



Event Calculator

Greenhouse Gas Accounting Worksheet

Version 8

Updated on February 12, 2004

Climate Neutral Network Event Calculator

The term “climate neutral” refers to products, services, activities, and enterprises that reduce or offset the climate gases with which they are associated to achieve a net zero impact on the earth’s climate. This greenhouse gas accounting tool addresses the requirements of a "climate neutral" designation of an event. Specifically, an event can choose to become climate neutral by offsetting the climate impacts of its operations across critical areas, including administration, transport, venue, accommodation and waste disposal. However, as part of a climate neutral proposal, events must be able to demonstrate outstanding performance in reducing greenhouse gas emissions for an event prior to purchasing offsets. The purpose of this worksheet is to help event organizers identify and inventory their internal sources of greenhouse gas emissions.

Each sheet embedded in this tool reflects a potential source of GHG emissions generated from an event. Event organizers must determine which modules of the worksheet pertain to their operations. For instance, most event organizers will complete the Venue Electricity module while Waste module may not apply. Instructions for completing unique modules are included at the top of each, and relevant notes are attached at the bottom. If multiple categories of data exist within a module, modules should be filled out a corresponding number of times and the sum-total should be manually entered at the bottom of the sheet.

The worksheet uses a combination of national averages and emission factors, but requires the input of event-specific data. Averages are built in to the calculations as defaults but should be replaced by more accurate event information, if available. Comments have been inserted to clarify data sources and provide guidance on the location of facility data, and are denoted with a red triangle in the upper-right hand corner of a cell. Once data has been supplied and calculations performed, the total pounds CO₂ emitted from that module will be automatically inserted as a factor in the company-total calculation. Appendix sheets are also provided, accessible via electronic links, for reference purposes.

Climate Neutral Network Event Calculator

Name of Event: _____

Date(s) of Event: _____

Place of Event: _____

Purpose of Event: _____

Number of participants: _____

Climate Neutral Network Event Calculator

Total Travel by Car, Plane and Train:

STEP 1: For each mode of travel, fill in **GRAY** box(s) by determining number of miles used in traveling to and from event. for avg round trip miles traveled by car and train, make an estimate of avg round trip miles traveled based on information known about attendees embarking location.

STEP 2: For train and bus travel, select the appropriate emission factor from Table 1 below and enter into yellow cell.

STEP 3: repeat if have multiple categories of travel in which data is differentiated and event specific.

STEP 4: Compute the sum of emissions from car, plane and train travel -- equals sum of lbs CO₂ emitted for all categories, then the grand total will automatically be entered below in the **PINK** box.

CAR:

$$\text{total cars} * \text{avg round trip miles traveled} = \text{total miles}$$

| | | | | |
|---|---|---|---|---|
| 0 | X | 0 | = | 0 |
|---|---|---|---|---|

$$\text{total miles/avg miles/gallon gasoline} = \text{gallons gas used}$$

| | | | | |
|---|---|------|---|---|
| 0 | / | 23.8 | = | 0 |
|---|---|------|---|---|

$$\text{gallons gas used} * \text{lbs CO}_2/\text{gallon gas used} = \text{lbs CO}_2 \text{ emitted}$$

| | | | | |
|---|---|-------|---|---|
| 0 | X | 19.56 | = | 0 |
|---|---|-------|---|---|

total lbs CO₂ emitted by Car =

PLANE:

$$\text{total number attendee flights} * \text{avg distance (miles)/trip (r/t)} = \text{total flight miles}$$

| | | | | |
|---|---|-------|---|---|
| 0 | X | 1,190 | = | 0 |
|---|---|-------|---|---|

$$\text{total miles traveled} * \text{lbs CO}_2 \text{ per passenger mile} = \text{lbs CO}_2 \text{ emitted}$$

| | | | | |
|---|---|------|---|---|
| 0 | X | 0.63 | = | 0 |
|---|---|------|---|---|

$$\text{Pounds of CO}_2 * \text{two} = \text{lbs CO}_2 \text{ equivalent emitted}$$

| | | | | |
|---|---|---|---|---|
| 0 | X | 2 | = | 0 |
|---|---|---|---|---|

total lbs CO₂ emitted by Plane =

TRAIN:

$$\text{total number train trips} * \text{avg distance (miles)/trip (r/t)} = \text{total miles traveled}$$

| | | | | |
|--|---|--|---|---|
| | X | | = | 0 |
|--|---|--|---|---|

$$\text{total miles traveled} * \text{lbs CO}_2 \text{ emitted/mile} = \text{total lbs CO}_2 \text{ emitted}$$

| | | | | |
|---|---|--|---|---|
| 0 | X | | = | 0 |
|---|---|--|---|---|

total lbs CO₂ emitted by Train =

Climate Neutral Network Event Calculator

Venue Electricity and Natural Gas Use:

- STEP 1: Enter the total square footage used by your event in the appropriate gray boxes for electricity and gas. Include a proportional square footage of the venue's common area.
- STEP 2: Enter in the **BLUE** boxes the total electricity usage (in kWh/day) and total natural gas (in Cf/day) used by the venue for the square footage identified.
- If kWh and Cf information is not available, fill in **GRAY** boxes by finding appropriate default value from the Building Default Data worksheet by selecting a building type, either by floor space or function, that most represents your venue.
- STEP 3: Enter the number of days your event takes place.
- STEP 4: Enter the state average electricity CO₂ emission factor from the State Emission Factor worksheet in the gray box. You may use the local utilities emission factor if available.
- STEP 5: The sum of electricity emissions and natural gas emissions will automatically be entered into the **PINK** box.

Electricity:

Total square feet used * average electricity consumption(kWh)/sq foot/day * event days = total kWh

sq ft X X = kWh

to building default data

kWh used * state avg lbs CO₂/kWh * 1.08 = lbs CO₂ emitted

X X = lbs CO₂

to state emission factors

total lbs CO₂ emitted from Electricity=

Natural Gas:

Total square feet used * average Natural Gas(cubic feet) /sq foot/day * event days = total Cubic Feet

sqft X X event days = CF Natural Gas

to building default data

Cubic Feet used * lbs CO₂/cubic feet = lbs CO₂ emitted

X = lbs CO₂

total lbs CO₂ emitted from Gas=

Natural Gas Emission Factor
in lbs CO₂ /million BTU = 117.08

total lbs CO₂ emitted from Electricity + Gas =

Climate Neutral Network Event Calculator

Accommodations

STEP 1: fill in **BLUE** boxes with total hotel nights stayed for all participants and average kWh and average gas consumption per room-night. Ask accommodations provider for avg kWh/room and avg therms/room. If this information is not available, use default factor provided. Choose a default based on the classification of the hotel (standard or upscale).

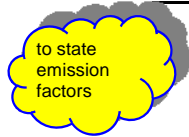
STEP 2: For electricity, fill **GRAY** box with state emission factor from the State Emission Factors worksheet

STEP 3: The total emissions from electricity and natural gas will be automatically calculated. The grand total will be automatically calculated and entered into the pink box.

Electricity:

$$\frac{\text{0}}{\text{0}} \times \frac{\text{0}}{\text{0}} = \frac{\text{0}}{\text{0}}$$

$$\frac{\text{0}}{\text{0}} \times \frac{\text{0}}{\text{0}} \times 1.08 = \frac{\text{0}}{\text{0}}$$



total lbs CO₂ emitted from Electricity = 0

Hotel Room Night Stay Defaults

| | |
|-----------------|------------------------|
| Standard Hotel: | 20 kWh/room night stay |
| Upscale Hotel: | 40 kWh/room night stay |

Natural Gas:

$$\frac{\text{0}}{\text{0}} \times \frac{\text{0}}{\text{0}} = \frac{\text{0}}{\text{0}}$$

$$\frac{\text{0}}{\text{0}} \times \frac{\text{0.1206}}{\text{0.1206}} = \frac{\text{0}}{\text{0}}$$

total lbs CO₂ emitted from Gas = 0

Natural Gas Emission Factor

| | |
|---------------------------------------|--------|
| in lbs CO ₂ /million BTU = | 117.08 |
|---------------------------------------|--------|

Hotel Room Night Stay Natural Gas Default

| |
|-----------------------|
| 0.16 MMBTU/Room-night |
| 155.3 BTU/CF |

total lbs CO₂ emitted from Electricity + Gas = 0

Climate Neutral Network Event Calculator

For relatively small and simple events, use **Waste calculation method 1**.

For larger events that produce a substantial amount of waste, use **Waste calculation method 2**

One way to estimate print paper waste is to obtain information on the number of reams of paper used for marketing and event print materials then obtain a weight for each ream of paper.

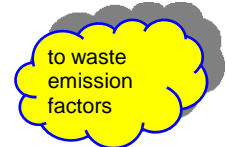
Waste Calculation Method 1:

STEP 1: Determine the most likely disposal scenario (in terms of landfilling versus combustion) for the waste material. If not sure whether waste is landfilled or incinerated, the user may consult the annual "State of Garbage" report published by BioCycle, which provides the fraction of waste in each state that is landfilled and incinerated.

STEP 2: Fill in the **BLUE** boxes with tons of waste sent to landfills and tons combusted.

STEP 3: Total amount of MTCE (Metric tons CO2 equivalent) from landfilling and combustion.

STEP 4: Repeat for multiple categories of waste and compute sum of all waste emissions.



Landfill emissions:

$$\frac{\text{MTCE/ton}}{0.17} \times \text{tons of waste sent to landfills} = \text{MTCE}$$

$$\frac{0.17}{0.17} \times \text{[blue box]} = 0$$

Combustion emissions:

$$\frac{\text{MTCE/ton}}{0.12} \times \text{tons of waste sent for combustion} = \text{MTCE}$$

$$\frac{0.12}{0.12} \times \text{[blue box]} = 0$$

Total Emissions:

$$\text{MTCE from Landfilling} + \text{MTCE from Combustion} = \text{Total MTCE}$$

$$0 + 0 = \boxed{0}$$

total tons CE emitted = 0
 total tons CO₂ emitted = 0
 total lbs CO₂ emitted = 0

Waste Calculation Method 2

STEP 1: Enter the total tons of each type of waste in the yellow table below.

STEP 2: For each type of waste, fill in the **BLUE** boxes with the appropriate emission factor by consulting the IWaste Emission worksheet. For landfilled material, the emission factor is also determined by whether the landfill has a gas recovery system.

STEP 3: Enter the tons of each type of waste landfilled and the tons combusted in the **Gray** boxes.

If you are not sure whether the waste material is landfilled or combusted the user may consult the annual "State of Garbage" report published by BioCycle which provides the fraction of waste in each state that is landfilled and incinerated.

STEP 3: The total MTCE from the waste materials is automatically calculated.

STEP 4: Repeat if needed for multiple categories of waste and enter the sum of all wastes in the cells.



Landfill emissions:

$$\text{MTCE/ton} \times \text{tons of waste sent to landfills} = \text{MTCE}$$

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}} 0$$

Combustion emissions:

$$\text{MTCE/ton} \times \text{tons of waste sent for combustion} = \text{MTCE}$$

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}} 0$$

Total Emissions:

$$\text{MTCE from Landfilling} + \text{MTCE from Combustion} = \text{Total MTCE}$$

$$\underline{\hspace{2cm}} 0 + \underline{\hspace{2cm}} 0 = \boxed{\hspace{2cm}} 0$$

total tons CE emitted = 0

total tons CO₂ emitted = 0

total lbs CO₂ emitted = 0

| | Tons Landfilled | Tons Combusted |
|----------------------------|-----------------|----------------|
| Corrugated Cardboard | | |
| Magazines/Third-class Mail | | |
| Newspaper | | |
| Office Paper | | |
| Phonebooks | | |
| Textbooks | | |
| Food Discards | | |
| Yard Trimmings | | |

| | | |
|--------------------------------------|--|--|
| Mixed Paper | | |
| Broad Definition ¹ | | |
| Office Paper Definition ² | | |
| Mixed Organics ³ | | |
| Mixed MSW ⁴ | | |

¹ Broad definition of mixed paper: 48% cardboard, 24% newspaper, 20% office paper, 8% magazines.

² Office definition of mixed paper: 5% cardboard, 21% newspaper, 38% office paper, 36% magazines.

³ Mixed organics definition: 52% yard trimmings, 48% food discards.

⁴ The emission factor for mixed MSW is based on a weighted average of municipal solid waste components included in EPA's *Municipal Solid Waste in the United States: 2000 Facts and Figures* Report, June 2002.

Climate Neutral Network Event Calculator

Total: (sum of subtotals for all modules)

Sum of emissions is automatically computed. One of the Waste entries may be empty depending on which waste calculation method you chose to follow. Total event emissions is converted to short tons for reporting purposes.

Travel CO₂ + VenueEnergy CO₂ + Accommodation CO₂ + WasteCalc1 CO₂ + WasteCalc2 CO₂ = total lbs CO₂ emitted for event

0 + 0 + 0 + 0 + 0 =

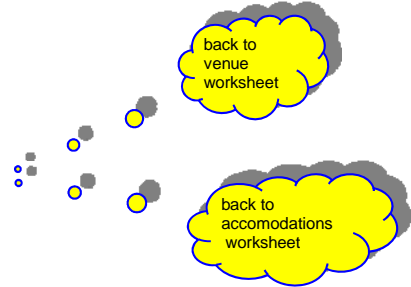
total lbs CO₂ emitted for the event =

total metric tons CO₂ emitted for the event =

Climate Neutral Network Event Calculator

Average Electricity Emissions Factors by State and Region

| Region/State | CO ₂ Emission Factors | | | CH ₄ | N ₂ O |
|------------------------------|----------------------------------|----------------|-----------------|-----------------|------------------|
| | lbs/kWh | short tons/MWh | metric tons/MWh | lbs/MWh | lbs/MWh |
| New England | 0.98 | 0.491 | 0.446 | 0.0207 | 0.0146 |
| Connecticut | 0.94 | 0.471 | 0.427 | 0.0174 | 0.012 |
| Maine | 0.85 | 0.426 | 0.386 | 0.0565 | 0.027 |
| Massachusetts | 1.28 | 0.639 | 0.579 | 0.0174 | 0.0159 |
| New Hampshire | 0.68 | 0.341 | 0.31 | 0.0172 | 0.0141 |
| Rhode Island | 1.05 | 0.526 | 0.477 | 0.0068 | 0.0047 |
| Vermont | 0.03 | 0.014 | 0.013 | 0.0096 | 0.0039 |
| Mid Atlantic | 1.04 | 0.52 | 0.471 | 0.0093 | 0.0145 |
| New Jersey | 0.71 | 0.353 | 0.32 | 0.0077 | 0.0079 |
| New York | 0.86 | 0.429 | 0.389 | 0.0081 | 0.0089 |
| Pennsylvania | 1.26 | 0.632 | 0.574 | 0.0107 | 0.0203 |
| East-North Central | 1.63 | 0.815 | 0.74 | 0.0123 | 0.0257 |
| Illinois | 1.16 | 0.582 | 0.528 | 0.0082 | 0.018 |
| Indiana | 2.08 | 1.038 | 0.942 | 0.0143 | 0.0323 |
| Michigan | 1.58 | 0.79 | 0.717 | 0.0146 | 0.025 |
| Ohio | 1.8 | 0.9 | 0.817 | 0.013 | 0.0288 |
| Wisconsin | 1.64 | 0.821 | 0.745 | 0.0138 | 0.026 |
| West-North Central | 1.73 | 0.864 | 0.784 | 0.0127 | 0.0269 |
| Iowa | 1.88 | 0.941 | 0.854 | 0.0138 | 0.0298 |
| Kansas | 1.68 | 0.842 | 0.764 | 0.0112 | 0.0254 |
| Minnesota | 1.52 | 0.762 | 0.691 | 0.0157 | 0.0247 |
| Missouri | 1.84 | 0.92 | 0.835 | 0.0126 | 0.0288 |
| Nebraska | 1.4 | 0.7 | 0.635 | 0.0095 | 0.0219 |
| North Dakota | 2.24 | 1.121 | 1.017 | 0.0147 | 0.0339 |
| South Dakota | 0.8 | 0.399 | 0.362 | 0.0053 | 0.0121 |
| South Atlantic | 1.35 | 0.674 | 0.612 | 0.0127 | 0.0207 |
| Delaware | 1.83 | 0.915 | 0.83 | 0.0123 | 0.0227 |
| Florida | 1.39 | 0.697 | 0.632 | 0.015 | 0.018 |
| Georgia | 1.37 | 0.683 | 0.619 | 0.0129 | 0.0226 |
| Maryland (*) | 1.37 | 0.683 | 0.62 | 0.0118 | 0.0206 |
| North Carolina | 1.24 | 0.621 | 0.563 | 0.0105 | 0.0203 |
| South Carolina | 0.83 | 0.417 | 0.378 | 0.0091 | 0.0145 |
| Virginia | 1.16 | 0.582 | 0.528 | 0.0137 | 0.0192 |
| West Virginia | 1.98 | 0.988 | 0.897 | 0.0137 | 0.0316 |
| East-South Central | 1.49 | 0.746 | 0.677 | 0.0128 | 0.024 |
| Alabama | 1.31 | 0.656 | 0.595 | 0.0137 | 0.0223 |
| Kentucky | 2.01 | 1.004 | 0.911 | 0.014 | 0.0321 |
| Mississippi | 1.29 | 0.647 | 0.587 | 0.0132 | 0.0165 |
| Tennessee | 1.3 | 0.648 | 0.588 | 0.0105 | 0.0212 |
| West-South Central | 1.43 | 0.714 | 0.648 | 0.0087 | 0.0153 |
| Arkansas | 1.29 | 0.643 | 0.584 | 0.0125 | 0.0203 |
| Louisiana | 1.18 | 0.589 | 0.534 | 0.0094 | 0.0112 |
| Oklahoma | 1.72 | 0.861 | 0.781 | 0.011 | 0.0223 |
| Texas | 1.46 | 0.732 | 0.664 | 0.0077 | 0.0146 |
| Mountain | 1.56 | 0.781 | 0.709 | 0.0108 | 0.0236 |
| Arizona | 1.05 | 0.525 | 0.476 | 0.0068 | 0.0154 |



| | | | | | |
|-------------------------------|-------------|--------------|--------------|---------------|---------------|
| Colorado | 1.93 | 0.963 | 0.873 | 0.0127 | 0.0289 |
| Idaho | 0.03 | 0.014 | 0.013 | 0.008 | 0.0033 |
| Montana | 1.43 | 0.717 | 0.65 | 0.0108 | 0.0227 |
| Nevada | 1.52 | 0.759 | 0.688 | 0.009 | 0.0195 |
| New Mexico | 2.02 | 1.009 | 0.915 | 0.0131 | 0.0296 |
| Utah | 1.93 | 0.967 | 0.878 | 0.0134 | 0.0308 |
| Wyoming | 2.15 | 1.073 | 0.973 | 0.0147 | 0.0338 |
| Pacific Contiguous | 0.45 | 0.224 | 0.203 | 0.0053 | 0.0037 |
| California | 0.61 | 0.303 | 0.275 | 0.0067 | 0.0037 |
| Oregon | 0.28 | 0.141 | 0.127 | 0.0033 | 0.0034 |
| Washington | 0.25 | 0.123 | 0.111 | 0.0037 | 0.004 |
| Pacific Non-contiguous | 1.56 | 0.78 | 0.707 | 0.0161 | 0.0149 |
| Alaska | 1.38 | 0.69 | 0.626 | 0.0068 | 0.0089 |
| Hawaii | 1.66 | 0.831 | 0.754 | 0.0214 | 0.0183 |
| U.S. Average | 1.34 | 0.668 | 0.606 | 0.0111 | 0.0192 |

* Includes the District of Columbia

Source: Energy Information Administration, Updated State-level Greenhouse Gas

Emission Factors for Electricity Generation 1998-2002 (April 2002) see: <http://eia.doe.gov/oiaf/1605/techassist.html>

Climate Neutral Network Event Calculator

Waste Emission Default Factors

Emissions Factors by Landfill Characteristics (MTCE/ton)

The emission factors presented below represent the total emissions in MTCE from landfilling one ton of each of the materials listed (i.e., methane emissions plus transportation emissions). If possible, users should select an emission factor based on the recovery practices at the landfill receiving their



| Material Landfilled | Default Landfill (Unsure of Landfill Gas Recovery Practices) ¹ | Landfill w/ Gas Recovery | Landfill w/ No Recovery |
|--------------------------------------|---|--------------------------|-------------------------|
| Corrugated Cardboard | 0.32 | 0.13 | 0.49 |
| Magazines/Third-class Mail | 0.18 | 0.08 | 0.28 |
| Newspaper | 0.16 | 0.07 | 0.24 |
| Office Paper | 0.7 | 0.28 | 1.1 |
| Phonebooks | 0.16 | 0.07 | 0.24 |
| Textbooks | 0.7 | 0.28 | 1.1 |
| Food Discards | 0.2 | 0.09 | 0.31 |
| Yard Trimmings | 0.12 | 0.05 | 0.18 |
| Mixed Paper | | | |
| Broad Definition ² | 0.34 | 0.14 | 0.54 |
| Office Paper Definition ³ | 0.38 | 0.16 | 0.59 |
| Mixed Organics ⁴ | 0.16 | 0.07 | 0.24 |
| Mixed MSW ⁵ | 0.17 | 0.07 | 0.27 |

Source: EPA's Waste Reduction Model (WARM)

¹ Broad definition of mixed paper: 48% cardboard, 24% newspaper, 20% office paper, 8% magazines.

² Office definition of mixed paper: 5% cardboard, 21% newspaper, 38% office paper, 36% magazines.

³ Mixed organics definition: 52% yard trimmings, 48% food discards.

⁴ The emission factor for mixed MSW is based on a weighted average of municipal solid waste components included in EPA's *Municipal Solid Waste in the United States: 2000 Facts and Figures* Report, June 2002.

Combustion Emission Factors (MTCE/ton)

The emission factors presented below represent the total emissions in MTCE from combustion of one ton of each of the materials listed (i.e., combustion emissions plus transportation emissions).

| Material Combusted | Total GHG Emissions Per Ton Combusted |
|--------------------------------------|---------------------------------------|
| Corrugated Cardboard | 0.02 |
| Magazines/Third-class Mail | 0.02 |
| Newspaper | 0.02 |
| Office Paper | 0.02 |
| Phonebooks | 0.02 |
| Textbooks | 0.02 |
| Food Discards | 0.02 |
| Yard Trimmings | 0.02 |
| Mixed Paper | 0.01 |
| Broad Definition ¹ | 0.02 |
| Office Paper Definition ² | 0.02 |
| Mixed Organics ³ | 0.02 |
| Mixed MSW ⁴ | 0.12 |

Source: EPA's Waste Reduction Model (WARM)

Climate Neutral Network Event Calculator

Building Energy Intensity Default Data

Electricity Consumption by Size and Type of Public Assembly Building

| | Total per Building per day (kWh) | kWh per Building Square Foot per day |
|--|----------------------------------|--------------------------------------|
| Building Floorspace (square feet) | | |
| Medium (5,001 to 50,000) | 405 | 0.031 |
| Large (Over 50,000) | 5567 | 0.044 |
| Building Activity Subcategory | | |
| Entertainment Venue | 688 | 0.031 |
| Library/Museum | 608 | 0.033 |
| Recreation | 532 | 0.038 |
| Meeting/Convention Center | 249 | 0.027 |



Natural Gas Consumption by Size and Type of Public Assembly Building

| | Total per Building per day (cubic feet) | CF per Building Square Foot per day |
|--|---|-------------------------------------|
| Building Floorspace (square feet) | | |
| Medium (5,001 to 50,000) | 1255 | 0.093 |
| Large (Over 50,000) | 9370 | 0.072 |
| Building Activity Subcategory | | |
| Entertainment Venue | N/A | N/A |
| Library/Museum | N/A | N/A |
| Recreation | 1921 | 0.118 |
| Meeting/Convention Center | 882 | 0.078 |

| Entertainment Venue: | Recreational Facility: | Meeting/Convention Center |
|---|---|--|
| Archive/art gallery/exhibit hall/library/museum Coliseum/arena (enclosed) Concert hall Observatory/planetarium Night Club Radio/TV station or studio Theater/movie house/cinema | Amusement arcade Bowling alley Community Centers Gymnasium/YMCA or YWCA/indoor racket sports, recreation center/athletic facility Indoor pool Poolroom Skating rink | Assembly hall Auditorium Convention hall Funeral home Lecture hall Lodge hall Meeting hall Student union Town hall |

Sources: US Department of Energy/Energy Information Administration:
<http://www.eia.doe.gov/emeu/cbecs/pba99/publicassembly/pubassemconstable.html#elec>

These tables based on the 1999 public assembly buildings activities consumption tables. Table values were divided by 365 to get per day energy consumption. Since this data is based on the average for a sample of buildings across the United States, actual facility data should be used when available.

Climate Neutral Network Event Calculator

Conversion Factors for Units of Measure

| To Convert: | To: | Multiply By: |
|--|---|----------------------|
| feet | meters | 0.3048 |
| miles | kilometers | 1.6093 |
| square feet | acres | $2.2957 * 10^{-5}$ |
| hectares | acres | 2.47 |
| cubic feet | liters | 28.32 |
| pounds | grams | 453.6 |
| British thermal units (Btu) | joules | 1055.1 |
| Foot pounds | Btu | $1.285 * 10^{-5}$ |
| kilowatt hours (kWh) | Btu | 3413 |
| quads (quadrillion Btu) | kWh | $2.93 * 10^{11}$ |
| (short) tons | metric tons | 0.9072 |
| barrels | gallons | 42 |
| quadrillion Btu | Btu | $1 * 10^{15}$ |
| pounds | tons | $5 * 10^{-4}$ |
| million metric tons CO ₂ per quad | pounds CO ₂ per Btu | $2.2046 * 10^{-6}$ |
| lb/Mwh | lb/kWh | 0.001 |
| carbon (tons) | CO ₂ (tons) | 3.67 <i>or</i> 44/12 |
| CO ₂ (metric tons) | CO ₂ (tons) | 1.102 |
| CO ₂ (pounds) | CO ₂ (metric tons) | $4.535 * 10^{-4}$ |
| CO ₂ (billion pounds) | carbon (million metric tons carbon equivalent) | 0.1237 |
| MMBtu | Btu | $1 * 10^6$ |
| therms | Btu | $1 * 10^5$ |

Sources: US Department of Energy/Energy Information Administration, Form EIA-1605 (2000).

Climate Neutral Network Event Calculator

Reference Documents

Bureau of Transportation Statistics "National Transportation Statistics 1999"
available at [www.bts.gov/ntda/nts/NTS99/data/Chapter 4/content.pdf](http://www.bts.gov/ntda/nts/NTS99/data/Chapter%204/content.pdf)

Thomas, Charles and Tessa Tennant for UNEP, "Creating a Standard for a Corporate CO2 Indicator"
Working Document 26 May 1998

"Carbon Dioxide Emissions from the Generation of Electric Power in the United States
DOE and EPA July 2000
http://www.eia.doe.gov/cneaf/electricity/page/co2_report/co2report.html

US Environmental Protection Agency, *Inventory of US Greenhouse Gas Emissions and
Sinks: 1990-1997*. EPA 236-R-99-003, April 1999.

IPCC (1996) GHG Inventory Reference Manual, Revised 1996 IPCC Guidelines for National
GHG Inventories

U.S. Department of Energy/Energy Information Agency,
"Instructions for Form 1605: Voluntary Reporting of Greenhouse Gases for Data through 2000", February 2001

Climate Neutral Network Event Calculator

Description of Event: A conference with 100 participants and 20 staff.
 The conference is being held in Portland, Oregon at a hotel. The event begins in the evening on a Friday and ends in the afternoon on a Sunday.

From information gathered from the conference registration forms, the conference has the following characteristics:

- ~ 15 people traveled by air.
- ~ 30 people are from the Portland area, so it is assumed they don't stay in hotels and they drive 3 trips, an average of 20 miles round trip.
- ~ 75 people traveled by car an estimated average of 175 miles round trip.

Total Travel by Car, Plane and Train:

CAR:

$$\text{total cars} \times \text{avg round trip miles traveled} = \text{total miles}$$

| | | | | |
|---|---|---|---|---|
| 0 | X | 0 | = | 0 |
|---|---|---|---|---|

$$\text{total miles} \times \text{avg miles/gallon gasoline} = \text{gallons gas used}$$

| | | | | |
|-------|---|------|---|-----|
| 14925 | / | 23.8 | = | 627 |
|-------|---|------|---|-----|

$$\text{gallons gas used} \times \text{lbs CO}_2/\text{gallon gas used} = \text{lbs CO}_2 \text{ emitted}$$

| | | | | |
|-----|---|-------|---|-------|
| 627 | X | 19.56 | = | 12266 |
|-----|---|-------|---|-------|

total lbs CO₂ emitted by Car = 12266

| Categories | | Total |
|--------------|---------|--------------|
| Car 1 | 30*3*20 | 1800 |
| Car 2 | 75*175 | 13125 |
| Total | | 14925 |

PLANE:

$$\text{total number attendee flights} \times \text{avg distance (miles)/trip (r/t)} = \text{total flight miles}$$

| | | | | |
|----|---|-------|---|-------|
| 15 | X | 1,190 | = | 17850 |
|----|---|-------|---|-------|

$$\text{total miles traveled} \times \text{lbs CO}_2 \text{ per passenger mile} = \text{lbs CO}_2 \text{ emitted}$$

| | | | | |
|-------|---|------|---|-------|
| 17850 | X | 0.63 | = | 11246 |
|-------|---|------|---|-------|

$$\text{Pounds of CO}_2 \times \text{two} = \text{lbs CO}_2 \text{ equivalent emitted}$$

| | | | | |
|-------|---|---|---|-------|
| 11246 | X | 2 | = | 22491 |
|-------|---|---|---|-------|

total lbs CO₂ emitted by Plane = 22491

TRAIN:

$$\text{total number train trips} \times \text{avg distance (miles)/trip (r/t)} = \text{total miles traveled}$$

| | | | | |
|-----|---|-----|---|---|
| [] | X | [] | = | 0 |
|-----|---|-----|---|---|

total miles traveled * lbs CO₂ emitted/mile = total lbs CO₂ emitted

$$\underline{0} \quad \times \quad \underline{0.35} \quad = \quad \underline{0}$$

total lbs CO₂ emitted by Train=

total Travel lbs CO₂ emitted =

Venue Electricity and Natural Gas Use:

The square footage of the conference hall is 18,000 sf. The hotel estimates 10 kWh/sq feet, and 27 cubic feet of natural gas /sq foot.

Electricity:

Total square feet used * kWh/sq foot = total kWh

$$\underline{18000} \quad \times \quad \underline{10} \quad = \quad \underline{180000}$$

to building default data

kWh used * state avg lbs CO₂/kWh * 1.08 = lbs CO₂ emitted

$$\underline{180000} \quad \times \quad \underline{0.280} \quad \times \quad \underline{1.08} \quad = \quad \underline{54432}$$

to state emission factors

total lbs CO₂ emitted from Electricity=

Natural Gas:

Total square feet used * Natural Gas(cubic feet) /sq foot = total Cubic Feet

$$\underline{18000} \quad \times \quad \underline{27} \quad = \quad \underline{486000}$$

to building default data

Cubic Feet used * lbs CO₂/cubic feet = lbs CO₂ emitted

$$\underline{486000} \quad \times \quad \underline{0.1206} \quad = \quad \underline{58612}$$

total lbs CO₂ emitted from Gas=

$$\text{total lbs CO}_2 \text{ emitted from Electricity + Gas} = 113044$$

Accommodations:

90 people stayed in the hotel for 2 nights and the hotel estimates 30 kWh/room.

Electricity:

$$\begin{aligned} &\# \text{ hotel nights} * \text{ avg kWh/room} = \text{Total kWh used} \\ &180 \times 30 = 5400 \\ &\text{kWh used} * \text{ state avg lbs CO}_2/\text{kWh} * 1.08 = \text{lbs CO}_2 \text{ emitted} \\ &5400 \times 0.280 \times 1.08 = 1633 \end{aligned}$$

to state emission factors

$$\text{total lbs CO}_2 \text{ emitted from Electricity} = 1632.96$$

Natural Gas:

$$\begin{aligned} &\# \text{ hotel nights} * \text{ avg natural gas (cubic feet) /room} = \text{Total Cubic Feet used} \\ &80 \times 155.3 = 12424 \\ &\text{Total Cubic Feet used} * \text{ lbs CO}_2/\text{Cubic foot} = \text{lbs CO}_2 \text{ emitted} \\ &12424 \times 0.1206 = 1498 \end{aligned}$$

$$\text{total lbs CO}_2 \text{ emitted from Gas} = 1512$$

$$\text{total lbs CO}_2 \text{ emitted from Electricity + Gas} = 3145$$

Waste 2:

Contacted hotels waste collector and found that 100% of waste is sent to landfills. Hotel estimates 1 tons of waste is sent to landfill each day from conference activities.

Landfill emissions: $\text{MTCE/ton} * \text{tons of waste sent to landfills} = \text{MTCE}$

$$0.17 \times 3 = 0.51$$

Combustion emissions: $\text{MTCE/ton} * \text{tons of waste sent for combustion} = \text{MTCE}$

$$0.12 \times \text{ } = 0$$

Total Emissions: $\text{MTCE from Landfilling} + \text{MTCE from Combustion} = \text{Total MTCE}$
 $\underline{0.51} + \underline{0} = \boxed{0.51}$

total lbs CO₂ emitted = $\boxed{4123}$

<-- To convert from Ce to CO₂ multiply by 44/12
<-- To convert MTCO₂ to lbs, divide by .0004535
<http://www.epa.gov/appdstar/pdf/brochure.pdf>

Total:

Travel + VenueEnergy + Accommodations + Waste = total lbs CO₂ emitted for firm

$\underline{34,757} + \underline{58,612} + \underline{3,145} + \underline{4,123} = \boxed{100,637}$

total metric tons CO₂ emitted for the event = $\boxed{45.6}$