

	A	B	C	D	E	F	G	H
1		Carbon In Our Daily Lives (Card version)						
2		From Piper Foster						
3		Revision by Rick Heede, CMS						
4		14-Jan-09						
5								
6								
7								
8		Sector or activity						
9			Quantity	Units	Source of estimate	Notes		CMS verified?
10		HOME ENERGY USE						
11								
12		Lights: use natural window light	-	lb CO2	Foster			ok
13		Cooling: open a window for fresh air	-	lb CO2	Foster			ok
14		Clothes: air dry the clothes	-	lb CO2	Foster			ok
15		Snow: shovel by hand	-	lb CO2/winter	Foster			ok
16		Bathing: hot shower, 5 minutes	3.5	lb CO2/shower	Heede (2008a)	Average of fuel input (natural gas) and electricity (US average carbon intensity), 3.75 gpm showerhead, 11 gallons of hot water delivered for a 5-minute shower		yes
17		Home: energy efficient house	3.8	lb CO2/sqft-yr	Heede (2008b)	The author's own home in Old Snowmass, Colorado: 6-year average energy and emissions, Holy Cross Energy is high-carbon utility (1.61 lb CO2/kWh), 4,000 passive-solar home averages 390 kWh per month (and 1.17 kWh per sf-yr), and 3.80 lb CO2e per square foot per year. While a number of homes around the US use no fossil energy -- i.e., low or negligible CO2 emissions -- this home is more representative of a grid-connected high-efficiency home. Total emissions: 7.7 tons CO2e.		yes
18		Laptop computer (home use)	0.3	lb CO2/day	Heede (2008a)	EIA RECS data from 2001, too dated: 77 kWh/yr, wattage and hours not specified. Laptops run ~15-45 watts vs desktops ~60-250 watts (www.michaelbluejay.com)		yes
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21		Lights: house lights - four 26-w CFL bulbs	1.7	lb CO2/day	Heede (2008a)	Replace the four 100-watt incandescents below with four 26-watt CFL lamps		yes
22		Cooling: electric fan	0.5	lb CO2/day	Heede (2008a)	EIA RECS data table, emissions per day calc by Heede, US ave electric EF		yes
23		Clothes: washing machine, cold water	0.4	lb CO2/day	Heede (2008a)	EIA RECS data table, emissions per day calc by Heede, US ave electric EF		yes
24		Snow: snowplow truck removal	950	lb CO2/winter	Heede (2008a)	Snowplow removal in Aspen, 30 events per winter, Caterpillar 930 G or Bobcat skid loader (0.71 gallons & 15.8 lb CO2 per storm [times 2 for longer driveway])		yes
25		Bathing: hot shower, 10 minutes	7.0	lb CO2/shower	Heede (2008a)	See 5-minute shower above, times two.		yes
26		Home: average US household (2,171 sf)	10	lb CO2/sf-yr	Heede (2008b)	RECS 2005 data, all 111 million US households, fuel consumption by type, emissions calculations by CMS, average household 2,170 sf and 26,222 lb CO2/yr (13.1 tons CO2/yr). The average home in Aspen (many of which are not occupied year-round) emit 25.5 tons CO2/yr and 23.2 lb CO2e/sf-yr.		yes
27		Desktop computer (home use)	1.0	lb CO2/day	Heede (2008a)	EIA RECS data. CMS worksheet cell G93.		yes
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30		Lights: 4 100-Watt bulbs for 12 hours each	6.5	lb CO2/day	Heede (2008a)	Four 100-watt incandescent A-lamps on 12-hours per day (exterior lights)		yes
31		Cooling: air conditioner	8.4	lb CO2/day	Heede (2008a), EIA RECS	Average energy and emissions for 81 million US households using Central AC or Room AC units		yes
32		Clothes: washing machine, hot water	4.0	lb CO2/day	Heede (2008a), HMM 1995	Heede, Homemade Money, p. 194, clothes washer. Includes estimated water heating energy. Also ref to EIA RECS and E source data.		yes
33		Clothes: electric dryer	4.0	lb CO2/day	Heede (2008a)	RECS data 2001, 1,079 kWh/yr.		yes
34		Snow: heated driveway	12,922	lb CO2/winter	Heede (2008a)	1,000 sf heated driveway, 22-week season, system boiler on 4 hrs per day; boiler capacity: 150 Btu (of natural gas) per sf of heated driveway area		yes
35		Bathing: soaking in an avg hot tub	9	lb CO2/day	Heede (2008a)	EIA RECS data, 2,300 kWh/yr; Aspen data suggests ~18 lb CO2 per day.		yes
36		Home: large size, many amenities	51	lb CO2/sf-yr	Heede (2007), ASHES rpt	Aspen household energy data reviewed by CMS for ASHES rpt, this Red Mtn house of 10,000 sf, 50.65 lb CO2e per sf-yr, and 253 tons CO2e total is one the most energy-intensive in Aspen.		yes
37		LCD 40" Flatscreen TV	1.2	lb CO2/day	Heede (2008a)	CMS worksheet cell K761. Assumes a 40 inch LCD TV using (per CNET) 0.28 w/square inch; assuming (per Nielsen Media Research) 4.3 hrs per individual (granted, not the same as hrs of on-time per TV), 0.85 kWh/d and, at US carbon intensity of 1.354 lb CO2/delivered kWh), 1.16 lb CO2/day. EPA: 275 million TVs consume >50 billion kWh; UCS: "10 coal-fired powerplants".		yes
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41		TRAVEL RECREATION						
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43		Driving: take the bus instead	0.2	lb CO2/passenger-mile	Heede (2008c), Heede (2008b)	Result based on Aspen's Roaring Fork Transit Authority, 2007 data: valley routes: 2.23 vehicle miles, 1.6 million riders, average 16 miles per ride, 26.1 million passenger-miles, 3,037 tons CO2 (accounting for 13.4 percent biodiesel): 0.233 lb CO2 per passenger-mile.		yes

December update

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						Why are we giving the green light to an extended air trip (high total emissions)? Just because the emission RATE is lower? This is where providing a good climate stewardship label (green vs red) becomes misleading. I propose we show emissions for a 3,000-mile vs 1,000 vs 100 mile air trip, or something else.		
44		Flights: long, extended trip*	0.3 lb CO2/passenger-mile		Heede (2008a)		yes/no	
45		Recreation: cross country ski	negligible lb CO2		Foster		ok	
46		Exercise: walk, hike outdoors	negligible lb CO2		Foster		ok	
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49		Driving: hybrid electric car, 41 mpg, solo	0.5 lb CO2/mile		Heede (2008a)	Motor Trend magazine, 2004 test showed average of 40.8 mpg. CMS calculates typical 0.48 lb CO2 per vehicle mile.	yes	
50		Flights: medium trip*	0.5 lb CO2/passenger-mile		Heede (2008a)	Ditto air travel above.	yes	
51		Recreation: lift-serviced skiing	45 lb CO2/day		Heede (2008a)	Data on Aspen Skiing Company for 2007: 30,767 tons CO2 and 1.37 million skier-days averages to 45 lb CO2 per skier-day. Copper averages 43 lb/day.	yes/no	
		Exercise: Running shoes		INSERT		http://60percent.blogspot.com/2008/11/runners-footprint.html identifies that 42kWh (Nike) go into the assembly of shoes, but this neglects the energy demanded to procure and process the material for the shoes. http://www.runnersworld.com/article/0,7120,s6-240-488-12892-1-1X2X3X4X5X6X7X8X9X10-11,00.html talks about life cycle but doesn't deliver a footprint number.	no	
52								
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55		Driving: average commuting vehicle	0.9 lb CO2/mile		Heede (2008d)	Based on CMS commuting survey in Hershey Pennsylvania, 186 survey returns, fuel economy of each vehicle from EPA website, average daily commute of 13.2 miles per day, 6,400 miles per year, 283 gallons of fuel, 5,553 lb CO2 per year, average 22.77 mpg, and 0.86 lb CO2 per mile.	yes	
56		Flights: short trip*	1.0 lb CO2/passenger-mile		Heede (2008a)	CMS uses the thirteen flights (UAL, CRJ700s & Dash-8s) analyzed by Heede through Dec08, flying the 131 miles between Aspen and Denver, using an average of 6.1 gallons of fuel per passenger per flight and emitting 0.974 lb CO2 per passenger-mile, or 128 lb CO2 per flight. GEO adopted short flight EF of 0.64 lb CO2 per pax-mile.	yes/no	
57		Recreation: heli-skiing	419 lb CO2/day		Heede (2008a)	Based on Canadian Mountain Holidays data, using Bell 212 ferrying four groups of 10 skiers at a fuel burn rate of 625 lb per hour or 2,096 lb CO2 per hour; 40-passenger total per 8-hr day converts to 419 lb CO2 per person.	yes	
58		Recreation: snowmobiling	87 lb CO2/hr		Heede (2008a)	National Vehicle and Fuel Emissions Laboratory, US EPA: 1.571 million snowmobiles used 396 million gallons in 89.5 million hrs (2000). CMS calc: 396/89.5 = 4.42 gallons per hour; gasoline EF of 19.594 lb CO2 = 86.63 lb CO2 per hour. Piper Foster snowmachine contact (Todd Palin) suggested average day of 6 hrs, or 520 lb CO2.	yes	
59		Exercise: a health/gym/recreational club	21 lb CO2/visit		Heede (2008a)	Averages an Aspen health club and the municipal Aspen Recreation Center. Utility data converted to CO2 emissions divided by annual visitors.	yes	
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61		*The shorter a flight, the more fuel is burned in take-off and landing than longer flights, which average the fuel consumption over longer flight				CMS note: this statement is unclear. Besides, the basic comparison here is between rates per passenger-mile, not of emissions per trip. See note above.		
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65		FOOD DRINK ☞						
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67		Water: tap water	0.0 lb CO2/liter		Heede (2008a)	Tap water from source to wastewater: Electricity input to the Aspen water plant (1.26 lb CO2 per 1,000 gallons) plus electricity and natural gas input to the Aspen Wastewater Treatment Plant (11.6 lb CO2 per 1,000 gallons); 12.88 lb CO2 per 1,000 gallons equates to 0.0034 lb CO2 per liter. Reverse osmosis process in a large seawater desalination plant (50 million gpd) means 0.040 lb CO2/liter.	yes	
68		Alcohol: New Belgium beer	1.8 lb CO2/12-oz bottle		Heede (2008a), New Belgium Brewery	Comprehensive life-cycle inventory of NBB's Fat Tire amber ale, including upstream (packaging, raw materials, 30.7 percent), brewery operations (3.5 percent), and downstream distribution, retail, use, and waste (65.8 percent).	yes	
69		Food: fruits & vegetables	1.6 lb CO2e/lb		Heede (2008a), Weber & Matthews	Based on Weber & Matthews life-cycle emissions from field to table, including transportation and processing, methane sources, refrigeration, etc. Results in lb CO2e per lb of product; CMS shows comparison of "fruits & vegetables" and "chicken/fish/eggs" and "red meat."	yes	
70		A banana	0.2 lb CO2e/banana		Craig/MIT (2008)	Based on the estimate provided by Tony Craig, MIT Center for Transportation & Logistics: Total Carbon footprint: 98 g CO2 equivalents This comes from: 43 g transportation 2 g electricity use and ripening process 15 g for growing the banana 20 g for packaging materials 18 g for disposal. 98 g CO2e = 0.216 lb CO2e.	yes	
71								
72								
73		Water: dispenser with Hot/Cold	3.1 lb CO2/day		Heede (2008a), EIA RECS	ACES 9th edition 3.07 lb CO2/day), her calculation assumes that 5 gallons are used daily ... Better to list 3.07 lb CO2/day	no/yes	
74		Alcohol: domestic wine	5.5 lb CO2/750 ml bottle		Heede (2008a), Colman & Paster (2007)	CMS uses data from Colman & Paster (2007) for vintners in Napa, California, glass manufacture, and bottling. Pablo Paster replied to CMS request to estimate transportation by truck from Napa to Aspen.	yes	

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110		Low carbon lifestyle, USA 2050 (scenario B)	10 lb CO2/day		Heede (2008a), Global Commons Institute, CMS	This scenario is based on the Global Commons Institute's Contraction & Convergence model for world emissions to be reduced by 79.5 percent below 2000 emissions by 2100. This model calls for US per capita emissions to decrease by 97 percent from 2000 to 2100 (from 5,389 kg C to 157 kg C per capita per year). CMS has converted the results of the GCI model for US per capita emissions in 2050 from 382 kg C per year to 8.3 lb CO2 per day. CMS also adjusted the GCI model to account for actual US emissions being higher in 2007 than the 2003 model assumed (since the US has done nothing about reducing emissions); this adjustment essentially delayed the US CO2 emissions reduction response, and 2050 emissions are 9.9 lb CO2 per capita per day.	yes	
111								
112						Piper: We'll have to discuss which scenario result to use. I lean toward scenario B based on GCI model. Scenario A is too simple, although it can be made more sophisticated (e.g., include US population growth) with more time. Aspen, for example, has committed to reduce total emissions by 80 percent below 2004 by 2050.		
113								