

2019 GHG Inventory Report

Executive Summary

This Greenhouse Gas Inventory (“Inventory”) describes Mozilla’s impact on the environment as measured in greenhouse gases (GHG) emitted in units of equivalent tons of carbon dioxide for the reporting year 2019, comprised of January 1, 2019 to December 31, 2019. The purpose of this Inventory is to benchmark Mozilla’s GHG emissions and to provide a consistent methodology for documenting the emissions inventory on an ongoing basis for both the Mozilla Corporation and the Mozilla Foundation.

POINT380 compiled the Inventory with support from the Mozilla Sustainability team, who also coordinated with numerous data owners across the organization.

Terminology

In this report, “spaces” refers to Mozilla offices and office colocations. Business services and operations” refers to Mozilla’s calculated Scope 1, 2 and 3 emissions with the exception of Scope 3 Use of Products.

Methodology

Mozilla’s Inventory is developed in accordance with the revised [GHG Protocol Corporate Standard](#) and the [Corporate Value Chain Accounting and Reporting Standard](#). The procedures developed and executed during development of the Mozilla Inventory for Reporting Year 2019 satisfy ISO Standard 14064-1^[1].

Inventory development involves the collection and examination of documentation, testimony and data from internal and external sources. Development also includes a determination of completeness and accuracy of the data provided and calculations completed using this data.

Key Findings

Mozilla’s 2019 GHG inventory is comprised of emissions from scope 1, scope 2 and relevant scope 3 categories.

Scope 2 emissions were calculated under two accounting methodologies: location-based and market-based. The location-based method reflects the emissions impact from the electricity that is generated where a facility is located. So-called “grid average” emissions factors account for all the renewable and non-renewable sources on the local electric grid, regardless of the purchaser. The market-based method reflects emissions impact from the electricity that is purchased by an organization, which may be different from the electricity that is generated

locally. This approach allows organizations to take credit for their own renewable energy purchases and to apply emissions factors that are specific to the energy sources and suppliers they purchase from. As a general rule, market-based accounting allows for greater accuracy when calculating an organization's emissions impact. Through inclusion of renewables, it is also an important means of accounting for and tracking achievement of emissions reduction goals.

The following table summarizes Mozilla's GHG inventory by emissions scope.

Table 1: 2019 Emissions Totals by Scope

Scope	Source	Emissions (mtCO ₂ e)	Details
Scope 1	Stationary Fuel/Heating, Refrigerants	735	Data collected for: 10 Mozilla offices, incl. Pocket, 6 office colocations
Scope 2	Purchased Electricity: Location-Based (grid average)	699	Data collected for: 10 Mozilla offices, incl. Pocket, 6 office colocations
	Market-Based (incl. renewables)	460	
Scope 3	Multiple Categories	798,499	Use of Products = 98% of Scope 3 total
Scope 1+2 Total (Market-Based)		1,195	mtCO ₂ e
Scope 1+2+3 Total		799,696	mtCO ₂ e

Mozilla 2019 Greenhouse Gas Inventory: Results

Table 2: 2019 Emissions Breakdown by Scope

Scope	Source	Emissions (mtCO ₂ e)	Details
Scope 1	Stationary Fuel/Heating	604	Resource consumption at Mozilla spaces
	Refrigerants	132	Resource consumption at Mozilla spaces
Scope 2	Purchased Electricity: Location-Based (grid average)	699	Resource consumption at Mozilla spaces
	Market-Based (incl. renewables)	460	Resource consumption at Mozilla spaces
Scope 3	Business Travel	2,657	
	Air Travel	2,189	
	Rail	71	
	Ground Vehicle	23	
	Hotel	191	
	Additional Expenses	182	
	Purchased Goods & Services	8,654	
Office expenses, electronic equipment, and other services	3,489		
Cloud Services	5,165		

	Employee Data	341	Data based on Mozilla employee survey
	Employee Commute	147	
	Remote Employees	194	
	Events	1,199	Detailed meeting and events data
	Waste	109	Includes waste generated in offices. Offices that did not report excluded from total (i.e. not estimated)
Transportation & Distribution	68	Includes received and shipped packages	
Use of Products	785,474	Includes Firefox Desktop, Firefox Mobile, Pocket, Mozilla Hubs	
Scope 1+2 Total (Market-Based)		1,196	mtCO₂e
Scope 1+2+3 Business Operations and Services Total		14,222	mtCO₂e
Scope 1+2+3 Total		799,696	mtCO₂e

Primary vs. Secondary Data

Primary Data refers to activity data taken directly from meter readings, i.e., the “raw” utility bill data. Primary Data are generally considered to be the most accurate, and preferable to estimated data.

Secondary Data, or estimated data, refers to the development and use of intensity factors and/or energy consumption models. Estimates are important for understanding and developing emissions control strategies, ascertaining the effects of sources and appropriate collection approaches, and prioritizing data sources to transition from Secondary to Primary (i.e. estimated to actual).

In the development of an emissions inventory, tradeoffs must be made between data accuracy and effort required to collect Primary Data over Secondary Data. Where risks of adverse environmental effects or adverse regulatory outcomes are high, more sophisticated and more costly Primary Data collection methods may be necessary. Where the risks of using Secondary Data are low, and the costs of more extensive methods are unattractive, less expensive estimation methods, such as energy intensity factors and energy consumption models, may be both satisfactory and appropriate. Selecting the method to be used to estimate source-specific activity data warrants a case-by-case analysis considering the costs and risks in the specific situation.

A brief summary of Primary vs. Secondary Data by Emissions Source used in the development of Mozilla's 2019 Operational Emissions Inventory is presented in the table below.

Table 3: Scope 1&2 Primary and Secondary Data

Emissions Source	<i>Emissions</i> (<i>mtCO₂e</i>)	<i>Primary</i> <i>Data</i>	<i>Secondary</i> <i>Data</i>	<i>Details</i>
Onsite fuel combustion: natural gas and heating oil	604	83.9%	16.1%	Estimated values applied due to missing data for 3 colocations: Seattle, Tulsa, Washington.
Refrigerants	132	0%	100%	Refrigerant data across all sites was estimated due to lack of reported values and/or outlier values
Electricity, Market-Based	460	98%	2%	Estimates were applied to four colocation sites: Seattle, Tulsa, Chicago, Washington
Total	1,195	86.6%	13.4%	

Mozilla GHG Inventory Development: 2019 Approach

This section describes Mozilla’s process for completing a high-quality, organization-wide inventory, as well as specific details relating to the approach to compile Mozilla’s 2019 GHG Inventory.

Boundary Conditions

The basis for reporting resource consumption and emissions data from Mozilla’s partially owned or controlled assets is based on a Control Approach: operational control criterion. An organization has operational control over a facility if the organization (or one of its subsidiaries) has the full authority to introduce and implement its operating policies (e.g. operating schedule, design, technologies, etc.). For Mozilla, this includes all spaces, including offices and office colocations, in which the organization operates. Mozilla uses “business services and operations” to refer to the organization’s calculated Scope 1, 2 and 3 emissions with the exception of Scope 3 Use of Products.

2019 GHG Inventory Inclusions

Mozilla’s 2019 office portfolio included 10 Mozilla offices, including Pocket, and 6 office colocations. All 16 spaces were included in the operational control boundary to calculate Mozilla’s scope 1 and 2 emissions.

Offices

- Berlin
- London
- Mountain View
- Paris
- Pocket (San Francisco)
- Portland
- San Francisco
- Taipei
- Toronto
- Vancouver

Office Colocations

- Brussels
- Chicago
- Denver
- Seattle
- Tulsa
- Washington

In addition to scope 1 and scope 2 emissions from Mozilla's office portfolio, development of Mozilla's 2019 GHG Inventory included an emissions screen of all 15 scope 3 categories. The results of this screen, in conjunction with conversations with Mozilla, identified seven scope 3 categories that are applicable to Mozilla and were included in the Inventory:

Scope 3 Categories

- Business Travel
- Purchased Goods & Services
- Employee Commuting
- Events
- Waste Generated in Operations
- Use of Products
- Transportation & Distribution

2019 GHG Inventory Exclusions

The following table outlines the emissions activities that were excluded from Mozilla’s 2019 GHG Inventory. All remaining eight emissions sources were deemed “non-material”, which means that their potential emissions impact is less than 3 percent of total organization-wide emissions.

Table 4: Inventory Exclusions

Emissions Scope	Emissions Source(s)	Explanation
Scope 2	District Energy (chilled water, steam)	No district energy was identified across the space portfolio.
Scope 3	Capital Goods	Potential emissions impact deemed de minimis.
	Fuel & Energy Related Activities	Potential emissions impact deemed de minimis.
	Upstream Leased Assets	This category is not relevant to Mozilla because Mozilla’s only leased assets (offices and colocations) are included in Mozilla’s scope 1 and 2 operational inventory.
	Processing of sold products	This category is not relevant to Mozilla because Mozilla does not sell intermediate products.
	End-of-Life Treatment of Product	This category is not relevant to Mozilla because Mozilla does not sell hard or soft goods.
	Franchises	This category is not relevant to Mozilla because Mozilla does not own or operate franchises.
	Investments	This category is not relevant to Mozilla because Mozilla is not an investor and does not provide financial services.

Emissions Methodology by Source: Scope 1

For Mozilla, Scope 1 emissions sources include only on-site fuel consumption and fugitive refrigerant leaks at Mozilla spaces. The following tables summarize the calculation methodology and assumptions applied to each emissions source. Below is a brief description of table components:

Emissions Methodology Components

- **Emissions scope:** Classification of emissions source as scope 1, 2 or 3
- **Activity data:** Source of reported raw activity data used in the inventory.
- **Key assumptions:** Assumptions made in the process of cleaning raw reported data, filling data gaps, and calculating emissions.
- **Data manipulations:** Required alterations made to the reported raw activity data to enable emissions calculations.
- **Estimation parameters:** The estimation approach and factors used to fill data gaps in reported raw activity data.
- **Emissions factor source(s):** Original publication source information for applied emissions factors.
- **Calculation details:** Brief description and example of the calculations used to compute emissions.
- **Additional details:** Relevant information related to raw reported data and/or the emissions calculation process.

Table 5: Onsite Fuel Consumption

<i>Emissions Scope</i>	Scope 1
<i>Activity Data</i>	Natural gas and heating oil consumption values reported by data managers via Mozilla GHG Inventory Data Request collection template. Of 16 total spaces, 6 did not provide usable natural gas data.
<i>Key Assumptions</i>	POINT380 assumed that all spaces used natural gas for space heating, unless otherwise reported.
<i>Data Manipulations</i>	In some cases, POINT380 applied a unit conversion to ensure all fuel consumption was quantified using common units: for natural gas, MMBtu; for heating oil, gallons.

Estimation Parameters There was insufficient data to develop a custom factor based on reported Mozilla data. Where data was missing or deemed erroneous (5 sites), POINT380 applied an MMBtu per square foot intensity factor derived from the most recent version of *Energy Information Administration's (EIA) Commercial Building Energy Consumption Survey (CBECS), Table C24 Natural Gas Consumption and Expenditure Intensities, 2012: Office*, with results published in 2016.

Emissions Factor Source(s) *United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories* (last updated March 9, 2020). This factor was applied globally.

Calculation Details Sum of natural gas and heating oil consumption, separately, multiplied by respective appropriate emissions factors to calculate total organizational GHG emissions in mtCO₂e.

Example, resource use for missing data:

- 3,600 sq ft x 0.0277648 MMBtu/sq ft = 100 MMBtu

Example, emissions calculation:

- 100 MMBtu x 0.053218 mtCO₂e/MMBtu = 5.32 mtCO₂e

Additional Details London and Paris, which indicated that natural gas or heating oil are not used in any capacity, were not estimated. Additionally, Chicago did not provide sufficient information to enable an estimation.

Table 6: Fugitive Refrigerants

<i>Emissions Scope</i>	Scope 1
<i>Activity Data</i>	Refrigerant type and leak amount reported by data managers via Mozilla GHG Inventory Data Request collection template. All offices reported refrigerant type, except for Portland, where no refrigerants are used. No colocations reported refrigerant type or leak data.
<i>Key Assumptions</i>	POINT380 assumed that spaces produced fugitive emissions unless otherwise reported. If refrigerant type was not reported, POINT380 assumed the use of R-134a (the most common commercial HVAC refrigerant).
<i>Data Manipulations</i>	In some cases, POINT380 applied a unit conversion to ensure all refrigerant leak values were quantified using a common unit: kilograms.
<i>Estimation Parameters</i>	There was insufficient data to enable development of a custom factor based on reported Mozilla data. POINT380 applied a leak rate assumption of 0.00427285 kg/sq ft. This leak rate was applied consistently, regardless of refrigerant type. The global warming potential applied was specified by standard AR5 and by refrigerant type.
<i>Emissions Factor Source(s)</i>	<i>United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories</i> (last updated March 9, 2020). Factors are global, i.e. not region-specific.

Calculation Details

Sum of space-specific refrigerant leak in kg by refrigerant type, divided by 1,000, multiplied by refrigerant type-specific global warming potential (GWP) to calculate organization total GHG emissions in mtCO₂e.

Example, resource use for missing data:

- 234 sq ft x 0.00427285 kg/sq ft = 1 kg

Example, emissions calculation:

- 1 kg R-134a x .001 mtCO₂e/kg x 1,300 GWP = 1.3 mtCO₂e

Additional Details

All fugitive refrigerant emissions are estimated.

Emissions Methodology by Source: Scope 2

For Mozilla, Scope 2 emissions sources include purchased electricity at Mozilla spaces. The following tables summarize the calculation methodology and assumptions applied to each emissions source.

Table 7: Purchased Electricity, Location-Based (Grid Average)

<i>Emissions Scope</i>	Scope 2
<i>Activity Data</i>	Consumption values and space location reported by data managers via Mozilla GHG Inventory Data Request collection template. All offices reported electricity use. 4 colocations did not provide electricity use and were estimated.
<i>Key Assumptions</i>	POINT380 assumed that all spaces used grid electricity unless otherwise reported.
<i>Data Manipulations</i>	Where required, POINT380 converted emissions factors to common units, mtCO ₂ e per kWh.
<i>Estimation Parameters</i>	To estimate missing consumption data, POINT380 developed custom intensity factors based on an average of Mozilla spaces reporting complete, validated data. The square-footage based intensity factor applied was: 11.839 kWh/sq.ft. for offices; 14.61 kWh/sq.ft. for office colocations. To estimate missing expense data, the expense-based factor applied was: 0.131 \$USD/sq.ft. for offices; 0.122 \$USD/sq.ft. for office colocations.

Emissions Factor Source(s)

North America: *United States Environmental Protection Agency (EPA), Emissions & Generation Resource Integrated Database, eGRID 2018_v2 (March 2020)*. Sites are assigned an eGRID subregion level emissions-factor-based location using the eGRID Power Profiler tool version 9.0 (March 2020). For Canada sites: *Environment and Climate Change Canada, National Inventory Report: 1990 - 2017 | Table A13 (2019)*. Sites are assigned an emissions factor based on location (province).

International: *Emissions Factors, International Energy Agency, 2019*. Sites are assigned a country-level emissions factor based on location. For Taiwan: Website of the *Bureau of Energy, Ministry of Economic Affairs, Taiwan (2018)*.

Calculation Details

Sum of space-specific annual electricity use in kWh, multiplied by appropriate electricity emissions factor to calculate total GHG emissions for organization-wide electricity use in mtCO₂e.

Example:

- $10,000 \text{ kWh} \times 1500 \text{ lbs CO}_2\text{e/MWh} \div 1 \text{ MWh}/1,000 \text{ kWh} \div 2,204.62 \text{ lbs/metric ton} = 6.804 \text{ mtCO}_2\text{e}$

Additional Details

Four colocations estimated: Seattle, Tulsa, Chicago, Washington. Denver's reported electricity was used to estimate Chicago, where reported data was incomplete and deemed to be an outlier, and where no square footage was reported. Mozilla identified Denver as a reasonable proxy for Chicago.

Table 8: Purchased Electricity, Market-Based (Includes Renewables)

<i>Emissions Scope</i>	Scope 2
<i>Activity Data</i>	Consumption values, space location and renewable energy and utility information reported by data managers via Mozilla GHG Inventory Data Request collection template. All offices reported electricity use. 4 colocations did not provide electricity use and were estimated. 3 offices and 1 colocation reported renewable energy purchases.
<i>Key Assumptions</i>	POINT380 assumed that all spaces used grid electricity unless otherwise reported.
<i>Data Manipulations</i>	Where renewable energy percentages were provided, POINT380 calculated the renewables consumed by the space by multiplying electric consumption in kWh by the reported percentage of renewables.
<i>Estimation Parameters</i>	See “Purchased Electricity, Location-Based” for estimations of electricity consumption and expense.
<i>Emissions Factor Source(s)</i>	<p>North America: Utility-specific or Independent System Operators (ISO) factors were applied where available. Where unavailable, grid average factors from eGRID 2018_v2 or province-specific factors from Canada’s National Inventory Report 2019 were applied (see “Purchased Electricity, Location-Based”).</p> <p>International: Utility-specific factors published on utility websites were applied where available. Where not available, <i>Association of Issuing Bodies (AIB) - European Residual Mixes 2019 – Figure 4, Version 1.0 (May 2020)</i>. Sites are assigned a country-level emissions factor based on location. Where unavailable, grid average factors from IEA 2019 were used (see “Purchased Electricity, Location-Based”).</p>

Calculation Details

Sum of space-specific annual electricity use in kWh, minus renewables applied in kWh, multiplied by appropriate electricity emissions factor to calculate total GHG emissions for organization-wide electricity use in mtCO₂e.

Example:

- 10,000 kWh – 2,000 kWh renewables = 8,000 kWh x 0.04319 kgCO₂e/kWh ÷ 1,000 kg/metric ton = 0.34552 mtCO₂e

Additional Details

The following sites reported renewables purchases in 2019: Berlin, Mountain View, San Francisco, Chicago.

Emissions Methodology by Source: Scope 3

For Mozilla, Scope 3 emissions sources include the following material categories: business travel, employee data (including commuting and remote work), purchased goods and services, events, waste, use of products, transportation and distribution. The following tables summarize the calculation methodology and assumptions applied to each emissions source. See Appendix A for additional information about the activities included in each category.

Table 9: Business Travel: Commercial Air Travel

<i>Emissions Scope</i>	Scope 3, Category 6
<i>Activity Data</i>	Flight segment data provided by Egencia Corporate Travel system. Data included origination, destination, date of travel, expense, etc. Some non-Egencia flight data was provided through expense reports.
<i>Key Assumptions</i>	Small percentage of air travel captured in expense reports and not included in Egencia data had Mozilla average kgCO ₂ e/\$ flight expense factor applied.
<i>Data Manipulations</i>	Multi-leg trip data was combined into a single entry in Egencia; POINT380 separated this information so that each origination-destination was a single entry.
<i>Estimation Parameters</i>	POINT380 applied flight miles associated with each origination-destination pair, using publicly available datasets for airport code and distance. Source: US DoT Bureau of Labor and Statistics, TranStats portal.
<i>Emissions Factor Source(s)</i>	<i>United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2020).</i>

Calculation Details

Total commercial airline miles traveled, segmented into three categories: short-, medium-, and long-haul flights, then multiplied by the appropriate category-specific emission factors to calculate total GHG emissions for corporate airline travel in mtCO₂e.

Examples:

- Short haul flight (<300 miles): 234 miles x 0.217 kgCO₂e/passenger-mile = 50.8 kgCO₂e
- Medium haul flight (300-2300 miles): 1,567 miles x 0.134 kgCO₂e/passenger-mile = 210.2 kgCO₂e
- Long haul flight (>2300 miles): 3,296 miles x 0.166 kgCO₂e/passenger-mile = 548.4 kgCO₂e

Additional Details

Table 10: Business Travel: Rail Travel

<i>Emissions Scope</i>	Scope 3, Category 6
<i>Activity Data</i>	Rail travel segment data provided by Egencia Corporate Travel system. Data included origination, destination, date of travel, expense, etc.
<i>Key Assumptions</i>	Trip distance provided by Egencia is accurate. Commuter Rail emissions factor is appropriate for all train travel (all distances and regions).
<i>Data Manipulations</i>	No data manipulations required.
<i>Estimation Parameters</i>	No estimation parameters required.

<i>Emissions Factor Source(s)</i>	United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2020).
<i>Calculation Details</i>	Total rail miles traveled by segment, multiplied by Commuter Rail emission factors to calculate total GHG emissions for corporate rail travel in mtCO ₂ e. Example: <ul style="list-style-type: none"> 198 miles x 0.149 kgCO₂e/passenger-mile = 25.6 kgCO₂e
<i>Additional Details</i>	One emissions factor applied to all train travel, regardless of region or length of trip.

Table 11: Business Travel: Ground Transport

<i>Emissions Scope</i>	Scope 3, Category 6
<i>Activity Data</i>	Commercial air flight segment data used as the basis for the number of ground transport trips
<i>Key Assumptions</i>	Each commercial air flight includes a ground transport roundtrip from airport to city center. Global average distance from airport to city center is 4.5 miles. All ground transport vehicles use gasoline and have common fuel efficiency (e.g. no differentiation between regional vehicle types and fuel types).
<i>Data Manipulations</i>	No data manipulations required
<i>Estimation Parameters</i>	Global average distance from airport to city center is 4.5 miles, calculated based on most visited 100 cities/airports globally. Source: https://www.travelstatsman.com/

<i>Emissions Factor Source(s)</i>	United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2020).
<i>Calculation Details</i>	<p>Total estimated ground transportation miles traveled for each flight segment, multiplied by Passenger Car emission factors to calculate total GHG emissions for corporate airline travel in mtCO₂e.</p> <p>Example: Berlin to Paris flight = 1 ground transport roundtrip to/from city center</p> <ul style="list-style-type: none"> 9 miles roundtrip x 0.337 kgCO₂e/passenger-mile = 3.04 kgCO₂e
<i>Additional Details</i>	

Table 12: Business Travel: Hotel Nights

<i>Emissions Scope</i>	Scope 3, Category 6
<i>Activity Data</i>	Hotel night data provided by Egencia Corporate Travel system. Data included location, date and length of stay, expense, etc. Some non-Egencia hotel data was provided through expense reports.
<i>Key Assumptions</i>	Country-level emissions factors are appropriate for the hotel type and location of Mozilla travel. Some portion of hotel night data captured in expense reports and not included in Egencia data had Mozilla average kgCO ₂ e/\$ hotel expense factor applied.
<i>Data Manipulations</i>	No data manipulations required
<i>Estimation Parameters</i>	No estimation parameters applied

Emissions Factor Source(s)

DEFRA, Department for Environment, Food and Rural Affairs (Defra), DEFRA 2020 Guidelines to Defra/DECC's GHG Conversion Factors for Company Reporting, Version 1.0, updated July 17, 2020. Hotel emissions factors based on original research from *Cornell University Center for Hospitality Research*, Hotel Sustainability Benchmarking Index 2016: Energy, Water and Carbon.

Calculation Details

Each hotel night is applied a country-specific emissions factor to calculate total GHG emissions in mtCO₂e.

Examples:

- 1 hotel night in United States = 1 x 21.7 kgCO₂e/room night = 21.7 kgCO₂e
- 3 hotel nights in Germany = 3 x 18.6 kgCO₂e/room night = 55.8 kgCO₂e

Additional Details

Table 13: Purchased Goods & Services

<i>Emissions Scope</i>	Scope 3, Category 1
<i>Activity Data</i>	Values reported by data managers via Mozilla GHG Inventory Data Request collection template. Includes PG&S reported by Mozilla spaces and other non-event expenses, such as professional services, electronic equipment and cloud services.
<i>Key Assumptions</i>	<p>Assumptions were made to facilitate mapping of Mozilla-defined category-level and supplier-level spend to DEFRA emissions factor categories.</p> <p>For cloud services, key assumptions include:</p> <ul style="list-style-type: none">• Annual server energy consumption: 1760.3 kWh/year• Server lifecycle emissions: 160 kgCO₂e/year

- Cloud utilization: 50% improvement over on-site servers
- Server allocation per \$ spend: 0.001 server / \$ spend
- Emissions factor: 0.0004 mtCO₂e/kWh (based on global average Firefox emissions / kWh consumed)

Data Manipulations

Mozilla-defined category-level and/or supplier-level spend was mapped to DEFRA emissions factor categories.

Estimation Parameters

Estimation parameters for cloud services described above and applied consistently across vendors (expect direct vendor emissions reporting)

Emissions Factor Source(s)

DEFRA, Department for Environment, Food and Rural Affairs (Defra), DEFRA 2012 Guidelines to Defra/DECC's GHG Conversion Factors for Company Reporting, Version 1.0, updated May 28, 2012. This is the most up-to-date version available.

Calculation Details

Sum of office-specific annual purchased goods and services in \$USD, categorized by DEFRA emissions category, multiplied by appropriate emissions factor to calculate total GHG emissions for organization-wide purchased goods and services in mtCO₂e.

Example:

- \$100,000 x 0.0007595 mtCO₂e/\$USD of spend on food and drink = 75 mtCO₂e
- \$600,000 x 1760.3 kWh/yr x 0.0001 server/\$ x 50% improvement = 530 MWh x 0.0004 mtCO₂e/kWh = 212.3 mtCO₂e

Additional Details

All factors and calculations for this category are an estimate of cradle-to-grave lifecycle emissions (i.e. material extraction, processing & manufacturing, product use, disposal & end of life). This is the only emissions category reporting lifecycle emissions.

Table 14: Employee Commute

<i>Emissions Scope</i>	Scope 3, Category 7
<i>Activity Data</i>	Detailed employee survey response data: country/city, commute mode, distance, frequency.
<i>Key Assumptions</i>	Survey response data are representative of all employee commute modes/distances for a given space, and can be scaled to account for the entire Mozilla office employee population. Commute mode emissions factors are consistent across geographies.
<i>Data Manipulations</i>	Calculation of commute distance and frequency required use of a single value rather than a range, as was requested in the survey response, e.g. a distance of 3.5 miles used when respondents selected travel distance of “0-5 miles”.
<i>Estimation Parameters</i>	Commute frequency (trips per week) and distance remain constant throughout the year. POINT380 assumed employees work 48 weeks per year.
<i>Emissions Factor Source(s)</i>	<i>United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2020).</i>

Calculation Details

Employee commute distance, mode, and frequency are captured in an employee survey and used to calculate total annual commute miles by mode/employee. Emissions factors, by mode, are applied to total miles traveled to compute annual commute emissions. Average annual commute emissions per responding employee are scaled to cover the remaining non-responding office employees.

Examples:

- Employee 1: Daily subway transit, 9 miles = 2,160 annual miles x 0.099 kgCO₂e/passenger-mile (Subway factor) = 215.1 kgCO₂e
- 242.6 kgCO₂e/employee calculated through 356 office employee direct survey responses
 - 242.6 kgCO₂e/employee x 249 non-responding office employees = 60,415.6 kgCO₂e added to emissions total from survey responses

Additional Details

Table 15: Remote Employees

<i>Emissions Scope</i>	Scope 3, Category 7
<i>Activity Data</i>	Detailed remote employee survey response data: location, square footage, electricity supply details (i.e. % renewables), count of key energy consuming office equipment (e.g. computer, printer, lights, etc.).
<i>Key Assumptions</i>	Remote employee office configuration remains constant throughout the year (e.g. no sq.ft. changes, computer equipment changes).
<i>Data Manipulations</i>	Calculation of office square footage and % renewables required use of a single value rather than a range which was requested in the survey response, e.g. 47% of renewable electricity used when respondents selected % renewables of “41-50%”.

Estimation Parameters Home office equipment energy consumption broken down by device type and power consumption, scaled to annual consumption based on estimated work schedule (1,920 work hours/year).

Home office electricity and natural gas consumption based on reported square footage and intensity factor derived from *Energy Information Administration's (EIA) Commercial Building Energy Consumption Survey (CBECS)* (kWh/sq.ft./year; MMBtu/sq.ft./year).

Emissions Factor Source(s) *United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories* (last updated March 9, 2019).

Calculation Details Remote employees annual work-related energy consumption calculated using survey responses. Emissions factors, by country, are applied to total kWh and MMBtu consumption to calculate total remote employee emissions. Average annual remote employee emissions per responding employee are scaled to cover the remaining non-responding remote employees.

Examples:

- Employee 1: Country, sq.ft., % renewables, office equipment
= (1.92 MMBtu x 53.1 kgCO₂e/MMBtu) + (847.0 kWh x 0.1158 kgCO₂e/kWh) = 124.4 kgCO₂e
- 439.6 kgCO₂e/employee calculated through 442 remote employee direct survey responses
 - 439.6 kgCO₂e/employee x 53 non-responding remote employees = 23,286.2 kgCO₂e added to emissions total from survey responses

Additional Details

Table 16: Events

<i>Emissions Scope</i>	Scope 3, Category 1
<i>Activity Data</i>	Detailed event data, including event start/end dates, number of attendees, venue square footage, number of hotel nights.
<i>Key Assumptions</i>	All multi-day events resulted in hotel nights, unless otherwise reported. It is possible that due to multiple raw data sources, hotel nights booked through Egencia have been double-counted (once in Scope 3 Business Travel, and once in Scope 3 Events). POINT380 and Mozilla do not anticipate this double-counting to be material.
<i>Data Manipulations</i>	No data manipulations required.
<i>Estimation Parameters</i>	Accommodations: Where attendee hotel nights were not reported, nights were estimated for events spanning more than one day using the following formula: hotel nights = number of attendees x (number of days – 1). Venue energy consumption estimated based on event duration and venue floor space.
<i>Emissions Factor Source(s)</i>	<p>Hotel nights: emissions are estimated based on emissions intensity/room night factors from <i>DEFRA, Department for Environment, Food and Rural Affairs (Defra)</i>, DEFRA 2020 Guidelines to Defra/DECC's GHG Conversion Factors for Company Reporting, Version 1.0, updated July 17, 2020. Hotel emissions factors based on original research from <i>Cornell University Center for Hospitality Research</i>, Hotel Sustainability Benchmarking Index 2016: Energy, Water and Carbon.</p> <p>Electricity and Natural Gas: Venue-related emissions are calculated using factors from the same sources used in Mozilla's operational inventory, see "Onsite Fuel Consumption" and "Purchased Electricity, Location-Based."</p>

Calculation Details

Meeting and event name, date, location, duration, attendee count and event space used (sq.ft.) are used to estimate associated energy consumption.

- Event Space: electricity and natural gas consumption estimates are calculated, then location-specific emissions factors are applied to produce an estimated total mtCO_2e for each event.

Accommodations: A country-level $\text{mtCO}_2\text{e}/\text{room night}$ factor is applied to reported/estimated hotel nights to produce an estimated accommodation-related mtCO_2e for events requiring overnight stays.

Additional Details

All travel mileage and travel expenses associated with events and reported through Egencia is included in Scope 3 Business Travel. All expenses pertaining to the events themselves, e.g. catering, swag, are included in Scope 3 Events. All hotel night data, reported and estimated, was reviewed with Mozilla to confirm accuracy.

Table 17: Waste Generated in Operations

<i>Emissions Scope</i>	Scope 3, Category 5
<i>Activity Data</i>	Values reported by data managers via Mozilla GHG Inventory Data Request collection template. Of the 10 offices included, 6 offices did not report landfill, recycling or compost. 4 offices did not report e-waste.
<i>Key Assumptions</i>	It was assumed that the overall emissions impact of waste generated by offices that did not report is de minimis, therefore, these values were not estimated.
<i>Data Manipulations</i>	Item counts of e-waste were translated into weight by applying a generic 'light, medium, heavy' categorization of each item based on the description provided. Diversion percentages and volume figures were similarly converted into weight. A unit conversion of 550 lbs per short ton was used to convert commercial compacted landfill and compost volume into weight.
<i>Estimation Parameters</i>	Where whole-building data was provided, the portion of waste allocated to Mozilla was calculated using a reported percent of building square footage.
<i>Emissions Factor Source(s)</i>	<i>United States Environmental Protection Agency (EPA)</i> Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2019). Emissions factors are assigned based on waste type and disposal method.

Calculation Details

Sum of office specific annual waste generation in lbs, multiplied by appropriate emissions factor to calculate total GHG emissions for organization-wide waste generation in mtCO₂e.

Examples:

- 3,575 lbs municipal solid waste ÷ 2,2046.2 lbs/short ton = 1.60 short ton x 0.63 mtCO₂e/short ton = 1 mtCO₂e
- E-waste: 3 laptops and 6 phones to 3 x 8 lbs + 6 x 1 lbs = 30 lbs x 0.000035 mtCO₂e/lb mixed electronics = 0.00105 mtCO₂e

Additional Details

The weight estimates applied to e-waste counts are as follows:

- Light equipment (phones, cables, etc.): 1 lbs
- Medium equipment (laptops, monitors, etc.): 8 lbs
- Heavy equipment (printers, servers, etc.): 50 lbs

Table 18: Use of Products

<i>Emissions Scope</i>	Scope 3, Category 11
<i>Activity Data</i>	Total monthly hours of use by region and Mozilla product type
<i>Key Assumptions</i>	Breakdown of devices used to access each Mozilla product, e.g. total usage of Firefox desktop is split 65% laptop, 35% desktop computer. Emissions factors applied to regions are derived from country-level emissions factors and appropriately represent emissions by broad geographic region. Energy consumption of technology used to access Mozilla products uses the entire power demand of that device (e.g. total estimated power demand of the device is required to assess/use Mozilla products, not a portion of device power).

Data Manipulations

Calculate hours of product use based on “Days of Active Session Time” (e.g. 0.5 days of session time x 24 hours per day = 12 total hours of product use).

*Estimation
Parameters*

Technology energy consumption used to access Mozilla products, broken down by type and power consumption: desktop computer, laptop computer, tablet, mobile, modem/router.

*Emissions Factor
Source(s)*

North America: *United States Environmental Protection Agency (EPA)*, Emissions & Generation Resource Integrated Database, eGRID 2018_v2 (March 2020). Sites are assigned an eGRID subregion level emissions-factor-based location using the eGRID Power Profiler tool version 9.0 (March 2020). Canada: *Environment and Climate Change Canada*, National Inventory Report: 1990 - 2017| Table A13 (2019). Sites are assigned an emissions factor based on location (province).

International: *Emissions Factors, International Energy Agency, 2019*. Sites are assigned a country-level emissions factor based on location.

Pooled Geographical Emissions factors for:

- Africa
- Antarctica
- Asia
- Europe
- North America
- Oceania
- South America
- Other (no geotag)

Calculation Details

Hours of session time in each region is multiplied by estimated power consumption of devices and device breakdown (% laptop, % tablet, etc.) used to access Mozilla products. This calculation produces total annual kWh by region. Regional electricity emissions factors are applied to calculate total regional emissions and summed to calculate total emissions by product.

Example:

- South America Region: 1.5B hour session time x (65% laptop x 60w laptop power) + (35% desktop x 110w desktop power) = 119 GWh regional electricity x region emissions factor .000350 mtCO₂e/kWh = 41,893 regional mtCO₂e
- Sum across all regions and products to calculate total emissions from use of products

Additional Details

Table 19: Transportation & Distribution (Upstream & Downstream)

<i>Emissions Scope</i>	Scope 3, Categories 4 and 9
<i>Activity Data</i>	Values reported by data managers via Mozilla GHG Inventory Data Request collection template. Data collected includes the number of packages shipped and received.
<i>Key Assumptions</i>	It was assumed that the overall emissions impact of packages shipped by offices that did not report is de minimis, therefore, these values were not estimated. It was assumed that the emissions factor reported by FedEx was representative of an industry average emissions factor.
<i>Data Manipulations</i>	No data manipulations required.
<i>Estimation Parameters</i>	Where expense values absent package counts were provided, no estimation was made as to the number of packages shipped.

Emissions Factor Source(s)

FedEx, [FedEx Global Citizen Report](#), Page 56 (2019)

Calculation Details

Sum of office-specific number of packages shipped, multiplied by appropriate emissions factor to calculate total GHG emissions for organization-wide shipping in mtCO₂e.

Example:

- 100 packages x 0.00495 mtCO₂e/package = 0.495 mtCO₂e

Additional Details

Emissions Factors

Mozilla applies emissions factors based on resources consumed. These factors are published by industry relevant sources, including The Climate Registry, United States Environmental Protection Agency (EPA), GHG Protocol, International Energy Agency, municipal and commercial utilities, and other entities outlined in The Climate Registry's General Reporting Protocol[2] and consistent with methodologies from the WRI/WBCSD GHG Protocol[3]. Mozilla uses the most up-to-date factors available at the time of annual inventory development.

POINT380 used emissions factors based on recognized published data applicable to the types of emissions associated with the Inventory. Nearly all factors applied to the Inventory are publicly available; however, there are a few cases where proprietary factors from fee-based sources and custom factors developed through Mozilla-driven research were applied. See "Limitations" section below for additional information regarding assumptions related to emissions factors, fuel heat values, petroleum fuels and intensity factors.

Limitations

GHG and energy use data are subject to inherent limitations. Information and data were collected via Mozilla staff and direct client communication. No on-site sampling was conducted. Rather than empirical measurements, Mozilla's inventory is based on appropriate emissions factors from industry relevant sources consistent with methodologies from the WRI/WBCSD GHG Protocol. This methodology has been accepted based on the source of the emission factors used. In particular:

Emissions Factors – Mozilla uses emissions factors based on recognized published data applicable to the types of emissions associated with the inventory. It was not possible to estimate or assess any possible error associated with the use of these published emissions factors as compared to empirical data.

Fuel Heat Values – The heat value of individual fuels varies over time and this variability can have a potentially material impact on the calculated emissions. The best available data has been used in the inventory development; however, this data is based on low intensity sampling and requires assumptions about consistency in heat value from season to season and year to year, because much of the data is based on samples taken outside the inventory period.

Petroleum Fuels – The emissions associated with the consumption of space heating (e.g. natural gas) and transport fuels (e.g. gasoline) are determined by combustion efficiency. The best available data has been used in the inventory development; however, this data is not based on individual sampling of technology or vehicles Mozilla has used. Rather, it relies on generalized testing and reporting data provided by federal agencies such as the Department of Transportation (DoT), Environmental Protection Agency (EPA), and others. As such, it was not possible to estimate or assess any possible error associated with the use of these published values as compared to empirical data.

Intensity Factors – A large percentage of Mozilla’s offices are part of developments in which energy consumption is not directly metered and/or the facility is leased. POINT380 was able to review and demonstrate that the intensity factors used to estimate the energy consumption at these offices were appropriate. Nevertheless, this data is based on low intensity sampling and requires assumptions about accuracy, consistency, and location applicability.

Table 20: 2019 Inventory Emissions Factors by Scope

<i>Emissions Scope</i>	<i>Emissions Source</i>	<i>Factor Source & Description</i>	<i>Public or Private</i>
Scope 1	Natural Gas	<i>United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2020)</i>	<i>Public</i>
	Heating Oil	<i>United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2020)</i>	<i>Public</i>
	Refrigerants	<i>United States Environmental Protection Agency (EPA) Emission Factors for</i>	<i>Public</i>

	Greenhouse Gas Inventories (last updated March 9, 2020)		
Scope 2	Electricity: United States Grid Average	<i>United States Environmental Protection Agency (EPA), Emissions & Generation Resource Integrated Database, eGRID 2018_v2 (March 2020). Sites are assigned an eGRID subregion level emissions-factor based on zip code location using the eGRID Power Profiler tool version 9.0 (March 2020).</i>	<i>Public</i>
	Electricity: Canada Grid Average	<i>Environment and Climate Change Canada, National Inventory Report: 1990 - 2017 Table A13 (2019). Sites are assigned an emissions factor based on provincial location.</i>	<i>Public</i>
	Electricity: International Grid Average	<i>Emissions Factors, International Energy Agency, 2019. Sites are assigned a country-level emissions factor based on location.</i>	<i>Private, based on Public data</i>
	Electricity: Taiwan Grid Average	<i>Website of the Bureau of Energy, Ministry of Economic Affairs, Taiwan (2018).</i>	<i>Public</i>
	Electricity: United States ISO	<i>PJM, 2012-2016 CO2, SO2 and NOX Emission Rates (March 2017): https://www.pjm.com/~media/library/reports-notices/special-reports/20170317-2016-emissions-report.ashx</i>	<i>Public</i>
	Electricity: International Residual Mix (all regions)	<i>Association of Issuing Bodies (AIB) - European Residual Mixes 2019 – Figure 4, Version 1.0 (May 2020). Sites are assigned a country-level emissions factor based on location.</i>	<i>Public</i>

	Electricity: Utility Factors	<i>Utility websites and public reporting sites.</i> When available, sites are assigned a utility-specific and/or tariff-specific emissions factor based on reported utility and electricity tariff.	<i>Public</i>
Scope 3	Business Travel: Commercial Air	<i>United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2020).</i>	<i>Public</i>
	Business Travel: Vehicles (gasoline)	<i>United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2020).</i>	<i>Public</i>
	Business Travel: Rail/Train	<i>United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2020).</i>	<i>Public</i>
	Employee Commute (various fuels, modes)	<i>United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories (last updated March 9, 2020).</i>	<i>Public</i>
	Purchased Goods & Services	<i>DEFRA, Department for Environment, Food and Rural Affairs (Defra), DEFRA 2012 Guidelines to Defra/DECC's GHG Conversion Factors for Company Reporting, Version 1.0, updated May 28, 2012. This is the most up-to-date version available.</i>	<i>Public</i>
	Purchased Goods & Services: Cloud Services	<i>Global average electricity emission factor.</i> Calculated based on Mozilla-specific emissions associated with Use of Products, i.e. cloud service emissions factor matches	<i>Point830 calc, Public</i>

blended average of Use of Products
emissions factor

<p>Meetings & Events (multiple sources)</p>	<p>Hotel room nights: <i>DEFRA, Department for Environment, Food and Rural Affairs (Defra)</i>, DEFRA 2020 Guidelines to Defra/DECC's GHG Conversion Factors for Company Reporting, Version 1.0, updated July 17, 2020. Hotel emissions factors based on original research from <i>Cornell University Center for Hospitality Research</i>, Hotel Sustainability Benchmarking Index 2016: Energy, Water and Carbon.</p> <p>Natural gas, see Scope 1, Natural Gas.</p> <p>Electricity, see Scope 2, Electricity: United States Grid Average, Electricity: Canada Grid Average, and Electricity: International Grid Average.</p>	<p><i>Public, Private (international electricity factors only)</i></p>
<p>Waste generated in operations</p>	<p><i>United States Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories</i> (last updated March 9, 2020). Emissions factors are assigned based on waste type and disposal method.</p>	<p><i>Public</i></p>
<p>Use of Products</p>	<p><i>Emissions Factors, International Energy Agency, 2019</i>. Regional emissions factors are derived from country-level emissions factors.</p>	<p><i>Private, based on Public data</i></p>
<p>Transportation & Distribution (Upstream, Downstream)</p>	<p><i>FedEx</i>, FedEx Global Citizen Report, Page 56 (2019)</p>	<p><i>Public</i></p>

Mozilla Inventory Data Management Recommendations

The recommendations below are based on POINT380’s past inventory and verification experience, POINT380’s involvement in the development of Mozilla’s 2019 GHG Inventory, and POINT380’s understanding of Mozilla’s existing operations and aspirations. The recommendations are intended to support Mozilla in improving data collection and quality over time.

Table 21: Inventory Data Management Recommendations

<i>Emissions Scope</i>	<i>Emissions Source</i>	<i>Current Status</i>	<i>Opportunities for Improvement</i>
Scope 1	Natural Gas	Complete primary data for all but 5 spaces, including 2 offices and 3 office colocations.	Confirm natural gas usage across all spaces. Collect additional primary data where available.
	Heating Oil	Complete primary data for single space reporting heating oil.	No change, current data is sufficient.
	Refrigerants	Reported refrigerant types. Estimations applied to all sites.	Collect primary data at largest offices, estimate at other locations.
Scope 2	Electricity	Complete primary data for all offices. Estimations applied to 4 colocations. Utility emissions factors applied at 3 spaces.	Collect primary data for all sites. Apply utility-specific factors to a greater number of sites to improve emissions calculation accuracy.

	Renewable Energy	Renewable energy reported at 4 sites. No documentation provided.	Gather documentation from utility/RE providers and cross-check against reported values. Confirm that RECs are being retired on Mozilla's behalf.
Scope 3	Business Travel: Commercial Air Travel	Large percentage of data reported/collected directly through Egencia.	Structure data into individual origin-destination pairs, rather than combined into all destinations for a trip
	Business Travel: Ground Transport	Miles traveled and emissions based 100% on estimated trips and mileage (connected to number of flights)	Look to car service (Lyft, Uber), rental vehicle company (Dollar, Enterprise), and expense report data to improve accuracy, accountability, and actionability of data.
	Business Travel: Rail Travel	Large percentage of data reported/collected directly through Egencia.	No change, current data is sufficient.
	Business Travel: Hotels	Large percentage of data reported/collected directly through Egencia.	Shift hotel expense report data to Egencia for improved accuracy.
	Purchased Goods & Services	Inconsistent category- and supplier-level spend, resulting in a mix of spend used for emissions calculations.	Expand coverage and consistency of category- and supplier-level spend. Use pre-defined categories to streamline raw data collection and mapping to emissions factors.

Scope 3

Purchased Goods & Services: Cloud Services	Direct reporting from only the two main vendors. All other vendor emissions estimated based on emissions / \$ spend.	Refine estimate of emissions per dollar \$. Consider collecting vendor data on where the service is hosted.
Employee Commuting	Employee survey provides key inputs to commute emissions analysis: mode, distance, frequency.	No change, current data is sufficient. Consider survey annually or every 2 years. Consider a couple of adjustments to capture 2020 SARS-CoV-2 impacts.
Remote Employees	Employee survey provides key inputs to remote employee emissions analysis: sq.ft., renewables, tech use.	No change, current data is sufficient. Consider survey annually or every 2 years.
Events	Some incomplete reporting, including hotel nights, venue square footage and attendees.	Complete reported data for all events.
Waste	Significant reporting gaps, and heavy reliance on estimations. Generic factors used to convert e-waste item counts into weight.	Gather primary data or additional secondary data at largest sites to facilitate improved estimation calculations. Refine conversion factors used to translate e-waste counts to weight.

Scope 3

Use of Products	Complete accounting of time of product use by region and product type.	No change in activity data, current data is sufficient. Consider custom analysis of energy consumption for <i>only</i> Mozilla products (rather than the entire device).
Transportation & Distribution	Significant reporting gaps: many sites did not report, and much of reported package counts appear incomplete.	Expand number of sites and coverage of reported data.

Appendix

Appendix A: Greenhouse Gas Inventory: Background and Definitions

GHG Protocol

The Greenhouse Gas (GHG) Protocol was developed by the GHG Protocol Initiative, a multi-stakeholder partnership of businesses, nongovernmental organizations (NGOs), governments, academics, and others convened by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI). Launched in 1998, the Initiative's mission is to develop internationally accepted greenhouse gas accounting and reporting standards and/or protocols, and to promote their broad adoption. According to the GHG Protocol Initiative, 92% of Fortune 500 companies responding to CDP (previously the Carbon Disclosure Project) in 2016 used the GHG Protocol directly or indirectly.

The original GHG Protocol Corporate Accounting and Reporting Standard (GHG Protocol Corporate Standard) was published in 2001. The revised GHG Protocol Corporate Standard, published in 2004, was further updated in 2015 to include additional guidance for calculating Scope 2 emissions. The GHG Protocol Corporate Standard covers the accounting and reporting of the six greenhouse gases covered by the Kyoto Protocol, including carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF₆).

The Corporate Value Chain Accounting and Reporting Standard, published in 2011, provides guidance for companies to assess their entire value chain (Scope 3) emissions impact from 15 categories of activities.

Accounting Principles

The International Organization for Standardization (ISO) is an international standard-setting body composed of representatives from various national standards organizations. ISO Standard 14064-1 defines six principles that should be upheld in the development of a GHG inventory assertion. These principles are intended to ensure a fair representation and a credible and balanced account of GHG emissions. The procedures developed and executed during development of the Mozilla Inventory for Reporting Year 2019 satisfy each of the principles below.

Relevance

Appropriate data sources are used to quantify, monitor, or estimate GHG sources. Appropriate minimum thresholds associated with emissions levels, i.e. from *de minimis* sources, are used to

justify the exclusion or the aggregation of minor GHG sources or the number and/or frequency of data points monitored.

Completeness

All sources within the Organization's boundaries are included within an identified source category.

Accuracy

Measurements and estimates are presented, without bias. Where sufficient accuracy is not possible or practical, measurements and estimates should be used while maintaining the principle of conservativeness.

Transparency

Information is presented in an open, clear, factual, neutral, and coherent matter that facilitates independent review. All assumptions are stated clearly and explicitly and all calculation methodologies and background material are clearly referenced.

Conservativeness

Appropriate parameters affecting the sources are utilized in the calculation of the GHG assertion. When parameters or data sources are highly uncertain, the choice of a specific parameter, data source, or estimated or default value to be utilized, results in an overestimation of the GHG assertion (i.e. total annual emissions would be overstated for the sake of conservativeness, and to avoid the risks associated with understating reported emissions).

Boundary

The GHG Protocol recommends the use of the more comprehensive of two approaches to setting an Organizational Boundary for an emissions inventory: control approach or equity approach. The control approach prescribes measurement of emissions from operations over which an Organization has practical control. The equity approach prescribes measurement of emissions from facilities over which an Organization has some degree of ownership.

Additionally, an Organization must establish an operational and temporal boundary, which define the emissions scopes and period of direct and indirect emissions included in the Organizational Boundary.

Scope

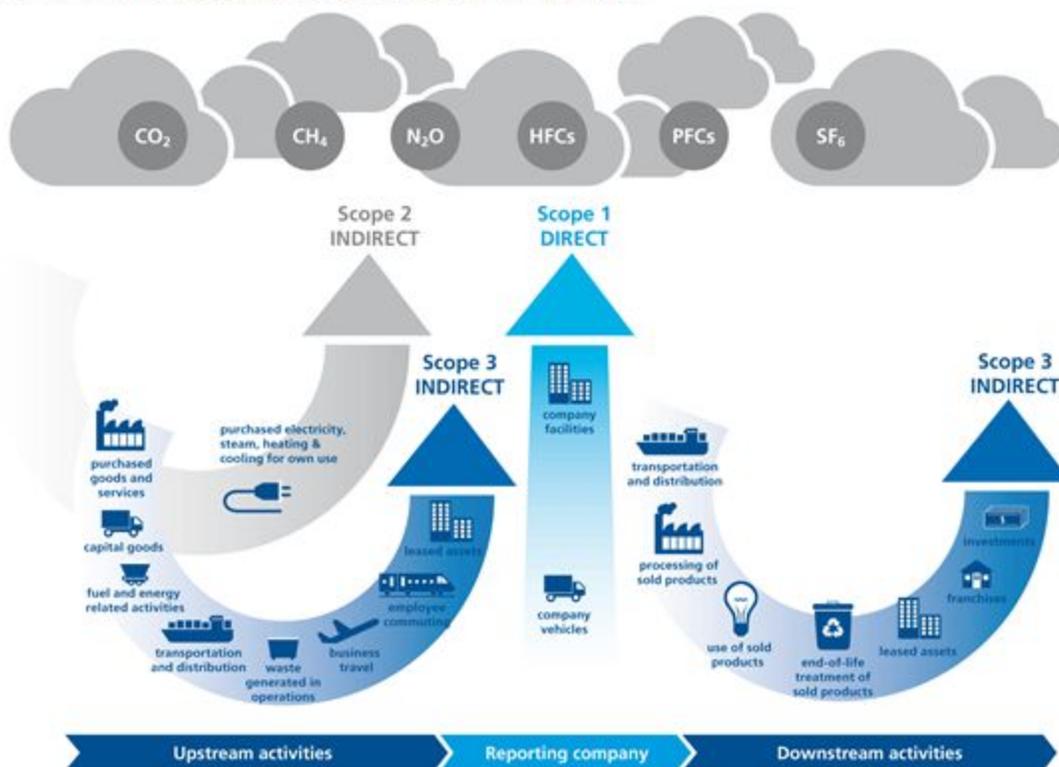
The Operational Boundary may encompass several different types of emissions scopes. The GHG Protocol Corporate Standard classifies an organization's GHG emissions into three scopes, defined below and depicted on the following page.

Scope 1 – Direct emissions from sources that are owned and or/controlled by the Organization. These include emissions from combustion of fossil fuels in office space heating, water heating, vehicles, etc.

Scope 2 – Indirect emissions from sources that are not owned or operated by the Organization but whose energy products are directly used by the Organization. These include purchased electricity, steam and chilled water. Purchase of renewable energy is included in the market-based calculation for Scope 2 emissions.

Scope 3 – Optional other indirect emissions that occur in the value chain of the Organization, from activities such as employee commuting, corporate travel and waste generated in operations. These items are considered optional but allow for comprehensive accounting of an Organization’s GHG inventory.

Overview of GHG Protocol scopes and emissions across the value chain



Source: myclimate.org - World Resources Institute & World Business Council for Sustainable Development, 2011.

Greenhouse Gases

Emissions scopes encompass a variety of greenhouse gases. The GHG Protocol Corporate Standard covers the accounting and reporting of the six greenhouse gases covered by the Kyoto Protocol, listed below.

- CO₂: Carbon Dioxide
- CH₄: Methane
- N₂O: Nitrous Oxide
- HFC: Hydrofluorocarbons (e.g. HFC-134a from refrigerant losses)
- PFC: Perfluorocarbons (e.g. Perfluoromethane from aluminum smelting)
- SF₆: Sulfur hexafluoride (e.g. e.g. in high voltage electrical equipment)
- NF₃: Nitrogen trifluoride

Global Warming Potential

Different GHGs have a different impact on the Earth's warming. The difference is due to the ability of a gas to absorb energy ("radiative efficiency") and the longevity of the gas in the atmosphere ("lifetime"). The Global Warming Potential (GWP) is a measure of how much heat a GHG traps in the atmosphere up to a specific time horizon, and allows comparison of the global warming impacts of different gases. GWP is expressed as a factor of carbon dioxide, which is to say that it reflects a measure of how much energy the emissions of 1 ton of a GHG will absorb over a given time period relative to the emissions of one metric ton of carbon dioxide (CO₂). The larger the GWP, the greater the contribution to Earth's warming.

The table below depicts 100-year time horizon GWP estimates as published in the International Panel for Climate Change (IPCC) Fifth Assessment Report (AR5) for the three GHGs covered by the Kyoto Protocol that are relevant to Mozilla. There are no significant sources of perfluorocarbons (PFCs), sulphur hexafluoride (SF₆), and nitrogen trifluoride (NF₃) in Mozilla's Inventory– the remaining GHGs required for accounting/reporting by the UNFCCC/Kyoto Protocol.

Global Warming Potential (GWP) by Greenhouse Gas

Greenhouse gas	Formula	GWP	time horizon	GWP Source
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Carbon Dioxide	CO ₂	1	100-year	IPCC AR5
Methane	CH ₄	28	100-year	IPCC AR5
Nitrous Oxide	N ₂ O	265	100-year	IPCC AR5

Emissions Factors

An emissions factor is a representative and estimated value that relates the quantity of a GHG released in the atmosphere to an activity, such as the burning of fuel or generation of electricity. Emission factors are generally expressed as the weight of pollutant divided by an activity unit (weight, volume, distance, duration), for example, metric tons of carbon equivalent emitted per kilowatt hour of electricity consumed.

Publishers of emissions factors include governmental agencies such as the U.S. Energy Information Administration (EIA), U.S. Environmental Protection Agency, U.K. Department for Environment, Food and Rural Affairs, Taiwan Bureau of Energy, the Paris-based International Energy Agency (IEA), publicly owned and commercially owned utilities, the Intergovernmental Panel on Climate Change (IPCC), research organizations and labs, etc.

Scope 3 Emissions Sources

The Greenhouse Gas Protocol Corporate Value Chain Accounting and Reporting Standard, published in 2011, provides guidance for companies to assess their entire value chain (Scope 3) emissions impact from 15 categories of activities. Below is a brief description of each category mapped to the category names and data tables used in Mozilla's 2019 Greenhouse Gas Inventory Report. Note that "Upstream" emissions encompass the first eight categories and refer to indirect GHG emissions related to purchased goods and services. "Downstream" emissions encompass categories nine through fifteen and refer to indirect GHG emissions related to sold goods and services.

Scope 3 Categories: GHG Protocol & Mozilla Inventory

	Activity Category	Description	Mozilla 2019 Inventory Category
1	Purchased goods	Extraction, production, and transportation of	Purchased goods

	and services	purchased or acquired goods and services. Examples: consulting services, catered lunches.	and services
2	Capital goods	Extraction, production, and transportation of physical goods/assets used in the production or manufacturing of goods and services. In financial accounting, these assets are depreciated or amortized over their life. Example: buildings, machinery.	Deemed <i>de minimis</i> , excluded from Inventory
3	Fuel- and energy-related activities	Extraction, production and transportation of purchased fuels and energy not accounted for in Scope 1 or 2. Includes upstream emissions resulting from the generation and transmission and distribution of fuels, such as natural gas, and of electricity. Example: emissions from extraction of natural gas used by Mozilla.	Deemed <i>de minimis</i> , excluded from Inventory
4	Upstream transportation and distribution	Transportation and distribution of products, or transportation and distribution services, between an organization's supply chain and its operations, or between an organization's facilities. Example: FedEx or UPS shipping.	Transportation and Distribution
5	Waste generated in operations	Disposal and treatment of waste generated in the course of business operations. Examples: food waste, recycling.	Waste generated in operations
6	Business travel	Transportation of employees for business-related activities in vehicles not owned by the reporting organization. Example: air travel, rail travel, taxis.	Business travel
7	Employee commuting	Transportation of employees between their homes and workspaces in vehicles not owned by the reporting organization. "Vehicles" may include automobiles, bus, rail, air, bicycle and other modes. Category also includes the energy/emissions associated with remote employee offices (i.e. home offices).	Employee data
8	Upstream leased assets	Operation of assets leased by the organization and not included in Scope 1 or 2. Only applicable to organizations that are lessees.	Not relevant, excluded from Inventory
9	Downstream transportation and	Transportation and distribution of sold products between organization and end	Transportation and Distribution

	distribution	consumer. Example: FedEx or UPS shipping.	
10	Processing of sold products	Processing of intermediate products by downstream companies. Example: wood used to manufacture furniture.	Not relevant, excluded from Inventory
11	Use of sold product	Direct use-phase emissions of sold products over their expected lifetime. Example: energy use of internet browser or laptop computer	Use of products
12	End-of-life treatment of sold products	Waste disposal and treatment of sold products at the end of their life. Example: treatment of cell phones at an e-waste recycling facility.	Not relevant, excluded from Inventory
13	Downstream leased assets	Operation of assets (energy) owned by the reporting organization and leased to other entities, not included in Scope 1 or 2. Only applicable to organizations that are lessors.	Not relevant, excluded from Inventory
14	Franchises	Operation of franchises, not included in Scope 1 or 2.	Not relevant, excluded from Inventory
15	Investments	Operation of equity and debt investments and project finance, not included in Scope 1 or 2. Primarily applicable to financial institutions, where this category includes the emissions produced by their investment holdings.	Not part of project scope, excluded from Inventory. To be reevaluated in future inventories.

[1] Additional information on accounting principles and inventory development can be found in Appendix A: Greenhouse Gas Inventory: Background and Definitions.

[2] The Climate Registry. General Reporting Protocol Version 2.1 (GRP v. 2.1). "Default Emissions Factors." April 2016.

[3] World Resources Institute and World Business Council for Sustainable Development. The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard. Revised Edition. 2015.

[5] Myhre, G., D. Shindell, F.-M. Bréon, W. Collins, J. Fuglestedt, J. Huang, D. Koch, J.-F. Lamarque, D. Lee, B. Mendoza, T. Nakajima, A. Robock, G. Stephens, T. Takemura and H. Zhang, 2013: Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.