Bringing communities together to plant trees and cool the planet

1treellion Carbon Offsetting Tools and Evidence Package

Let's Plant the Future Together

A Future of Trillion Trees

1TREELLION.org

MISSION

Collectively raise enough fund to make a meaningful global impact by bringing communities together and plant 1 trillion (1,000,000,000,000) trees to cool the planet.

1TREELLION CARBON OFFSETTING TOOLS AND EVIDENCE PACKAGE

ltreellion is a not-for-profit movement aiming to plant trillions of trees globally to help offset carbon dioxide emissions and partially revert the effects of climate change. This evidence package aims to provide the science and data behind trees as an important tool in the fight to stave off global warming, as well as some formulas and tools to estimate our carbon footprint and the capacity of trees to offset those emissions.

Science behind trees as form of climate change mitigation

Recent research shows that planting trees is the most cost-effective and realistic way to preserve our planet.

Trees are important tools in the fight to stave off global warming. They absorb and store carbon dioxide (CO2)—the key greenhouse gas emitted by our daily activity — before it has a chance to reach the upper atmosphere and trap heat around the Earth's surface, making our world a healthier, and safer place to live.

Therefore trees are considered nature's most efficient "carbon sinks". It is this characteristic that makes planting trees a form of climate change mitigation.

Become carbon neutral

If you are willing to make your life, business, event, travel activity, etc. carbon neutral these are the three simple steps that needs to be done:

1. Calculate your carbon footprint.
2. Calculate the number of trees to offset your emissions.
3. Estimate your donation to become carbon neutral.

Donate to ltreellion Global Fund the amount needed to plant those trees. ltreellion, in collaboration with its tree planting partners, will plant on your behalf.

STEP 1. Calculate your Carbon Footprint

You can estimate your annual carbon emissions based on your lifestyle, personal or business related events, travel activity, etc.

For each of those calculations there are existing formulas and algorithms that enable us to estimate our carbon dioxide emissions, using emission factors (EF) as multipliers for each of those categories. (see APPENDIX I)

After analyzing different algorithms and footprint calculators, ltreellion recommends using the Carbonfootprint and Carbonfund calculators based on their reliability, consistency as well as simplicity.

Carbonfootprint is more adequate to calculate your lifestyle/household footprint, while Carbonfund is specifically recommended for business or event related emissions. Both Carbonfund and Carbonfootprint tools are consistent and reliable to calculate the emissions associated with your travel activity.

Use the following links to estimate the carbon dioxide emissions associated to:

- Your lifestyle and/or house living activity: **Click to Calculate**
- Your business activity: **Click to Calculate**
- Your personal or business event: **Click to Calculate**
- Your personal or business flight activity: **Click to Calculate**

For further information on calculation methods, emission factors and formulas, see APPENDIX I

STEP 2. Calculate Number of Trees to Offset Your Emissions

Most scientists agree that the least expensive and perhaps easiest way for individuals to help offset the CO2 that they generate in their everyday lives is to plant a tree.Any tree, as long as it is appropriate for the given region and climate (i.e support the ecosystem, and bio diverse).

Some trees are better than others when it comes to preventing climate change and calculating carbon sequestration rates is a complicated process. The amount of carbon captured depends on a variety of criteria including the tree species, densities, and the climate. To have an exact estimate of carbon sequestered by a single tree, you would have to remove the tree and all of its roots, dry them, and calculate the weight of the tree. However, this is not practical or desirable for a carbon offsetting system.

STEP 2. Calculate Number of Trees to Offset Your Emissions (Cont.)

YInstead, there are less arduous and more efficient estimation methods that are recommended to be employed for this protocol. While some research exists to estimate the capacity of carbon sequestration per type of tree, location etc. there is always associated caveats to each calculation. After analyzing different sources of data and calculation methodologies, ltreellion works under the assumption that each tree is able to absorb 0.06 metric ton CO2, assuming that each tree is planted in an urban setting* and allowed to grow for 10 years.

Therefore, to calculate the number of trees that needs to be planted you just need to do the following simple math:

#trees = your carbon footprint in metric tons of CO2 (result of step 1) / 0.06

For further information on carbon dioxide tree sequestration and associated caveats, see APPENDIX II.

STEP 3. Estimate your donation to become carbon neutral

The cost per tree planted can vary from $0.35 to $10 approximately, depending on the location, tree type, associated cost, maintenance, etc.

ltreellion includes the cost per tree as well as maintenance requirements, among other, as key criteria for the specific assessment of each tree planting organization we partner with.

Based on the different programs that ltreellion partners with, the average cost per tree is estimated to be $1 per tree planted.

Therefore to calculate your donation to make your like, business, event or flight activity carbon neutral, just translate into $ the number of trees you calculate in step 2.

# of trees from step 2 = # of $ to become carbon neutral

Now you know the data behind the calculations, make a meaningful step in the fight against global warming by becoming (partially or fully) carbon neutral by donating to ltreellion Global Fund

Be a seed, help us cooling the Earth - Donate to 1treellion

**1treellion's priority is to plant in rural areas; that said, the calculation is based on urban setting since the estimates for forest areas are based on acres/hectares (instead of single trees), what makes the estimation more complex and potentially less reliable since the forest tree density is very dependent on type of tree and location.*

References

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APPENDIX I. Carbon offsetting Formula and Emission Factors (EFs)

Electricity: We calculate emissions from electricity generation with the EPA's eGRID emission factors based on 2016 data published in 2018, using the US average electricity source emissions of 0.9884 lbs CO2 per kWh (0.4483 kgs CO2 per kWh).

Heating Oil: There are 10.16 kgs of CO2 per gallon of home heating oil. (Source: U.S. Department of Energy)

Natural Gas: There are 0.00531 metric tonnes of CO2 per 100 cubic feet (CCF) of natural gas. (Source: U.S. Department of Energy)

Propane: There are 0.00576 metric tonnes of CO2 per gallon of propane. (Source: U.S. Department of Energy)

Vehicles: Unleaded automobile gasoline emits 8.78 kgs CO2 per gallon. Diesel fuel emits 10.21 kgs CO2 per gallon.

Air Travel: CO2 emissions for coach/economy air travel vary by length of flight, ranging from 0.137 kgs CO2e per passenger mile to 0.227 kgs CO2e per passenger mile, with higher emissions for shorter flight segments. Our calculator uses a simplified factor of 0.2 kgs per passenger mile.

Rail Travel: The CO2 emissions for long distance trains (i.e., intercity rail) is 0.14 kgs per passenger mile.

APPENDIX I. Carbon offsetting Formula and Emission Factors (EFs) - Cont.

Product Shipments: Product shipping emissions is calculated by the total number of parcels multiplied by the average parcel weight and average parcel shipping distance then by the applicable emissions factor per ton-mile.

- Ground/truck shipping emissions factor is 0.202 kgs/ton-mile
- Air shipping emissions factor is 1.32 kgs/ton-mile
- Ocean/water shipping emissions factor is 0.0603 kgs/ton-mile

APPENDIX II. Additional information on carbon dioxide tree sequestration and associated caveats

Number of urban tree seedlings grown for 10 years:

- A medium growth coniferous or deciduous tree, planted in an urban setting and allowed to grow for 10 years, sequesters 23.2 and 38.0 lbs of carbon, respectively. These estimates are based on the following assumptions:
- The medium growth coniferous and deciduous trees are raised in a nursery for one year until they become 1 inch in diameter at 4.5 feet above the ground (the size of tree purchased in a 15-gallon container).
- The nursery-grown trees are then planted in a suburban/urban setting; the trees are not densely planted.
- The calculation takes into account "survival factors" developed by U.S. DOE (1998). For example, after 5 years (one year in the nursery and 4 in the urban setting), the probability of survival is 68 percent; after 10 years, the probability declines to 59 percent. To estimate losses of growing trees, in lieu of a census conducted to accurately account for the total amount of seedlings planted versus surviving to a certain age, the sequestration rate (in lbs per tree) is multiplied by the survival factor to yield a probability-weighted sequestration rate. These values are summed for the 10-year period, beginning from the time of planting, to derive the estimate of 23.2 lbs of carbon per coniferous tree or 38.0 lbs of carbon per deciduous tree.
- The estimates of carbon sequestered by coniferous and deciduous trees were then weighted by the percent share of coniferous versus deciduous trees in cities across the United States. Of a sample of approximately 11,000 coniferous and deciduous trees in seventeen major U.S. cities, approximately 11 percent and 89 percent of sampled trees were coniferous and deciduous, respectively (McPherson et al. 2016). Therefore, the weighted average carbon sequestered by a medium growth coniferous or deciduous tree, planted in an urban setting and allowed to grow for 10 years, is 36.4 lbs of carbon per tree.

Please note the following caveats to these assumptions:

- While most trees take 1 year in a nursery to reach the seedling stage, trees grown under different conditions and trees of certain species may take longer: up to 6 years.
- Average survival rates in urban areas are based on broad assumptions, and the rates will vary significantly depending upon site conditions.
- Carbon sequestration is dependent on growth rate, which varies by location and other conditions.
- This method estimates only direct sequestration of carbon, and does not include the energy savings that result from buildings being shaded by urban tree cover.

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