton Account (PGA)

For suppliers that do not report to CDP, or wish to report emissions reductions that were not included in their CDP disclosure, Walmart has created an alternative pathway to report directly to Walmart using their Project Gigaton Account (suppliers may also review the data submitted through CDP in their PGA – see section 4.1). The PGA allows the supplier to report to any or all of the pillars of Project Gigaton during the annual Project Gigaton reporting cycle.

If a supplier chooses to report completed emission reduction activities directly to Walmart through the PGA, there are two options for doing so:

- Report aggregate greenhouse gas emissions reductions in CO2e and activity description; this option is detailed in 4.2.1

  OR

- Report using the Project Gigaton Calculators; report the relevant activity metrics requested by the pathways within each of the six program pillars (e.g., tons of certified paper, kWh of energy saved, etc.) and allow Walmart to calculate the associated emissions reductions according to the pathway methodologies detailed in section 4.2.2-4.2.7

Reporting aggregate emissions

Data component definition

This reporting option is for suppliers who don't report their aggregate emissions reductions to Project Gigaton through CDP and don't want to report to the Project Gigaton Calculators because they've already calculated the metric tons of CO2e emission savings associated with their efforts, or their efforts don't fit neatly within the Project Gigaton Calculators outlined in section 4.2.2 – 4.2.7 of this document.

Last updated July 2022

A 20% discount will be applied to any data reported through this pathway. Here's why: Walmart strongly prefers that suppliers publicly report their emissions reductions annually through the CDP Climate Change Questionnaire using credible, third-party assessed methodologies; CDP data can then be used to report to Project Gigaton.

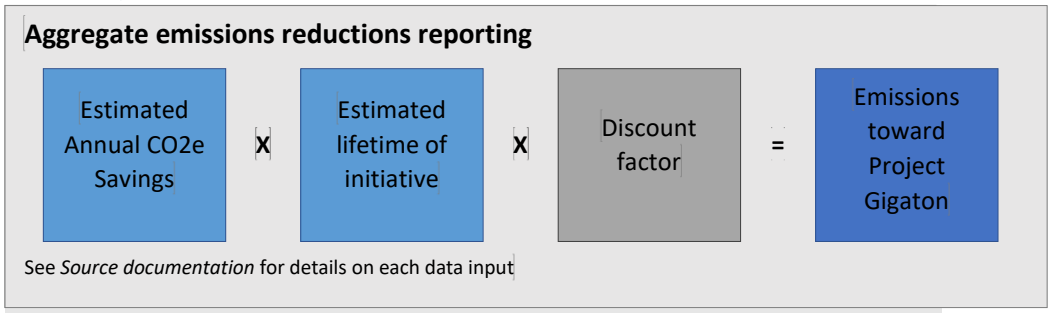
As an alternative to CDP, we've worked with credible environmental organizations to deliver the Project Gigaton Calculators as an option for suppliers to report activity metrics (e.g., tons of certified paper, kWh of energy saved, etc.) and allow Walmart to calculate the associated emissions reductions according to methodologies detailed in section 4.2.2 – 4.2.7 Project Gigaton Accounting Methodology.

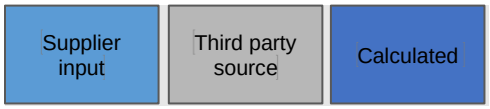
In cases where suppliers choose to use this question to report aggregate greenhouse gas emissions reductions directly to Walmart, instead of disclosing through CDP or using the Project Gigaton Calculators, a 20% discount will be applied to any data submitted. This discount factor is intended to address the uncertainty and lack of transparency into the methodology used to calculate your results. In future years we hope your company will decide to disclose your emissions reductions through CDP, or use the Project Gigaton Calculators.

Additionally, all submissions to this question undergo additional review due and post-reporting follow up may occur if more information is needed – suppliers are requested to be thorough in their responses.

Note regarding the 2018 reporting cycle: the application of the 20% discount for all supplier data submitted through this reporting pathway in the 2018 Project Gigaton reporting cycle was applied to the published, aggregate 2018 results after the close of reporting. Individual supplier reports have been retroactively modified to reflect this at the end of calendar year 2019 and an explanatory note has been posted on the page where a supplier views their 2018 report summary in their Project Gigaton Account. For 2019 and beyond, the discount will apply at the time of reporting and will be reflected immediately.

Data component calculation





Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated	Metric tons CO2e	Suppliers may also report emissions via other pathways, but should not repeat activities.

Estimated Annual CO2e Savings	Supplier input	Metric tons CO2e	
Activity type	Supplier input	Selected from dropdown	See *Appendix 4.1.1 – CDP Climate Change Questionnaire* for list of all activity type dropdown options, and mapping to relevant Project Gigaton pillar
Description of activity	Supplier input	Free text	Supplier description of the emissions reduction activity they are reporting on. Does not impact the calculation.
Implementation percentage	Supplier input	0-100%	Percentage of Scope that the emissions reduction activity covers. Does not impact the calculation.
Estimated lifetime of the initiative	Supplier input	Selected from dropdown	Possible dropdown selections: • <1 year • 1-2 years • 3-5 years • 6-10 years • 11-15 years • 16-20 years • 21-30 years • >30 years • Ongoing The lower threshold of each date range is used when multiplying the annual CO2e savings. Activities marked as <1 year, 1-2 years or "ongoing" are only counted for one year. The maximum "estimated lifetime" multiplier is the number of reporting years left in Project Gigaton (2017-2031). For example, if a supplier reports an activity with a lifetime of 21-30 years to Project Gigaton in 2018, the maximum multiplier is 14 years (not 20 years).

Description of calculation approach	Supplier input	Free text	Supplier description of the calculation methodology used to produce the annual CO2e savings reported. Does not impact the calculation.
Third-party validation	Supplier input	Selected from dropdown	Selection of whether the reported supplier data has been third-party validated. Possible dropdown selections: • "are" (yes to third-party validation) "are not" (no to third-party validation)
Third-party validator	Supplier input	Free text	Supplier provides name of third-party validator used. Data collected *only* if selection for Third-party validation is "are" (i.e. yes).
Scope	Supplier input	Selected from dropdown	Possible dropdown selections: • Non-owned supply chain • Owned operations, • Product use phase (i.e. customer use or end of life) Does not impact the calculation.
Discount factor	Third-party source	Numerical value	.8 A 20% discount (i.e. .8 multiplier) is applied to all data submitted through this pathway. See explanation under the *Data component definition* heading of this section.

5. Pillars within Project Gigaton

Energy

Energy related emissions can be addressed through two main types of activities: by reducing energy demand through optimization and efficiency and by transitioning to low-carbon energy sources (e.g., wind, solar). Project Gigaton allows suppliers to report activity-specific reductions achieved through both approaches and can result in reductions in a supplier's Scope 1, 2 and/or 3 emissions.

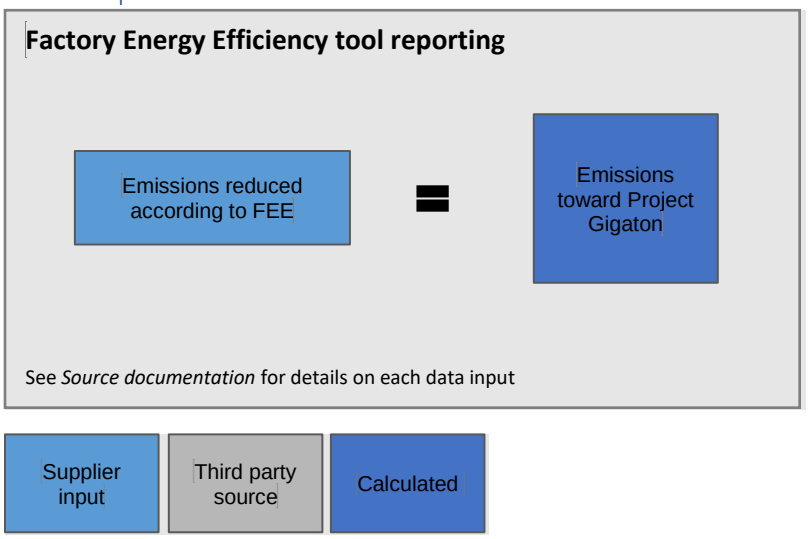
The Energy Pillar generally includes activities relating to energy efficiency, low-carbon energy (further defined below) and some non-energy fugitive emissions such as those from refrigerants. Note: Product design activities that result in emissions reductions during product use are included in the Product Use and Design pillar, waste recovery activities in the Waste pillar, and anaerobic digestion for manure management in the Nature pillar. Suppliers cannot report the same emissions reductions in more than one pillar, and thus, in some cases suppliers must use their judgment to report an initiative in the most appropriate pillar (e.g., supplier could choose to report poultry barn efficiency in either the Energy or Nature pillar).

Factory Energy Efficiency tool

Data component definition

Through the Walmart Factory Energy Efficiency Program (FEE), we are working with our suppliers to promote energy efficiency in factories in the global supply chain. A summary of any emissions reductions achieved is provided by the tool and can be entered toward Project Gigaton.

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	

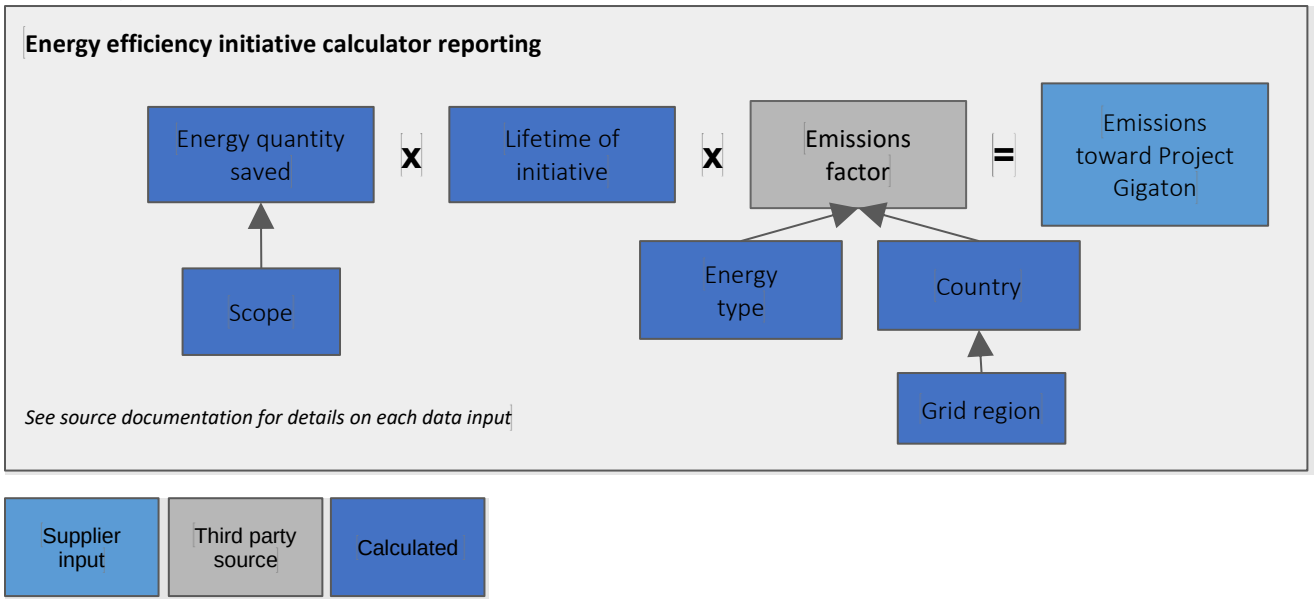
Emissions reduced according to FEE	Supplier input	Metric tons CO2e	The FEE tool provides an emissions reduction figure as a result of activities tracked using the tool. Suppliers may enter this value to report to Project Gigaton.

4.2.2.2 Energy efficiency calculator

Data component definition

Suppliers who have completed one or more energy efficiency or energy conservation initiatives can determine the estimated emissions reduction value of these. The calculator allows for many different initiatives types and several types of energy sources ranging from electricity to stationary and transport fuels. You will need to know a few things about your project including the location of the initiative, the type of energy source being saved (e.g. gasoline), the amount of that energy type saved annually (e.g. gallons) and expected lifetime of the projects. The follow diagram and tables provide more detail on this pathway and calculator for determining your avoided emissions.

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of energy quantity, lifetime, location, etc. Projects of the same activity type should be grouped together; similar projects reducing grid electricity demand in different

			regions however, should be entered as separate initiatives
Activity type	Supplier input	Select from dropdown	This is the type of energy efficiency activity that best describes the project. This has no impact on the emissions calculation. See *Appendix 4.2.2.2 – Energy efficiency calculator* for list of all dropdown options.
Energy quantity saved	Supplier input	Numerical value	*Annual* consumption of energy reduced by this initiative. This can be a measured or based on engineering estimates or specifications as compared to current conditions
Energy type	Supplier input	Select from dropdown	See *Appendix 4.2.2.2 – Energy efficiency calculator* for list of all dropdown options
Scope	Supplier input	Select from dropdown	Possible dropdown selections: Own operations (Scope 1 and Scope 2) Supply chain (Scope 3)
Lifetime of initiative	Supplier input	Select from dropdown	Possible dropdown selections: <1 year 1-2 years 3-5 years 6-10 years 11-15 years 16-20 years 21-30 years >30 years Ongoing

			The lower threshold of each date range is used when multiplying the annual CO2e savings. Activities marked as <1 year, 1-2 years or "ongoing" are only counted for one year. The maximum "estimated lifetime" multiplier is the number of reporting years left in Project Gigaton (2017-2031). For example, if a supplier reports an activity with a lifetime of 21-30 years to Project Gigaton in 2018, the maximum multiplier is 14 years (not 20 years). Note that most energy efficiency initiatives should have a lifetime of no more than 10 years.
Country	Supplier input	Select from dropdown	Grid region is only collected if the United States or China is selected as a Country; grid region is an optional field (if not utilized, use country level factors) See *Appendix 4.2.2.2 – Energy efficiency calculator* for list of all dropdown options
Grid region	Supplier input	Select from dropdown	
Emissions factor	IEA and EPA	Metric tons CO2e per unit energy	If only country is provided, IEA emissions factors are used If U.S. grid region is provided, eGRID emissions factors are used If China province is provided, World Resources Institute GHG Protocol emission factors are used Stationary and mobile fuel combustion emission factors were sourced from the E.P.A. Center for Corporate Climate Leadership Emission Factors Hub

			See *Appendix 4.2.2.2 – Energy efficiency calculator* for list of all emissions factors

4.2.2.3 Low-carbon energy calculator

Data component definition

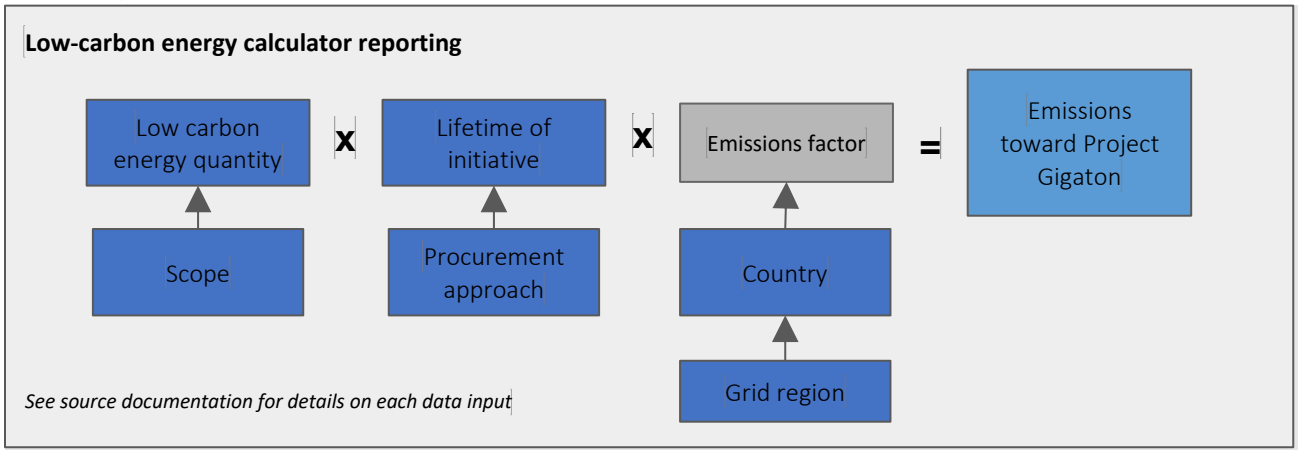
According to CDP guidance, "low-carbon energy" is considered to be any type of energy that will have no direct emissions and of which the indirect emissions are considered as negligible considering the life cycle of the given technology. Project Gigaton allows reporting of power technologies such as wind, solar, tidal, geothermal, most hydro power, and nuclear energy. Natural gas, combined cycle gas turbine and combined heat and power cogeneration are not considered low-carbon energy for the purposes of Project Gigaton, despite being less carbon intensive than other means of electricity production, like coal.

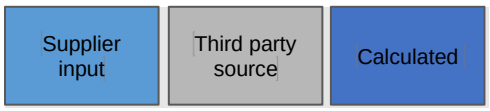
If a supplier invests in a new low -carbon energy system (e.g. solar PV panels) with their own capital, and connects it directly to their operations, then it would report the estimated annual emission reduction and operational lifetime of this system. If the company enters into a multi-year contract to receive power and the associated renewable energy or carbon credits (or similar applicable market instrument) generated from a low-carbon energy system either onsite or offsite from its facility it should report the avoided emissions from this project in the reporting year along with the remaining length of term left in the contract. For these market-based transactions the supplier will need to report the annual avoided emissions each year from these projects even if it is from a multi-year contract. In cases where the supplier purchases renewable energy annually without a multi-year agreement, for example in the case of unbundled renewable energy credits (RECs), the supplier should report the associated avoided emissions every year that RECs are purchased. When reporting renewable energy, suppliers should ensure that they have retained the appropriate rights to that renewable energy (e.g. RECs are retained or retire on behalf of the reporting company) and they have not been resold (to avoid double counting of the same renewable energy source).

In the first year a supplier responds to Project Gigaton, they can report preexisting installations and contracts for purchases, but the reported lifetime of the initiative should be prorated to reflect the number of years remaining at the time of reporting, not the number of years from when the installation was established. As stated above, the purchased energy, even if under a multi-year contract must be re-reported each year based on the amount received during the reporting period.

Last updated July 2022

Data component calculation





Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of energy quantity, lifetime, procurement method, location, etc. Projects of the same activity type and location should be grouped together; similar projects occurring in different regions should be entered as separate initiatives.
Low-carbon energy quantity	Supplier input	Kilowatt hours (kWh)	*Annual* consumption and/or purchase of low carbon energy.
Low-carbon energy source type	Supplier input	Select from dropdown	Wind, solar, etc. Selection does not impact calculation. See *Appendix 4.2.2.3 - Low-carbon energy calculator* for list of all dropdown options
Scope	Supplier input	Select from dropdown	Possible dropdown selections: • Own operations (Scope 1 and Scope 2) • supply chain or grid (Scope 3)

Lifetime of initiative	Supplier input	Select from dropdown	Possible dropdown selections: • <1 year • 1-2 years • 3-5 years • 6-10 years • 11-15 years • 16-20 years • 21-30 years • >30 years • Ongoing The lower threshold of each date range is used when multiplying the annual CO2e savings. Activities marked as <1 year, 1-2 years or "ongoing" are only counted for one year. If Procurement Approach is "Installation", the emissions are multiplied out by lifetime. "Purchase" should be reported annually and should not be multiplied (lifetime value defaults to 1). The maximum "estimated lifetime" multiplier is the number of reporting years left in Project Gigaton (2017-2031). For example, if a supplier reports an activity with a lifetime of 21-30 years to Project Gigaton in 2018, the maximum multiplier is 14 years (not 20 years).
Procurement approach	Supplier input	Select from dropdown	Possible dropdown selections: • installation and direct connection to • procurement of power and associated energy attribute certificates from • purchase of energy attribute certificates from
Country	Supplier input	Select from dropdown	

Grid region	Supplier input	Select from dropdown	Grid region is only collected if the United States or China is selected as a Country. See *Appendix 4.2.2.3 - Low-carbon energy calculator* for list of all dropdown options.
Emissions factor	IEA and EPA	Metric tons CO2e per kWh of electricity	If only country is provided, IEA emissions factors are used. If U.S. grid region is provided, eGRID emissions factors are used. If China province is provided, World Resources Institute GHG Protocol emission factors are used. See *Appendix 4.2.2.3 - Low-carbon energy calculator* for list of all emissions factors.

Waste

Food, product and material waste is associated with significant amounts of greenhouse gas emissions. Diversion and reduction of waste can avoid greenhouse emissions that would otherwise have been emitted to create virgin material or from landfills.

Project Gigaton allows suppliers to report activity-specific reductions achieved in a supplier's operations (e.g. company waste-to-landfill) and/or supply chain (e.g. farms, factories, etc) through food and general waste reduction and diversion activities such as recovery of materials and energy through prevention, donation, recycling, composting, anaerobic digestion, and incineration.

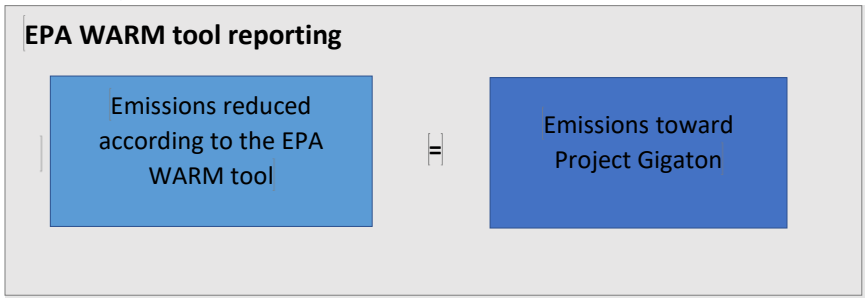
Additionally, the pillar accounts for food waste reduction at customer level as a result of implementing standardized date labeling.

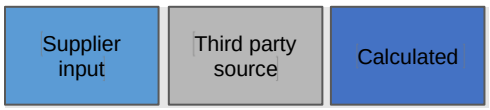
4.2.3.1 EPA WARM tool

Data component definition

This data component captures emissions reductions calculated using the Waste Reduction Model (WARM) tool that was created by the U.S. Environmental Protection Agency (EPA) to help solid waste planners and organizations estimate greenhouse gas (GHG) emission reductions from several different waste management practices.

Data component calculation





Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated	Metric tons CO2e	To avoid double counting, Walmart only allows suppliers to report data through pathway 4.2.3.1 or 4.2.3.2.
Emissions reduced according to the EPA WARM tool	Supplier-provided	Metric tons CO2e	The EPA WARM tool provides an emissions reduction figure as result of activities tracked using the tool. Suppliers may enter this value to report to Project Gigaton

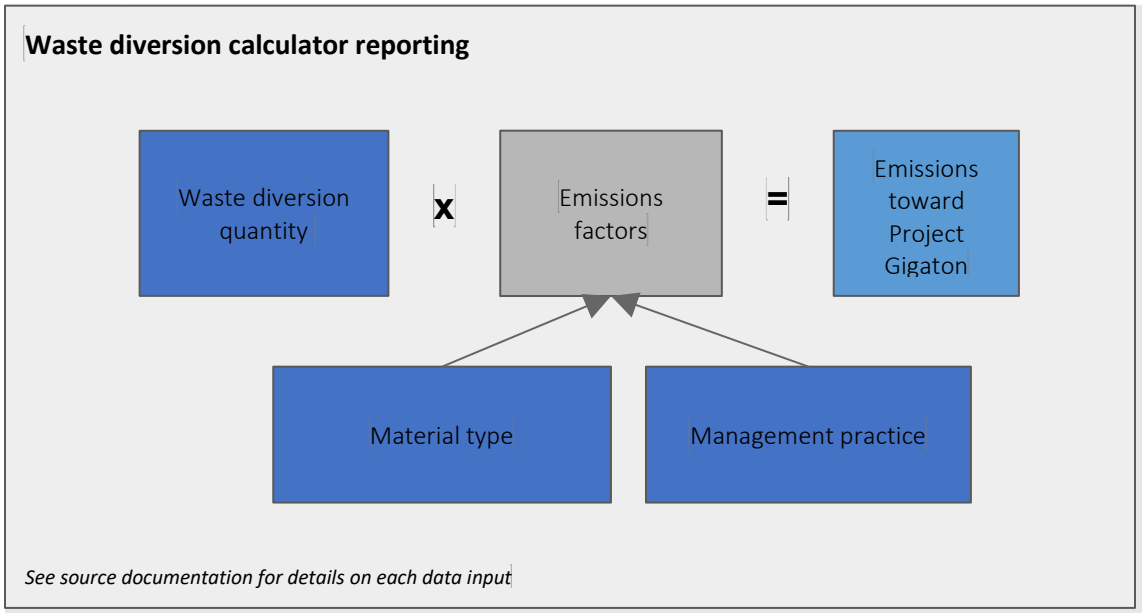
4.2.3.2 Waste diversion calculator

Data component definition

This reporting pathway is for suppliers that do not calculate reductions using the EPA WARM tool and helps calculate the greenhouse gas impact of waste diversion and management practices in both a supplier's operations (e.g. company waste-to-landfill) and/or supply chain (e.g. farms, factories, etc). Parts of this methodology differ from the EPA WARM tool; additional detail can be found in Appendix 4.3.3.2 – Waste diversion calculator.

Last updated July 2022

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated	Metric tons CO2e	To avoid double counting, Walmart only allows suppliers to report data through pathway 4.2.3.1 or 4.2.3.2. Suppliers may complete this question twice, once for each "Scope".
Scope	Supplier input	Selected from dropdown	Dropdown options should include: • Operations • Supply chain
Waste diversion quantity	Supplier input	Short tons	Suppliers may enter multiple combinations of waste diversion quantity, material type, and management practice
Material type	Supplier input	Selected from dropdown	See *Appendix 4.3.3.2 – Waste diversion calculator* for list of all dropdown options
Management practice	Supplier input	Selected from dropdown	See *Appendix 4.3.3.2 – Waste diversion calculator* for list of all dropdown options

Emissions factors	EPA WARM Tool v14	MTCO2e/short ton	See *Appendix 4.3.3.2 – Waste diversion calculator* for list of all emissions factors

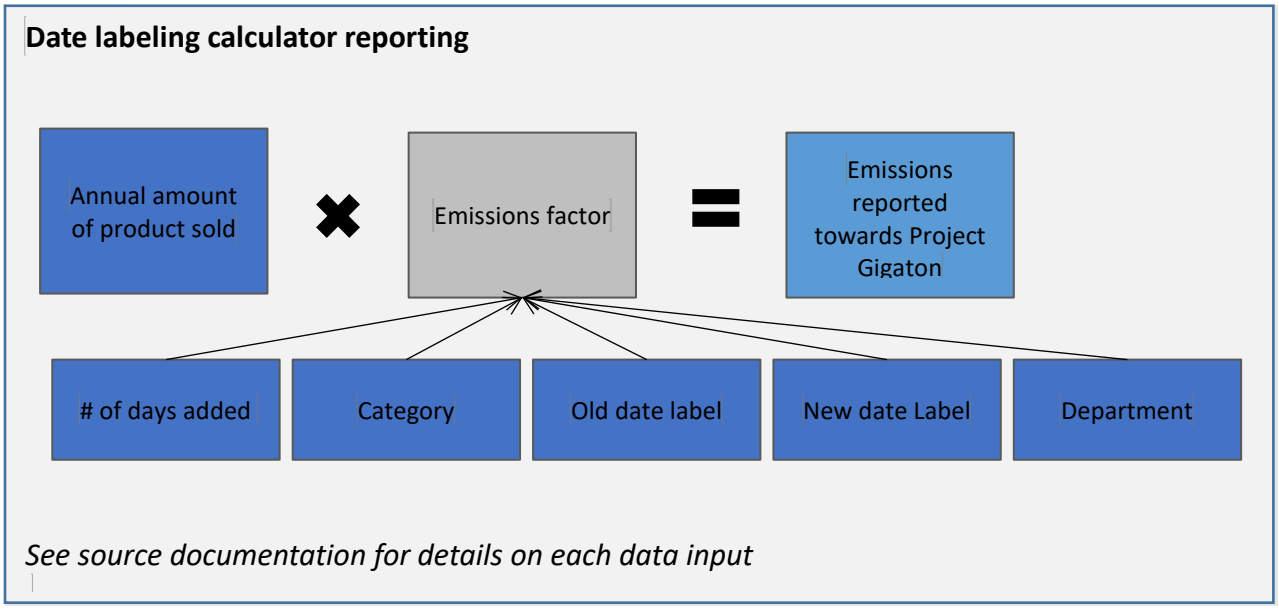
4.2.3.3 Date labeling calculator

Data component definition

Food waste reduction at customer level is an important component of the Waste pillar. This methodology was developed through collaboration between ReFED, WWF and Ohio State University, with support from the Ohio Agriculture Research and Development Center. The data pathway calculates greenhouse gas emissions reductions at the customer level that result from implementation of standardized date labeling. Transitioning to a standardized date labels ("Best if Used By" and "Use By") help eliminate confusion around expiration dates and reduce food waste at the consumer level.

Suppliers may report for the greenhouse gas benefits of switching to standardized date labeling for products sold until the industry has transitioned 90% of all food products to "Best if Used By" and "Use By" label adoption, as which point this methodology will be removed as a reporting option.

Data component calculation



Source Documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated	Metric tons CO2e	
Annual amount of product sold	Supplier input	Metric tons	Supplier reported weight of products sold with standardized date labeling

			verbiage within date range; should *not* include packaging weight
Department	Supplier input	Selected from dropdown	E.g., Dairy, Dry Grocery, etc. See *Appendix 4.3.3.3 – Date labeling calculator* for list of all dropdown options
Category	Supplier input	Selected from dropdown	E.g. Yogurt, Packaged Cereals, etc. See *Appendix 4.3.3.3 – Date labeling calculator* for list of all dropdown options
Old date label	Supplier input	Selected from dropdown	See *Appendix 4.3.3.3 – Date labeling calculator* for list of all dropdown options
New date label	Supplier input	Selected from dropdown	Dropdown options: Best if Used By Use By
# of days added	Supplier input	Selected from dropdown	Number of days added to package date selected from range See *Appendix 4.3.3.3 – Date labeling calculator* for list of all dropdown options
Emissions factor	ReFED emissions factors	Metric tons CO2e / pound	See *Appendix 4.3.3.3 – Date labeling calculator* for list of all emissions factors

Packaging

Packaging is critical to protecting, preserving, and promoting products, and those functions can be maintained while improvements are made to lower greenhouse gas emissions. Optimizing design, sourcing sustainably, and supporting recycling in packaging can reduce greenhouse gas emissions by reducing weight in transportation, increasing recycling rates, and lowering the greenhouse gas emissions intensity during the manufacture of packaging materials. Designers, manufacturers and brands have a unique opportunity to help deliver more efficient and innovative packaging to shelf.

For the purpose of Project Gigaton, suppliers may report emissions reductions through a collection of approaches within a core packaging sustainability framework of sourcing sustainably, optimizing design, and supporting recycling:

Source sustainably:

1. Increasing usage of post-consumer recycled content
2. Using certified virgin fiber

Optimize design:

- Reducing material usage
- Increasing volumetric efficiency
- Substituting packaging materials

Support recycling:

- Investing in the Closed Loop Fund
- Making design-for-recyclability improvements

Additionally, suppliers may use the streamlined life cycle assessment tool COMPASS to estimate emissions reductions from any improvement to the packaging system not addressed by the pathways listed above.

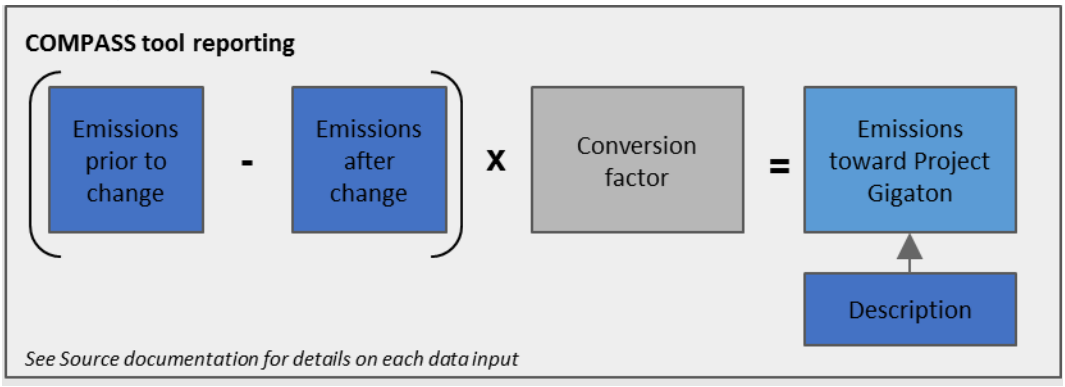
Greenhouse gas emissions may also be reduced when protective packaging is improved to lower product damage rates, thereby reducing the occurrence of products becoming too damaged for use by consumers and preventing wastage of the greenhouse gas emissions that have been invested into those products. Although there is recognition of the importance of this pathway, insufficient information exists at this time and a calculator for this pathway will be further explored in the future.

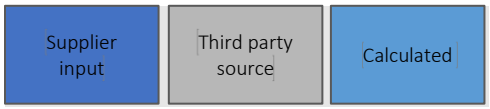
4.2.4.1 COMPASS tool reporting

Data component definition

Under this pathway, suppliers are able to report emissions reductions from any packaging change estimated using the COMPASS LCA tool. There are no geographic boundaries for data entered through this pathway.

Data component calculation





Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	The COMPASS tool does not produce metric tons CO2e as an output, hence the calculation using outputs provided through the tool Suppliers may enter multiple lines of data
Emissions prior to change	Supplier input	kgCO2e	Total emissions prior to change is an output from the COMPASS tool
Emissions after change	Supplier input	kgCO2e	Total emissions after change is an output from the COMPASS tool
Conversion factor	Third party source	Metric tons/kg	.001 metric ton/kg
Description	Supplier input	Free text	Optional field to describe packaging change made

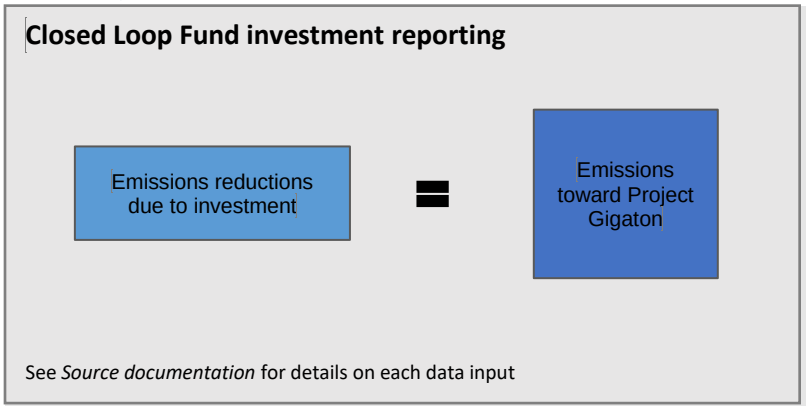
4.2.4.2 Closed Loop Fund investment reporting

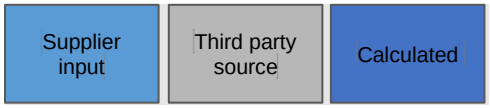
Data component definition

The Closed Loop Fund invests in scaling recycling infrastructure to improve recycling, and they estimate the greenhouse gas emission reductions associated with those activities. The Closed Loop Fund may attribute portions of the overall emission reductions to investors based on the magnitude of the investment and the timeframe in which the capital was deployed. Investors in the Closed Loop Fund may receive their attributed greenhouse gas emission reduction directly from the Closed Loop Fund, and no further calculation will be required.

Last updated July 2022

Data component calculation





Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated	Metric tons CO2e	Data component should only be completed once (one line of data)
Emissions reductions due to investment	Supplier input	Metric tons CO2e	The Closed Loop Fund will provide investors with a figure reflecting the approximate annual emissions reductions resulting from their company's investment in Closed Loop Fund projects

4.2.4.3 Recycled content pulp and paper in packaging calculator

See *4.2.5.3 Recycled content pulp and paper in packaging calculator*

4.2.4.4 Certified timber, pulp and paper in packaging calculator

See *4.2.5.4 Certified timber, pulp and paper in packaging calculator*

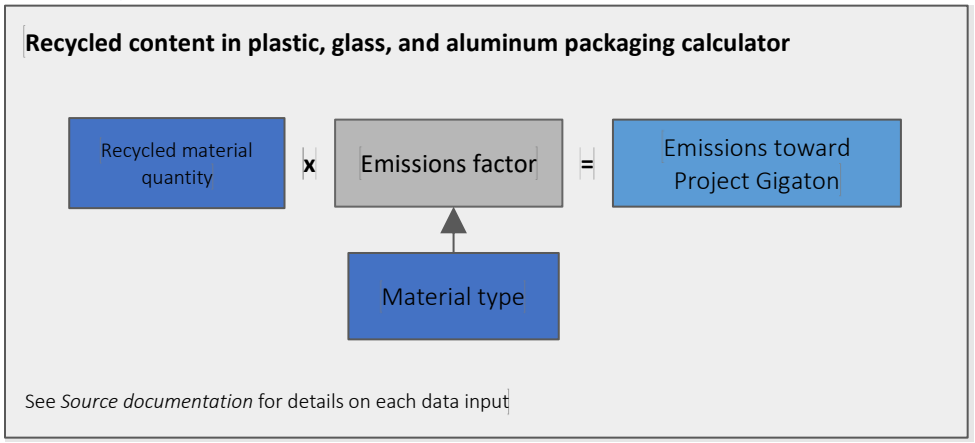
4.2.4.5 Recycled content in plastic, glass, and aluminum packaging calculator

Data component definition

Using post-consumer recycled content instead of virgin materials reduces upstream greenhouse gas emissions associated with material manufacturing. This data component captures emissions avoided from use of recycled content in packaging. Use of recycled content in products should be reported to *4.2.7.5 Recycled content in plastic, glass, and aluminum products calculator*.

Last updated July 2022

Data component calculation



Supplier input | Third party source | Calculated

Source documentation

Model inputs	Source	Units	Notes
CO2e reduction	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of material quantity and type.
Recycled material quantity	Supplier input	Metric tons	Mass of PCR content used to replace virgin material
Material type	Supplier input	Select from dropdown	See *Appendix 4.2.4.5 Recycled content in plastic, glass, and aluminum packaging calculator* for list of all dropdown options The supplier should enter the type of PCR plastic being used and it's assumed that the virgin plastic being replaced is the same plastic type
Emissions Factor	Third party source	Metric tons CO2e per metric ton material	This will be the delta between the PCR and virgin Impact for each material See *Appendix 4.2.4.5 Recycled content in plastic, glass, and aluminum packaging calculator* for list of all emissions factors

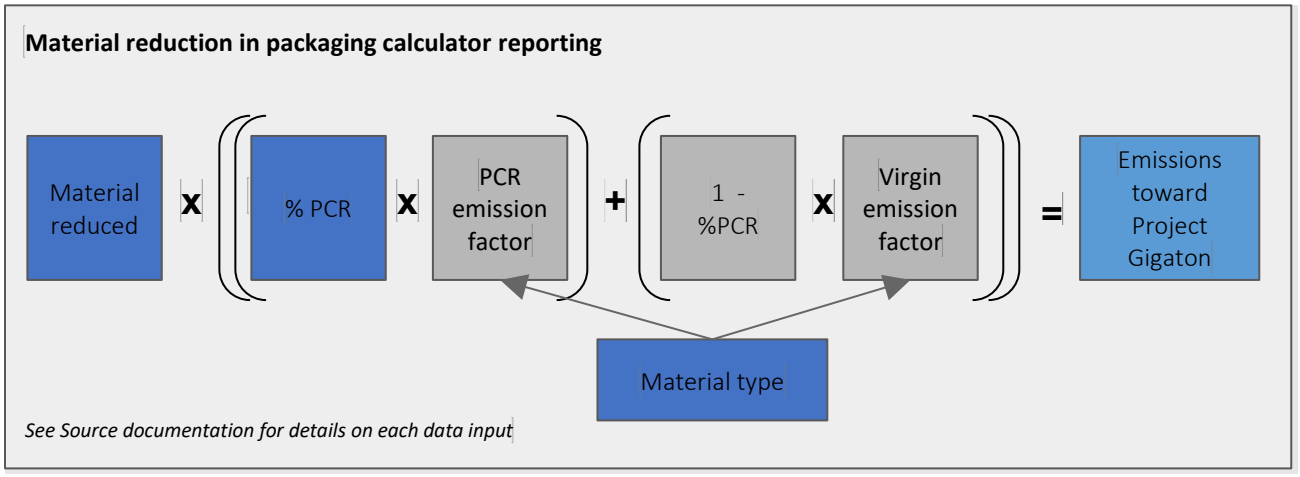
4.2.4.6 Material reduction in packaging calculator

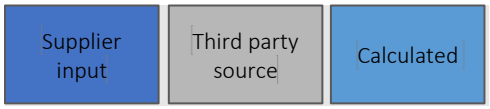
Data component definition

All packaging materials produce greenhouse gas emissions during their manufacture and reducing the amount of material needed to make effective packaging will avoid unnecessary emissions. This data component captures emissions avoided from material reduction in packaging. Reducing material in products should be reported to *4.2.7.6 Material reduction in products calculator*.

Suppliers must make careful design decisions so as not to compromise the ability of packaging to adequately protect the product, and suppliers must take care to ensure that any corresponding changes in the overall packaging system, such as an increase in transport packaging to compensate for reduced primary packaging, are accounted for in this pathway. Suppliers are asked to input the percentage of material reduced that was post-consumer recycled content, since the greenhouse gas emissions incurred during the manufacture of post-consumer recycled content differ from those or virgin material.

Data component calculation





Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of material quantity and type
Material reduced	Supplier input	Metric tons	Aggregate mass of material that has been eliminated from the package over the units shipped
Material type	Supplier input	Select from dropdown	See *Appendix 4.2.4.6 Material reduction in packaging calculator* for list of all dropdown options

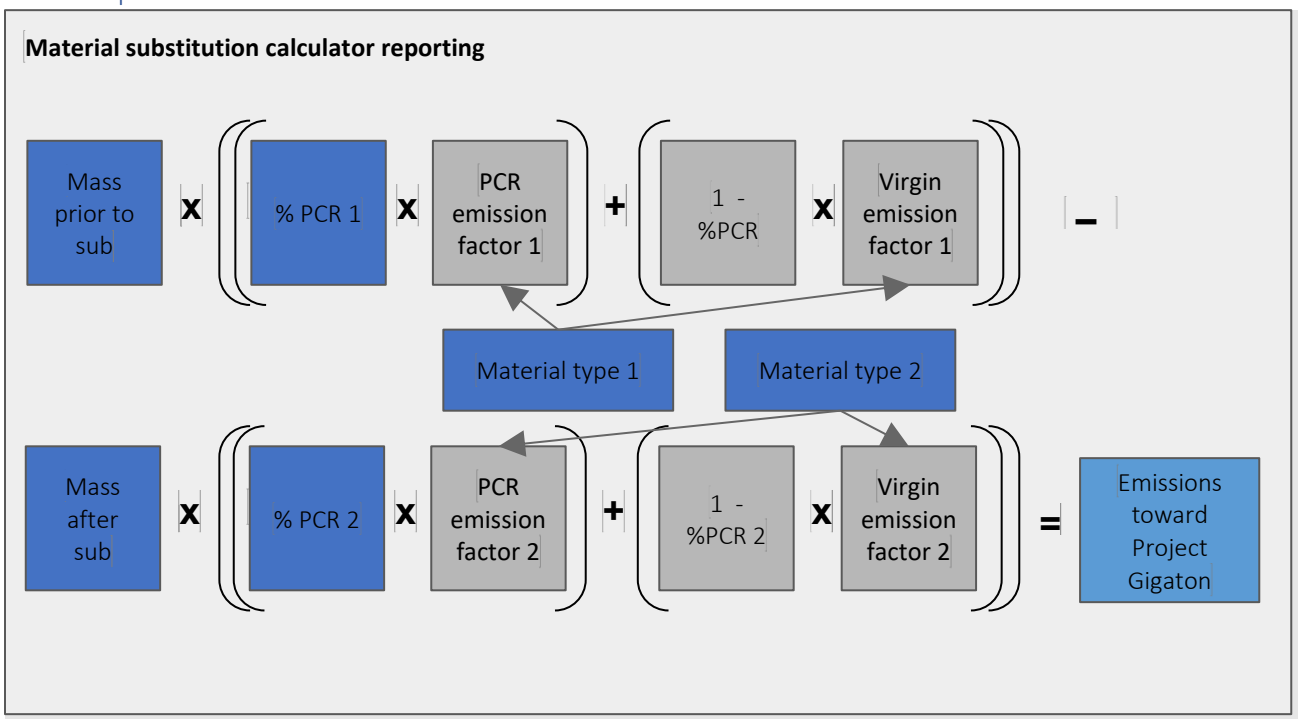
PCR	Supplier Input	Percentage	Percentage of recycled material incorporated into the package prior to material reduction
Emissions factor	Third party source	Metric tons CO2e per metric ton material	See *Appendix 4.2.4.6 Material reduction in packaging calculator* for list of all emissions factors

4.2.4.8 Substituting Packaging Materials

Data component definition

Different packaging materials incur different amounts of greenhouse gas emissions during their manufacture, and thoughtful changes in packaging materials used may lower greenhouse gas emissions. Suppliers must ensure that packaging performance is maintained when considering different packaging materials, and suppliers must take care to ensure that any corresponding changes in the overall packaging system, such as an increase in transport packaging to compensate for reduced primary packaging, are accounted for in this pathway. Suppliers are asked to input the percentage of material reduced that was post-consumer recycled content, since the greenhouse gas emissions incurred during the manufacture of post-consumer recycled content differ from those or virgin material.

Data component calculation



Source documentation

Model inputs	Source	Units	Notes

Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of material quantity and type
Mass prior to sub	Supplier input	Metric tons	Mass of the package before the material is substituted for the new one This should be calculated as follows: [material mass per unit prior to substitution] x [number of units sold in the **current** reporting year]
Material type 1	Supplier input	Select from dropdown	Material type prior to material substitution Possible dropdown selections: • PET • HDPE • LDPE • PP • Glass • Aluminum • Steel • Boxboard • Corrugate
PCR 1	Supplier input	Percentage	Percentage of recycled material incorporated into the package before material substitution
Emissions factor 1	Third party source	Metric tons CO2e per metric ton material	Based on selection of material type 1. If no PCR emissions factor is available, use virgin emissions factor See *Appendix 4.2.4.9 Material substitution calculator* for list of all emissions factors
Mass after sub	Supplier input	Metric Tons	Mass of the package after the material substitution This should be calculated as follows: [material mass per unit after substitution] x [number of units sold in the **current** reporting year]
Material type 2	Supplier input	Select from dropdown	Material type after substitution Possible dropdown selections: • PET

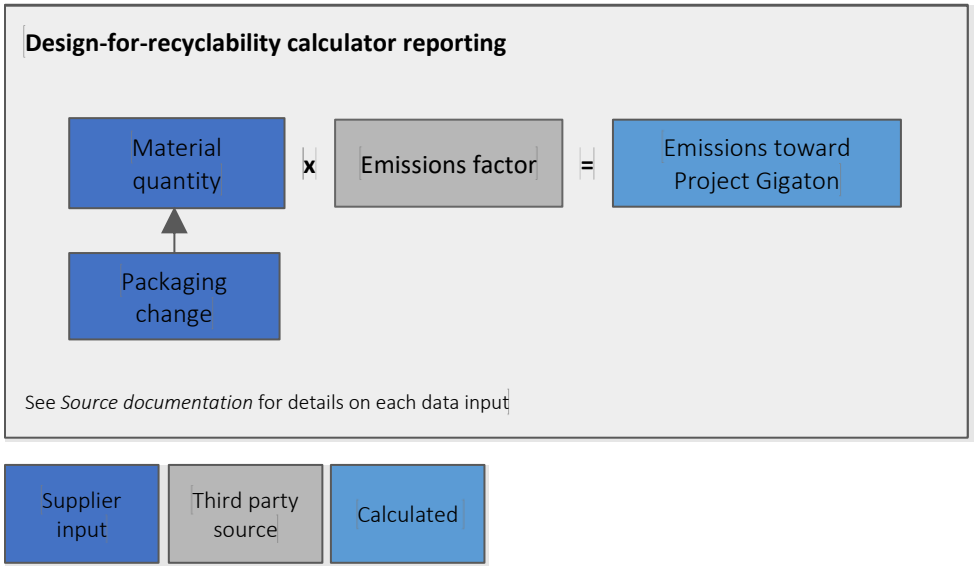
			• HDPE • LDPE • PP • Glass • Aluminum • Steel • Boxboard • Corrugate
PCR 2	Supplier input	Percentage	Percentage of recycled material incorporated into the package after material substitution
Emissions factor 2	Third party source	Metric tons CO2e per metric ton material	Based on selection of material type 2. If no PCR emissions factor is available, use virgin emissions factor. See *Appendix 4.2.4.9 Material substitution calculator* for list of all emissions factors

4.2.4.9 Design-for-recyclability calculator

Data component definition

Common design changes can eliminate technical incompatibilities with the U.S. recycling system and increase recycling rates of specific packaging types. The design changes are: 1) Removing or replacing non-recyclable PETG, non-recyclable shrink-wrap sleeve, or non-recyclable pressure sensitive labels from PET packaging; 2) Removing or replacing wax coatings from corrugated trays or cases; 3) Removing or replacing metal, PVC, and/or silicone closures, pumps, or sprayers from packaging; and 4) Removing barrier additives and non-PET layers from PET bottles.

Data component calculation



Last updated July 2022

Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of material quantity and packaging change.
Packaging change	Supplier input	Selected from dropdown	See *Appendix - 4.2.4.9 Design-for-recyclability improvements* for list of possible dropdown options
Material quantity	Supplier input	Short tons	Total mass of packaging material that has been improved over all units in the reporting period.
Emissions factor	Third party source	Metric tons CO2e per short ton material	See *Appendix - 4.2.4.9 Design-for-recyclability improvements* for list of all emissions factors

Last updated July 2022

Nature

The Nature Pillar within the Project Gigaton platform will calculate emission reductions and spatial contribution towards our nature aspirations with an initial focus on the following commodities:

- Palm oil
- Beef
- Coffee
- Cocoa
- Corn
- Cotton
- Rice
- Soy
- Wheat
- Timber, Pulp and Paper
- Wild-Caught Tuna*
- Wild-Caught Salmon*
- Wild-Caught Shrimp*
- Farmed Salmon
- Farmed Shrimp

The Nature Pillar will be tracking progress against our aspiration to protect, restore or more sustainably manage 50M acres of land and 1M square miles of ocean by 2030 using a continuous improvement framework of basic, better, best. The ambition is to increase as many acres and square miles into the best pillar by the conclusion of our goal. To understand how your responses will fit into this continuous improvement framework, see Table 1 for the commodities that are included this year.

Table 1 Mapping of certifications and practices to Basic, Better, Best framework

	Commodities	Basic	Better	Best
FORESTS	Coffee/Cocoa	Fair Trade	Rainforest Alliance	Credible Place-based, Jurisdictional Approach + Investments in Restoration, Conservation
	Palm Oil	RSPO (mass balanced), Rainforest Alliance, ISCC, ISPO	RSPO (segregated supply & identity preserved), CSPO	
	Pulp/Paper	PEFC, SFI	FSC	
AGRICULTURE	Cotton	Organic cotton standards, Fair Trade, Cotton USA, US CottonTrust Protocol, Better Cotton Initiative (BCI)		
	Soy	Cefetra Responsible Soy*, Proterra Standard*	Roundtable on Responsible Soy (RTRS)	
	Beef, Corn/Maize, Wheat, & Rice	1+ nature positive practice linked to 2+ nature positive outcomes**	2+ nature positive practices linked to 4+ nature positive outcomes	

	Produce	IPM certifications: Bee Better Certified, LEAF Marque, Equitable Food Initiative	IPM certifications: Rainforest Alliance, Sustainable Food Group Sustainability Standard, USDA Organic, or basic IPM certification with 1+ practice linked to 2+ outcomes indicators	
SEAFOOD	Wild-Caught Seafood	Global Sustainable Seafood Initiative (GSSI) recognized certification OR active participation in FIP with definitive, ambition goals, measurable metrics, and timebound milestones	MSC	
	Farmed Seafood	Global GAP, Participation in AIP with definitive, ambition goals, measurable metrics, and timebound milestones	ASC, BAP	

The following sections outline the methods used to calculate the avoided greenhouse gas emissions and the spatial conversions associated with the new Nature pillar questions.

Key Definitions

Please reference these key definitions as needed for the new Nature questions.

TERM	DEFINITION	SOURCE
Coastal area	The interfacial region between the inland and oceans such as wetlands and mangroves. For the purposes of this methodology, they will be counted towards the land target.	FAO Definition
Land	A delineable area of the earth's terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface including those of the near-surface climate, the soil and terrain forms, the surface hydrology (including shallow lakes, rivers, marches and swamps), the near-surface sedimentary layers and associated groundwater reserve, the plant and animal populations, the human	United Nations 1994 Definition referenced by FAO and IPCC

	settlement pattern and physical results of past and present human activities.	
Ocean	Body of saltwater covering 71% of Earth's surface. The low-water line along the coast as marked on large-scale charts officially recognized by the coastal State.	UN Convention of Law of the Sea
Conservation	Set aside natural landscapes and seascapes to preserve ecosystem benefits.	Aligned with The International Union for Conservation of Nature's (IUCN) guidance
Restore	The process of assisting the recovery of an ecosystem, and its associated conservation values, that has been degraded, damaged, or destroyed.	Accountability Framework
Sustainable management	Support more regenerative practices for productive land/seascapes.	Aligned with UN SDG 15

Avoided Land Use Change/Avoided Deforestation Calculations

Avoided Deforestation Accounting Methodology

The following outlines how avoided emissions tied to avoided land use change and avoided deforestation are calculated. This method only applies to commodities that are drivers of deforestation and land use change and therefore not all 13 commodities or all regions where these commodities are produced will be reflected within this methodology.

The "avoided deforestation" emission factors are attributed to a selected list of actions suppliers can take that aim to alleviate deforestation in supply chains. Each action was categorized by type, either as a certification or aerial deforestation-free monitoring and verification tool, or remote sensing tree cover loss analysis tool. Next, the amount of avoided emissions was quantified for each action.

For specific commodities, there may not be an "avoided deforestation" emission factor attributed. For farmed shrimp and farmed salmon, conversion/ deforestation in feed is a relevant factor, however, there is currently a lack of credible certification/ verification programs to determine this. It is anticipated this will change soon and c-free terrestrial feed ingredients in aquaculture can be identified and verified and added to these calculations. For aquatic environments, a useful conceptual corollary to direct deforestation would be "degradation to the point of conversion." However, this is difficult concept to universally define and identify in a marine environment and there are no geospatial tool options to report clearly defined changes in land use the way there are on land. For farmed salmon, farmed shrimp, and wild-caught seafood a spatial conversion factor attributed to their certification or engagement in a Fishery Improvement Project was used. These commodities include wild-caught tuna, shrimp, and salmon and very simply aim to identify the amount of ocean space or land used per metric ton of product based on average yield intensities in each managed area. In the future there may also be

a way to consider how this could be applied to upcoming aquaculture feed verification/ certification options for wild-caught or farmed fish used in salmon feed.

Data Component Definition

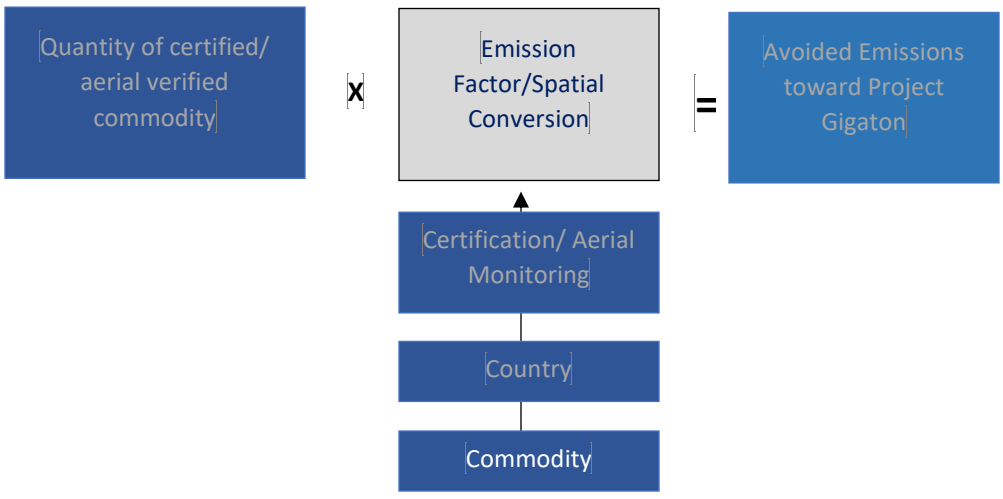
This data component captures spatial equivalents and **avoided emissions tied to avoided land use change and avoided deforestation** for commodities that are drivers of deforestation (see Table 2 for commodities by country).

Table 2: List of countries & commodities included in this land use change question (in bold existing commodities and countries previously in Project Gigaton)

Commodity	Country
Palm	**Indonesia, Malaysia, Papua New** Guinea, Nigeria, Ecuador, Guatemala, Colombia, Cameroon Democratic Republic of Congo, Guinea
Beef	**Brazil,** Canada, Australia, France
Soy	Brazil, Argentina, Bolivia, Cambodia, Ecuador, Paraguay, Uruguay, Venezuela, Uganda
Pulp & Paper	**Global**
Cocoa	Indonesia, Cameroon, Nigeria, Papua New Guinea, Peru, Brazil, Cote d'Ivoire, Ghana, Malaysia, Madagascar, Sierra Leone, Venezuela, Angola
Coffee	Indonesia, Peru, Brazil, Colombia, Uganda, Malaysia
Maize/Corn	Brazil, USA, South Africa, China, Argentina, Russia, Ukraine
Cotton	Cameroon, Central Africa, Brazil, USA, China, Vietnam, India, Nigeria
Wheat	Brazil, USA, Canada, Russia, Argentina
Avocado	Indonesia, Peru, Venezuela
Farmed Shrimp	China, Ecuador, India, Indonesia, Thailand, Vietnam
Farmed Salmon	Chile

Data component calculation

Figure 1 Q1 Calculation Steps for approved certifications



Last updated July 2022

Supplier Input | Third Party Source | Calculated

Source documentation

Model inputs	Source	Units	Notes
Avoided emissions toward Project Gigaton	Calculated value	MT CO_2e	Suppliers may enter multiple combinations of commodity, country, and verification mechanism. Pulls from and aligns to all calculator questions.
Commodity	Supplier input	Select from dropdown	See Table 1 for options.
Volume	Supplier input	Metric tons (MT)	Refers to volume of chosen commodity.
Country	Supplier input	Select from dropdown	See Table 1 for options.
Certification/Aerial Monitoring	Supplier input	Select from dropdown	For all commodities using remote sensing analysis/Global Forest Watch (GFW) Pro tools to show avoided deforestation there is a 50% discount applied.
Certificate Number	Supplier input	Supplier Input	This only applies when certifications are used as the validation mechanism
Cut-off date	Third-party source	Year	These dates are pre-populated in the tool and suppliers must confirm the date.
Emissions factor	Calculated using the Dryad model	MT CO2e/MT commodity	See Appendix 4.2.5.1 for the detailed methodology and list of emission factors by country, commodity and certification.
Spatial Conversion	Third-party source	MT/ Acre	See Appendix 4.2.5.2

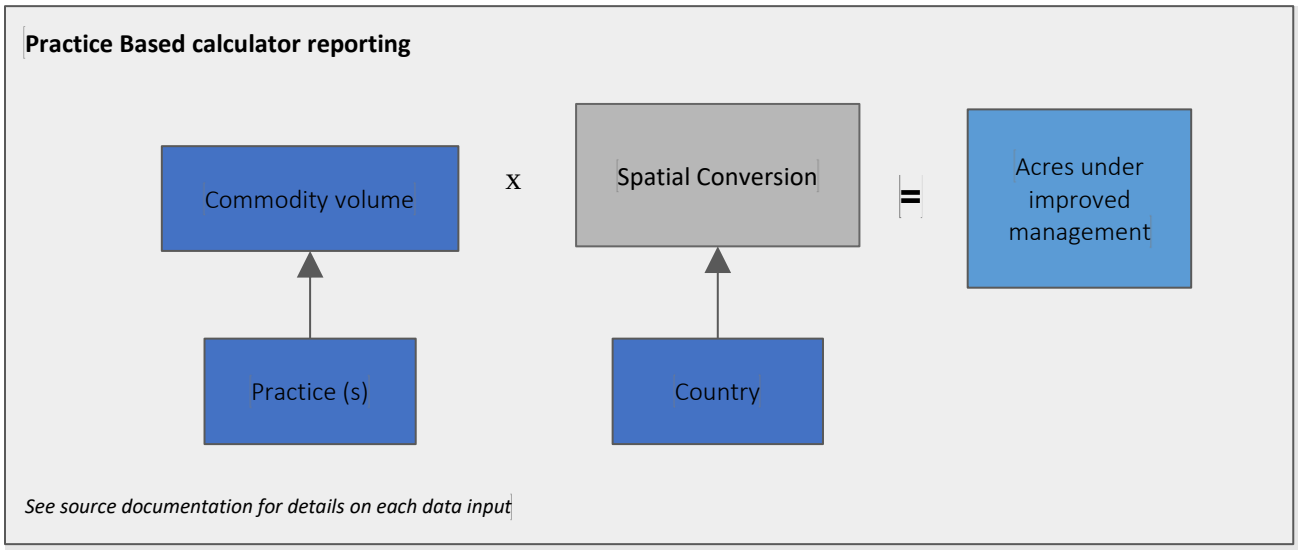
Last updated July 2022

Nature Q2 -Improved Management Calculations

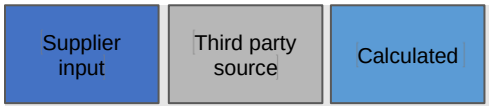
Data component definition

This data component captures spatial equivalents resulting from commodities sourced using practices associated with nature positive outcomes and aligned with Walmart's Nature aspiration while also indicating external tools that may be used to calculate avoided greenhouse gas emissions from these practices.

Data component calculation



Calculation steps



Source documentation

Model inputs	Source	Units	Notes
Acres under improved management	Calculated value	Acres	Suppliers may enter multiple combinations of commodity, country, and practices. Pulls from and aligns to all calculator questions.
Commodity Volume	Supplier input	Metric tons	Refers to volume of chosen commodity. Applies only to terrestrial commodities, but aquatic commodities will be added in the next iteration.

Country	Supplier input	Select from dropdown	See Appendix 4.2.5.1 for options. For wild-caught tuna, select the relevant RFMO.
Spatial Conversion	Based on commodity/country combination	MT commodity/acre	See Appendix 4.2.5.2 for spatial conversion factors. For ag commodities, a 5-year average from 2015-2019 was used to determine yields. Data from the US was pulled from NASS survey data, converted to lbs using this source, and then converted to lbs per acre using total harvested acres. For non-US conversion factors, FAOSTAT data was used for the same time period. Both sources were converted to MT/acre to determine the final conversion factor. This year the calculator assumes each crop entered was grown on a different acre, which may be an overestimate for crops sourced from acres in rotations. This consideration will be addressed in future versions of the spatial conversions. For beef, it is assumed the volume sold at Walmart represents a fraction (38%) of the total weight of a cow at slaughter and of that percentage on average 50% of the weight is gained on pasture. This weight is then compared to a weighted average of stocking rates in wet and dry regions of the US to determine an average MT of beef/acre conversion factor. Global numbers are still being developed, so in the current calculator the US number is used as a proxy. (See Appendix 4.2.5.2 for sources). These numbers will continue to be refined in the next iteration of this guidance to reflect not only country differences, but the difference between wet and dry pasture. For pulp and paper, average 5-year yields pulled from FAO, USDA, Arets 2012, and Natural Resource Canada were used to determine spatial conversion factors.

Emissions factor or Calculator	Recommendation provided once combinations from above are entered	MT CO2e/MT commodity	Emissions will be calculated utilizing existing Gigaton questions for fertilizer optimization (Cornell University FAST-GHG Tool) and the following tools will be recommended based on the practice and country combinations: Cool Farm Tool (international agriculture commodities) FieldPrint calculator (domestic row crops) COMET-Planner (conservation improvements)
Avoid Land Use Change (LUC) Emissions for shrimp	Calculated Value	tCO2e/MT shrimp	Avoided Land use emissions were calculated by WWF in the following way. Total per country land use emissions from shrimp were calculated using country level mangrove lost (converting into annual number) (ha/ per year) using Clark Labs data (which includes all aquaculture ponds in coastal region) times average carbon content of mangroves (tC/ha/ year) using Intergovernmental Panel on Climate Change (IPCC) data plus other wetlands lost (converting into annual number) (ha/per year) using Clark labs data times average carbon content of other wetlands (IPCC data). Then multiplying these combined numbers times IPCC conversion factor (3.67) to get co2 (tCO2e/ year). This country average of aquaculture land use change emissions per year from aquaculture was then discounted using a percentage derived from volume of brackish farmed shrimp produced by a country compared to all brackish aquaculture (data metric tonnes from FAO Fish Stat 2019). Then this was discounted by 20 years
Spatial Nature Goal- Farmed Shrimp	Value from Scientific Literature	T shrimp/ ha/ year	This number gives average yield intensity per ha per shrimp country making it a relatively straightforward way to understand how a volume of shrimp translates to a spatial area. Yield intensities from Table 5 in Boyd et all 2021

Spatial Nature Goal Farmed Salmon	Value from Scientific Literature	T salmon/ha	This number gives an estimate of salmon yield intensity per ha ocean using overall salmon farming permit areas in Norway compared to national yields. (Source: SINTEF Fisheries and Aquaculture report) Assumptions/ Future Updates: Norwegian, not Chilean, 10 years old
Spatial Nature Goal: Wild-Caught Fish	Based on species group/geography combination	MT commodity/mi^2	For seafood, the spatial conversion factor is specific to the geography identified and at a high level takes the volume of all managed species in the area (mt) divided by the volume of product reported to understand the proportion of reported product sourced of the total volume in the area and then applies that percentage to the area of the geography to convert to a spatial equivalent. Sources: FAO Fishstat, Certification and Ratings Collaborative Data Tool, Sea Around Us.

Place-based Approaches/Jurisdictional Approaches (JA)

Walmart encourages suppliers to enhance their supply chain efforts by engaging, investing, and sourcing from credible place-based partnerships and jurisdictional approaches. JA/PB initiatives seek to align governments, businesses, NGOs, and other stakeholders around shared goals of conservation, supply chain sustainability, and green economic development. JAs also focus on the political level at which land use decisions are made and enforced. As such, they contain the building blocks to align multiple stakeholders and incentive mechanisms around core, common interests such as responsible commodity production, improved economic growth and livelihood opportunities, and a resilient natural resource base that can continue to provide crucial ecosystem services such as clean water, clean air, and flood mitigation.

It is too soon to assess the success of JA and PB initiatives; if successful, they will deliver results in years rather than in months. But these are increasingly compelling models for addressing deforestation and land conversion growing understanding of the complexity and systemic nature of the issues underlying these challenges in many geographies. As many of these efforts are in their early stages, it is difficult to link them directly with sourcing; however, Walmart would like to capture participation in these efforts by their suppliers to amplify these actions. Toward this end, we have designed a calculator question to collect participation in JA/PB efforts.

Core Criteria for Place-based and Jurisdictional Projects

Last updated July 2022

Credible jurisdictional and place-based approaches must be on a path to contain elements in each box in the table below, which are informed by assorted NGO feedback. The criteria below are primarily applicable to terrestrial JA/PB project. Specific criteria for marine projects are still under development. To find a list of projects that you could get engaged with visit (insert name for project pipeline on sustainability hub and link to it).

SCOPE & SCALE

Sustainability and production-based goals are clearly stated and relevant to the landscape/seascape in which the program is being implemented

The program is of meaningful scale to drive improvements at the landscape/seascape-level

STAKEHOLDER ENGAGEMENT

A representative, multi-stakeholder body is developed transparently and leads the program design and implementation

Relevant levels of government are engaged in developing and implementing approach/program

PROGRAM DESIGN

A clearly defined action plan is developed that lays out steps to meet program milestones and outcomes

Meaningful, relevant metrics and KPIs are defined to enable assessments of progress towards targets and milestones

Effective data governance systems and protocols are implemented to credibly gather, store, analyze, and use data

IMPLEMENTATION

A baseline assessment is performed at the outset of the program against which improvements and performance claims will be measured

Jurisdiction resources are identified as an input to the development of action plans and mapped for the entire landscape/seascape

Appropriately sized incentives are included for participating producers that are commensurate to opportunity

TRANSPARENCY

There is transparency in the structure, commitments, agreements, financing, and actions of the initiative and this information is publicly accessible

Stakeholders communicate performance progress relative to the defined baseline or target and share factual statements of specific performance levels

Data sources are available in an accessible format to enable third parties to verify and derive

CONTINUOUS IMPROVEMENT

A framework is established to enable the jurisdictional or place-based approach to continuously improve processes and impacts

costs of conversion, where applicable	insights about metrics performance

Place Based/Jurisdictional Approach Question

Are you participating in a place-based or jurisdictional approach? ***Only used for informational purposes this year.***

Data component definition

This data captured through this question will only be used to understand current participating in JAs/PBs projects and will not contribute to either the Gigaton or Nature goal this year. For more information on best practices for engaging in a JA/PB project please see Error! Reference source not found.Hub

Data component calculation

None in the current model

Source documentation

Model inputs	Source	Units	Notes
Commodity	Supplier input	Select from dropdown	Suppliers may enter multiple combinations of commodity, country, and project name.
Country	Supplier input	Select from dropdown	Driven from project intake forms provided by NGOs
Region/City	Supplier input	Select from dropdown	Driven from project intake forms provided by NGOs
Project Name	Supplier input	Free text	Can use to compare to submitted projects for NGOs
Organization	Supplier input	Select from dropdown	All organizations who contributed to projects

Restoration & Protection

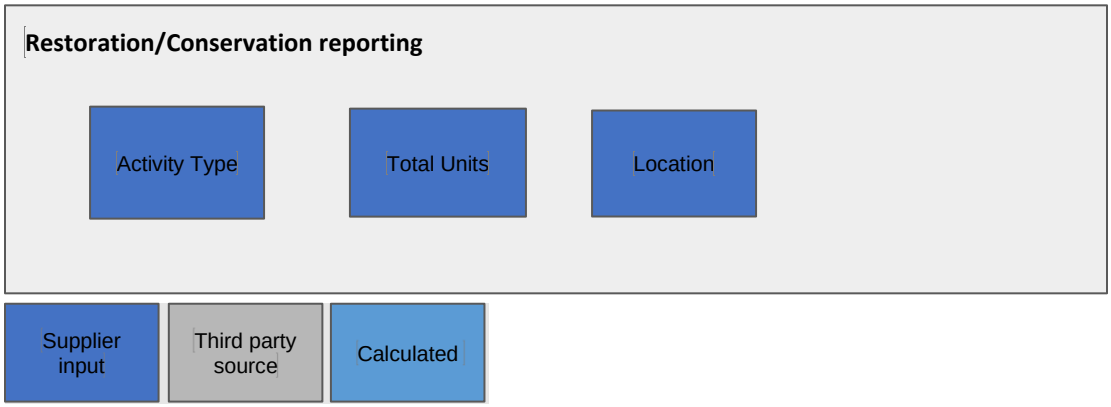
Have you restored and/or conserved any land/ocean? [Restoration/Conservation] [Acres/Sq Miles] of [Land, Ocean, Coastal Area]. ***GHG calculation for land covered in existing Gigaton method***

Last updated July 2022

Data component definition

This data captured through this question will be used to capture direct acres and square miles that can be counted towards Walmart's Nature goal in addition to information used to capture avoided GHG emissions (refer to existing Gigaton methodology for these calculations).

Data component calculation



Source documentation

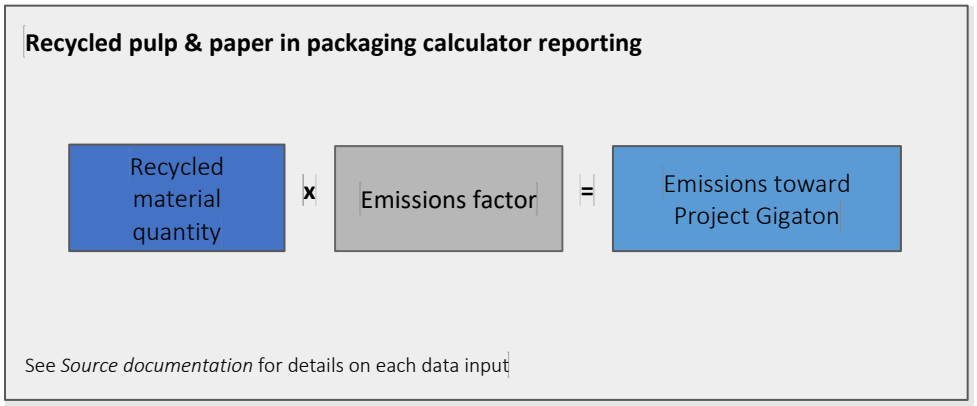
Model inputs	Source	Units	Notes
Activity type	Supplier input	Select from dropdown	Suppliers chose if the activity is restoration or conservation. Suppliers can add more than one line if they are involved in multiple projects or in both restoration and conservation.
Total units	Supplier input	Acres, Sq miles, hectares	Refers to the land or ocean spatial areas conserved or restored.
Location	Supplier input	Select from dropdown	Refers to if the conserved or restored spatial area is on land, in the ocean, or at the boundary of a coastal area.

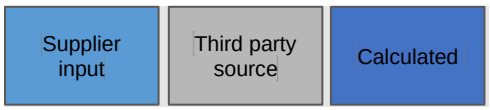
4.2.5.3 Recycled content pulp and paper in packaging calculator

Data component definition

This data component captures emissions avoided from use of recycled content in pulp- and paper-based packaging.

Data component calculation





Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may not enter multiple lines of data. Data component also available in the Packaging pillar, however suppliers may only complete once. All emissions reported are allocated to the Packaging pillar totals.
Recycled material quantity	Supplier input	Metric tons	Only post-consumer recycled material is allowed. See *Appendix 4.2.5.3 Recycled content pulp and paper in packaging calculator* for definition
Emissions factor	Developed using FAO and other data sources as described in Appendix 4.2.5.3	Metric tons CO2e/metric ton recycled content	0.05 metric tons CO2e/metric ton recycled content See *Appendix 4.2.5.3 Recycled content pulp and paper in packaging calculator* for additional detail

4.2.5.4 Certified timber, pulp and paper in packaging calculator

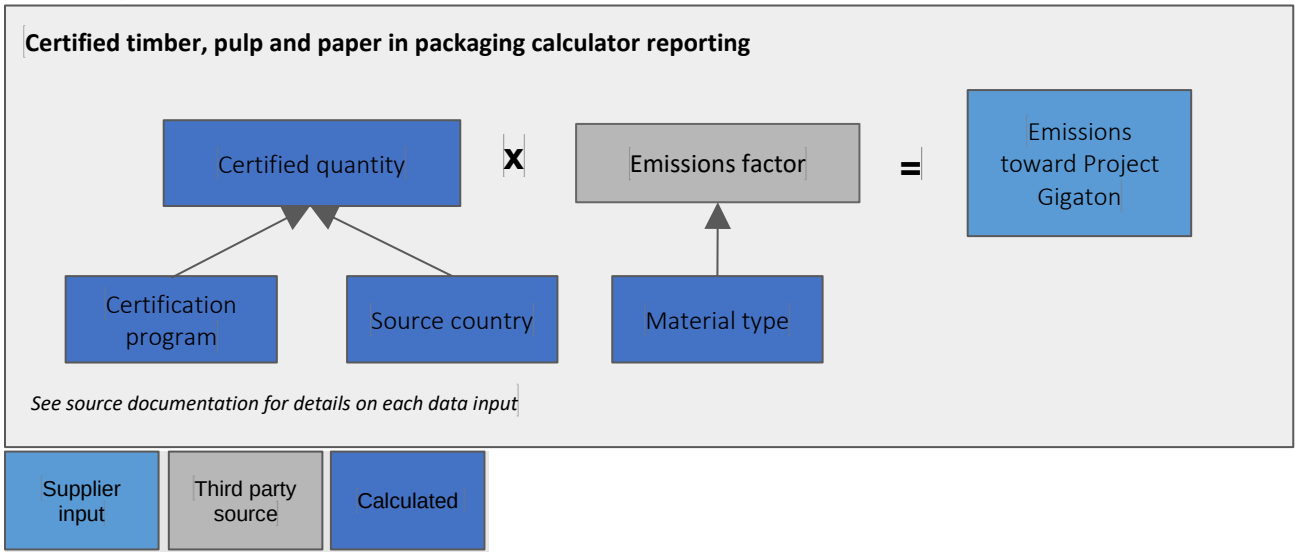
Data component definition

This data component captures emissions avoided from use of certified timber, pulp and paper in packaging. Project Gigaton counts virgin timber, pulp and paper certified by Forest Stewardship Council (FSC) from all countries; Sustainable Forestry Initiative (SFI) and Programme for the Endorsement of

Forest Certification (PEFC) certification is counted if the wood was harvested in one of the countries listed in *Appendix 4.2.5.4 Certified timber, pulp and paper in packaging calculator*.

Although this data component captures emissions avoided from sustainably sourced timber, please note that timber production is not a major driver of deforestation globally – unsustainable and illegal logging is more a contributor to forest degradation.

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of material quantity, certification type, and source country. Data component also available in the Packaging pillar, however suppliers may only complete once. All emissions reported are allocated to the Nature pillar totals.
Certified quantity	Supplier input	Metric tons	
Material type	Supplier input	Select from dropdown	Possible dropdown selections: • Timber • Pulp and paper
Certification program	Supplier input	Select from dropdown	Project Gigaton counts virgin timber, pulp and paper certified by FSC from all

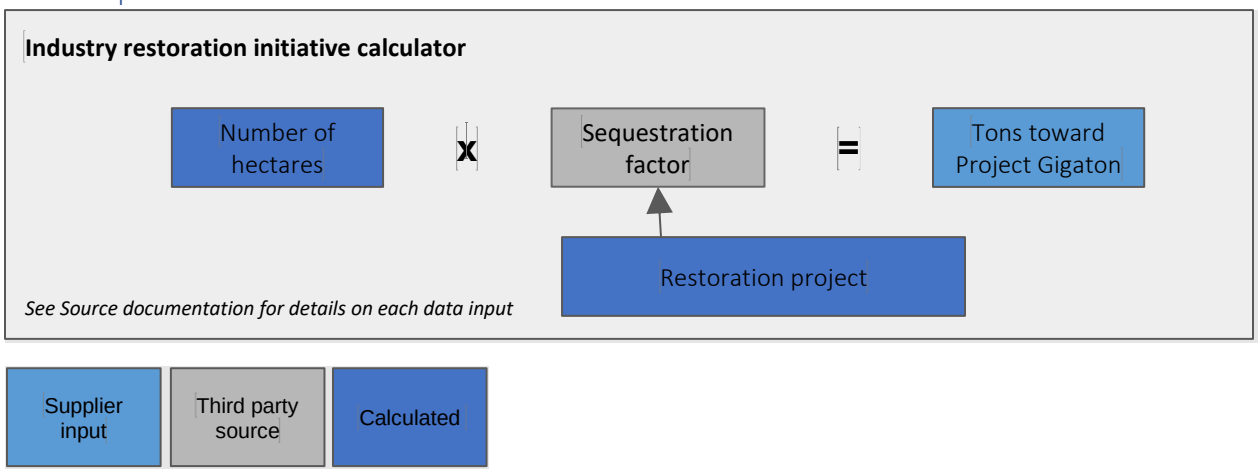
Source country	Supplier input	Select from dropdown	countries; SFI and PEFC certification is counted if the wood was harvested certain countries See *Appendix 4.2.5.4 Certified timber, pulp and paper in packaging calculator* for a list of all possible certification program and source country dropdown combinations
Emissions factor	Developed using FAO and other data sources as described in Appendix 4.2.5.3	Metric ton CO2e/metric ton certified pulp	0.05 metric tons CO2e/metric ton certified pulp or paper 0.003 metric tons CO2e/metric ton certified timber See *Appendix 4.2.5.4 Certified timber, pulp and paper in packaging calculator* for additional detail

4.2.5.5 Industry restoration initiative calculator

Data component definition

This pathway is designed for suppliers to report on participation in any one of the pre-screened restoration initiatives listed. A list can be found in *Appendix 4.2.5.5 - Industry restoration initiative calculator.* Project Gigaton asks suppliers to report on estimated sequestration *on an annual basis*, but suppliers may also want to estimate sequestration over the lifetime of the project for their own interest.

Data component calculation



Source documentation

Model inputs	Source	Units	Notes

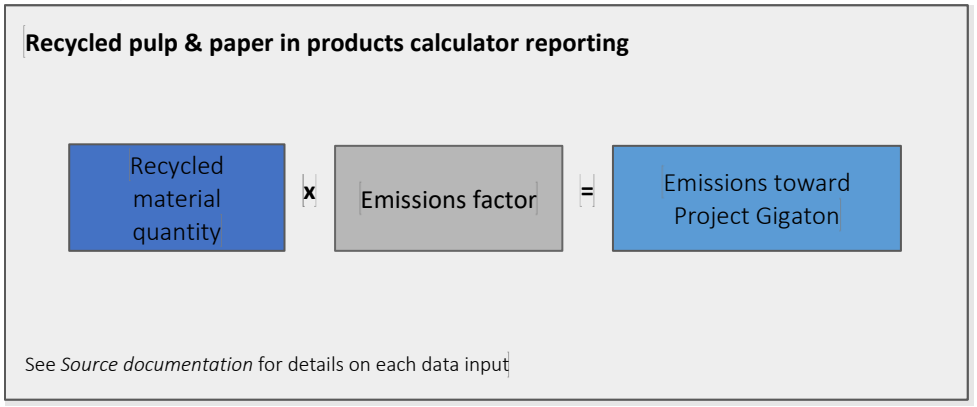
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of hectares and restoration program.
Number of hectares	Supplier input	Hectares	Supplier provides the number of hectares they plan to restore
Restoration project	Supplier input	Selected from dropdown	Supplier provides the name of the approved restoration project; see *Appendix 4.2.5.5 - Industry restoration initiative calculator* for list of potential dropdown options
Sequestration factor	Provided by restoration project owner	Metric tons CO2e per hectare	See *Appendix 4.2.5.5 - Industry restoration initiative calculator* for list of emissions factors

4.2.5.7 Recycled content pulp and paper in products calculator

Data component definition

This data component captures emissions avoided from use of recycled content in pulp- and paper-based products. Use of recycled content in pulp- and paper-based packaging should be reported to *4.2.5.3 Recycled content pulp and paper in packaging calculator*.

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may not enter multiple lines of data. Data component also available in the Product Use and Design pillar, however suppliers may only complete once. All

			emissions reported are allocated to the Product Use and Design pillar totals.
Recycled material quantity	Supplier input	Metric tons	Only post-consumer recycled material is allowed. See *Appendix 4.2.5.3 Recycled content pulp and paper calculator* for definition
Emissions factor	Developed using FAO and other data sources as described in Appendix 4.2.5.3	Metric tons CO2e/metric ton recycled content	0.05 metric tons CO2e/metric ton recycled content See *Appendix 4.2.5.3 Recycled content pulp and paper calculator* for additional detail

Nature- Agriculture

The adoption of best-in-class agricultural practices, including precision agriculture and animal feed optimization, can help reduce farmer input costs, improve water quality and reduce greenhouse gas (GHG) emissions. With almost 92 million cattle, 71 million swine and millions of acres of farmland in the U.S. alone, there is an important opportunity to scale solutions in agriculture.

By pursuing best practices in areas such as manure management, enteric emissions, grazing, and other activities in animal agriculture along with fertilizer optimization in crop production, there is potential to reduce greenhouse gas emissions while at the same time reducing waste and improving yield.

Project Gigaton calculates reductions associated with:

- Fertilizer optimization
- Field to Market Fieldprint Calculator
- Animal agriculture
- Overall farm emissions for dairy, pork, and poultry
- Manure management
- Beef grazing
- Enteric emissions

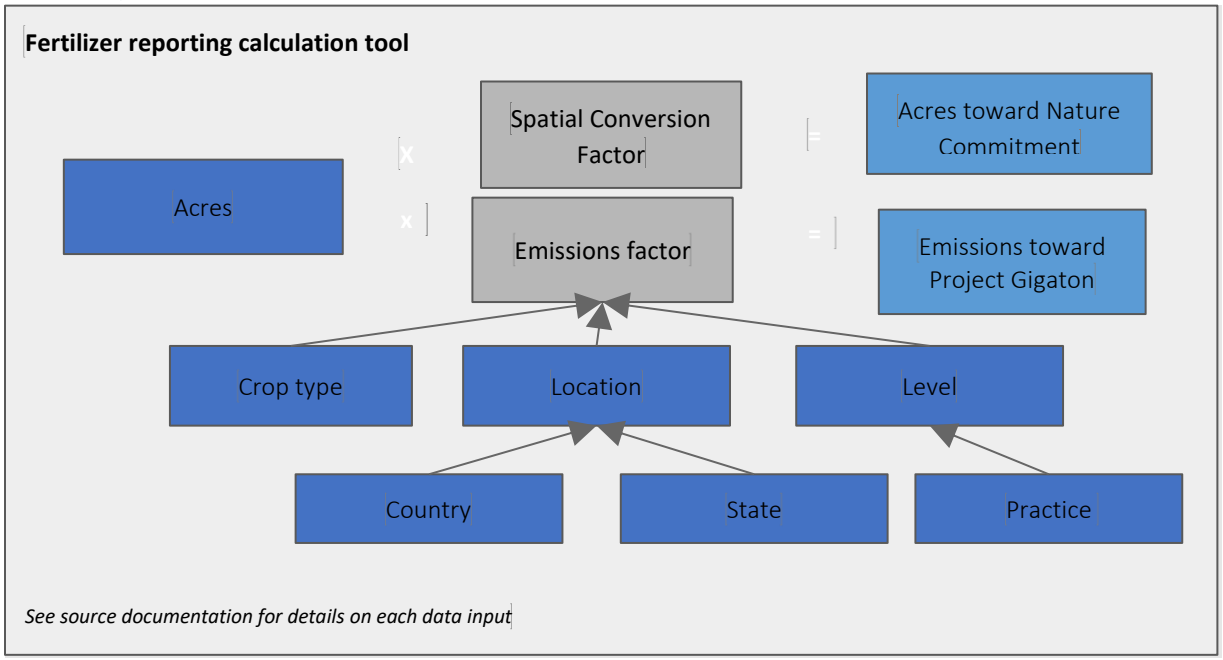
4.2.6.1 Fertilizer calculator

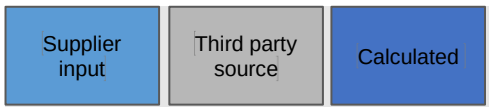
Data component definition

Project Gigaton includes emissions reductions from fertilizer optimization programs for crops sourced for products or as animal feed. A list of eligible fertilizer optimization practices that can be reported in this data component are listed in *Appendix - 4.2.6.1 Fertilizer calculator*.

Last updated July 2022

Data component calculation





Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of Acre, location, crop and practice set The same combination of crop and location should not be reported twice, thus suppliers should aggregate data from different farms with the same crop and location and report as a single entry. Suppliers completing this data component should not be able to submit data through 4.2.6.2 Field to Market tool, 4.2.6.3 FARM ES tool, 4.2.6.4 PPEFC tool, or 4.2.6.5 FAO GLEAM tool due to the potential of double counting some activities.
Acres	Supplier input	Acres	
Crop type	Supplier input	Selected from dropdown	See *Appendix 4.2.6.1 – Fertilizer* for list of all dropdown options

Country	Supplier input	Selected from dropdown	
State	Supplier input	Selected from dropdown	
Joint project	Supplier input	Selected from dropdown	Supplier indicates if reported acres are tied to joint or multi-stakeholder project. Possible dropdown options are: • Yes • No
Practice	Supplier input	Selected from dropdown	Supplier should be able to make multiple selections of practice for each crop and location combination
Level	USDA and in conjunction with our partners	Multi-selected from dropdown	Each practice type is assigned a level of "low" or "high" which corresponds to an emissions factor chosen to the crop and location combination. See *Appendix 4.2.6.1 – Fertilizer* for list of all levels and emissions factors
Emissions factors	Developed using USDA model for Greenhouse Gas Emissions	Metric tons CO2e per acre per year	Emission factors are currently only available for some of crops, locations, and levels. Emissions factors are not cumulative. When a supplier selects more than one "practice", the highest "level" of selected practices is used to determine the emission factor for the crop and location being calculated See *Appendix 4.2.6.1 – Fertilizer* for list of all levels and emissions factors
Spatial Conversion Factor	Walmart Provided	Acres toward nature commitment per acres reported	Spatial Conversion Factor = 1

4.2.6.2 Field to Market tool

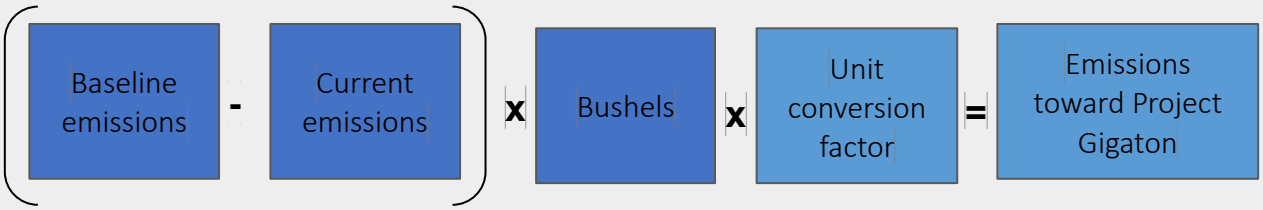
Data component definition

The Field to Market Fieldprint® Calculator (and associated Fieldprint Analysis) helps farmers estimate field-level performance on eight sustainability metrics including the greenhouse gas emissions of their commodity crop production. The guidance below is specific to Project Gigaton and does not constitute a Field to Market claim. Field to Market has developed an impact claims verification protocol that requires a minimum of five years of data for the calculation of metric improvements and associated claims.

Last updated July 2022

Data component calculation

Field to Market tool reporting



See Source documentation for details on each data input

Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple lines of data. Suppliers completing this data component should not be able to submit data through 4.2.6.1 Fertilizer calculator, 4.2.6.3 FARM ES tool, 4.2.6.4 PPEFC tool, or 4.2.6.5 FAO GLEAM tool due to the potential of double counting some activities.
Baseline emissions	Supplier input	Lbs CO2e/bushel	Supplier should use a lbs CO2e project weighted average. If a supplier reported in a previous year, the previous year's lbs CO2e/bushel "current emissions" figure should be used as this year's "baseline emissions". This is because other incremental reductions have already been accounted for.
Current emissions	Supplier input	Lbs CO2e/bushel	Supplier should use a lbs CO2e project weighted average. If supplier reported in a previous year, the next available year of data should be used as the "current emissions". The "current emissions" figure should be the most recent assessment available during the reporting period selected. Project Gigaton reporting asks suppliers to only report reductions. If there are increases, supplier should report 0.

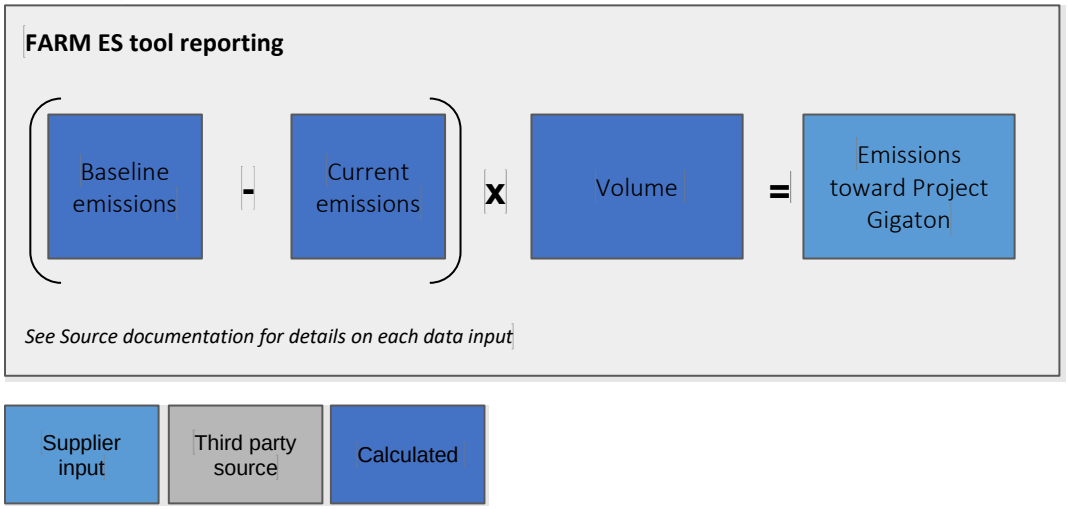
Bushels	Supplier input	Bushels	Number of bushels produced by the acres enrolled in the project. (Will need to allow for up to 4 decimal places in supplier input)
Unit conversion factor	Third party source	0.00045359237	Converting the lbs CO2e to MT CO2e

4.2.6.3 FARM ES tool (dairy)

Data component definition

The National FARM Program Environmental Stewardship Module (FARM ES) tool captures emissions reductions resulting from programs implemented on dairy farms. If a supplier produces products from dairy cows the supplier may provide emissions calculated using the tool toward Project Gigaton.

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may not enter multiple lines of data. The supplier may utilize stratified random sampling of farms along guidelines provided by FARM ES. Suppliers completing this data component should not be able to submit data through *4.2.6.6 Manure management calculator* due to the potential of double counting some activities. If the supplier has already reported energy improvements via the FARM ES tool (e.g., barn energy efficiency projects) the supplier should

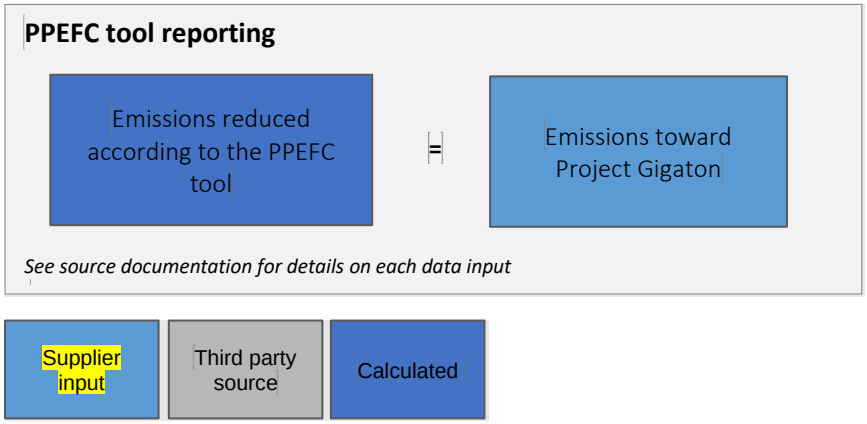
			not report those same reductions via the Energy pillar. Currently Project Gigaton only includes reductions for farms in the US.
Baseline emissions	Supplier input	Metric tons CO2e/gallon	CO2e per gallon of fat protein corrected milk (FPCM) is an output from the FARM ES tool. The baseline year chosen should be 2015, if available, or the earliest available year thereafter.
Current emissions	Supplier input	Metric tons CO2e/gallon	CO2e per gallon of fat protein corrected milk (FPCM) is an output from the FARM ES tool. The current value chosen should be the most recent assessment available during the reporting period specified by the supplier.
Volume	Supplier input	gallon	Volume of fat protein corrected milk (FPCM) produced during the reporting period specified by the supplier.

4.2.6.4 PPEFC tool (pork)

Data component definition

The Pig Production Environmental Footprint Calculator (PPEFC) tool captures emissions reductions resulting from programs implemented on pork farms.

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may not enter multiple lines of data.

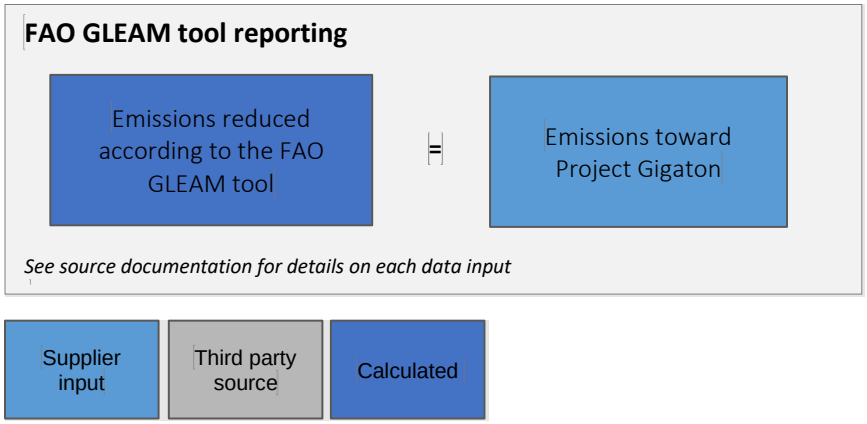
			The supplier may utilize stratified random sampling of farms along guidelines provided by PPEFC. Suppliers completing this data component should not be able to submit data through 4.2.6.6 Manure management calculator due to the potential of double counting some activities. If the supplier has already reported energy improvements via the PPEFC tool (e.g., barn energy efficiency projects) the supplier should not report those same reductions via the Energy pillar. Currently Project Gigaton only includes reductions for farms in the US.
Emissions reduced according to the PPEFC tool	Supplier input	Metric tons CO2e	CO2e is an output from the PPEFC tool.

4.2.6.5 FAO GLEAM tool (poultry and eggs)

Data component definition

The Food and Agriculture Organization of the United Nations' Global Livestock Environmental Assessment Model (FAO GLEAM) tool captures emissions reductions resulting from programs implemented on poultry and egg farms.

Data component calculation



Source documentation

Model inputs	Source	Units	Notes

Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may not enter multiple lines of data. Suppliers completing this data component should not be able to submit data through 4.2.6.6 Manure management calculator due to the potential of double counting some activities. If the supplier has already reported energy improvements via the FAO GLEAM tool (e.g., barn energy efficiency projects) the supplier should not report those same reductions via the Energy pillar.
Emissions reduced according to the FAO GLEAM tool	Supplier input	Metric tons CO2e	CO2e is an output from the FAO GLEAM tool.

4.2.6.6 Manure management calculator (cattle, dairy, pork)

Data component definition

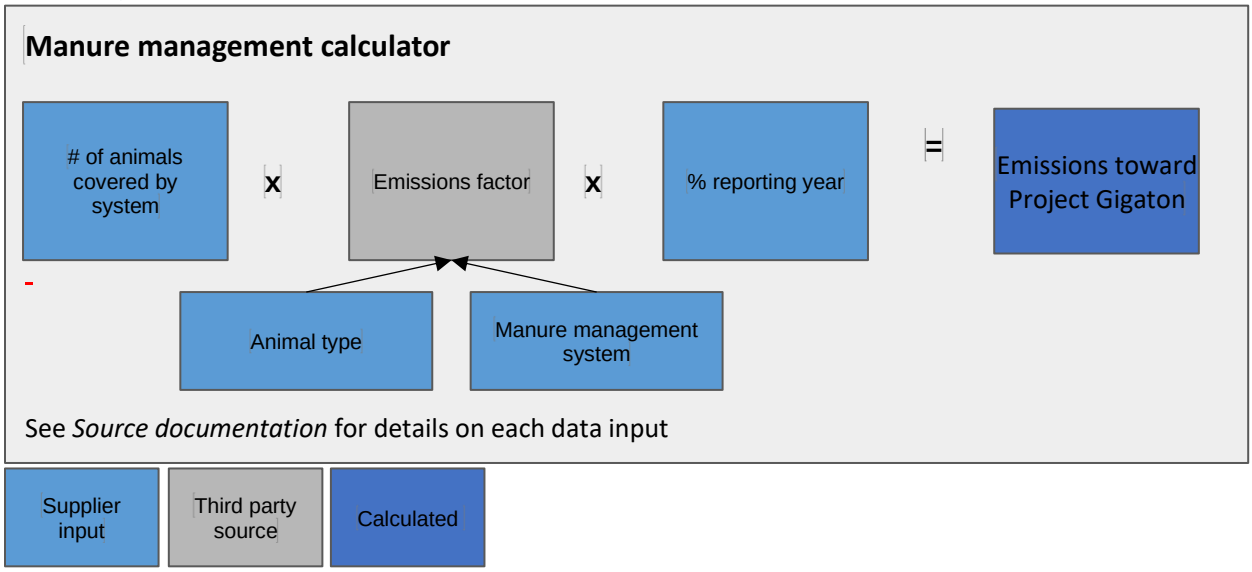
This data component captures emissions reductions resulting from programs implemented on farms involved in beef, pork, and dairy production for suppliers not using the FARM ES tool, GLEAM tool, and/or PPEFC tool.

There are eleven manure management systems currently considered under Project Gigaton:

Composting (in-vessel or static)
Composting (natural aeration)
Composting (intensive with forced aeration)
Dry lot
Liquid/slurry storage with natural or induced crust
Liquid/slurry storage without crust
Anaerobic Digester
Covered anaerobic lagoon
Daily spread
Anaerobic treatment
Pit storage below animals, less than 1 month

Last updated July 2022

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple lines of data. Suppliers completing this data component should not be able to submit data through *4.2.6.3 FARM ES tool*, *4.2.6.4 PPEFC tool*, *4.2.6.5 FAO GLEAM tool* due to the potential of double counting some activities. Suppliers report management scenarios the year they were implemented and again in the years that follow. Emissions factors are currently only available for the US and thus suppliers should only report manure management activities for farms in the US.
Animal type	Supplier input from dropdown	Selected from dropdown	Type of animal production covered in system. Possible dropdown selections: swine cattle
% reporting year	Supplier input	%	% of the reporting year that the new manure management system active, calculated as follows: [# months active / 12] = % reporting year

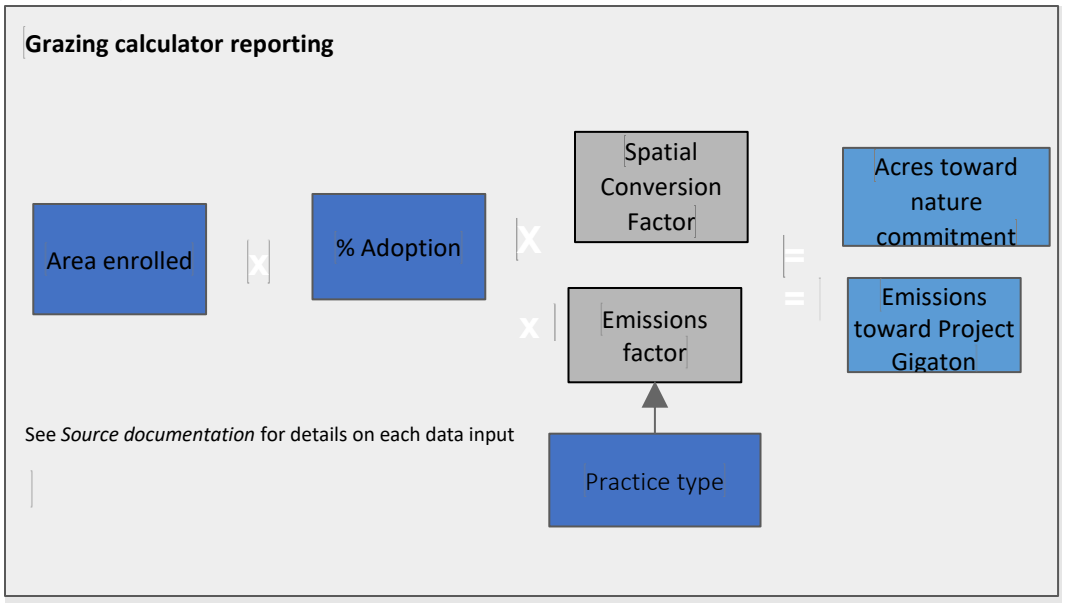
# of animals covered by system	Supplier input	Numeric	Refers to the total average population of animals covered by the system during the year.
Manure management system	Supplier input	Selected from dropdown	See *Appendix - 4.2.6.6 Manure management calculator* for full list of dropdown options.
Emissions factor	Aggregated from sources including the EPA, California Air Resources Board, and FARM ES	Metric tons CO2e/head/year	See *Appendix - 4.2.6.6 Manure management calculator* for full list of emissions factors.

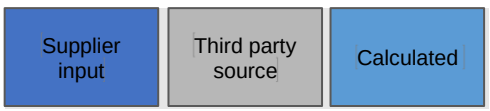
4.2.6.7 Grazing calculator (cattle)

Data component definition

This data component captures emissions reductions resulting from grazing optimization programs for both beef and dairy cattle, where applicable.

Data component calculation





Source documentation

Model inputs	Source	Units	Notes

Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple lines of data. Emissions factors are currently only available for the US and thus suppliers should only report grazing optimization activities for farms in the US.
Area enrolled	Supplier input	Acres	Number of acres enrolled in a grazing land optimization program.
% Adoption	Supplier input	Numeric	Percent of acres with NRCS practices successfully implemented. Percentages are reported for area enrolled in grazing optimization programs in the reporting year: Optional field - if % adoption of practices is unknown, supplier may reference and utilize default percentages as noted in *Appendix - 4.2.6.7 Grazing calculator*.
Practice type	Supplier input	Selected from dropdown	See *Appendix - 4.2.6.7 Grazing calculator* for list of dropdown options.
Emissions factor	Based on emission reduction coefficients from NRCS/Colorado State University's COMET-Planner	Metric tons C02e per acre	See *Appendix - 4.2.6.7 Grazing calculator* for full list of emissions factors.
Spatial Conversion Factor	Walmart Provided	Acres toward nature commitment per acres reported	Spatial Conversion Factor = 1

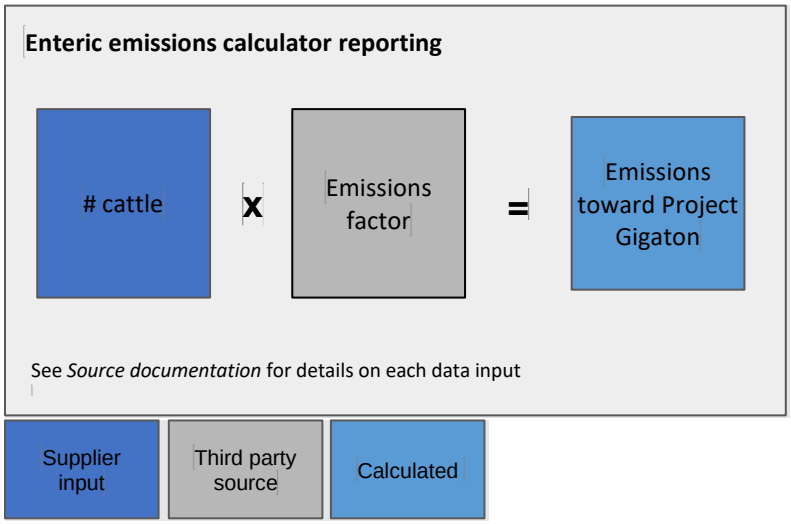
4.2.6.8 Enteric emissions calculator (cattle)

Data component definition

This data component captures emissions reductions resulting from enteric emissions optimization for beef and dairy cattle.

Last updated July 2022

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may not enter multiple lines of data.
# cattle	Project Gigaton Submission Form	Numeric	Refers to the **average** population of cattle covered by enteric emissions optimization program in the reporting year.
Emissions factor	US EPA GHG Inventory Based on dairy science combined with US EPA potential for beef reduction	Metric tons CO2e per hear per year	0.01431 metric tons CO2e/head/year Emissions factor calculated as follows: [Enteric factor] x [% reduction enteric emissions due to optimization] à [1.06 MT CO2e/head/year] x [1.35%]

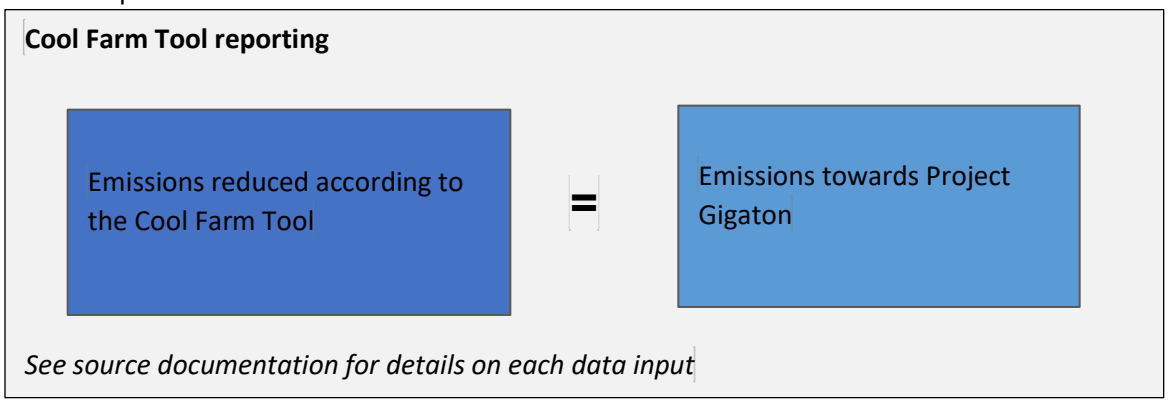
4.2.6.9 Cool Farm Tool (crops and livestock)

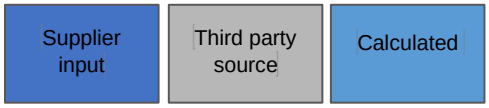
Data component definition

Cool Farm Tool is an assessment tool for sustainable agriculture focusing on greenhouse gases, biodiversity and water use. The greenhouse gas metric considers crops and livestock (dairy, beef, pigs, poultry etc.). The Cool Farm Tool covers fertilizer, crop protectants, farm management, energy, transport, livestock feed, manure emissions and much more for various crops as well as livestock including grazing and enteric fermentation emissions. The emissions figures produced by the tool are based on emissions savings related to agricultural inputs, fuel & energy use, change in carbon stocks, transport and irrigation. CFT is able to evaluate and assess improvements in agricultural management with respect to emissions, by doing different “what if” scenarios.

Last updated July 2022

Data component calculation





Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO_2e	Suppliers may enter multiple lines of data. The supplier can use Cool Farm Tool for reporting emissions reductions on a single crop and field or for multiple fields and crops. They can also use Cool Farm Tool for their livestock products. They can either report individual values or aggregated emissions for all products and emission types. Supplier completing this data component may not submit data via the tools mentioned under 4.2.5.9, 4.2.6.1, 4.2.6.3, 4.2.6.4, 4.2.6.5, 4.2.6.6, 4.2.6.7 and 4.2.6.8 due to the potential of double counting some activities. If the supplier has already reported energy improvements via the Cool Farm Tool the supplier should not report those same reductions via the Energy pillar.
Emissions reduced according to Cool Farm Tool	Supplier input	Metric tons CO_2e	CO_2e is an output from the Cool Farm Tool.

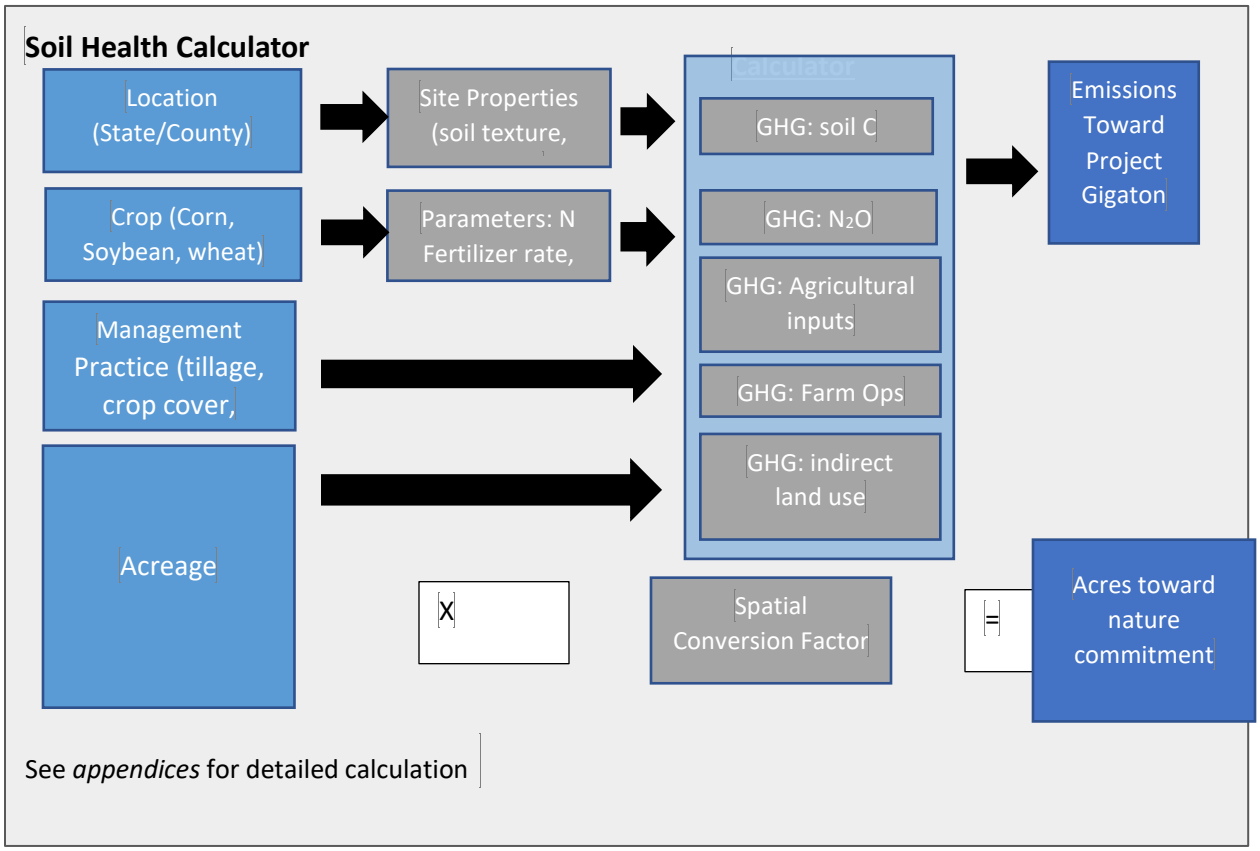
4.2.6.10 Soil Health Calculator

Data Component Definition

The Cornell Soil Health & Nitrogen Fertilizer Optimization GHG Calculator calculates the net greenhouse gas reduction of cover crop management, reduced-till or no-till management for three commodity crops (corn, soybean, wheat) in the conterminous USA. The calculator accounts for (1) changes in soil carbon, (2) direct and indirect nitrous oxide emissions due to agricultural field management, (3) energy use of agricultural inputs (seeds, herbicide, N-fertilizer), (4) energy use from on-farm agricultural operations, and (5) indirect land use change. Soil health and N-fertilizer optimization practices included are defined in Soil Health Calculator full document which is available on the Sustainability Hub.

Last updated July 2022

Data Component Calculation



Supplier input | Third party source | Calculated

Source documentation

Model Inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	
Acres	Supplier input		
Spatial Conversion Factor	Walmart Provided	Acres toward nature commitment per acre reported	Spatial Conversion Factor = 1

Last updated July 2022

Product use and Design

All products produce greenhouse gas emissions during their manufacturing, and electricity-consuming products also generate emissions when used by customers at home. Designers, manufacturers and brands have a unique opportunity to help deliver more efficient and innovative products to shelf by making smart material choices during product design, as well as helping the customer lower the greenhouse gas emissions associated with their use of the product after bringing it home.

Project Gigaton's Product Use and Design pillar counts activities associated with upstream greenhouse gas emissions reductions from product material production/manufacturing (such as optimizing design or sourcing materials sustainably), as well as activities associated with downstream greenhouse gas emissions reductions during customer use of a product after bringing it home (such as improvements in the energy efficiency of the product, or use of low global warming potential (GWP) refrigerants in products like air conditioners).

Walmart's methodology for calculating greenhouse gas improvements during product use involves estimating the lifetime emissions savings resulting from a more energy efficient or low-GWP product when compared to a baseline model.

Walmart's methodology for calculating greenhouse gas improvements through product design involves a collection of approaches related to sourcing materials sustainably and/or optimizing design:

Source sustainably:

Increasing usage of post-consumer recycled content

Using certified virgin fiber

Optimizing design:

Reducing material usage

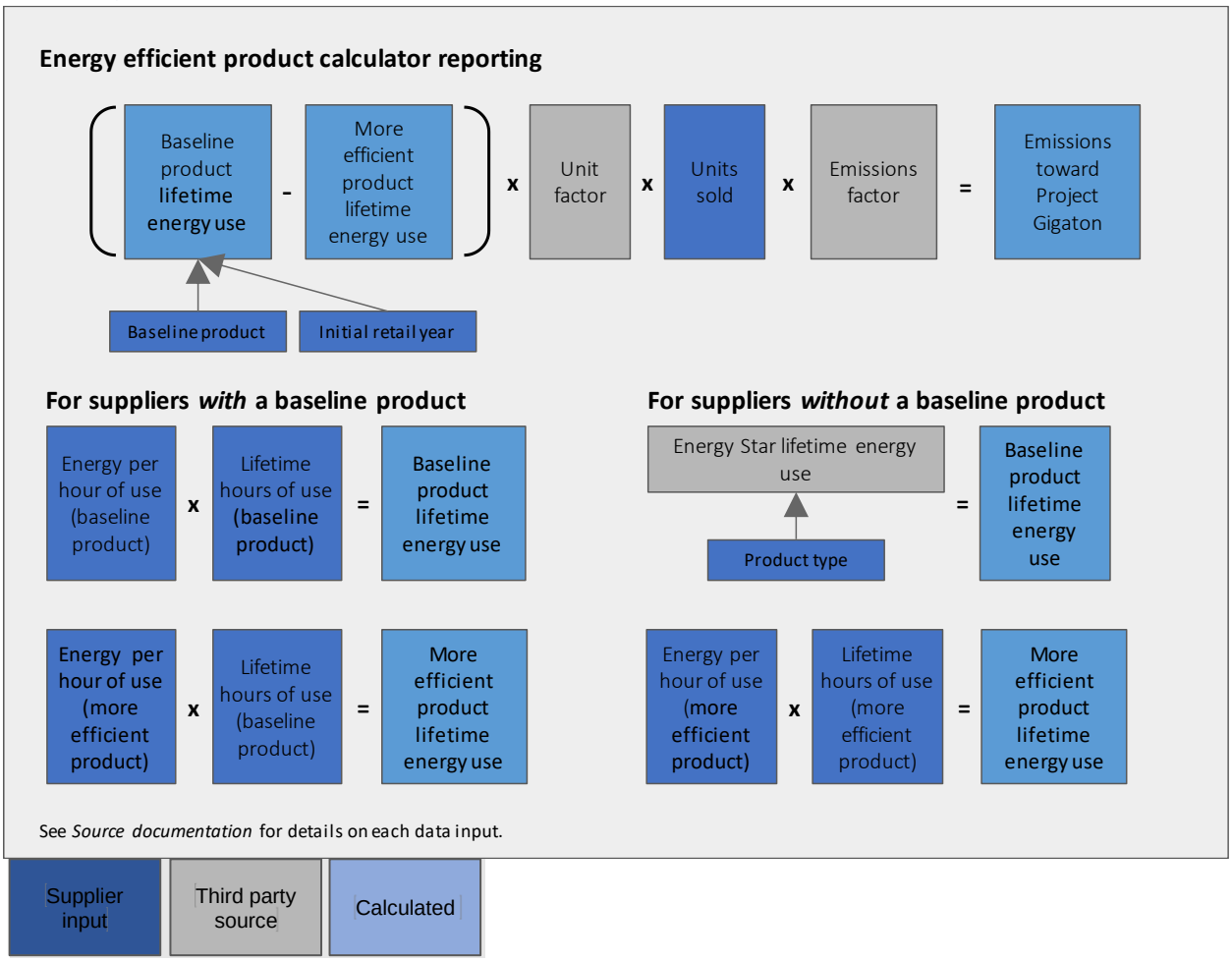
4.2.7.1 Energy efficient product calculator

Data component definition

This data pathway calculates the greenhouse gas impact of delivering a more energy efficient product to consumers for use in their homes. Only energy efficiency gains for products that use electricity are currently allowed to be reported under the Product Use and Design pillar of Project Gigaton.

Last updated July 2022

Data component calculation



Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated	Metric tons CO2e	Suppliers may enter multiple lines of data. Instead of reporting at an item level, suppliers may choose to also report consolidated data for a large number of products by developing average figures that are weighted proportionately to the products represented. The calculation methodology remains the same.
Product category	Supplier input	Selected from dropdown	*See Appendix 4.2.7.1 Energy efficient product calculator* for list of all dropdown options.

			This field is collected for suppliers with and without a baseline product. Selection does not impact calculation for suppliers *with* a baseline product.
Baseline product	Supplier input	Selected from dropdown	Possible dropdown selections: • have • do not have Selecting "Other" for *Product category* will default *Baseline product* input to "have".
Units sold	Supplier input	Numerical value	Number of units sold during the specified reporting period
Emissions factor	IEA	Metric tons CO2e per kWh	The emissions factor for the United States is used as proxy for all geographies of use. See *Appendix 4.2.2.2 – Energy efficiency calculator* for list of all emissions factors.
Energy per hour of use (baseline product)	Supplier input	Numerical value	Watts (Wh) per hour Field available only for suppliers specifying they "have" a Baseline product.. *See Appendix 4.2.7.1 Energy efficient product calculator* for list of baseline values by Product Type
Energy per hour of use (more efficient product)	Supplier input	Numerical value	Watts (Wh) per hour
Unit factor	N/A	Numerical value	.001 Converts watt hours into kilowatt hours to be comparable with other units used in the equation.
Lifetime hours of use (baseline product)	Supplier input	Numerical value	Field available only for suppliers specifying they "have" a Baseline product.

			Average lifetime hours of use for the baseline product. Walmart assumes the average lifetime is consistent between the baseline and more efficient product.
Lifetime hours of use (more efficient product)	Supplier input	Numerical value	*Average* lifetime hours of use for the more efficient product.
ENERGY STAR lifetime energy use	EPA	kWh	Data used only for 1) suppliers specifying they "do not have" a Baseline product, or 2) suppliers with a "more efficient" product that has either an initial retail date before the start of Project Gigaton in 2016 or more than five years before the reporting dates they selected. See *Appendix 4.2.7.1 – Energy efficient product calculator* for list of values by product type.
ENERGY STAR certification	Supplier input	Selected from dropdown	Possible dropdown selections: is is not This selection does not impact the calculation.
Initial retail year	Supplier input	Selected from dropdown	Initial retail year of the *more efficient* product. Possible dropdown selections: 2015 or earlier 2016 2017 2018 2019 2020 **Please note:** if the initial retail date was before the start of Project Gigaton in 2016 (i.e., 2015 or earlier), suppliers are treated the same as those ***without a baseline product*** and are not permitted to enter baseline product information. Similarly, suppliers whose initial retail date is 5 or more years before the start date of

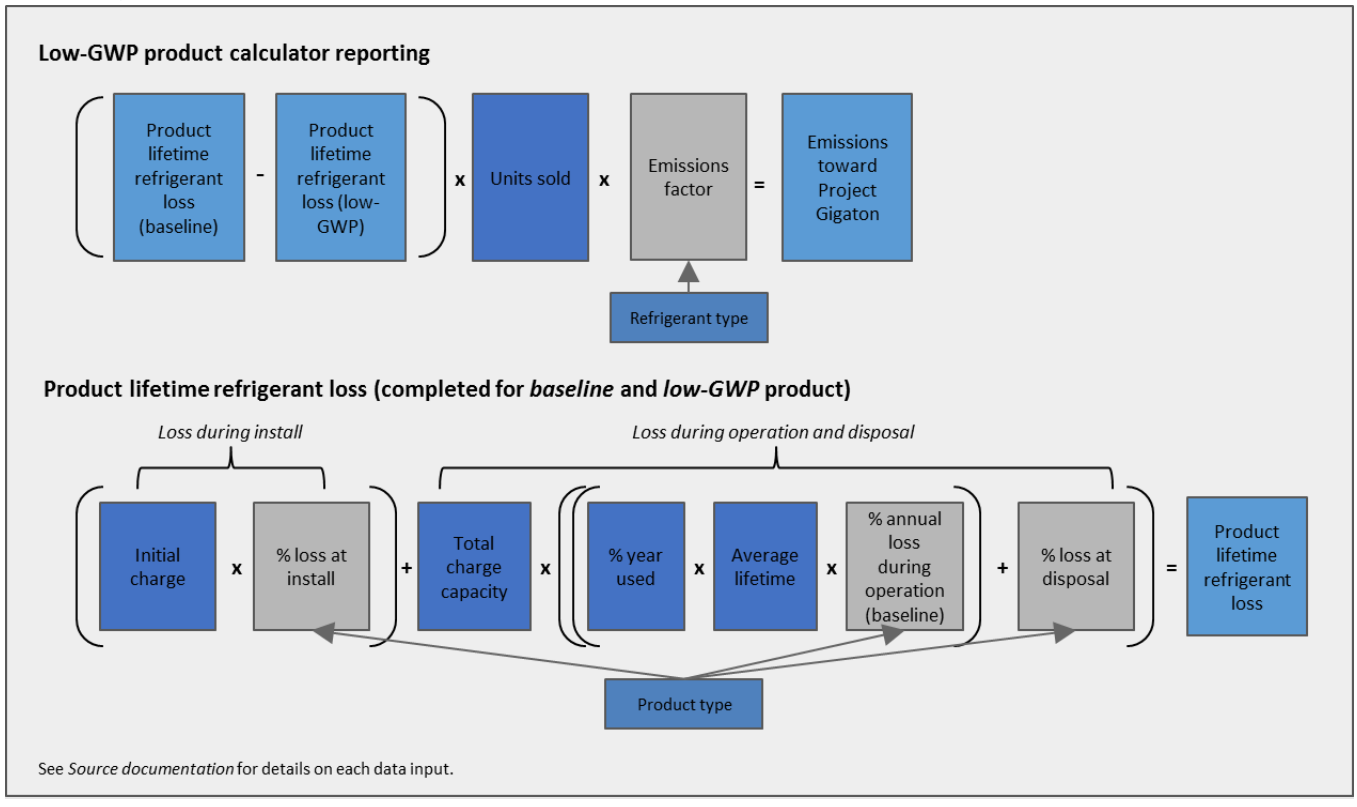
			their selected reporting period will also be treated as suppliers without a baseline product. This is because in these cases the unit sales of the "more efficient" product can continue to be reported to Project Gigaton only if the product's energy performance exceeds the default ENERGY STAR performance thresholds based on the product category selected.

4.2.7.2 Low-GWP refrigerant calculator

Data component definition

This data pathway calculates the greenhouse gas impact of transitioning a product to utilize low global warming potential (GWP) refrigerants and considers refrigerant loss during installation, operation, and disposal of residential refrigerators and air conditioning (A/C) units.

Data component calculation



Supplier input | Third party source | Calculated

Last updated July 2022

Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated	Metric tons CO2e	Suppliers may enter multiple lines of data.
Product type	Supplier input	Selected from dropdown	Possible dropdown selections: Residential Refrigerator Residential A/C
Units sold	Supplier input	Numerical value	Units of Low-GWP Product sold during the specified reporting period.
Refrigerant type	Supplier input	Selected from dropdown	*See Appendix 4.2.7.2 Low-GWP refrigerant calculator* for list of all dropdown options. Value collected for both baseline and low-GWP refrigerant product.
Product lifetime refrigerant loss	Calculated value	Numerical value	Value in kilograms (kg). Calculated value for the baseline product and low-GWP refrigerant product.
Initial charge	Supplier input	Numerical value	Initial refrigerant charge collected in kilograms (kg). Value collected for both baseline and low-GWP refrigerant product.
% loss at install	EPA	Percent	Assumed refrigerant loss at assembly A/C: 0.2% Refrigerators: 1%.
Total charge capacity	Supplier input	Numerical value	Product total refrigerant charge capacity collected in kilograms (kg). Value collected for both baseline and low-GWP refrigerant product.
% annual loss during operation	EPA, LBNL	Percent	Assumed annual refrigerant loss during operation. A/C: 10% Refrigerators: 5%.
% year used	Supplier input	Percent	Percent of the year during which the product is used.

			Value needed for baseline product only and applied to calculation for low-GWP product.
Average lifetime	Supplier input	Numerical value	Average lifetime years of use entered in years. Value needed for baseline product only and applied to calculation for low-GWP product.
% loss at disposal	EPA	Percent	Assumed percent value for capacity remaining at disposal. A/C: 80% Refrigerators: 80%
Emissions factor	IPCC, EPA	Numerical Value	*See Appendix 4.2.7.2 Low-GWP refrigerant calculator* for list of emissions factors.

4.2.7.3 Recycled content pulp and paper in products calculator

See *4.2.5.7 Recycled content pulp and paper in products calculator in the Nature pillar.*

4.2.7.4 Certified timber, pulp and paper in products calculator

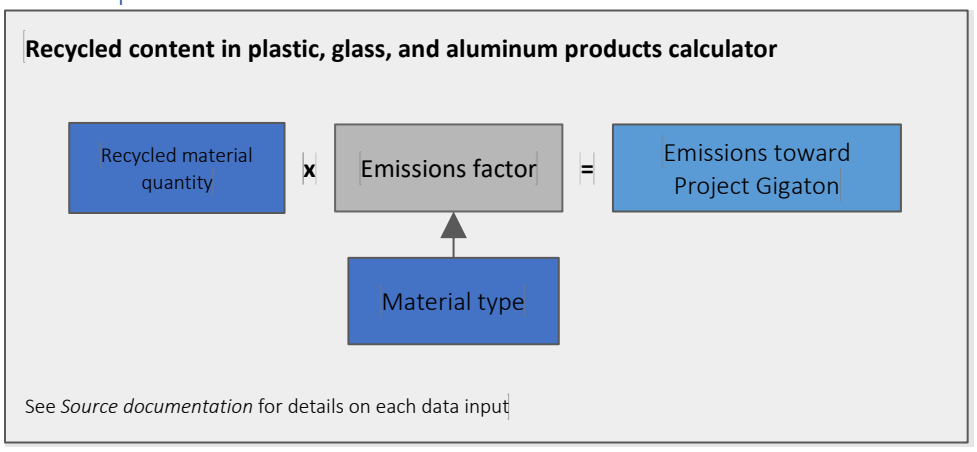
See *4.2.5.8 Certified timber, pulp and paper in products calculator in the Nature pillar.*

4.2.7.5 Recycled content in plastic, glass, and aluminum products calculator

Data component definition

Using post-consumer recycled content instead of virgin materials reduces upstream greenhouse gas emissions associated with material manufacturing. This data component captures emissions avoided from use of recycled content in products. Use of recycled content in packaging should be reported to *4.2.4.5 Recycled content in plastic, glass, and aluminum packaging calculator*.

Data component calculation



Last updated July 2022

Supplier input	Third party source	Calculated

Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated	Metric tons CO2e	Suppliers may enter multiple combinations of material quantity and type.
Recycled material quantity	Supplier input	Metric tons	Mass of PCR content used to replace virgin material.
Material type	Supplier input	Select from dropdown	See *Appendix 4.2.7.5 Recycled content in plastic, glass, and aluminum products calculator* for list of all dropdown selections. The supplier should enter the type of PCR plastic being used and it's assumed that the virgin plastic being replaced is the same plastic type.
Emissions Factor	Third party source	Metric tons CO2e per metric ton material	This will be the delta between the PCR and virgin Impact for each material. See *Appendix 4.2.7.5 Recycled content in plastic, glass, and aluminum products calculator* for list of all emissions factors.

Material reduction in products calculator

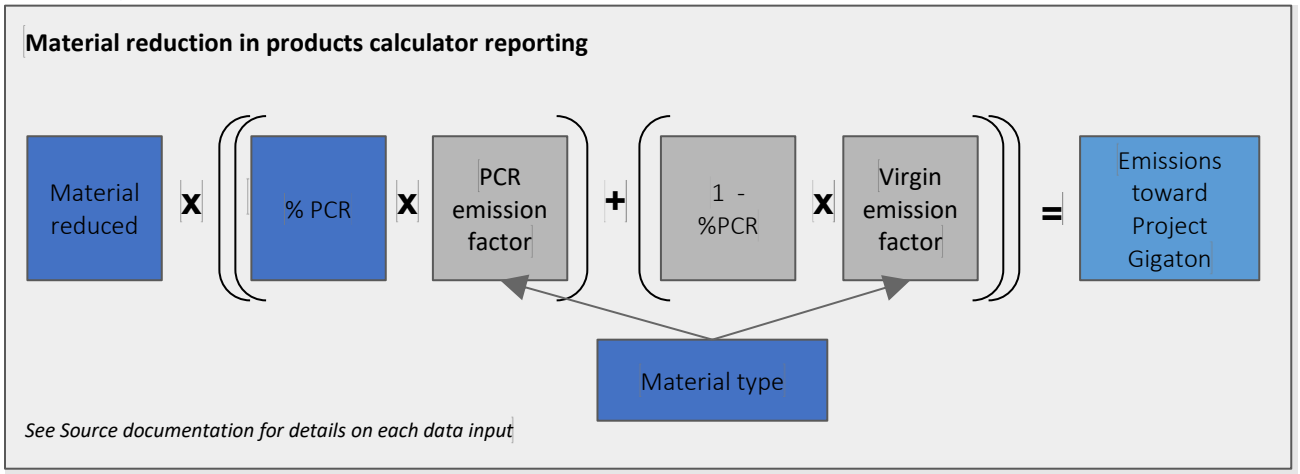
Data component definition

All product materials produce greenhouse gas emissions during their manufacturing. Reducing the amount of material needed to make effective products will avoid unnecessary emissions. This data component captures emissions avoided from material reduction in products. Reducing material in packaging should be reported to *4.2.4.6 Material reduction in packaging calculator*.

Suppliers are asked to input the percentage of material reduced that was post-consumer recycled content, since the greenhouse gas emissions incurred during the manufacture of post-consumer recycled content differ from those or virgin material.

Last updated July 2022

Data component calculation



Supplier input | Third party source | Calculated

Source documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of material quantity and type.
Material reduced	Supplier input	Metric tons	Aggregate mass of material that has been eliminated from the product over the units shipped.
Material type	Supplier input	Select from dropdown	See *Appendix 4.2.4.6 Material reduction in packaging calculator* for list of all dropdown options
PCR	Supplier Input	Percentage	Percentage of recycled material incorporated into the product prior to material reduction.
Emissions factor	Third party source	Metric tons CO2e per metric ton material	See *Appendix 4.2.4.6 Material reduction in packaging calculator* for list of all emissions factors.

Last updated July 2022

Transport

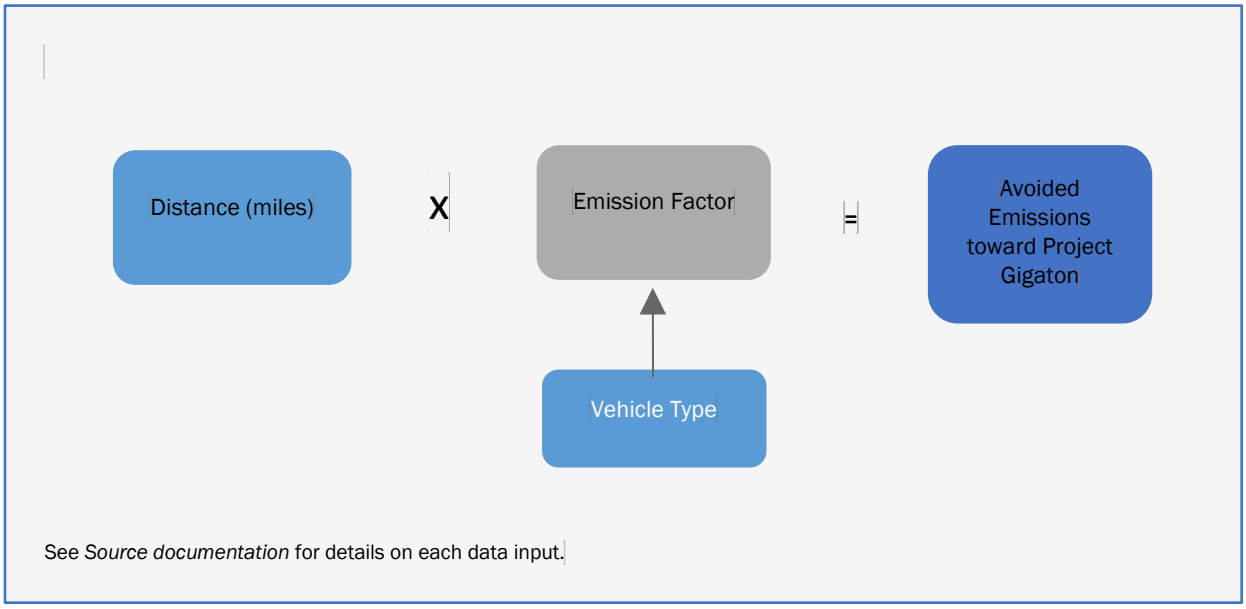
Reduction in Transportation Miles (Road) Calculator

Data Component Definition

All fossil fuel powered vehicles produce greenhouse gas emissions during their operation. Reducing the miles travelled by the fleet avoids unnecessary emissions. This data capture emissions avoided due to reduction in miles travelled.

Suppliers are asked to input the avoid distance in miles, vehicle type and further details of how the transport was optimized.

Data Component Calculation



Supplier input | Third party source | Calculated

Source Documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of avoided miles and vehicle type
Distance	Supplier input	Miles	Avoided miles achieved by optimizing fleet
Vehicle Type	Supplier input	Select from dropdown	
Optimization method	Supplier Input	Select from dropdown	

Emissions factor	Third party source	Metric tons CO2e	Emission factors sourced from the EDF Green freight Guide

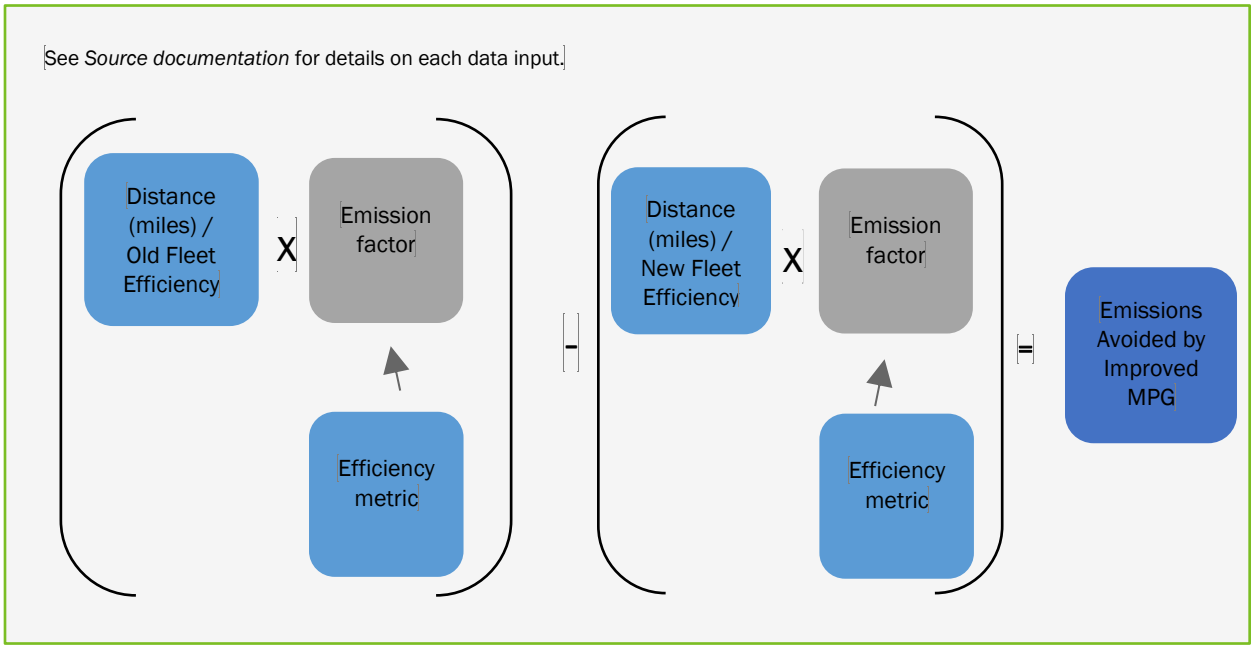
Fleet Efficiency Calculator

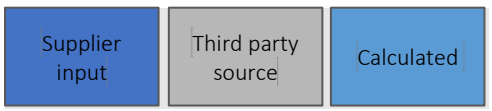
Data Component Definition

All fossil fuel powered vehicles produce greenhouse gas emissions during their operation. Increasing the fleet efficiency avoids unnecessary emissions. This data captures emissions avoided due to an increase in efficiency.

Suppliers are asked to input the distance in miles, efficiency metric, efficiency strategy, old efficiency (MPG etc.) and new efficiency (MPG etc).

Data Component Calculation





Source Documentation

Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of avoided miles and vehicle type

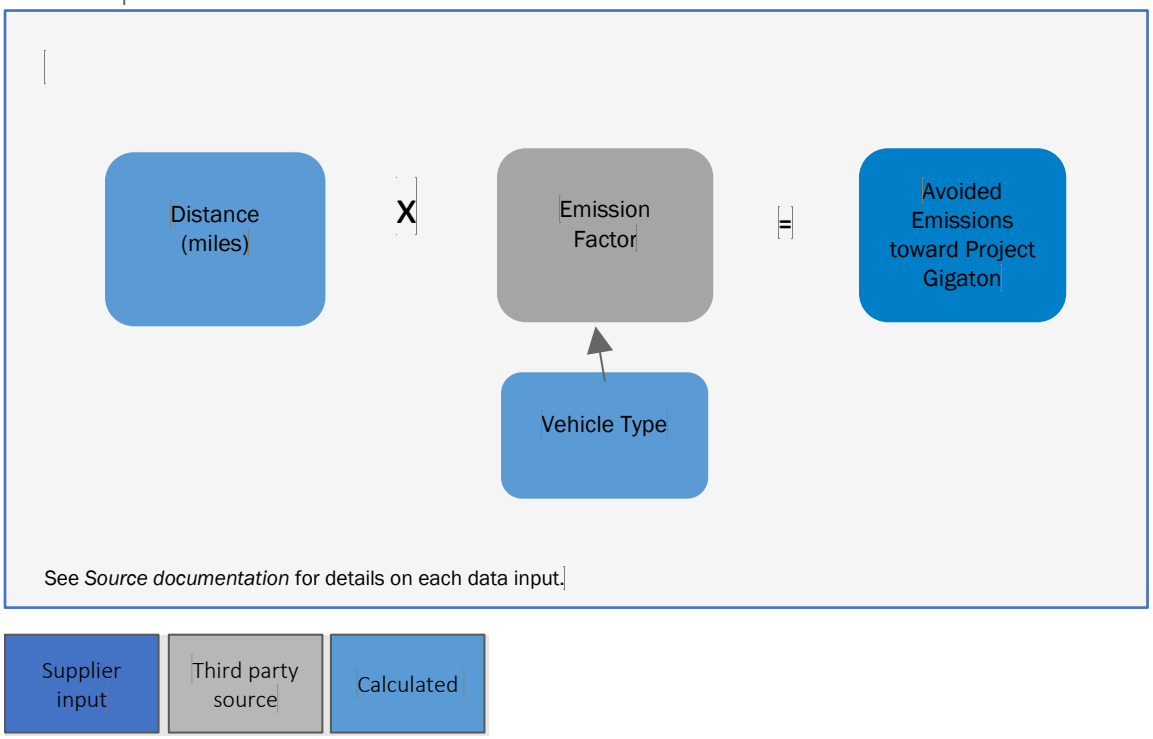
Miles Per Gallon			
Distance	Supplier input	Miles	Avoided miles achieved by optimizing fleet
Efficiency Metric			
Efficiency Strategy	Supplier Input	Select from dropdown	
Emissions factor	Third party source	Metric tons CO2e	Emission factors sourced from the EDF Green freight Guide

Zero Emissions Vehicle Calculator

Data Component Definition

Zero emission vehicles do not produce tail pipe emissions during their operation. Increasing the number of ZEV avoids unnecessary emissions. This data captures emissions avoided due to an increased used of ZEV. Suppliers are asked to input the distance in miles and vehicle type.

Data Component Calculation



Source Documentation

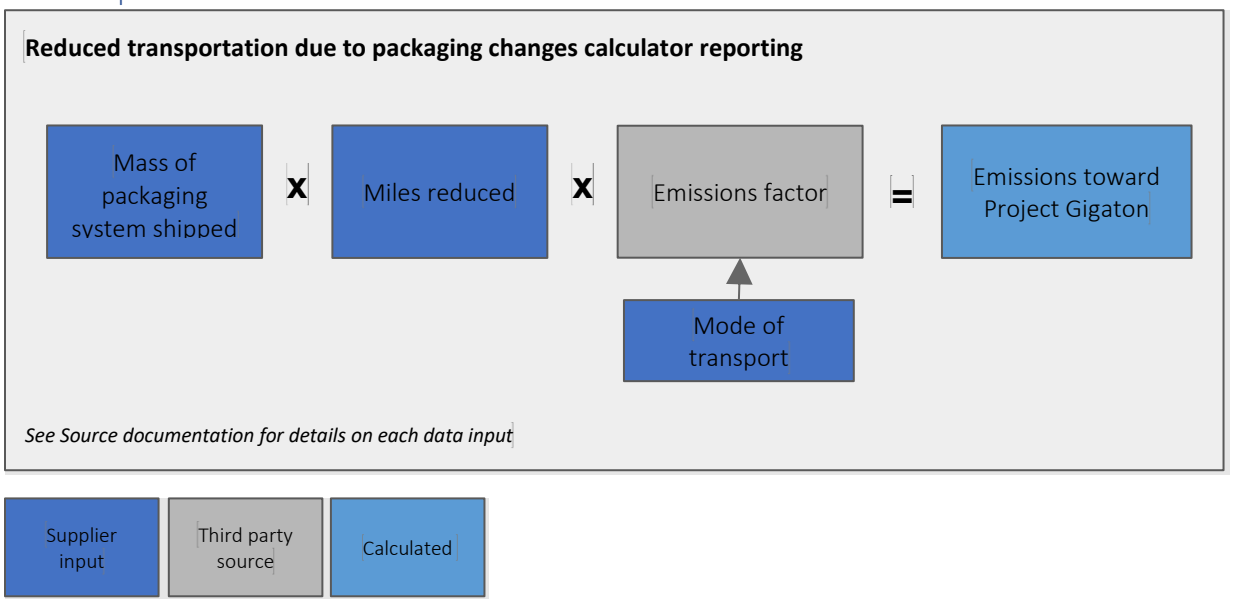
Model inputs	Source	Units	Notes
Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of avoided miles and vehicle type
Distance	Supplier input	Miles	Avoided miles achieved by optimizing fleet
Vehicle Type	Third party source		
Emissions factor	Third party source	Metric tons CO2e	Emission factors sourced from the EDF Green freight Guide

Reduced transportation due to packaging changes calculator

Data component definition

When packaging designs are optimized for volume efficiency, products can be shipped with lessened transportation requirements and greenhouse gas emissions associated with transportation can be avoided.

Data component calculation



Source documentation

Model inputs	Source	Units	Notes

Emissions toward Project Gigaton	Calculated value	Metric tons CO2e	Suppliers may enter multiple combinations of mass, miles, and mode of transportation
Mass of packaging system shipped	Supplier input	Kilograms	Mass of the packaging system that is being shipped; this should be weight of the full pallet being shipped including product, primary packaging, and transport packaging This mass is used to calculate the impact of transporting the product/package
Mode of Transport	Supplier input	Select from dropdown	Possible dropdown selections: Road (Combination Truck, Single Unit Truck, etc.) Rail Sea Air
Emissions factor	Third party source	Metric tons CO2e per kilogram-mile of transport	See *Appendix 4.2.4.7 - Reduced transportation due to packaging changes calculator* for list of all emissions factors
Number of Miles Reduced For Transport of Packaging System	Supplier input	Miles	Number of miles the transport of the packaging system was reduced Used along with the mass to calculate the impact of transporting the product and package this far → kilogram-mile emission based factor

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Reporting using a CDP Questionnaire Appendix

Appendix 4.1.1 – CDP Climate Change Questionnaire

Activity-pillar mapping

Each emissions reduction activity reported to CDP or the GSF aggregate emissions option is mapped and added to the appropriate Project Gigaton Pillar based on the activity type, description of activity, and comment provided. Based on the Activity Type and Description of Activity provided, some emissions reductions will be allocated to a Project Gigaton pillar automatically, a 'direct map'. Other activities will need to be manually reviewed and allocated to a Project Gigaton pillar based on the Activity Description and Comment provided, 'CDP assessed'. Activities mapped to Other Emissions are those that do not align with one of the other pillars.

Projects with an 'estimated lifetime' greater than one year (as reported by the supplier) will be multiplied by the lifetime reported and counted in the year in which the supplier reported the activity to Project Gigaton according to the Temporal treatment specified below. The lower threshold of each date range is used when multiplying the annual CO2e savings. Activities marked as <1 year, 1-2 years or "ongoing" are only counted for one year. The maximum "estimated lifetime" multiplier is the number of reporting years left in Project Gigaton (2017-2031). For example, if a supplier reports an activity with a lifetime of 21-30 years to Project Gigaton in 2018, the maximum multiplier is 14 years (not 20 years). Walmart may review and remove a temporal allocation greater than one year.

For guidance on reporting correctly to both CDP and the GSF aggregate emissions option, including selection of the correct activity type, description, and estimated lifetime, please refer to CDP's guidance document.

See next page for table.

Activity type (dropdown)	Description of activity (dropdown)	Comment	Project Gigaton Pillar mapping	Type of reduction	Temporal treatment	Direct map or assessed?
Energy efficiency: Building fabric	Insulation Maintenance program Other, please specify	Free text	Energy	Absolute	Total emissions saved = metric tons CO2e x Estimated lifetime of the initiative	Direct map
Energy efficiency: Building services	Building controls HVAC Lighting Motors and drives Combined heat and power Other, please specify	Free text	Energy	Absolute	Total emissions saved = metric tons CO2e x Estimated lifetime of the initiative	Direct map

Energy efficiency: Processes	Heat recovery Cooling technology Refrigeration Process optimization Fuel switch Compressed air Combined heat and power Waste water treatment Water reuse Reuse of steam Machine replacement Other, please specify		Energy	Absolute	Total emissions saved = metric tons CO2e x Estimated lifetime of the initiative	Direct map
Fugitive emissions reductions	Agriculture methane capture Agriculture N2O reductions, Landfill methane capture, Oil/natural gas methane leak capture/prevention Refrigerant leakage reduction Other, please specify	Free Text	Energy, Agriculture, or Other	Absolute and/or Avoided	Total emissions saved = metric tons CO2e x Estimated lifetime of the initiative	CDP assessed
Low carbon energy purchase	Biomass Biogas Fuel Cells Geothermal Hydro Solar Hot Water Solar PV Solar CPV Natural Gas Nuclear Carbon Capture & Storage Wind (note: GSF option only) Other, please specify		Energy	Avoided	Should be reported annually - do not multiply by estimated lifetime of initiative	Direct map
Low carbon energy installation	Biomass Biogas Fuel Cells Geothermal Hydro Solar Hot Water Solar PV		Energy	Absolute	Total emissions saved = metric tons CO2e x Estimated lifetime of the initiative	Direct map

	Solar CPV Natural Gas Carbon Capture & Storage Wind (note: GSF option only) Other, please specify					
Process emissions reductions	New equipment Changes in operations Process materials selection Process water Other, please specify		Multiple (Energy, Waste, etc)	Absolute	Total emissions saved = metric tons CO2e x Estimated lifetime of the initiative	CDP assessed
Waste recovery (note: GSF option only)	Waste diversion / management Material reduction		Waste	Avoided	Should be reported annually - do not multiply by estimated lifetime of initiative	Direct map
Other, please specify			Multiple	Absolute or Avoided	For data provided through CDP: Total emissions saved = metric tons CO2e x Estimated lifetime of the initiative For data provided through the GSF aggregate reporting option: Should be reported annually - do not multiply by estimated	CDP assessed

					lifetime of initiative	

Energy Appendix

Appendix 4.2.2.2 – Energy efficiency calculator

Energy efficiency activity types

Below is a list of common energy efficiency activities that may be reported through 4.2.2.2 – Energy efficiency calculator.

Energy efficiency activity types
insulation
maintenance program
building controls
HVAC
lighting
motors and drives
combined heat and power
heat recovery
cooling technology
refrigeration
process optimization
fuel switch
compressed air
combined heat and power
waste water treatment
water reuse
reuse of steam
machine replacement
distribution
other, please specify

Energy type, units and emission factors – gas and fuel

Source: U.S. EPA Center for Corporate Climate Leadership GHG Emission Factors Hub

Energy type	Unit	Emissions Factor (metric tons CO2e per unit)
natural gas	mmBtu	0.05306
blast furnace gas	mmBtu	0.27432
coke oven gas	mmBtu	0.04685
fuel gas	mmBtu	0.059
propane (gas)	mmBtu	0.06146

Aviation gasoline	Gallon	0.00831
Kerosene	Gallon	0.01015
Liquified Petroleum Gases (LPG)	Gallon	0.00568
Motor gasoline	Gallon	0.00878
Propane (liquid)	Gallon	0.00572
Crude oil	Gallon	0.07454
Motor diesel fuel	Gallon	0.01021
Liquified Natural Gas (LNG)	Gallon	0.0045
Electricity	Kilowatt-hour (kWh)	Varies by location (refer to other tables)

Emissions factors by country - electricity

Besides the US and China, emissions can only be calculated based on country selection (opposed to at a region or grid level). Due to these emissions factors being part of a pay subscription, Walmart will not publish the factors.

Source: Country electricity emission factors are based on IEA data from the *Emissions Factors* (2017 edition) © OECD/IEA 2017,www.iea.org/statistics. License: www.iea.org/t&c; as modified by Walmart Inc.

International Energy Agency CO2 Emissions from Fuel Combustion (September 2017)

Country	Metric tons CO2e/kWh
Algeria	0.0005345
Angola	0.0003865
Argentina	0.0003842
Armenia	0.0001635
Australia	0.0007548
Austria	0.0001638
Azerbaijan	0.0004873
Bahrain	0.0007175
Bangladesh	0.0005672
Belarus	0.0003870
Belgium	0.0002258
Benin	0.0006752
Plurinational State of Bolivia	0.0003953
Bosnia and Herzegovina	0.0009009
Botswana	0.0012856
Brazil	0.0001566
Brunei Darussalam	0.0005664
Bulgaria	0.0004978
Cambodia	0.0005689
Cameroon	0.0001712
Canada	0.0001512
Chile	0.0004383

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People's Republic of China	0.0006567
Colombia	0.0002003
Republic of the Congo	0.0002739
Democratic Republic of the Congo	0.0000013
Costa Rica	0.0000066
Cote d'Ivoire	0.0004352
Croatia	0.0002327
Cuba	0.0007705
Curacao/Netherlands Antilles	0.0006891
Cyprus	0.0006491
Czech Republic	0.0005212
Denmark	0.0001742
Dominican Republic	0.0005993
Ecuador	0.0003351
Egypt	0.0004724
El Salvador	0.0002654
Eritrea	0.0008594
Estonia	0.0010255
Ethiopia	0.0000003
Finland	0.0001068
France	0.0000463
Former Yugoslav Republic of Macedonia	0.0006920
Gabon	0.0004115
Georgia	0.0001177
Germany	0.0004501
Ghana	0.0002851
Gibraltar	0.0007625
Greece	0.0005843
Guatemala	0.0004256
Haiti	0.0009105
Honduras	0.0003859
Hong Kong (China)	0.0007344
Hungary	0.0002740
Iceland	0.0000002
India	0.0007713
Indonesia	0.0007326
Islamic Republic of Iran	0.0005510
Iraq	0.0011407
Ireland	0.0004176
Israel	0.0006072
Italy	0.0003424

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Jamaica	0.0006441
Japan	0.0005401
Jordan	0.0005882
Kazakhstan	0.0004157
Kenya	0.0001135
Korea	0.0005264
Democratic People's Republic of Korea	0.0002626
Kosovo	0.0010533
Kuwait	0.0006247
Kyrgyzstan	0.0000925
Latvia	0.0001453
Lebanon	0.0007020
Libya	0.0006595
Lithuania	0.0001857
Luxembourg	0.0002812
Malaysia	0.0006870
Malta	0.0006517
Mauritius	0.0007978
Mexico	0.0004596
Republic of Moldova	0.0004966
Mongolia	0.0012493
Montenegro	0.0005177
Morocco	0.0007017
Mozambique	0.0000647
Myanmar	0.0003044
Namibia	0.0000253
Nepal	0.0000000
Netherlands	0.0004888
Nicaragua	0.0003581
Niger	0.0009881
Nigeria	0.0004129
Norway	0.0000087
New Zealand	0.0001241
Oman	0.0005091
Pakistan	0.0004105
Panama	0.0003129
Paraguay	0.0000001
Peru	0.0002443
Philippines	0.0006143
Poland	0.0007302
Portugal	0.0003465

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Qatar	0.0004863
Romania	0.0003401
Russian Federation	0.0003950
Saudi Arabia	0.0007262
Senegal	0.0006165
Serbia	0.0007572
Singapore	0.0004351
Slovak Republic	0.0001689
Slovenia	0.0002646
South Africa	0.0009903
Spain	0.0002929
Sri Lanka	0.0005137
South Sudan	0.0008552
Sudan	0.0003029
Suriname	0.0003960
Sweden	0.0000108
Switzerland	0.0000242
Syrian Arab Republic	0.0006238
Chinese Taipei	0.0005832
Tajikistan	0.0000076
United Republic of Tanzania	0.0004397
Thailand	0.0005108
Togo	0.0002371
Trinidad and Tobago	0.0005839
Tunisia	0.0004686
Turkey	0.0004411
Turkmenistan	0.0008928
United Arab Emirates	0.0005679
United Kingdom	0.0003487
Ukraine	0.0004073
Uruguay	0.0000514
United States	0.0004556
Uzbekistan	0.0005508
Bolivarian Republic of Venezuela	0.0002823
Viet Nam	0.0004798
Yemen	0.0007339
Zambia	0.0000214
Zimbabwe	0.0007342

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Emissions factors by US grid region - electricity

According to the EPA Center for Corporate Climate Leadership, annual non-baseload output emission factors can be used to estimate greenhouse gas emissions reduction from reductions in electricity use.

Source: U.S. Subregion non-baseload electricity emission factors source: EPA eGrid2016, February 2018. Accessed from the E.P.A. Center for Corporate Climate Leadership Emission Factors Hub (Table 6 of GHG Emission Factors Hub, March 2018).

https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub

eGrid subregion name	CO2 Factor (non-baseload) metric tons CO2/kWh
AKGD (ASCC Alaska Grid)	0.00062042
AKMS (ASCC Miscellaneous)	0.00069572
AZNM (WECC Southwest)	0.00062813
CAMX (WECC California)	0.00042769
ERCT (ERCOT All)	0.00063630
FRCC (FRCC All)	0.00053909
HIMS (HICC Miscellaneous)	0.00069400
HIOA (HICC Oahu)	0.00074276
MROE (MRO East)	0.00078930
MROW (MRO West)	0.00082644
NEWE (NPCC New England)	0.00044230
NWPP (WECC Northwest)	0.00069168
NYCW (NPCC NYC/Westchester)	0.00048158
NYLI (NPCC Long Island)	0.00060727
NYUP (NPCC Upstate NY)	0.00046185
RFCE (RFC East)	0.00065063
RFCM (RFC Michigan)	0.00081923
RFCW (RFC West)	0.00087743
RMPA (WECC Rockies)	0.00076580
SPNO (SPP North)	0.00090301
SPSO (SPP South)	0.00075410
SRMV (SERC Mississippi Valley)	0.00053796
SRMW (SERC Midwest)	0.00088686
SRSO (SERC South)	0.00065930
SRTV (SERC Tennessee Valley)	0.00079714
SRVC (SERC Virginia/Carolina)	0.00064510

Emissions factors by China grid region - electricity

Source: the World Resources Institute ©2017, *Energy Factors for Cross-sector Tools* (March 2017)

Original source: GHG Protocol - A Calculation Tool for GHG Emissions from Fuel Use (2011) (available in Chinese only). The emission factors are calculated using data from the China Energy Statistics Yearbooks, IPCC, and China Key Energy Users Energy Use Reporting System.

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China Region	metric tons CO2e/kWh
Beijing	0.001123
Tianjin	0.001123
Hebei	0.001123
Shanxi	0.001123
Inner Mongolia	0.001123
Liaoning	0.001172
Jilin	0.001172
Heilongjiang	0.001172
Shanghai	0.000827
Jiangsu	0.000827
Zhejiang	0.000827
Anhui	0.000827
Fujian	0.000827
Jiangxi	0.000689
Shandong	0.001123
Henan	0.000689
Hubei	0.000689
Hunan	0.000689
Guangdong	0.00066
Guangxi	0.00066
Hainan	0.000775
Chongqing	0.000689
Sichuan	0.000689
Guizhou	0.00066
Yunnan	0.00066
Shaanxi	0.000853
Gansu	0.000853
Qinghai	0.000853
Ningxia	0.000853
Xinjiang	0.000853

Appendix 4.2.2.3 – Low-carbon energy calculator

Low-carbon energy types:
Biomass
Biogas
Fuel Cells
Geothermal
Hydro
Solar Hot Water
Solar PV
Solar CPV

Nuclear
Wind

Emissions factors by country - electricity

See *Appendix 4.2.2.2 – Energy efficiency calculator, sub-section Emissions factor by country – electricity*

Emissions factors by US grid region - electricity

According to the EPA Center for Corporate Climate Leadership, total output emission factors can be used to estimate greenhouse gas emissions from carbon footprint accounting.

Source: U.S. Subregion total output electricity emission factors source: EPA eGrid2016, February 2018. Accessed from the E.P.A. Center for Corporate Climate Leadership Emission Factors Hub (Table 6 of GHG Emission Factors Hub, March 2018).

https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub

U.S. eGrid Subregion Name	Total Output Emission Factors (metric tons CO2e/kWh)
ASCC Alaska Grid	0.000421721
ASCC Miscellaneous	0.000309856
WECC Southwest	0.000399103
WECC California	0.000258769
ERCOT All	0.000520746
FRCC All	0.000490228
HICC Miscellaneous	0.000429791
HICC Oahu	0.000676019
MRO East	0.000760462
MRO West	0.000623964
NPCC New England	0.000261614
WECC Northwest	0.000414322
NPCC NYC/Westchester	0.000302518
NPCC Long Island	0.000546272
NPCC Upstate NY	0.000166759
RFC East	0.000378512
RFC Michigan	0.00069972
RFC West	0.000630887
WECC Rockies	0.000793524
SPP North	0.000719606
SPP South	0.000673494
SERC Mississippi Valley	0.000465892
SERC Midwest	0.000810028
SERC South	0.000521964
SERC Tennessee Valley	0.000610271
SERC Virginia/Carolina	0.000391353

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Emissions factors by China grid region – electricity

See *Appendix 4.2.2.2 – Energy efficiency calculator*, sub-section *Emissions factor by China grid region – electricity*

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Waste Appendix

Appendix 4.2.3.2 – Waste diversion calculator

Differences between the EPA WARM model and Project Gigaton waste diversion calculation

In the WARM model, greenhouse gas savings are calculated by comparing the emissions associated with managing materials under an alternative scenario (e.g. donation, recycling) with the emissions associated with the user's baseline scenario (e.g. landfilling, combustion), as opposed to simply multiplying the quantity of materials managed by an emission factor. For example, the greenhouse savings of recycling one (1) short ton (standard U.S. ton) of aluminum cans instead of landfilling them would be calculated as follows:

(1 short ton × -9.11 MTCO2E/short ton) - (1 short ton × 0.02 MTCO2E/short ton) = -9.13 MTCO2E

In the waste diversion calculator, Walmart is simply multiplying the quantity of materials managed by the final management scenario's emission factor (which is more conservative) because it does not include the difference in management options. Walmart does not want to collect additional information about the baseline scenario of each material for each supplier. Suppliers who are using the EPA WARM model will capture the complete benefit due the consideration of a baseline scenario; Suppliers who use Walmart's calculator will only be accounting for the benefit from recovery.

Definition of waste management practices

According to EPA WARM guidance:

- Source Reduction – refers to practices that reduce the amount of materials entering the waste stream, including changes in the design, manufacture, purchase or use of materials.
- Recycling – the separation and collection of wastes, their subsequent transformation or remanufacture into usable or marketable products or materials, and the purchase of products made from recyclable materials.
- Composting – aerobic microbial decomposition that transforms organic substrates into a stable, humus-like material.
- Anaerobic Digestion – a biological process in which microorganisms break down organic material in the absence of oxygen. While breaking down this matter, the microorganisms release biogas and leave behind digested solids referred to as a digestate.
- Combustion – the burning of municipal solid waste at a waste-to-energy facility that results in emissions of CO_2 and N_2O.

In addition to the waste management practices listed in the EPA WARM model, the waste diversion calculator includes "donated" and "sent to animal feed" as management types.

Other waste management pathways:

- Donation – Food and merchandise recovered for distribution to those in need.
- Animal Feed – Direct feeding of food throwaways to livestock (swine, dairy, big cats, fish, etc.).

General and Food Waste emissions factors

All emissions factors units are metric ton CO2e/short ton of material and are from the EPA WARM tool (unless otherwise noted).

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For food, suppliers may submit data at the category level (non-meat, meat). Data for food not harvested/plowed in, food sent to sewer/wastewater treatment, and food landfilled and combusted is not part of this pathway.

To generate the emission factors for "donation" and "sent to animal feed" for food, the waste diversion emissions calculator utilizes EPA's donation modeling guidance which provides different emission factors per food category. Electronics have also been included as a commonly donated item and an emission factor has been assigned using EPA's reuse guidance.

Material	Management practice						
	Source Reduced	Donated	Recycled	Composted	Anaerobically Digested	Sent to animal feed	Combusted
Aluminum Cans	4.80	NA	9.11	NA	NA	NA	N/A
Aluminum Ingot	7.48	NA	7.20	NA	NA	NA	N/A
Steel Cans	3.03	NA	1.83	NA	NA	NA	1.59
Copper Wire	6.72	NA	4.49	NA	NA	NA	N/A
Glass	0.53	NA	0.28	NA	NA	NA	N/A
HDPE	1.42	NA	0.85	NA	NA	NA	N/A
LDPE	1.80	NA	NA	NA	NA	NA	N/A
PET	2.17	NA	1.15	NA	NA	NA	N/A
LLDPE	1.58	NA	NA	NA	NA	NA	N/A
PP	1.54	NA	NA	NA	NA	NA	N/A
PS	2.50	NA	NA	NA	NA	NA	N/A
PVC	1.93	NA	NA	NA	NA	NA	N/A
PLA	2.45	NA	NA	0.15	NA	NA	0.63
Corrugated Containers	5.58	NA	3.14	NA	NA	NA	0.49
Magazines/Third-class Mail	8.57	NA	3.07	NA	NA	NA	0.35
Newspaper	4.77	NA	2.75	NA	NA	NA	0.58
Office Paper	7.95	NA	2.86	NA	NA	NA	0.47
Phonebooks	6.17	NA	2.62	NA	NA	NA	0.56
Textbooks	9.02	NA	3.10	NA	NA	NA	0.47
Dimensional Lumber	2.03	NA	2.46	NA	NA	NA	0.61
Non-meat food waste	0.76	0.76	0.18	0.18	0.04	0.76	0.13
Meat food waste	15.10	15.10	0.18	0.18	0.04	0.54	NA
Yard Trimmings, Grass, Leaves, Branches	NA	NA	NA	0.15	0.09	NA	0.17
Mixed Paper	6.07	NA	3.55	NA	NA	NA	0.49
Mixed Metals	3.65	NA	4.39	NA	NA	NA	1.02
Mixed Plastics	1.87	NA	1.03	NA	NA	NA	NA
Mixed Recyclables	NA	NA	2.85	NA	NA	NA	0.42
Mixed MSW	NA	NA	NA	NA	NA	NA	0.07
Carpet	3.86	NA	2.38	NA	NA	NA	NA
Personal Computers	50.49	47.98	2.50	NA	NA	NA	0.19
Concrete	0.11	NA	0.08	NA	NA	NA	NA
Fly Ash	NA	NA	0.87	NA	NA	NA	NA
Tires	4.30	NA	0.38	NA	NA	NA	NA

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Appendix 4.2.3.3 - Date labeling calculator

Emissions factor development approach

The date labeling methodology was developed in collaboration of Walmart, ReFED, WWF and Ohio State University, with support from the Ohio Agriculture Research and Development Center. The full methodology is known as the Complete Standardized Date Labeling Impact Framework Methodology ("Measuring the impact of standardized date labels on consumer food waste and resulting greenhouse gas emissions reduction") and can be found here.

The below table is an example of the dropdown selections and emissions factors driving the calculator; a complete list of all fields and combinations can be found here.

Food Category	Food Subcategory	Previous Verbiage	Current Verbiage	# of Days Added for Dropdown	Emissions factor (metric tons CO2e avoided per ton of food product sold with standardized labels)
Beverages	Coffee, tea & cocoa	BEST BEFORE	BEST IF USED BY	0	0.001
Breads & Bakery	Breads & bakery products	DATE ONLY, NO VERBIAGE	BEST IF USED BY	1	0.008
Dairy & Eggs	Butter, margarine & spreads	BEST BEFORE	USE BY	2	0.148
Dry Goods	Baking	EXPIRES ON	BEST IF USED BY	4-6	0.013
Fresh Meals & Snacks	Fresh meals & snacks (non-meat)	BEST BEFORE	USE BY	3+	0.032
Fresh Meat & Seafood (inc. Deli Meats)	Beef	BEST BEFORE	BEST IF USED BY	2	1.188
Fresh Packaged Produce	Cut fruit	DATE ONLY, NO VERBIAGE	BEST IF USED BY	1	0.004
Frozen	Frozen vegetables	BEST BEFORE	BEST IF USED BY	10+	0.002

The emissions factor used in this methodology is a consolidated factor calculated by ReFed and derived from lower level factors, as explained below:

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"Consolidated" Emissions Factor = *Food Waste Avoided Factor* x *MTCO2e per Ton of Consumer Food Waste*

Food Waste Avoided Factor = % consumer waste × % consumer waste due to past date labels × % consumer waste reduction due to standardized date labeling

Parameter	Definition	Source
Percent Consumer Waste	Percent consumer waste occurring in the home for each food type	USDA ERS, "Food Availability (Per Capita) Data System," 29 October 2018. [Online]. Available: https://www.ers.usda.gov/data-products/food-availability-per-capita-data-system/. [Accessed 21 January 2019]
Percent Consumer Waste Due to Past Date Labels	Percent consumer home waste due to labels that are past the package date	NRDC, "Estimating Quantities and Types of Food Waste at the City Level," October 2017. [Online]. Available: https://www.nrdc.org/sites/default/files/food-waste-city-level-report.pdf. [Accessed 21 January 2019].
Percent Consumer Waste Reduced Due to Standardized Date Labeling	Percent of consumer waste reduced by transitioning to standardized date labels, accounting for original label verbiage and changes to label dates	Ohio State University Original Research (See Appendix C of Standardized Date Labeling Impact Framework Methodology)

MTCO2e per Ton of Consumer Food Waste = *Source Emissions Reduction + Disposal Emission Reduction*

Parameter	Definition	Source
Source emissions reduction factor	Breakdown of consumer food waste by disposal type	U.S. EPA, "Waste Reduction Model (WARM)," 31 October 2018. [Online]. Available: https://www.epa.gov/warm. [Accessed 21 January 2019].
Disposal emissions reduction factor	GHG emissions associated with food product category production and disposal destination	U.S. EPA, "Waste Reduction Model (WARM)," 31 October 2018. [Online]. Available: https://www.epa.gov/warm. [Accessed 21 January 2019].

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Packaging Appendix

Appendix 4.2.4.5 - Recycled content in plastic, glass, and aluminum packaging calculator

Post-consumer recycled content (PCR) definition

Refers to the amount of post-consumer recycled content contained in the package as defined by ISO 14021. The impact of converting the PCR material, so that it can be used as an input into a new package, is considered in this impact. The PCR material is incorporated into the production of the package and therefore reduces the virgin impact required to make the package.

Material Virgin and PCR Emissions Factors

These emissions factors are sourced from the COMPASS method using background data from ecoinvent 3 libraries. The IPCC 2013 method with climate feedback loops considered is used to calculate the avoided GHG impacts of the packages. The below emissions factors are for the virgin and PCR material impact for various packaging materials. The table also includes the emission factors for the most common modes of transport.

An additional assumption is made that the recycled material created via the recycling of the improved packaging is not the same material used by suppliers when they report increased recycled content usage in pathway 4.2.4.5 or 4.2.5.3. The emission factors in 4.2.4.9 include the greenhouse gas emissions benefits associated with the use of recycled content to offset virgin material manufacturing in new production processes, so this assumption means there is no "double counting" if a supplier reports both improved recyclability and improved usage of recycled content through pathways 4.2.4.9,4.2.4.5, and 4.2.5.3 respectively.

To derive emissions factors in metric tons CO2e per metric ton material, the kilograms CO2e per metric ton material were divided by 1000.

Material type	Source	Kilograms CO2e per metric ton (tonne) material	Metric tons CO2e per metric ton (tonne) material	Emissions factor used (virgin – PCR)
Polyethylene Terephthalate (PET)	Virgin	3283.0463	3.283	1.852
	PCR	1431.1489	1.431	
High Density Polyethylene (HDPE)	Virgin	2178.0869	2.178	1.405
	PCR	773.26874	0.773	
Low Density Polyethylene (LDPE)	Virgin	2374.0811	2.374	1.601
	PCR	773.26874	0.773	
Polypropylene (PP)	Virgin	2193.4122	2.193	1.42
	PCR	773.26874	0.773	
Container Glass	Virgin	1257.5319	1.258	0.274
	PCR	983.76786	0.984	
Aluminum	Virgin	19261.71	19.262	18.447
	PCR	815.00396	0.815	
Steel	Virgin	1777.0328	1.777	1.042
	PCR	734.6346	0.735	

Appendix 4.2.4.6 - Material reduction in packaging calculator

Please note, section *4.2.7.6 - Material reduction in products calculator* also refers to this appendix due to the similarity in methodologies.

See *Appendix - 4.2.4.5 Recycled content in plastic, glass, and aluminum packaging calculator* for information on the source of all factors except for boxboard and corrugate. See *Appendix 4.2.5.3 - Recycled content pulp and paper in packaging calculator* for boxboard and corrugate.

Material type	Source	Kilograms CO2e per metric ton (tonne) material	Metric tons CO2e per metric ton (tonne) material
Polyethylene Terephthalate (PET)	Virgin	3283.0463	3.283
	PCR	1431.1489	1.431
High Density Polyethylene (HDPE)	Virgin	2178.0869	2.178
	PCR	773.26874	0.773
Low Density Polyethylene (LDPE)	Virgin	2374.0811	2.374
	PCR	773.26874	0.773
Polypropylene (PP)	Virgin	2193.4122	2.193
	PCR	773.26874	0.773
Container Glass	Virgin	1257.5319	1.258
	PCR	983.76786	0.984
Aluminum	Virgin	19261.71	19.262
	PCR	815.00396	0.815
Polystyrene (PS)*	Virgin	3942.2633	3.942
Expanded Polystyrene (EPS)*	Virgin	3823.6027	3.824
Steel	Virgin	1777.0328	1.777
	PCR	734.6346	0.735
Boxboard	Virgin	281.57054	0.282
	PCR	See *Appendix 4.2.5.3*	0.05
Corrugated	Virgin	841.10102	0.841
	PCR	See *Appendix 4.2.5.3*	0.05

*Recycled content emissions factors are unavailable, thus these are listed for reference only and are not available as part of the calcualtor.

Appendix 4.2.4.7 - Reduced transportation due to packaging changes calculator

The miles of transport reduced in this equation is user defined. It could be based on using less pallets to ship the same amount of product/package and therefore less trucks corresponding to less distance

travelled. The supplier needs to determine how much transportation has been reduced by overall for a particular packaging system.

To derive emissions factors in metric tons CO2e per kilogram-mile of transport, the kilograms CO2e per kilogram-kilometer of transport factors were multiplied by 0.621371 and divided by 1000.

Mode of transport	Vehicle Type	Kilograms CO2e per kilogram-kilometer (kgkm) of transport	Metric tons CO2e per kilogram-mile of transport
Air	Air Freight	0.001119844	0.000000696
	International Air Freight	0.001088329	0.000000676
Rail	Freight Train, diesel	5.88E-05	0.000000037
Road	Truck > 32 ton	9.17E-05	0.000000057
	Truck 7.5-16 ton	0.000217817	0.000000135
Sea	Barge	4.86E-05	0.000000030
	Transoceanic Freight Ship	1.15E-05	0.000000007

Appendix 4.2.4.8 - Material substitution calculator

See *Appendix - 4.2.4.5 Recycled content in plastic, glass, and aluminum packaging calculator* for information on the source of all factors except for boxboard and corrugate. See *Appendix 4.2.5.3 - Recycled content pulp and paper in packaging calculator* for boxboard and corrugate.

Material type	Source	Kilograms CO2e per metric ton (tonne) material	Metric tons CO2e per metric ton (tonne) material
Polyethylene Terephthalate (PET)	Virgin	3283.0463	3.283
	PCR	1431.1489	1.431
High Density Polyethylene (HDPE)	Virgin	2178.0869	2.178
	PCR	773.26874	0.773
Low Density Polyethylene (LDPE)	Virgin	2374.0811	2.374
	PCR	773.26874	0.773
Polypropylene (PP)	Virgin	2193.4122	2.193
	PCR	773.26874	0.773
Container Glass	Virgin	1257.5319	1.258
	PCR	983.76786	0.984
Aluminum	Virgin	19261.71	19.262
	PCR	815.00396	0.815
Steel	Virgin	1777.0328	1.777
	PCR	734.6346	0.735
Boxboard	Virgin	281.57054	0.282
	PCR	See *Appendix 4.2.5.3*	0.05
Corrugated	Virgin	841.10102	0.841
	PCR	See *Appendix 4.2.5.3*	0.05

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Appendix 4.2.4.9 - Design-for-recyclability improvements

Methodology assumptions

For these calculations, an assumption is made that the previous design entirely prevented the packaging from being recycled and that 100% of that packaging ended up in landfill. With the improved design, Walmart assumes that recycling is enabled, and emissions reductions are calculated based on the EPA's metrics for the national average recycling rate for the waste type (e.g., PET bottle, corrugate). Because this methodology uses US national average recycling rates, suppliers may only report data for packaging in the United States. Data entered for the material type of the bottle/container determines the recycling rate and the emissions factor used for the calculation.

Emissions factors are determined by the following formula:

(Recycling emissions factor + landfill emissions factor) x recycling rate = emissions factor for packaging change

Sources:

- Emissions factors: Documentation for Greenhouse Gas Emission and Energy Factors Used in the Waste Reduction Model (WARM), US EPA, February 2016
- Advancing Sustainable Materials Management: 2014 Tables and Figures, US EPA, December 2016

Emissions factors

Packaging change	Material type	Avoided emissions factor (metric tons CO2e per short ton)			Recycling rate	Emissions factor for Project Gigaton
		Recycling	Landfill	Total		
Removed or replaced wax coatings from corrugated trays or cases	Corrugate	3.12	0.23	3.35	89.5%	**2.99825**
Removed or replaced non-recyclable PETG, non-recyclable shrink-wrap sleeve, or non-recyclable pressure sensitive labels from PET packaging	PET	1.12	0.02	1.14	31.2%	**.35568**
Removed or replaced metal, PVC, and/or silicone closures, pumps, or sprayers from PET packaging	PET	1.12	0.02	1.14	31.2%	**.35568**
Removed or replaced metal,	HDPE	.87	0.02	.89	21.6%	**.19224**

PVC, and/or silicone closures, pumps, or sprayers from HDPE packaging						

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Nature Appendix

Appendix 4.2.5.1 – Avoided Land Use Change/Avoided Deforestation

Avoided Emissions Methodology

General methodology for emission factor calculation

The assumption used to calculate the avoided emissions for reducing deforestation pressures is that if Walmart sources "deforestation-free" commodities, the footprint is lower than the conventional LUC footprint. Avoided emissions are therefore given by commodity after one year being deforestation-free. This is reflected as the "avoided emission LUC emission factor". Commodities do not automatically retain deforestation-free status after the initial deforestation-free year nor do they accumulate/aggregate credits year to year. Instead, a security factor ensures that the action the supplier takes is continuously implemented over the span of 20 years and the full credit is therefore evenly distributed across 20 years of action. This approach rewards long-term action without overestimating the impact reduction during the first year and aligns with the IPCC legacy emission factor.

The approach used to calculate the "avoided deforestation" emission factors for all of Walmart's commodities is described by the following equation:

Conventional LUC EF/ security factor * proof factor = Avoided Emissions LUC EF (kg CO2eq / kg of commodity sourced)

Whereas:

- Conventional LUC EF = LUC per crop and country (in kg CO2eq / kg commodity)
- Security factor = set to 20 years, represents deforestation-free credits allocation
- Proof factor = factor that indicates level of proof from suppliers. The methodology distinguishes between:
    - 0% auto-declared, no proof / documentation
    - 50% auto-declared, with remote sensing desktop analysis (no certification)
    - 100% certified or reviewed by 3rd party aerial monitoring tool (includes both certification and aerial monitoring tools)

The proof factor definitions are:

- *Auto-declared, no proof / documentation*: The supplier makes a claim that they bought verified deforestation-free commodities but has no documentation (e.g., verification tool documentation, etc.) to back up this claim.
- *Auto-declared, using remote sensed analysis:* The supplier makes a claim that they bought deforestation-free commodities and has documentation (e.g., GFW Pro analysis) to back up this claim.
- Certified or 3rd party reviewed/aerial monitoring subscription: The supplier bought third-party certified commodities or verified deforestation-free commodities that a 3rd party reviewed and has documentation verifying this claim with the supplier.

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Actions considered by commodity and proof factors by action

The following list of actions count towards Project Gigaton and have avoided GHG emissions associated with them (see Table 4 for the specific conversion factors). The table also shows how they align to Walmart's basic, better, best framework.

Table 3: Actions by commodity and program allowed

Commodity	Action per Walmart methodology	Programs
Beef/Pasture	Sourcing verified deforestation-free beef using aerial verification tools	N/A: Terras, AgroTools, Safe Trace, SIMFaz
	Sourcing verified deforestation-free beef by ensuring feed is deforestation-free	N/A: Deforestation-free feed commitments
Avocado	Sourcing verified deforestation-free avocado using aerial verification tools	N/A: Satelligence, Starling, GFW Better: Rainforest Alliance
Cocoa	Sourcing certified cocoa	Basic: Fair Trade Better: Rainforest Alliance (RA)
Coffee	Sourcing certified coffee	Basic: Fair Trade Better: RA
Corn	Sourcing verified deforestation-free corn	N/A: Satelligence, Starling, GFW
Cotton	Sourcing verified deforestation-free cotton	N/A: Satelligence, Starling, GFW
Palm Oil	Sourcing certified palm oil (the assumption is that by sourcing certified palm oil from these regions from certifications that exclude land use change or conversion of natural habitat - you avoid these emissions from deforestation, peat oxidation and fires)	Basic: RSPO (Mass Balance), RA, ISCC, Better: RSPO (segregated, identity preserved)
Soy	Either by sourcing certified or verified deforestation-free soy using certifications and aerial verification tools	N/A : Terras, AgroTools, SafeTrace, SIMFaz (Agrosatelite) Basic : ProTerra, Cefetra Responsible Soy Better : RTRS
Wheat	Sourcing verified deforestation-free wheat	N/A: Satelligence, Starling, GFW
Pulp & Paper	Sourcing certified pulp & paper	Basic: PEFC*in the following countries: Anguilla, Belgium, Czech Republic, Denmark, Estonia, Germany, Hungary, Ireland, Latvia, Lithuania, Netherlands, Portugal, South Korea, Spain, Switzerland, United Kingdom

		Better: FSC
Farmed Shrimp	Sourcing conversion free shrimp	Better: ASC N/A: BAP, GG, AIP

Avoided deforestation emission factors

The table below includes the specific avoided emission factors used to calculate contributions towards Project Gigaton.

Table 4 Avoided deforestation factors by commodity, country, and validation mechanism.

Commodity	Geography	Validation Mechanism	Avoided Emission Factor	Units	Source
AVOCADO	Indonesia	Rainforest Alliance	0.096	ton CO2e/ton of commodity	WWF
AVOCADO	Indonesia	GFW Pro	0.048	ton CO2e/ton of commodity	WWF
AVOCADO	Peru	Rainforest Alliance	0.050	ton CO2e/ton of commodity	WWF
AVOCADO	Peru	GFW Pro	0.025	ton CO2e/ton of commodity	WWF
AVOCADO	Venezuela	Rainforest Alliance	0.045	ton CO2e/ton of commodity	WWF
AVOCADO	Venezuela	GFW Pro	0.023	ton CO2e/ton of commodity	WWF
COCOA	Angola	Rainforest Alliance	1.37	ton CO2e/ton of commodity	WWF
COCOA	Angola	Fair Trade International	1.37	ton CO2e/ton of commodity	WWF
COCOA	Angola	GFW Pro	0.685	ton CO2e/ton of commodity	WWF
COCOA	Brazil	Rainforest Alliance	0.44	ton CO2e/ton of commodity	WWF
COCOA	Brazil	Fair Trade International	0.44	ton CO2e/ton of commodity	WWF
COCOA	Brazil	GFW Pro	0.22	ton CO2e/ton of commodity	WWF

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COCOA	Cameroon	Rainforest Alliance	1.52	ton CO2e/ton of commodity	WWF
COCOA	Cameroon	Fair Trade International	1.52	ton CO2e/ton of commodity	WWF
COCOA	Cameroon	GFW Pro	0.76	ton CO2e/ton of commodity	WWF
COCOA	Cote d'Ivoire	Rainforest Alliance	0.66	ton CO2e/ton of commodity	WWF
COCOA	Cote d'Ivoire	Fair Trade International	0.66	ton CO2e/ton of commodity	WWF
COCOA	Cote d'Ivoire	GFW Pro	0.33	ton CO2e/ton of commodity	WWF
COCOA	Ghana	Rainforest Alliance	0.77	ton CO2e/ton of commodity	WWF
COCOA	Ghana	Fair Trade International	0.77	ton CO2e/ton of commodity	WWF
COCOA	Ghana	GFW Pro	0.385	ton CO2e/ton of commodity	WWF
COCOA	Indonesia	Rainforest Alliance	3.12	ton CO2e/ton of commodity	WWF
COCOA	Indonesia	Fair Trade International	3.12	ton CO2e/ton of commodity	WWF
COCOA	Indonesia	GFW Pro	1.560	ton CO2e/ton of commodity	WWF
COCOA	Madagascar	Rainforest Alliance	0.57	ton CO2e/ton of commodity	WWF
COCOA	Madagascar	Fair Trade International	0.57	ton CO2e/ton of commodity	WWF
COCOA	Madagascar	GFW Pro	0.285	ton CO2e/ton of commodity	WWF
COCOA	Malaysia	Rainforest Alliance	6.64	ton CO2e/ton of commodity	WWF
COCOA	Malaysia	Fair Trade International	6.64	ton CO2e/ton of commodity	WWF
COCOA	Malaysia	GFW Pro	3.320	ton CO2e/ton of commodity	WWF

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COCOA	Nigeria	Rainforest Alliance	1.33	ton CO2e/ton of commodity	WWF
COCOA	Nigeria	Fair Trade International	1.33	ton CO2e/ton of commodity	WWF
COCOA	Nigeria	GFW Pro	0.665	ton CO2e/ton of commodity	WWF
COCOA	Papua New Guinea	Rainforest Alliance	7	ton CO2e/ton of commodity	WWF
COCOA	Papua New Guinea	Fair Trade International	7	ton CO2e/ton of commodity	WWF
COCOA	Papua New Guinea	GFW Pro	3.500	ton CO2e/ton of commodity	WWF
COCOA	Peru	Rainforest Alliance	0.68	ton CO2e/ton of commodity	WWF
COCOA	Peru	Fair Trade International	0.68	ton CO2e/ton of commodity	WWF
COCOA	Peru	GFW Pro	0.340	ton CO2e/ton of commodity	WWF
COCOA	Sierra Leone	Rainforest Alliance	0.2	ton CO2e/ton of commodity	WWF
COCOA	Sierra Leone	Fair Trade International	0.2	ton CO2e/ton of commodity	WWF
COCOA	Sierra Leone	GFW Pro	0.100	ton CO2e/ton of commodity	WWF
COCOA	Venezuela	Rainforest Alliance	1.03	ton CO2e/ton of commodity	WWF
COCOA	Venezuela	Fair Trade International	1.03	ton CO2e/ton of commodity	WWF
COCOA	Venezuela	GFW Pro	0.515	ton CO2e/ton of commodity	WWF
COFFEE	Brazil	Fair Trade International	0.07	ton CO2e/ton of commodity	WWF
COFFEE	Brazil	Rainforest Alliance	0.07	ton CO2e/ton of commodity	WWF
COFFEE	Brazil	GFW Pro	0.035	ton CO2e/ton of commodity	WWF

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COFFEE	Colombia	Fair Trade International	0.33	ton CO2e/ton of commodity	WWF
COFFEE	Colombia	Rainforest Alliance	0.33	ton CO2e/ton of commodity	WWF
COFFEE	Colombia	GFW Pro	0.165	ton CO2e/ton of commodity	WWF
COFFEE	Indonesia	Fair Trade International	1.7	ton CO2e/ton of commodity	WWF
COFFEE	Indonesia	Rainforest Alliance	1.7	ton CO2e/ton of commodity	WWF
COFFEE	Indonesia	GFW Pro	0.85	ton CO2e/ton of commodity	WWF
COFFEE	Malaysia	Fair Trade International	0.31	ton CO2e/ton of commodity	WWF
COFFEE	Malaysia	Rainforest Alliance	0.31	ton CO2e/ton of commodity	WWF
COFFEE	Malaysia	GFW Pro	0.155	ton CO2e/ton of commodity	WWF
COFFEE	Peru	Fair Trade International	0.54	ton CO2e/ton of commodity	WWF
COFFEE	Peru	Rainforest Alliance	0.54	ton CO2e/ton of commodity	WWF
COFFEE	Peru	GFW Pro	0.27	ton CO2e/ton of commodity	WWF
COFFEE	Uganda	Fair Trade International	0.47	ton CO2e/ton of commodity	WWF
COFFEE	Uganda	Rainforest Alliance	0.47	ton CO2e/ton of commodity	WWF
COFFEE	Uganda	GFW Pro	0.235	ton CO2e/ton of commodity	WWF
MAIZE/CORN	Argentina	GFW Pro	0.025	ton CO2e/ton of commodity	WWF
MAIZE/CORN	Brazil	GFW Pro	0.05	ton CO2e/ton of commodity	WWF
MAIZE/CORN	China	GFW Pro	0.002	ton CO2e/ton of commodity	WWF

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MAIZE/CORN	Russia	GFW Pro	0.025	ton CO2e/ton of commodity	WWF
MAIZE/CORN	South Africa	GFW Pro	0.004	ton CO2e/ton of commodity	WWF
MAIZE/CORN	Ukraine	GFW Pro	0.0015	ton CO2e/ton of commodity	WWF
MAIZE/CORN	USA	GFW Pro	0.002	ton CO2e/ton of commodity	WWF
COTTON	Brazil	GFW Pro	0.35	ton CO2e/ton of commodity	WWF
COTTON	Cameroon	GFW Pro	1.66	ton CO2e/ton of commodity	WWF
COTTON	Central African Republic	GFW Pro	4.89	ton CO2e/ton of commodity	WWF
COTTON	China	GFW Pro	0.005	ton CO2e/ton of commodity	WWF
COTTON	India	GFW Pro	0.005	ton CO2e/ton of commodity	WWF
COTTON	Nigeria	GFW Pro	1.28	ton CO2e/ton of commodity	WWF
COTTON	USA	GFW Pro	0.03	ton CO2e/ton of commodity	WWF
COTTON	Vietnam	GFW Pro	0.12	ton CO2e/ton of commodity	WWF
PALM	Cameroon	RSPO	0.024	ton CO2e/ton of commodity	WWF
PALM	Cameroon	Rainforest Alliance	0.024	ton CO2e/ton of commodity	WWF
PALM	Cameroon	International Sustainability and Carbon Certification (ISCC)	0.024	ton CO2e/ton of commodity	WWF
PALM	Cameroon	GFW Pro	0.012	ton CO2e/ton of commodity	WWF
PALM	Colombia	RSPO	0.01	ton CO2e/ton of commodity	WWF

PALM	Colombia	Rainforest Alliance	0.01	ton CO2e/ton of commodity	WWF
PALM	Colombia	International Sustainability and Carbon Certification (ISCC)	0.01	ton CO2e/ton of commodity	WWF
PALM	Colombia	GFW Pro	0.005	ton CO2e/ton of commodity	WWF
PALM	Democratic Republic of Congo	RSPO	0.03	ton CO2e/ton of commodity	WWF
PALM	Democratic Republic of Congo	Rainforest Alliance	0.03	ton CO2e/ton of commodity	WWF
PALM	Democratic Republic of Congo	International Sustainability and Carbon Certification (ISCC)	0.03	ton CO2e/ton of commodity	WWF
PALM	Democratic Republic of Congo	GFW Pro	0.015	ton CO2e/ton of commodity	WWF
PALM	Ecuador	RSPO	0.022	ton CO2e/ton of commodity	WWF
PALM	Ecuador	Rainforest Alliance	0.022	ton CO2e/ton of commodity	WWF
PALM	Ecuador	International Sustainability and Carbon Certification (ISCC)	0.022	ton CO2e/ton of commodity	WWF
PALM	Ecuador	GFW Pro	0.011	ton CO2e/ton of commodity	WWF
PALM	Guatemala	RSPO	0.02	ton CO2e/ton of commodity	WWF
PALM	Guatemala	Rainforest Alliance	0.02	ton CO2e/ton of commodity	WWF
PALM	Guatemala	International Sustainability and Carbon	0.02	ton CO2e/ton of commodity	WWF

		Certification (ISCC)			
PALM	Guatemala	GFW Pro	0.01	ton CO2e/ton of commodity	WWF
PALM	Guinea	RSPO	0.008	ton CO2e/ton of commodity	WWF
PALM	Guinea	Rainforest Alliance	0.008	ton CO2e/ton of commodity	WWF
PALM	Guinea	International Sustainability and Carbon Certification (ISCC)	0.008	ton CO2e/ton of commodity	WWF
PALM	Guinea	GFW Pro	0.004	ton CO2e/ton of commodity	WWF
PALM	Indonesia	RSPO	0.06	ton CO2e/ton of commodity	WWF
PALM	Indonesia	Rainforest Alliance	0.06	ton CO2e/ton of commodity	WWF
PALM	Indonesia	International Sustainability and Carbon Certification (ISCC)	0.06	ton CO2e/ton of commodity	WWF
PALM	Indonesia	GFW Pro	0.03	ton CO2e/ton of commodity	WWF
PALM	Malaysia	RSPO	0.03	ton CO2e/ton of commodity	WWF
PALM	Malaysia	Rainforest Alliance	0.03	ton CO2e/ton of commodity	WWF
PALM	Malaysia	International Sustainability and Carbon Certification (ISCC)	0.03	ton CO2e/ton of commodity	WWF
PALM	Malaysia	GFW Pro	0.015	ton CO2e/ton of commodity	WWF
PALM	Nigeria	RSPO	0.03	ton CO2e/ton of commodity	WWF

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PALM	Nigeria	Rainforest Alliance	0.03	ton CO2e/ton of commodity	WWF
PALM	Nigeria	International Sustainability and Carbon Certification (ISCC)	0.03	ton CO2e/ton of commodity	WWF
PALM	Nigeria	GFW Pro	0.015	ton CO2e/ton of commodity	WWF
PALM	Papua New Guinea	RSPO	0.15	ton CO2e/ton of commodity	WWF
PALM	Papua New Guinea	Rainforest Alliance	0.15	ton CO2e/ton of commodity	WWF
PALM	Papua New Guinea	International Sustainability and Carbon Certification (ISCC)	0.15	ton CO2e/ton of commodity	WWF
PALM	Papua New Guinea	GFW Pro	0.075	ton CO2e/ton of commodity	WWF
SOY	Global/All Countries	Round Table on Responsible Soy (RTRS)	0	ton CO2e/ton of commodity	WWF
SOY	Global/All Countries	ProTerra	0	ton CO2e/ton of commodity	WWF
SOY	Argentina	Round Table on Responsible Soy (RTRS)	0.05	ton CO2e/ton of commodity	WWF
SOY	Argentina	ProTerra	0.05	ton CO2e/ton of commodity	WWF
SOY	Argentina	GFW Pro	0.025	ton CO2e/ton of commodity	WWF
SOY	Bolivia	Round Table on Responsible Soy (RTRS)	0.39	ton CO2e/ton of commodity	WWF
SOY	Bolivia	ProTerra	0.39	ton CO2e/ton of commodity	WWF
SOY	Bolivia	GFW Pro	0.195	ton CO2e/ton of commodity	WWF

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SOY	Brazil	Round Table on Responsible Soy (RTRS)	0.2	ton CO2e/ton of commodity	WWF
SOY	Brazil	ProTerra	0.2	ton CO2e/ton of commodity	WWF
SOY	Brazil	GFW Pro	0.1	ton CO2e/ton of commodity	WWF
SOY	Brazil	Cefetra Responsible Soy	0.2	ton CO2e/ton of commodity	WWF
SOY	Cambodia	Round Table on Responsible Soy (RTRS)	0.93	ton CO2e/ton of commodity	WWF
SOY	Cambodia	ProTerra	0.93	ton CO2e/ton of commodity	WWF
SOY	Cambodia	GFW Pro	0.465	ton CO2e/ton of commodity	WWF
SOY	Ecuador	Round Table on Responsible Soy (RTRS)	1.85	ton CO2e/ton of commodity	WWF
SOY	Ecuador	ProTerra	1.85	ton CO2e/ton of commodity	WWF
SOY	Ecuador	GFW Pro	0.925	ton CO2e/ton of commodity	WWF
SOY	Gabon	Round Table on Responsible Soy (RTRS)	0.0011	ton CO2e/ton of commodity	WWF
SOY	Gabon	ProTerra	0.0011	ton CO2e/ton of commodity	WWF
SOY	Gabon	GFW Pro	0.00055	ton CO2e/ton of commodity	WWF
SOY	Paraguay	Round Table on Responsible Soy (RTRS)	0.35	ton CO2e/ton of commodity	WWF
SOY	Paraguay	ProTerra	0.35	ton CO2e/ton of commodity	WWF
SOY	Paraguay	GFW Pro	0.175	ton CO2e/ton of commodity	WWF

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SOY	Uganda	Round Table on Responsible Soy (RTRS)	0.39	ton CO2e/ton of commodity	WWF
SOY	Uganda	ProTerra	0.39	ton CO2e/ton of commodity	WWF
SOY	Uganda	GFW Pro	0.195	ton CO2e/ton of commodity	WWF
SOY	Uruguay	Round Table on Responsible Soy (RTRS)	0.024	ton CO2e/ton of commodity	WWF
SOY	Uruguay	ProTerra	0.024	ton CO2e/ton of commodity	WWF
SOY	Uruguay	GFW Pro	0.012	ton CO2e/ton of commodity	WWF
SOY	Venezuela	Round Table on Responsible Soy (RTRS)	1.52	ton CO2e/ton of commodity	WWF
SOY	Venezuela	ProTerra	1.52	ton CO2e/ton of commodity	WWF
SOY	Venezuela	GFW Pro	0.76	ton CO2e/ton of commodity	WWF
WHEAT	Argentina	GFW Pro	0.085	ton CO2e/ton of commodity	WWF
WHEAT	Brazil	GFW Pro	0.21	ton CO2e/ton of commodity	WWF
WHEAT	Canada	GFW Pro	0.04	ton CO2e/ton of commodity	WWF
WHEAT	Russia	GFW Pro	0.04	ton CO2e/ton of commodity	WWF
WHEAT	USA	GFW Pro	0.01	ton CO2e/ton of commodity	WWF
BEEF (FEED)	Australia	GFW Pro	1.73	ton CO2e/ton of commodity	WWF
BEEF (FEED)	Brazil	Agrotools	1.77	ton CO2e/ton of commodity	WWF
BEEF (FEED)	Brazil	Terras	1.77	ton CO2e/ton of commodity	WWF

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BEEF (FEED)	Brazil	Safe Trace	1.77	ton CO2e/ton of commodity	WWF
BEEF (FEED)	Brazil	SIMFaz	1.77	ton CO2e/ton of commodity	WWF
BEEF (FEED)	Canada	GFW Pro	0.865	ton CO2e/ton of commodity	WWF
BEEF (FEED)	France	GFW Pro	0.045	ton CO2e/ton of commodity	WWF
BEEF (FEED)	USA	GFW Pro	0.2	ton CO2e/ton of commodity	WWF
PULP & PAPER	Global/All Countries	FSC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Anguilla	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Belgium	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Czech Republic	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Denmark	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Estonia	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Germany	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Hungary	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Ireland	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Latvia	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Lithuania	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Netherlands	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Portugal	PEFC	0.1	ton CO2e/ton of commodity	WWF

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PULP & PAPER	South Korea	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Spain	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	Switzerland	PEFC	0.1	ton CO2e/ton of commodity	WWF
PULP & PAPER	United Kingdom	PEFC	0.1	ton CO2e/ton of commodity	WWF
TIMBER	Global/All Countries	FSC	0.1	ton CO2e/ton of commodity	WWF
TIMBER	Anguilla	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Belgium	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Czech Republic	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Denmark	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Estonia	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Germany	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Hungary	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Ireland	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Latvia	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Lithuania	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Netherlands	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Portugal	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	South Korea	PEFC	0.003	ton CO2e/ton of commodity	WWF

TIMBER	Spain	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	Switzerland	PEFC	0.003	ton CO2e/ton of commodity	WWF
TIMBER	United Kingdom	PEFC	0.003	ton CO2e/ton of commodity	WWF
Farmed Shrimp	China	ASC	0.00956461	ton CO2e/ton of commodity	WWF
Farmed Shrimp	Ecuador	ASC	0.01521497	ton CO2e/ton of commodity	WWF
Farmed Shrimp	India	ASC	0.01053249	ton CO2e/ton of commodity	WWF
Farmed Shrimp	Indonesia	ASC	0.78555514	ton CO2e/ton of commodity	WWF
Farmed Shrimp	Thailand	ASC	0.03279614	ton CO2e/ton of commodity	WWF
Farmed Shrimp	Vietnam	ASC	0.25685672	ton CO2e/ton of commodity	WWF

Appendix 4.2.5.2 – Nature Spatial Conversion Factors

Commodity	Geography		Spatial Conversion Factor	Unit	Source
Beef	**Global**	**Average**	**0.23**	**MT/acre**	**Sources: Asem-Hiablie, et al (2017). Management characteristics of beef cattle production in the western US. ARPAS.; Asem-Hiablie, et al (2018). Management characteristics of beef cattle production in the eastern US. ARPAS.; Asem-Hiablie, et al (2016). Management characteristics of beef cattle production in the Northern Plains and Midwest regions of the US. ARPAS.; Asem-Hiablie, et al (2015). Management characteristics of cow-calf,**
Beef	US	Average	0.23	MT/acre	
Beef	Brazil		0.23	MT/acre	
Beef	Argentina		0.23	MT/acre	
Beef	Paraguay		0.23	MT/acre	
Beef	Colombia		0.23	MT/acre	

					stocker, and finishing operations in Kansas, Oklamhoma, and Texas. ARPAS.
Corn	Global		2.32	MT/acre	FAO
Corn	Brazil		2.14	MT/acre	FAO
Corn	China		2.46	MT/acre	FAO
Corn	US	Average	4.39	MT/acre	USDA NASS
Corn	US	Illinois	4.9	MT/acre	USDA NASS
Corn	US	Indiana	4.37	MT/acre	USDA NASS
Corn	US	Iowa	5.04	MT/acre	USDA NASS
Corn	US	Minnesota	4.73	MT/acre	USDA NASS
Corn	US	Nebraska	4.66	MT/acre	USDA NASS
Cotton	Global		0.87	MT/acre	FAO
Cotton	Brazil		1.63	MT/acre	FAO
Cotton	China		1.85	MT/acre	FAO
Cotton	India		0.53	MT/acre	FAO
Cotton	Turkey		1.96	MT/acre	FAO
Cotton	Pakistan		0.79	MT/acre	FAO
Cotton	US	Average	0.94	MT/acre	USDA NASS for lint cotton, which was then converted to seed cotton using a 41% lint percentage conversion (sources: Cotton.org; UTexas Extension)
Cotton	US	Texas	0.78	MT/acre	
Cotton	US	Georgia	0.97	MT/acre	
Cotton	US	Mississippi	1.22	MT/acre	
Cotton	US	Arkansas	1.26	MT/acre	
Cotton	US	Alabama	1.00	MT/acre	
Rice	Global		3.10	MT/acre	FAO
Rice	China		4.69	MT/acre	FAO
Rice	India		2.6	MT/acre	FAO
Rice	Pakistan		2.54	MT/acre	FAO
Rice	Thailand		2.01	MT/acre	FAO

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Rice	US	Average	3.8	MT/acre	USDA NASS
Rice	US	Arkansas	3.72	MT/acre	USDA NASS
Rice	US	California	4.39	MT/acre	USDA NASS
Rice	US	Louisiana	3.44	MT/acre	USDA NASS
Rice	US	Missouri	3.68	MT/acre	USDA NASS
Rice	US	Mississippi	3.69	MT/acre	USDA NASS
Rice	US	Texas	3.76	MT/acre	USDA NASS
Soy	Global		1.12	MT/acre	FAO
Soy	Brazil		1.29	MT/acre	FAO
Soy	China		0.75	MT/acre	FAO
Soy	Thailand		0.65	MT/acre	FAO
Soy	US	Average	1.35	MT/acre	USDA NASS
Soy	US	Illinois	1.58	MT/acre	USDA NASS
Soy	US	Indiana	1.47	MT/acre	USDA NASS
Soy	US	Iowa	1.55	MT/acre	USDA NASS
Soy	US	Minnesota	1.32	MT/acre	USDA NASS
Soy	US	Nebraska	1.59	MT/acre	USDA NASS
Wheat	Global		1.4	MT/acre	FAO
Wheat	Brazil		1.05	MT/acre	FAO
Wheat	Canada		1.33	MT/acre	FAO
Wheat	China		2.21	MT/acre	FAO
Wheat	US	Avg	1.31	MT/acre	USDA NASS
Wheat	US	Kansas	1.26	MT/acre	USDA NASS
Wheat	US	Montana	1.01	MT/acre	USDA NASS
Wheat	US	North Dakota	1.23	MT/acre	USDA NASS
Wheat	US	Oklahoma	0.91	MT/acre	USDA NASS
Cocoa	Global		0.18	MT/acre	FAO
Cocoa	Cote d'Ivoire		0.19	MT/acre	FAO

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Cocoa	Ghana	0.21	MT/acre	FAO
Cocoa	Indonesia	0.17	MT/acre	FAO
Coffee	Global	0.36	MT/acre	FAO
Coffee	Brazil	0.64	MT/acre	USDA FAS
Coffee	Colombia	0.4	MT/acre	USDA FAS
Coffee	Indonesia	0.23	MT/acre	USDA FAS
Coffee	Malaysia	1.25	MT/acre	FAO
Coffee	Peru	0.33	MT/acre	USDA FAS
Coffee	Central America	0.26	MT/acre	FAO
Palm Oil	Global	1.04	MT/acre	FAO
Palm Oil	Guatemala	1.77	MT/acre	FAO
Palm Oil	Indonesia	1.14	MT/acre	FAO
Palm Oil	Malaysia	1.57	MT/acre	FAO
Pulp & Paper/Timber	Canada	5.53	MT/acre	FAO, Natural Resource Canada
Pulp & Paper/Timber	US	7.51	MT/acre	FAO, USDA
Pulp & Paper/Timber	Global	4.45	MT/acre	Arets 2012
Farmed Shrimp	China	1.7879	MT/acre	Boyd et al 2021
Farmed Shrimp	Ecuador	1.4685	MT/acre	Boyd et al 2021
Farmed Shrimp	India	1.563	MT/acre	Boyd et al 2021
Farmed Shrimp	Indonesia	0.8333	MT/acre	Boyd et al 2021
Farmed Shrimp	Thailand	4.163	MT/acre	Boyd et al 2021
Farmed Shrimp	Vietnam	0.3854	MT/acre	Boyd et al 2021
Farmed Salmon	Chile	0.000149	MT/acre	Skontorp Hognes 2011

Wild-Caught Salmon	Russia (MSC, FIP)	2.6072	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Salmon	United States (MSC, AK RFM, FIP)	2.4989	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Salmon	Other (FIP)	2.6072	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Shrimp	Thailand (MSC, FIP)	14.3993	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Shrimp	Indonesia (MSC, FIP)	3.1212	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Shrimp	India (MSC, FIP)	8.4870	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Shrimp	Other (MSC)	0.8621	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Shrimp	Other (GULF RFM)	2.6715	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Shrimp	Other (MEL)	1.9022	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Shrimp	Other (FIP)	14.3993	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Tuna	IATTC (MSC, MEL, FIP)	0.0247	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Tuna	WCPFC (MSC, MEL, FIP)	0.0658	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us

Wild-Caught Tuna	IOTC (MSC, MEL, FIP)	0.0492	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us
Wild-Caught Tuna	ICCAT (MSC, MEL, FIP)	0.0156	MT/mi^2	FAO, Certification and Ratings Collaborative, Sea Around Us

Appendix 4.2.5.3 - Recycled content pulp and paper in packaging calculator

Please note, section *4.2.5.7 Recycled content pulp and paper in products calculator* also refers to this appendix due to the similarity in methodologies.

Post-consumer recycled content definition

According to the EPA's definition, postconsumer recycled content is:

- Paper, paperboard, and fibrous wastes from retail stores, office buildings, homes, and so forth, after they have passed through their end-usage as a consumer item, including: used corrugated boxes; old newspapers; old magazines; mixed waste paper; tabulating cards; and used cordage; and
- All paper, paperboard, and fibrous wastes that enter and are collected from municipal solid waste. Postconsumer fiber does not include fiber derived from printers' over-runs, converters' scrap, and over-issue publications.

Emissions factor development approach

These recycled content and certification calculations provide a rough estimate of the amount of avoided emissions reductions from deforestation/land use change from the active purchasing of certified pulp, paper & timber and purchase of recycled pulp & paper, which is acting as a proxy for deforestation-free or land use change-free material. Annual deforestation rates were calculated by region based on FAO and GFW data, and the allocation to timber and paper was estimated using several sources listed below. Consistent with consequential modeling, the method assumes that one metric ton of marginal uncertified timber/pulp/paper demand would stimulate a global average market of uncertified timber/pulp/paper production (and parallel deforestation/land use change from that uncertified timber/pulp/paper production), calculated using a production-weighted average from FAO data base year 2015, certified content from FSC and PEFC sources and geographic and carbon pool contents from the FAO Forest Resources Assessment. Carbon fate was estimated using the Taverna study. The calculation first develops a "business as usual" scenario estimating deforestation at the hands of forest products, globally, and then uses an "action" scenario which is the act of buying certified or recycled material. This in estimates avoided emissions (CO_2e) per ton of certified material purchased," including the application of a 20 year temporal allocation of avoided emissions consistent with the IPCC's legacy emissions guidance.

Sources:

- **Annual Deforestation Rate**: Global Forest Watch 2011-2015, Forest Resource Assessment, FAO 2015
- **Fraction of Deforestation allocated to timber, pulp & paper**: Project Catalyst 2008; Honsuma, et al. An assessment of deforestation and forest degradation drivers in developing countries. 2012;
- Indonesia GHG Abatement Cost Curve 2010, Indonesian Government.
- **Carbon Density of Regional Forests**: FAO FRA 2015
- **Fate of Carbon**: Taverna, R., Hofer, P., Werner, F., Kaufmann, E., Thürig, E., (2007) The CO_2 effects of the Swiss forestry and timber industry Scenarios of future potential for climate-change mitigation, Environmental studies no. 0739. Federal Office for the Environment, Bern, Switzerland, p. 102.
- **Timber, Pulp & Paper Production and Certified volumes**: FAOSTAT 2015; FSC Facts & Figures, March 2017; PEFC Facts & Figures Dec 2016

Emissions factors

Material	Avoided Emissions Factor
Post-Consumer Recycled Paper	0.05 metric tons CO2e/metric ton recycled content

Appendix 4.2.5.4 - Certified timber, pulp and paper in packaging calculator

Please note, section *4.2.5.8 Certified timber, pulp and paper in products calculator* also refers to this appendix due to the similarity in methodologies.

Emissions factor development approach

See *Appendix 4.2.5.3 Recycled content pulp and paper packaging calculator* for description.

Accepted certifications and references for timber, pulp & paper

Certification	Reference
Forest Stewardship Council	https://ic.fsc.org/en
Sustainable Forestry Initiative	http://www.sfiprogram.org
Programme for the Endorsement of Forest Certification	https://www.pefc.org

Emissions factors

Below are the certification, country, and avoided emissions factor combinations that will be recognized for the purposes of Project Gigaton.

Certification	Country	Timber	Pulp and paper
Forest Stewardship Council (FSC)	All Countries	0.003 metric tons CO2e/metric ton certified timber	0.05 metric tons CO2e/metric ton certified pulp
Sustainable Forestry Initiative (SFI)*	US		
	Canada		
Programme for the Endorsement of Forest Certification (PEFC)	Anguilla		
	Belgium		
	Czech Republic		
	Denmark		
	Estonia		
	Germany		
	Hungary		
	Ireland		
	Latvia		
	Lithuania		
	Netherlands		
	Portugal		
	South Korea		
	Spain		
	Switzerland		
	United Kingdom		

*Note SFI is a member of PEFC

Appendix 4.2.5.5 - Industry restoration initiative calculator

Restoration project criteria

Restoration projects must meet the following criteria:

- *Landscape context*: Restoration projects should be embedded within a larger landscape context, including socio-economic and ecological considerations at the broader scale, rather than just project focused. This approach will optimize conservation and development goals.
- *Social integrity*: Local stakeholders are actively engaged in decision making, collaboration and implementation (free, prior, and informed consent process followed). Livelihoods secured at a landscape scale.
- *Ecological integrity*: Project has net positive climate and biodiversity benefits and maintains or enhances any high conservation values. Native species are used unless otherwise justified and invasive species and genetically modified organisms are not used. Restoration projects in boreal forests are excluded due to uncertainty as to whether the albedo effect (reducing the reflectivity of the Earth's surface) due to restoration in these regions counteracts the climate benefits of sequestration.[1]
- *Relevance:* To encourage landscape scale-insetting, projects should be prioritized that focus on key sourcing geographies in supplier's supply chains. Projects should have a quantified carbon benefit per hectare.
- *Strong Project Management*: Monitoring and evaluation, learning and adaptation of the project throughout its implementation is central to effective project management that will ensure permanence of carbon benefits, broader ecosystem services enhancement and co-benefit sharing with communities. This includes addressing land tenure rights and allocation of sufficient funds for long-term monitoring and evaluation of the project.

Emissions factors for industry initiatives

This list may expand over time; if you have a restoration initiative that you would like us to consider, please contact corpsu@walmart.com.

Restoration initiative (dropdown for supplier selection)	Location (for reference only)	Forest type (for reference only)	Start year (for reference only)	Sequestration factor – metric ton CO2e /hectare /year
Conservation International's Amazon restoration	Brazil (Amazonas, Acre, Pará, Rondonia)	Tropical rain forest	2017	15.1
American Forests' Sierra Nevada	United States (California)	Subtropical dry forest/	2018	9.6

[1] Bright, R. M., Zhao, K. G., Jackson, R. B. & Cherubini, F. Quantifying surface albedo and other direct biogeophysical climate forcings of forestry activities. *Global Change Biology* **21**, 3246-3266, doi:10.1111/gcb.12951 (2015)

		mixed conifers		
American Forests' Lower River Grande Valley	United States (Texas)	Subtropical steppe/ Tamaulipan thornscrub	2018	6.9
American Forests' Ozarks and Appalachians/ White Oaks	United States (Missouri and Kentucky)	Temperate continental / oak-hickory	2018	9.7
Trillion Trees' Restoring forests at major deforestation fronts in Amazonia	Brazil	Tropical rain forest	2019	18.97
Trillion Trees' Restoration of the Annamese Lowland forest reserves	Vietnam	Tropical rain forest	2019	20.2
Trillion Trees' Restoration of the tropical montane forests of Nyungwe National Park, Rwanda	Rwanda	Tropical mountain system	2019	12.8
The International Small Group Tree Planting Program (TIST)	Kenya, Uganda, Tanzania, and India	Various, mosaic restoration	1999	26.6
African Forest Landscape Restoration Initiative (AFR10)'s Moringa Smallholder Program	Malawi	Tropical moist deciduous forest	2018	8.62

Project descriptions for industry initiatives

- Conservation International, Amazon restoration project**:** The largest tropical restoration project to date, planning to restore 30,000 hectares, or approximately 73 million trees, in the Brazilian Amazon.

- American Forests, Sierra Nevada: Goal to replant at least five million climate-resilient trees across the Sierra Nevada and Southern Ranges in California, focusing on the most important water supply areas.
- American Forests, Lower River Grande Valley: Goal to replant two million Texas thornscrub trees to newly acquired farmlands as they are added to National Wildlife Refuge units, protecting more than 500 species of birds and endangered species such as the ocelot.
- American Forests, Ozarks and Appalachians/ White Oaks: Goal to restore five million white oaks, which filter important water supplies across seven U.S. states and also support thousands of jobs in the barrel-making and distilling industries.
- Trillion Trees, Restoring forests at major deforestation fronts in Amazonia: Working with landowners across three major deforestation fronts in the Brazilian states of Acre, Amazonas, and Rondônia to support rural producers to restore forests in compliance with Brazil's Forest Code.
- Trillion Trees, Restoration of the Annamese Lowland forest reserve: Working with local communities in the buffer zone around this forest reserve in Vietnam to restore three parcels of land, strengthening the ecological integrity of the reserve.
- Trillion Trees, Restoration of the tropical montane forests of Nyungwe National Park, Rwanda: Working to restore the more than 100,000 hectares of Africa's largest protected montane forest which burned in wildfires in the 1990s.
- The International Small Group Tree Planting Program (TIST): An initiative that works with groups of smallholder farmers in India, Kenya, Tanzania, and Uganda to plant trees in tens of thousands of individual project areas (17 million trees planted to date).
- AFR100, Moringa Smallholder Program: A project within AFR100, a World Resources Institute-led initiative which aims to restore 100 million hectares of degraded land in Africa by 2030, the Moringa Smallholder Program plans to restore key water catchment areas in the Shire River Basin in Malawi.

Appendix 4.2.6.1 - Fertilizer calculator

The emissions factor is based on crop, location, and practice type. The list of practices have been sorted into "None", "Low" and "High" levels depending on the level of impact they have on reducing greenhouse gas emissions (e.g., wheat grown in Nebraska has different avoided emissions by type of practice employed). "None" is provided for reference only and is not a reporting option.

Practices by level of greenhouse gas savings

None (for reference only)	Low	High

Data collection tool that helps benchmark current practices Rate recommendation based on model optimizing fertilizer cost and crop yield Land-grant university rate recommendation Reduced tillage including conservation tillage and no-till Non-nitrogen fixing cover crops Combination of tools or farmer surveys with sufficient data showing nutrient use efficiency improvement of less than 10%	Precision agriculture calibrated to optimize yield Mid- to late-season application informed by nitrogen-loss monitoring using real-time weather data Optical sensors with nutrient use efficiency improvement lower than 20% or unknown Nutrient/Soil management based on soil mapping High efficiency/sub-surface drip fertigation Crop rotation or cover crop with nitrogen fixing crops such as soybeans, alfalfa, beans, clover, cowpeas, lupines, and vetches. Working with an agronomist to evaluate and improve nutrient use efficiency Combination of tools, programs, or farmer surveys with sufficient data showing nutrient use efficiency improvement of 10-20%	Overall rate recommendations optimized using real-time weather data Use of a nitrification inhibitor Optical sensors showing nutrient use efficiency improvement of more than 20% Combination of tools, programs, or farmer surveys with sufficient data showing nutrient use efficiency improvement of more than 20%

Emissions Factors by Crop, Location and Level of GHG Savings

Crop	Country	State	Level translation to High / Low	Emission Factor (MT CO2e/acre/year)
Barley	United States	Colorado	Low	0.030
Barley	United States	Colorado	High	0.059
Barley	United States	Idaho	Low	0.020
Barley	United States	Idaho	High	0.041
Barley	United States	Montana	Low	0.0102
Barley	United States	Montana	High	0.020
Barley	United States	North Dakota	Low	0.016
Barley	United States	North Dakota	High	0.033
Barley	United States	United States	Low	0.016

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Barley	United States	United States	High	0.032
Barley	United States	Wyoming	Low	0.021
Barley	United States	Wyoming	High	0.042
Carrots	United States	Arizona	Low	0.012
Carrots	United States	Arizona	High	0.023
Carrots	United States	California	Low	0.008
Carrots	United States	California	High	0.015
Carrots	Canada	Any state	Low	0.019
Carrots	Canada	Any state	High	0.037
Carrots	United States	Georgia	Low	0.021
Carrots	United States	Georgia	High	0.042
Carrots	United States	Michigan	Low	0.017
Carrots	United States	Michigan	High	0.034
Carrots	United States	New Jersey	Low	0.014
Carrots	United States	New Jersey	High	0.029
Carrots	United States	Ohio	Low	0.017
Carrots	United States	Ohio	High	0.034
Carrots	United States	Texas	Low	0.015
Carrots	United States	Texas	High	0.030
Carrots	United States	Washington	Low	0.030

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Carrots	United States	Washington	High	0.061
Celery	United States	Michigan	Low	0.039
Celery	United States	Michigan	High	0.078
Corn	United States	California	Low	0.050
Corn	United States	California	High	0.095
Corn	United States	Colorado	Low	0.006
Corn	United States	Colorado	High	0.012
Corn	United States	Georgia	Low	0.067
Corn	United States	Georgia	High	0.129
Corn	United States	Illinois	Low	0.048
Corn	United States	Illinois	High	0.093
Corn	United States	Indiana	Low	0.096
Corn	United States	Indiana	High	0.096
Corn	United States	Iowa	Low	0.035
Corn	United States	Iowa	High	0.058
Corn	United States	Kansas	Low	0.019
Corn	United States	Kansas	High	0.037
Corn	United States	Kentucky	Low	0.047
Corn	United States	Kentucky	High	0.089
Corn	United States	Michigan	Low	0.023
Corn	United States	Michigan	High	0.039

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Corn	United States	Minnesota	Low	0.024
Corn	United States	Minnesota	High	0.045
Corn	United States	Missouri	Low	0.021
Corn	United States	Missouri	High	0.041
Corn	United States	Nebraska	Low	0.020
Corn	United States	Nebraska	High	0.037
Corn	United States	New Mexico	Low	0.028
Corn	United States	New Mexico	High	0.043
Corn	United States	New York	Low	0.009
Corn	United States	New York	High	0.018
Corn	United States	North Carolina	Low	0.017
Corn	United States	North Carolina	High	0.028
Corn	United States	Ohio	Low	0.038
Corn	United States	Ohio	High	0.068
Corn	United States	Pennsylvania	Low	0.016
Corn	United States	Pennsylvania	High	0.030
Corn	United States	South Carolina	Low	0.009
Corn	United States	South Carolina	High	0.018
Corn	United States	South Dakota	Low	0.012
Corn	United States	South Dakota	High	0.024

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Corn	United States	Tennessee	Low	0.007
Corn	United States	Tennessee	High	0.014
Corn	United States	Texas	Low	0.021
Corn	United States	Texas	High	0.041
Corn	United States	Other location	Low	0.025
Corn	United States	Other location	High	0.049
Corn	United States	Utah	Low	0.024
Corn	United States	Utah	High	0.041
Corn	United States	Vermont	Low	0.046
Corn	United States	Vermont	High	0.088
Corn	United States	Virginia	Low	0.014
Corn	United States	Virginia	High	0.027
Corn	United States	Wisconsin	Low	0.014
Corn	United States	Wisconsin	High	0.027
Oats	Canada	Alberta	Low	0.022
Oats	Canada	Alberta	High	0.044
Oats	Canada	Manitoba	Low	0.022
Oats	Canada	Manitoba	High	0.044
Oats	Canada	New Brunswick	Low	0.027
Oats	Canada	New Brunswick	High	0.053

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Oats	Canada	Ontario	Low	0.009
Oats	Canada	Ontario	High	0.018
Oats	Canada	Quebec	Low	0.018
Oats	Canada	Quebec	High	0.035
Oats	Canada	Saskatchewan	Low	0.012
Oats	Canada	Saskatchewan	High	0.024
Oranges	United States	Florida	Low	0.044
Oranges	United States	Florida	High	0.088
Potatoes	United States	Idaho	Low	0.056
Potatoes	United States	Idaho	High	0.112
Potatoes	United States	New Jersey	Low	0.050
Potatoes	United States	New Jersey	High	0.101
Rice	United States	Arkansas	Low	0.035
Rice	United States	Arkansas	High	0.070
Rice	United States	Louisiana	Low	0.027
Rice	United States	Louisiana	High	0.055
Soybeans	United States	Iowa	Low	0.009
Soybeans	United States	Iowa	High	0.019
Soybeans	United States	Minnesota	Low	0.006
Soybeans	United States	Minnesota	High	0.013

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Soybeans	United States	Nebraska	Low	0.002
Soybeans	United States	Nebraska	High	0.004
Soybeans	United States	North Carolina	Low	0.004
Soybeans	United States	North Carolina	High	0.008
Sugar Beets	United States	Idaho	Low	0.033
Sugar Beets	United States	Idaho	High	0.065
Sugar Beets	United States	Minnesota	Low	0.014
Sugar Beets	United States	Minnesota	High	0.028
Sugar Beets	United States	North Dakota	Low	0.016
Sugar Beets	United States	North Dakota	High	0.032
Sugar Beets	United States	Other location	Low	0.024
Sugar Beets	United States	Other location	High	0.049
Tomatoes	United States	California	Low	0.01404
Tomatoes	United States	California	High	0.02807
Wheat	United States	Idaho	Low	0.016
Wheat	United States	Idaho	High	0.309
Wheat	United States	Illinois	Low	0.029
Wheat	United States	Illinois	High	0.055
Wheat	United States	Iowa	Low	0.016
Wheat	United States	Iowa	High	0.031

Wheat	United States	Kansas	Low	0.093
Wheat	United States	Kansas	High	0.186
Wheat	United States	Montana	Low	0.107
Wheat	United States	Montana	High	0.138
Wheat	United States	Nebraska	Low	0.092
Wheat	United States	Nebraska	High	0.183
Wheat	United States	North Carolina	Low	0.034
Wheat	United States	North Carolina	High	0.067
Wheat	United States	North Dakota	Low	0.152
Wheat	United States	North Dakota	High	0.303
Wheat	United States	Ohio	Low	0.145
Wheat	United States	Ohio	High	0.290
Wheat	United States	South Carolina	Low	0.033
Wheat	United States	South Carolina	High	0.065
Wheat	United States	United States	Low	0.012
Wheat	United States	United States	High	0.015
Wheat	United States	Virginia	Low	0.004
Wheat	United States	Virginia	High	0.009 0.009

Appendix 4.2.6.6 - Manure management calculator emissions factors

These factors are aggregated from sources including the EPA, California Air Resources Board, and FARM ES. The estimated greenhouse gas equivalency will be calculated in accordance with the methodology

outlined by the Intergovernmental Panel on Climate Change (IPCC). Each practice has been assigned an emissions factor.

Animal Type	Manure management system	Metric tons CO2e/head/year
cattle	composting (in-vessel or static)	1
cattle	composting (natural aeration)	1
cattle	composting (intensive with forced aeration)	1
cattle	dry lot	0.666
cattle	liquid/slurry storage with natural or induced crust	0.675
cattle	liquid/slurry storage without crust	0.802
cattle	pit storage below animals (less than 1 month)	1
cattle	aerobic treatment	1
cattle	daily spread	1
cattle	covered anaerobic lagoon	2
cattle	anaerobic digester	2
swine	iquid/slurry storage without crust	0.2
swine	liquid slurry storage with natural or induced crust	0.2
swine	dry lot	0.2
swine	composting (natural aeration)	0.2
swine	composting (in-vessel or static)	0.2
swine	composting (intensive with forced aeration)	0.2
swine	pit storage below animals (less than 1 month)	0.2
swine	aerobic treatment	0.2
swine	daily spread	0.2
swine	covered anaerobic lagoon	0.4
swine	anaerobic digestor	0.4

Appendix 4.2.6.7 - Grazing calculator emissions factors

Emissions factors refer to avoided emissions as a result of implementing NRCS practices. Factors vary by practice type. See Appendix for full list of factors. Note 80% of production in dry production zones was assumed for the factors.

Practice type	Default percentage of total acres under grazing land optimization program (suppliers enter a value, so this is for reference only)	Emissions factor (metric tons CO2e/acre)
Managed/prescribed grazing	10%	0.196

Riparian buffers (3% of production land available for adoption)	1%	1.22
Converting marginal cropland to pasture	10%	0.37
Range planting or restoration	30%	0.372
Silvopasture	1%	0.788
Fertilizer timing	20%	0.054
Manure fertilizer	10%	1.16

Product Use and Design Appendix

4.2.7.1 Energy efficient product calculator

The supplier chooses the "**baseline product**" which must be the supplier's own product that represents the generation *immediately preceding the more efficient product*. If no such prior product exists, default values for a baseline product will be provided based on current ENERGY STAR energy performance thresholds for the product category selected; ENERGY STAR performance thresholds are not available if "Other" is selected and therefore selecting "Other" for *Product category* will default *Baseline product* input to "have".

If the initial retail date was before the start of Project Gigaton in 2016 (i.e., 2015 or earlier), suppliers are treated the same as those without a baseline product and are not permitted to enter baseline product information. Similarly, suppliers whose initial retail date is 5 or more years before the start date of their selected reporting period will also be treated as suppliers without a baseline product. This is because in these cases the unit sales of the "more efficient" product can continue to be reported to Project Gigaton only if the product's energy performance exceeds the default ENERGY STAR performance thresholds based on the product category selected.

For example, if the initial retail date of the "more efficient" product was 2016, the comparison to ENERGY STAR performance thresholds would be required if the reporting period start date selected by the supplier is 2021 or later (i.e., 2016 initial retail date + 5 years = 2021).Please see the table on next page to review the ENERGY STAR performance thresholds by product category.

Estimated Energy Use of Products that Meet Energy Star Performance Thresholds

ENERGY STAR Product Category(selected from dropdown)	ENERGY STAR Product Category Description	ENERGY STAR Performance (kWh/year)	ENERGY STAR Assumed Product Lifetime (yrs)	ENERGY STAR Lifetime Energy Use (kWh)
Consumer Electronics & IT				
Notebook Computers	A computer designed specifically for portability and to be operated for extended periods of time both with and without a direct connection to an ac mains power source. Notebook Computers include an Integrated Display, a non-detachable, mechanical keyboard (using physical, moveable keys), and pointing device.	25	4	102
Desktops	A computer whose main unit is designed to be located in a permanent location, often on a desk or on the floor. Desktop computers are not designed for portability and are designed for use with an external display, keyboard, and mouse. Desktop computers are intended for a broad range of home and office applications, including point of sale applications.	166	4	663
Small Network Equipment	A device whose primary function is to pass Internet Protocol (IP) traffic among various network interfaces / ports intended for use in residential and small business settings.	61	5	305
Set Top Boxes	A device with the primary purpose of receiving digital television services from a coaxial, hybrid fiber coaxial, or fiber-to-the-home distribution system, from satellites, or encapsulated in IP packets from managed IP distribution networks; decrypting or descrambling these signals; and decoding/ decompressing for delivery to residential consumer displays and/or recording devices, and/or one or more other Set-Top Boxes, including Thin Clients, in a residential multi-room architecture. STBs that incorporate common LAN functionality as a secondary function are considered STBs for this specification	60	6	360
Inkjet Multifunction Imaging Equipment	A product that performs the core functions of a Printer and Scanner. An MFD may have a physically integrated form factor, or it may consist of a combination of functionally integrated components. MFD copy	16	3.5	56

	functionality is considered to be distinct from single-sheet convenience copying functionality sometimes offered by fax machines. This definition includes products marketed as MFDs and "multi-function products" (MFPs).			
Decorative Light String	A string of lamps that operates on AC power in North America (120 V RMS AC, 60 Hz) or via a power adapter or controller that connects directly to AC power, and is used for decorative, residential lighting purposes. The lamps may be replaceable or sealed into the lamp holder/wiring harness.	3	5	15
Standard A Shape Light Bulbs (Halogen vs. LED)	A general service replacement lamp with an ANSI standard base that emits the majority of light produced in an even distribution. These lamps can be standard; having an ANSI standard lamp shape of A or non-standard, such as a self-ballasted compact fluorescent that utilizes a bare spiral.	10	13.7	137
Typical Candle Shape Light Bulbs (Incandescent vs. LED)	A lamp with a candle-like shape envelope including shapes B, BA, C, CA, DC, and F as defined in ANSI C79.1-2002.	5.5	13.7	75
Typical Globe Shape Light Bulbs (Incandescent vs. LED)	A lamp with a globe shape envelope "G" as defined in ANSI C79.1-2002.	5.5	13.7	75
Typical Reflector (R Shapes) Light Bulbs (Halogen vs. LED)	ANSI standard PAR and MR lamps having at least 80% light output with a solid angle of π steradians, corresponding to a cone with an angle of 120°, self-ballasted compact fluorescent forms that utilize a reflector, and ANSI standard R, BR and ER shapes.	10.95	13.7	137
Luminaires (Light Fixture)	A complete lighting unit consisting of lamp(s) and ballast(s) (when applicable) together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamp(s) to the power supply (as per ANSI/IES RP-16-17).	10	13.7	137
TVs	A product designed to produce dynamic video, contains an internal TV tuner encased within the product housing, and that is capable of receiving dynamic visual content from wired or wireless sources including but not limited to: (a) Broadcast and similar services for terrestrial, cable, satellite, and/or broadband transmission of analog and/or digital signals; and/or (b) Display-specific data connections, such as HDMI, Component video, S-video, Composite video; and/or (c) Media storage devices such as a USB flash drive, a memory card, or a DVD; and/or (d) Network connections, usually using Internet Protocol, typically carried over Ethernet or Wi-Fi.	81	5	405
Home/Office Telephony	A commercially available electronic product whose primary purpose is to transmit and receive sound over a distance using a voice or data network.	7	7	49
Computer Monitors	A product with a display screen and associated electronics, often encased in a single housing, that as its primary function produces visual information from (1) a computer, workstation, or server via one or more inputs (e.g., VGA, DVI, HDMI, DisplayPort, IEEE 1394, USB), (2) external storage (e.g., USB flash drive, memory card), or (3) a network connection.	32	7	224
Blu-Ray Player	A mains-connected product that offers Audio Amplification and/or Optical Disc Player functions.	9	7	63
Home Audio Equipment	A mains-connected product that offers Audio Amplification and/or Optical Disc Player functions.	22	7	154
Appliances				
Dehumidifiers	A product, other than a portable air conditioner, room air conditioner, or packaged terminal air conditioner, that is a self-contained, electrically operated, and mechanically encased assembly consisting of: (a) a refrigerated surface (evaporator) that condenses moisture from the atmosphere; (b) a refrigerating system, including an electric motor; (c) an air-circulating fan; and (d) means for collecting or disposing of the condensate.	428	11	4708
Air Purifier (Cleaner)	An electric cord-connected, portable appliance with the primary function of removing particulate matter from the air and which can be moved from room to room.	317	9	2853
Residential Clothes Washers	As defined in page 1 of the ENERGY STAR Product Specification for Clothes Washers.	316	11	3476
Residential Clothes Dryers	As defined in page 1 of the ENERGY STAR Product Specification for Clothes Dryers.	608	12	7302
Room Air Conditioners	A consumer product, other than a "packaged terminal air conditioner," which is powered by a single phase electric current and which is an encased assembly designed as a unit for mounting in a window or through the wall for the purpose of providing delivery of conditioned air to an enclosed	556	9	5004

	space. It includes a prime source of refrigeration and may include a means for ventilating and heating.			
Residential Dishwashers	A cabinet-like appliance which with the aid of water and detergent, washes, rinses, and dries (when a drying process is included) dishware, glassware, eating utensils, and most cooking utensils by chemical, mechanical and/or electrical means and discharges to the plumbing drainage system.	181	12	2171
Residential Refrigerators	A cabinet designed for the refrigerated storage of food, designed to be capable of achieving storage temperatures above 32 °F (0 °C) and below 39 °F (3.9 °C), and having a source of refrigeration requiring single phase, alternating current electric energy input only. An electric refrigerator may include a compartment for the freezing and storage of food at temperatures below 32 °F (0 °C) but does not provide a separate low temperature compartment designed for the freezing and storage of food at temperatures below 8 °F (-13.3 °C).	488	12	5860
Residential Freezers	A cabinet designed as a unit for the freezing and storage of food at temperatures of 0 °F (-17.8 °C) or below, and having a source of refrigeration requiring single phase, alternating current electric energy input only.	281	11	3094
Pool Pumps	Residential Pool Pump.	1,410	6	8459
Water Coolers	A freestanding device that consumes energy to cool and/or heat potable water.	259	5	1293
HVAC Products				
Ceiling Fans (without lighting)	A non-portable device designed for home use that is suspended from the ceiling for circulating air via the rotation of fan blades. Some ceiling fans are sold with ceiling fan light kits.	41	14	575
Ceiling Fans (with lighting)	A fan whose purpose is to actively supply air to or remove air from the inside of a residence. This includes ceiling and wall-mounted fans, or remotely mounted in-line fans, designed to be used in a bathroom or utility room, supply fans designed to provide air to the indoor space, and kitchen range hoods. Supply fans may also be designed to filter incoming air.	55	14	777
Ventilation Fans	A product that utilizes electricity to heat potable water for use outside the heater upon demand, including: Storage type units designed to heat and store water at a thermostatically-controlled temperature of less than 180 °F, including electric heat pump type units with a maximum current rating of 24 amperes at an input voltage 250 volts or less, and having a manufacturer's rated storage capacity of 120 gallons or less.	16	11	181
Residential Electric Heat Pump Water Heater	An air-source unitary heat pump model is a product other than a packaged terminal heat pump, which consists of one or more assemblies, powered by single phase electric current, rated below 65,000 Btu per hour, utilizing an indoor conditioning coil, compressor, and refrigerant-to-outdoor air heat exchanger to provide air heating, and may also provide air cooling, dehumidifying, humidifying circulating, and air cleaning.	1,634	13	21236
Residential Air-Source Heat Pump	A product, which is powered by single phase electric current, air cooled, rated below 65,000 Btu per hour, not contained within the same cabinet as a furnace, the rated capacity of which is above 225,000 Btu per hour, and is a heat pump or a cooling unit only.	4,444	12	53331
Residential Central AC	A non-portable device designed for home use that is suspended from the ceiling for circulating air via the rotation of fan blades. Some ceiling fans are sold with ceiling fan light kits.	2,228	11	24505
Other (not an ENERGY STAR product category)				
Other	*N/A*	*N/A*	*N/A*	*N/A*

Source: All ENERGY STAR specifications with definitions and requirements can be found at: https://www.energystar.gov/products/spec

Emissions factor

See *Appendix 4.2.2.2 – Energy efficiency calculator* for list of emissions factors. The emissions factor for the United States is used as proxy for all geographies of use.

4.2.7.2 Low-GWP refrigerant calculator

Currently, this guidance is only applicable for residential refrigerators or air-conditioning products. Suppliers reporting to this calculator may also report on efficiency gains through *4.2.7.2 Energy efficient products calculator*.

Any zero or low-GWP refrigerant used must be an acceptable substitute according to national or local regulatory guidelines (e.g. United States EPA Significant New Alternatives Policy (SNAP) program; China Ministry of Ecology and the Environment, Foreign Economic Cooperation Office; European Commission Directorate of Climate Action) and be used in accordance with use conditions laid out in those regulatory guidelines.

To calculate avoided emissions, the emissions from refrigerant leakage during installation, operation, and disposal and recovered refrigerant should be accounted for. Totals for each type of refrigerant used should be calculated separately. At this time, refrigerant recovery during disposal is considered to be 0% and is not accounted for in this methodology.

The supplier chooses the **"baseline product"** which must be the supplier's own product that represents the generation *immediately preceding the "more efficient" product*. Emissions improvements from low-GWP refrigerants cannot currently be calculated if suppliers do not have a baseline product.

Refrigerant Types and GWPs by Product

Product Type	Refrigerant type (Gas or Blend Name)	GWP (metric tons CO2e / metric ton loss)	Emissions factor (GWP in metric tons C02e/kg loss)	Data Source
Low-GWP Alternative Refrigerants				
Refrigerators	R-290	3	.003	EPA, SNAP
A/C				
Refrigerators	R-600a	3	.003	IPCC Fourth Assessment Report
Refrigerators	R-441A	5	.005	EPA, SNAP
A/C				
Refrigerators	R-450	601	.601	EPA, SNAP
Refrigerators	R-513A	630	.630	EPA, SNAP
AC	HFC-32	677	.677	IPCC Fifth Assessment Report (2014)
Baseline Refrigerants				
Refrigerators	HFC-134a	1,300	1.3	IPCC Fifth Assessment Report (2014)
A/C				
Refrigerators	R-407C	1,744	1.744	IPCC Second Assessment Report (1996)
A/C	R-410A	2,088	2.088	IPCC Second Assessment Report (1996)
Refrigerators	R-417A	2,346	2.346	IPCC Second Assessment Report (1996)
Refrigerators	R-404A	3,922	3.922	IPCC Second Assessment Report (1996)
Refrigerators	R-507 or R-507A	3,985	3.985	IPCC Second Assessment Report (1996)

4.2.7.5 Recycled content in plastic, glass, and aluminum products calculator

Post-consumer recycled content (PCR) definition

Refers to the amount of post-consumer recycled content contained in the package as defined by ISO 14021. The impact of converting the PCR material, so that it can be used as an input into a new package, is considered in this impact. The PCR material is incorporated into the production of the package and therefore reduces the virgin impact required to make the package.

Material Virgin and PCR Emissions Factors

These emissions factors are sourced from the COMPASS method using background data from ecoinvent 3 libraries. The IPCC 2013 method with climate feedback loops considered is used to calculate the avoided GHG impacts of the packages. The below emissions factors are for the virgin and PCR material impact for various packaging materials. The table also includes the emission factors for the most common modes of transport.

To derive emissions factors in metric tons CO2e per metric ton material, the kilograms CO2e per metric ton material were divided by 1000.

Material type	Source	Kilograms CO2e per metric ton (tonne) material	Metric tons CO2e per metric ton (tonne) material	Emissions factor used (virgin – PCR)
Polyester Fiber (used in textiles)	Virgin	5222.7006	5.223	3.792
	PCR	1431.1489	1.431	
Polyethylene Terephthalate (PET)	Virgin	3283.0463	3.283	1.852
	PCR	1431.1489	1.431	
High Density Polyethylene (HDPE)	Virgin	2178.0869	2.178	1.405
	PCR	773.26874	0.773	
Low Density Polyethylene (LDPE)	Virgin	2374.0811	2.374	1.601
	PCR	773.26874	0.773	
Polypropylene (PP)	Virgin	2193.4122	2.193	1.42
	PCR	773.26874	0.773	
Container Glass	Virgin	1257.5319	1.258	0.274
	PCR	983.76786	0.984	
Aluminum	Virgin	19261.71	19.262	18.447
	PCR	815.00396	0.815	
Steel	Virgin	1777.0328	1.777	1.042
	PCR	734.6346	0.735	