Tree CO2 Calculations

$$Savings over first ten years= \frac{23.2 lbs carbon}{1 tree}\left(\frac{44 units carbon dioxide}{12 unit carbon}\right)\left(\frac{1 metric ton}{2204.6 lbs}\right)=0.0386 metric tons per tree $$

$$CO\_{2} savings per year= \frac{0.0386 metric tons per tree}{10 years}\left(\frac{2204.6 lbs}{1 metric ton}\right)=8.51 lbs per tree per year over the first ten years$$

Note: The initial statistic, 23.2 pounds of carbon per tree, accounts for many trees not surviving the full ten years; it assumes that 68% of trees survive five years, and 59% survive ten years.

Source: [http://www.epa.gov/cleanenergy/energy-resources/refs.html#seedlings](http://www.epa.gov/cleanenergy/energy-resources/refs.html%23seedlings)

Water Bottle CO2 Calculations

$$CO\_{2} savings = \left(\frac{2.07 metric tons CO\_{2} saved}{1 short ton PET reduced}\right)\left(\frac{2204.62 lbs CO\_{2}}{1 metric ton CO\_{2}}\right)\left(\frac{1 short ton PET}{2000 lbs PET}\right)=2.28 lbs CO\_{2} per lb of PET reduced$$

Source: <http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_Form.html>

CFL Bulb Calculations

**Sources:**

Wattage of bulbs can be found at <http://www.duke-energy.com/pdfs/Duke_CFLflyer_406_generic.pdf>.

Carbon dioxide emissions due to electricity use can be found at <http://oaspub.epa.gov/powpro/ept_pack.charts>.

Estimates for lifetime of CFL bulbs found at <http://www.energystar.gov/index.cfm?c=cfls.pr_cfls_savings>.

Shopping Bag Calculations

|  |  |  |
| --- | --- | --- |
| **Information** | **Number** | **Source or calculation** |
| Avg. # of paper bags per week, per person | 2 bags | Source 1 |
| Avg. # of plastic bags per week, per person | 7 bags | Source 1 |
| Greenhouse Gas Emissions (CO2 Equiv. Tons) to manufacture 1000 paper shopping bags | 0.08 tons | Source 2 |
| Greenhouse Gas Emissions (CO2 Equiv. Tons) to manufacture 1000 plastic shopping bags | 0.04 tons | Source 2 |
| Greenhouse Gas Emissions (CO2 Equiv. lbs) to manufacture 1 paper shopping bag | 0.16 lbs | $$\frac{0.08 tons CO\_{2}}{1000 paper bags}\left(\frac{2000 lbs}{1 ton CO\_{2}}\right)=0.16 lbs$$ |
| Greenhouse Gas Emissions (CO2 Equiv. lbs) to manufacture 1 plastic shopping bag | 0.08 lbs | $$\frac{0.04 tons CO\_{2}}{1000 paper bags}\left(\frac{2000 lbs}{1 ton CO\_{2}}\right)=0.08 lbs$$ |
| Avg. # of paper bags per year, per person | 104 bags | $$\left(\frac{2 paper bags}{1 week}\right)\left(\frac{52 weeks}{1 year}\right)=104 bags/yr$$ |
| Avg. # of plastic bags per year, per person | 364 bags | $$\left(\frac{7 plastic bags}{1 week}\right)\left(\frac{52 weeks}{1 year}\right)=364 bags/yr$$ |
| Avg. lbs CO2 from manufacture of paper bags used per year, per person | 16.64 lbs | $$\left(\frac{104 paper bags}{1 year}\right)\left(\frac{0.16 lbs}{1 bag}\right)=16.64 lbs$$ |
| Avg. lbs CO2 from manufacture of plastic bags used per year, per person | 29.12 lbs | $$\left(\frac{364 plastic bags}{1 year}\right)\left(\frac{0.08 lbs}{1 bag}\right)=29.12 lbs$$ |
| Net average lbs CO2 from manufacture of paper and plastic bags used per year, per person | 45.76 lbs | 16.64 lbs + 29.12 lbs = 45.76 lbs |

Source 1: <http://www.carbonrally.com/challenges/5-reusable-grocery-bags>

Source 2: <http://www.savetheplasticbag.com/UploadedFiles/2007%20Boustead%20report.pdf>, page 4

Alternative Transportation Calculations

**Sources:**

<http://www.epa.gov/cleanenergy/energy-resources/refs.html>

<http://www.gasbuddy.com/GB_Price_List.aspx>

Showerhead Calculations

$$CO2 savings (gas)= \frac{1440 therms}{1 AF}\left(\frac{1 AF}{325851.427 gal}\right)\left(\frac{\# gallons saved}{1}\right)\left(\frac{0.005302 metric tons CO2}{1 therm}\right)\left(\frac{2204.62 lbs CO2}{1 metric ton}\right)$$

$$CO2 savings (electric) = \frac{42361 kWh}{1 AF}\left(\frac{1 AF}{325851.427 gal}\right)\left(\frac{\# gallons saved}{1}\right)\left(\frac{0.0006896 metric tons CO2}{1 therm}\right)\left(\frac{2204.62 lbs CO2}{1 metric ton}\right)$$

$$Money savings (gas)= \frac{1440 therms}{1 AF}\left(\frac{1 AF}{325851.427 gal}\right)\left(\frac{\# gallons saved}{1}\right)\left(\frac{\$ price}{1 therm}\right)$$

$$Money savings (electric)= \frac{42361 therms}{1 AF}\left(\frac{1 AF}{325851.427 gal}\right)\left(\frac{\# gallons saved}{1}\right)\left(\frac{\$ price}{1 kWh}\right)$$

**Sources:**

<http://www.westernresourceadvocates.org/water/CWCBe-wstudy.pdf>

<http://data.bls.gov/search/query/results?cx=013738036195919377644%3A6ih0hfrgl50&q=average+energy+prices>