1

Calculate Your Carbon Footprint

You may never know what results from your action. But, if you do nothing, there will be no results.
— Mahatma Gandhi

With the help of these ten solutions, you and your family can make a steady transition to a carbon-neutral life that will actually save you money.

The solutions have been designed so that you can use them as the basis for an eight-week course with a group of friends and neighbors. (See #10.) Week One starts with calculating your carbon footprint and setting your goal to reduce it.

Your *ecological footprint* is the total imprint you make on the Earth through the resources you consume and the carbon emissions you produce, which require forests and oceans to absorb them. It is measured as an area of land — a rich family might be using 25 hectares; a poor family in India as little as a quarter hectare. Across the Earth as a whole, the average human uses 2.7 hectares, but Earth's total biological capacity only allows for 1.8 hectares, which shows how much we are overconsuming our environment — and other species have to eat, too. The average American uses 9.4 hectares; Canadian 7.6 hectares.

Your *carbon footprint* is more limited. It measures your personal and household emissions that cause global warming from five sources:

- The oil you burn when traveling in a car, bus, boat or airplane
- The coal, oil or gas you use to heat your home
- The electricity you use, some of which probably comes from burning coal or gas
- The waste you produce, because rotting garbage produces methane
- The goods you consume, especially meat and dairy

Including the food we eat, the average American produces 20 tonnes of CO_2 a year; a wealthy family with two children could easily produce 200 tonnes. The average Canadian produces 18 tonnes a year, the average European 12.5 tonnes. Most people in Africa produce less than half a tonne a year. The challenge is to get this down to zero. There are many carbon calculators that you can use to work out your carbon footprint, based on how much fuel you use, how many flights you take, etc.

Your first task in Week One is to hold a family meeting, so that you are all on the same page.

- Be the Change Earth Alliance: bethechangeearthalliance.org
- Climate Challenge 8-week course: theclimatechallenge.ca
- CO_2 emissions from an average home: rmi.org/sitepages/pid209.php
- Comparative list of carbon calculators: earthfuture.com/calculators
- Global Footprint Network: footprintnetwork.org
- Michael Bluejay calculator: michaelbluejay.com/electricity/carboncalculator.html
- The Atkinson Diet: theatkinsondiet.com
- The Good Life: thegoodlife.wwf.ca
- Together: together.com
- Zero Footprint Calculator: calc.zerofootprint.net/calculator

Low Carbon Living

Ann and Gord Baird live with their two children and two parents in a 2150-square-foot passive-solar cob-earth home in Victoria, BC, which they built themselves (see photo). A 2 kW solar PV system provides power, and 60 solar tubes provide hot water and heat for their home. They also harvest rainwater, use composting toilets and practice gray water recycling. They are mostly vegetarian and grow much of their own food, with chickens for their eggs. They work from home and use a minivan to ferry their kids to school. They vacation by paddling in local waters. Total: 17.1 tonnes (2.85 tonnes each)

Ann and Gord Baird

The Baird's solar-cob house in Victoria, BC. eco-sense.ca

Start a carbon reduction notebook where you can track your emissions and the changes you make as you work through these solutions. Other alternatives are to join a "Be the Change" group or to use David Gershon's Low Carbon Diet.

Next, use a carbon calculator to work out your household's footprint. I recommend using one from Zero Footprint or Michael Bluejay. (See box.)

Now set a goal to reduce your carbon footprint. If you reduce it by 10% a year, you will achieve a 100% reduction, bringing it down to zero. By then, electric vehicles and other carbon-reducing technologies will be more widely available and affordable.

What will it cost you? In his wonderful book *The Carbon Busters Home Energy Handbook,* Godo Stoyke calculates that, the investments to reduce your carbon footprint by 73% will save you $17,000 over five years. If you include changing your diet, which will cost you nothing, your carbon reduction will increase to over 80%.

Good Reading

- *How to Live a Low Carbon Life* by Chris Goodall: earthscan.co.uk
- *The Carbon Busters Home Energy Handbook* by Godo Stoyke: carbonbusters.org
- *Low Carbon Diet: A 30-Day Program to Lose 5000 Pounds* by David Gershon: empowermentinstitute.net

Actions

- Calculate your CO_2 emissions
- Hold a family meeting
- Set your reduction goal
- Create a carbon reduction notebook

2

Change the Way You Eat

We have to do what we have to do. Miracles happen. The life force of this planet is very strong. Dandelions poke through sidewalks. We don't know enough to give up. We only know enough to know that we have to try to change the course of human events.

— Elizabeth May, leader of Canada's Green Party

There are many inconvenient truths related to global warming, one of which is that livestock animals raised for meat and dairy (chiefly cattle and pigs) are responsible for 14–18% of the climate problem.[1] (See p. 62.)

Each kilogram of conventional beef produces 96 kg of CO_2e; the average American eats 44 kg of beef a year, producing 4.2 tonnes of CO_2e a year. A single quarter-pound hamburger produces 9 kg of CO_2e — the equivalent of burning a gallon of gas or driving 20–25 miles in a car. Raising animals for food generates more greenhouse gases than all the transportation in the world.[2]

CAROLYN HERRIOT

The author turning compost at his home in Victoria, British Columbia

Our overall food consumption may cause up to 33% of global warming, because of:

- The impact of beef, pork and dairy. (Beef has the greatest impact.) (See pp.62, 288.)
- The distance that food ravels before it reaches our plates. Most fruit and vegetables travel 2,500 to 4,000 kilometers from farm to store. A 225-gram package of imported organic spinach flown across the Atlantic produces 3 kg of CO_2.
- The way it is grown. Organic food produces 26% fewer emissions. If you eat locally grown organic vegan food, you could reduce your food's carbon footprint to 0.35 tonnes of CO_2e a year.
- The packaging and waste associated with food.

How big is your food's carbon footprint? Find out at eatlowcarbon.org.

Eat less meat

A meat eater on a bicycle has a larger carbon footprint than a vegan driving an efficient car.[3] Don't just substitute for meat with eggs or tofu. Buy a good vegetarian cookbook, such as *The Moosewood Cookbook*, and visit some vegetarian websites. Vegetarian cooks have developed mouth-watering recipes, and it is rare to find an unhappy vegetarian. It is much better for your health — studies show that vegetarians have less

Actions

- Calculate your food CO_2 emissions
- Visit a local farmers market, and buy local organic produce
- Read a vegetarian or vegan cookbook
- Eat for one day a week without meat
- Plan to plant a food garden

cancer and live longer.[4] It may feel like a leap, but it's a very sound investment. Organic, grass-fed beef produces 40% fewer emissions, as it does not require rainforest destruction to grow soybeans to feed the cows and does not produce N_2O emissions. It is also much healthier for you.

Eat less dairy

The same arguments apply to a vegan diet that cuts out *all* animal products, including milk, cheese and ice cream. Buy a good cookbook, such as *How it All Vegan,* and start experimenting by eating a vegan diet one day a week.

Eat organic food

Organic farming requires 63% less energy than conventional farming, produces no nitrous oxide emissions, and stores 15–28% more carbon in the soil.[5] Until recently, everyone ate organically by default. Since organic food contains more antioxidants and salvestrols, it is also better for your health. If the whole world went organic, yields in the developed world would not fall, and yields in the developing world would double, so there is no reason to worry that we could not feed the world. (See p. 63.)

Grow your own food

If you've got a garden, you can grow your own food — your ancestors did it all the time. The smallest space can house a tub of tomatoes, and you'll discover what they should taste like. Take a "grow your own food" book out of the library, and start sowing seeds. As long as you nourish the soil with good compost and leaf mulch, water regularly in summer, and encourage wildlife to take care of the pests, your plants will reward you with mouth-watering food. To reduce the energy needed to cook your food, try using a solar cooker, haybox or a pressure cooker.

- 30 Days to a Greener, Healthy Diet: thedailygreen.com/healthy-eating-plans
- *A Year on the Garden Path — 52-Week Organic Gardening Guide*, by Carolyn Herriot: earthfuture.com/gardenpath/Book.htm
- Cool Foods Campaign: coolfoodscampaign.org
- In a Vegetarian Kitchen: vegkitchen.com
- Love Food Hate Waste: lovefoodhatewaste.com
- Low Carbon Diet Calculator: eatlowcarbon.org
- Meat and the Environment: goveg.com/environment.asp
- Meat-Free Monday: supportmfm.org
- Meatless Monday: meatlessmonday.com
- Take a Bite Out of Climate Change: takeabite.cc
- *The Hundred Mile Diet:* 100milediet.org
- VegCooking: vegcooking.com
- Vegsource: vegsource.com

Buy locally grown food

The more you buy from local farmers markets, the smaller will be your food's carbon footprint — and your food will also be fresher and healthier. In a comparison between two Christmas meals, the one with imported food produced 100 times more emissions than the locally grown meal — 11.89 kg versus 0.12 kg.[6] The less food you waste, too, the better: 27% of food in the US is thrown away as waste. Each American throws away 163 pounds of food a year from uneaten portions and food wasted in preparation.[7]

3

Wake Up to Green Electricity

By spending just $30 a year on wind power, an average Colorado family can cut its household CO_2 production by about 10%.

— Colorado Wind Power

Most people take their electricity for granted — you flick the switch, and on it comes. If you follow the wires, however, they often lead to a coal or gas-fired power plant. 85% of the world's electricity comes from burning fossil fuels, producing 8 billion tonnes of CO_2 a year, representing 21% of the global CO_2 emissions and 13% of the cause of global warming.[1]

The solutions are to use less power by conserving and changing to energy-efficient appliances; to switch to green power; and if you can afford it, to install solar PV on your roof. For our purposes, we are assuming that saved power displaces a mixture of coal and natural gas, saving 600 grams (1.34 lbs) of CO_2 per kWh, at 10 cents/kWh.

The chart lists some of the ways you can reduce your emissions. For larger appliance upgrades look for the Energy Star label, and do your homework first. *The Consumer Guide to Home Energy Savings* is a great investment, and their Online Guide is an excellent resource. With every kilogram of CO_2 you save, you help protect our planet from global warming.

Buy Green Power

In many regions, utilities will sell you green power from wind and other sources for a small premium. If you use 10,000 kWh a year, this will cost you $2.50 to $25 a month, and save up to 6 tonnes of CO_2 a year — 10 tonnes if your power is 100% coal-fired. This is one of the most effective ways to reduce your carbon footprint.

Energy-Saving Measures	CO_2 saved per year	Cost	$ saved per year
Switch off five 60 W lights that don't need to be on.	270 kg	$0	$27
Replace 20 light bulbs with efficient ones (each bulb saves 50 kg of CO_2 per year").	1000 kg	$100	$100
Don't use the dryer. Use an outdoor clothes line or indoor rack.	280 kg	$0	$28
Install a low-flow showerhead.	230 kg	$15	$23
Replace a large inefficient fridge with a smaller efficient one.	400 kg	$750	$40
Use your dishwasher only when full, no drying cycle.	45 kg	$0	$4
Upgrade to an efficient front-loading clothes washer.	450 kg	$614	$45
Wash clothes in cold water, not warm or hot.	250 kg	$0	$25
Ditch the waterbed.	480 kg	$0	$48
Put your consumer electronics on power bars, and switch off when not in use to reduce standby power.	240 kg	$40	$24
Turn off your computer and printer when not in use.	420 kg	$0	$42
Totals	4065 kg	$1519	$406
Numbers will vary according to the local price of power and whether you use electricity or gas, etc.			

Install Solar PV

Solar PV makes tremendous sense, if you can afford it. In 2009 it cost just under $5 a watt ($8–10 installed), so a 2kW system cost $16–$20,000. There is every hope that prices continue to fall: we dream of the day when solar costs 50 cents per watt and a 2 kW system costs $2,000. To find out about local solar incentives, call a solar dealer. A 1 kW solar system will produce 1000 to 1500 kWh a year, depending on how much sunshine you get, and reduce your carbon footprint by 600 to 900 kg a year.

Clever Technologies

A $40 Kill-A-Watt meter will tell you how much each appliance is using. A motion detector will switch off your lights when there's no one in the room. A solar hot water heater will reduce your hot water bill by 40–60%. A low-flow showerhead will reduce your use of hot water.

Actions

- Walk around the house. List every appliance, and count the lights you use regularly
- Replace as many bulbs as you can afford to
- Buy or borrow a Kill-A-Watt meter, to see where you are using power
- Make a list of the appliances you'd like to upgrade
- Research the cost of new appliances
- Call a green power company and ask to make the switch
- Call a solar PV and a solar hot water company to get quotes

- Consumer Guide to Home Energy Savings: aceee.org/consumerguide
- Earth Aid Kit: earthaidkit.com
- Energy Star Appliances: energystar.gov
- Fridge-Freezer Energy Rating Database: kouba-cavallo.com/refmods.htm
- Green Guides: bchydro.com/guides_tips
- Green Made Simple: greenmadesimple.com
- Green Power Network: apps3.eere.energy.gov/greenpower
- Home Energy Saver: hes.lbl.gov
- Install a motion sensor light switch: tinyurl.com/8k4x53
- Install a Low-Flow Showerhead: tinyurl.com/7lkhzl
- Insulate your Water Heater: tinyurl.com/93qogq
- Kill-A-Watt video: tinyurl.com/99feeb
- Lowest Flow Showerhead: tinyurl.com/4ola36
- Office of Energy Efficiency, Canada: oee.nrcan.gc.ca
- Price of Solar PV: solarbuzz.com/ModulePrices.htm
- Real Goods: realgoods.com
- Rocky Mountain Institute Home Energy Briefs: tinyurl.com/3obh7r
- Solar cost calculator: infinitepower.org/calc_pv.htm
- Smart Power Strip: tinyurl.com/42jm9c
- US renewable energy incentives: dsireusa.org

GRAY WATSON, 256.COM/SOLAR

The Watson Family 5 kW Solar House in Lexington, MA.

4

Keep It Warm, Keep It Cool

Investing in a home on your street could be more profitable than investing in Wall Street.

— Home Energy Saver

We used to live in caves or the open air. For many a century, we huddled around a wood fire to keep warm in winter. Next came coal, with its filthy air pollution, and then central heating, with oil or gas furnaces. We also began to realize how important it was to insulate our homes to keep out the cold.

Many of our homes are still very leaky and inefficient. A modern German *Passivhaus* using super-insulation, super-windows and sub-soil heat exchange uses only 9.2 kWh per square meter per year for heat, 95% less than the German average. In winter when it's –10°C (14°F) outside, it needs no heating inside, and in summer when it's 35°C (95°F) outside, it is only 26°C (79°F) indoors. More than 6,000 passive houses have been built in Europe, so this is not an experimental design.

The average North American single-family home produces almost 12 tonnes of CO_2 a year, 55% of which comes from heating and cooling.[1] Here, we look at ways to keep the heat in — and out. In Solution #5, we look at ways to eliminate your use of fossil fuels altogether.

Keeping Warm	**CO_2 saved per year**	**$ saved per year**
Data from Cool Citizens. Numbers will vary according to fuel use and local prices		
Turn down water heater thermostat from 60°C to 49°C (140°F to 120°F)	97 kg	$12
Wash clothes in cold water	148 kg	$18
Wrap the water heater in an insulating jacket; insulate hot water pipes	143 kg	$18
Install water-saving showerheads and faucet aerators	218 kg	$27
Install programmable thermostats in your main rooms, set to 20°C (68°F) daytime, 13–14° C (55–58°F) night. Wear a sweater to keep warm	161 kg	$29
Seal large air-leaks. Caulk and weather-strip/draft-proof around windows, doors, baseboards, attic hatches and power switch plates	862 kg	$104
Add extra insulation in the attic (R-30)	763 kg	$91
Add extra insulation in the basement	338 kg	$45
Add extra insulation in the walls	216 kg	$26
Upgrade to high performance windows	971 lbs	$51
Add thin plastic film to the windows in winter	188 kg	$22
Seal and insulate your heating ducts, and get your furnace tuned	544 kg	$59
Keeping Cool		
Raise your cooling thermostat to 26°C (78°F)	154 kg	$19
Tune up your air-conditioning unit	59 kg	$7
Add an attic radiant barrier	57 kg	$7
Paint your roof white	214 kg	$26

City Green Solutions

All loaded up and ready to do a home energy assessment in Victoria, Canada.

Financial Planning

Your whole family needs to be involved, so work together to create a plan. There are often grants and incentives available for energy upgrades, so call city hall, a local environmental organization or a local energy company to find out more. According to the Home Energy Saver, a package of ten energy-saving investments will cost you $3,960, save you $597 a year and give you pay-back in 6.6 years, at a 16% rate of return. If you live in a condo or apartment, an energy efficiency upgrade will reduce your carbon footprint by around 30% and pay for itself in 3–5 years.

Keeping Cool

The better your insulation, the cooler your home. The more greenery you plant to shade south-facing walls, the better. Gainesville, Florida, has a strict tree ordinance and twice the tree-cover of nearby Ocala, so Gainesville residents spend $126 less per year on electricity, saving 1.4 tonnes of CO_2 a year per household.[2] When it comes to air conditioning, the Ice-Bear 30 hybrid provides efficient cooling, reducing energy demand by 95%.

- ASE Energy Efficient Financing: ase.org/consumer/finance.htm
- *Cool Citizens: Everyday Solutions to Climate Change,* Rocky Mountain Institute, 2002, rmi.org/images/PDFs/Climate/C02-12_CoolCitizensBrief.pdf.
- Energy Efficient Financing Info Center: nationalguild.com/residential/hers.html
- Green Home Guide: greenhomeguide.org
- Home Energy Saver: hes.lbl.gov
- Ice Bear: ice-energy.com
- Installing a Programmable Thermostat (video): tinyurl.com/a4v7qq
- Profitability of Energy Efficiency Upgrades: hes.lbl.gov/hes/profitable.html
- Residential Energy Services Network: natresnet.org
- Rocky Mountain Institute Home Energy Briefs: tinyurl.com/3obh7r

Actions

- Use your utility bills and a carbon calculator to work out your CO_2 emissions from heating and cooling
- Ask city hall about retrofits, grants and incentives
- Consider your options from the chart, and create a plan to do as many as you can over the next six months
- Call an energy company for a quote on things you cannot do yourself

Return on Investment

Fluorescent lamps and fixtures	41%
Duct sealing	41%
Energy Star clothes washer	37%
Energy Star thermostat	30%
Energy Star refrigerator	27%
10-point energy efficiency upgrade	16%
Dow Jones industrials, 2000–2007	16%
30-year bond	4.2%

Source: Home Energy Saver

5

Heat Your Home Without Carbon

Our planet has a rising fever. If the crib catches fire you don't say: 'Hmmm, how fast is that crib going to burn? Has it ever burned before? Is my baby flame retardant?'

— Al Gore

In Solution #4, we looked at ways to reduce your carbon footprint by making your home more efficient. Here, we look at ways to keep warm with no fossil fuels at all.

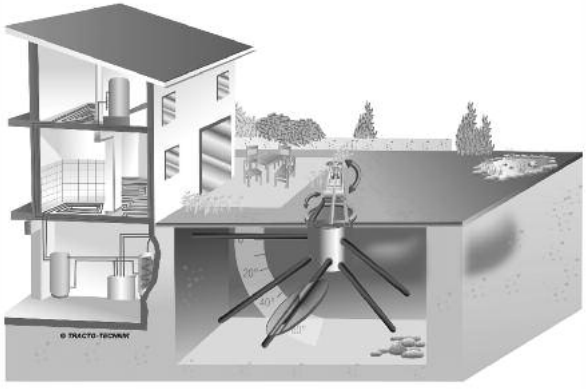
Solar Hot Water

If you have an area of south facing roof or available land, a solar hot water system can reduce your annual carbon footprint by up to 678kg.[1] There are two types of technology, the older flat plates and the newer evacuated tubes, which are being used by 40 million households in China, with prices starting at $190. They will likely cost $5,000 to $8,000 in North America and reduce your hot water bill by 33% to 75%. There may be local grants or incentives available, and your payback will depend on how much hot water you use. If you have a heated pool, you should definitely invest in a solar hot water system.

Heat Pumps

In a temperate climate where the winters are mild (warmer than –10 C°), an air-source heat pump that extracts heat from the air and circulates it through your home by ducts or under floor pipes is a really good investment, getting a payback in 2–7 years. If your house does not have a duct system to distribute the heat, you will need a mini-split system, which will cost 30% more.

A ground-source heat pump (also known as geo-exchange or geothermal) works in all climates, using pipes filled with a fluid that freezes at a very low temperature installed under your garden or driveway, where the temperature is a constant 7–14°C (45–58°F). For each unit of energy used by the pump, you'll get 3–4 units back. If you live on rock, the system uses deep boreholes, with a slower payback from 8 to 30 years. In summer the system can work in reverse, cooling your home by



Tracto-Technik's innovative technology allows for the installation of a groundsource heat system in a single day. See tracto-technik.de

- Heat Pumps: tinyurl.com/2y5dxe
- Passive Solar Design: eere.energy.gov/de/passive_solar_design.html
- Pellet Stoves: naturalheat.ca
- Rocky Mountain Institute HQ: rmi.org/sitepages/pid229.php
- Solar Wall: solarwall.com
- Topolino wood-burning Stove: constructionresources.com
- Wood Heat: woodheat.org
- Wood Pellet Association of Canada: pellet.org
- Zero Energy Design: ZeroEnergyDesign.com

pumping unwanted heat into the ground below. If you live next to water, a water-source heat pump can heat your home in the same way with loops that sit in the water. In Zurich and Vancouver, new homes use heat from the sewers, linked to a district heating system.

Solar Heat

The best way to benefit from the sun is to build a super-efficient passive-designed solar house. In Colorado, the 4,000-square-foot Rocky Mountain Institute's headquarters is passive solar designed and super-insulated, with advanced glazing and a large built-in greenhouse roof. Even though it is at 11,000 feet, it has no additional heat-source, and the eco-components only cost an additional $1.50 per square foot, winning their payback in just ten months.

For new builds, it is possible to design a zero-net energy house, using these technologies plus ground-source heating. Some people have designed their own solar heating systems, using solar-heat air or water stored underground and circulated under the floor. There is no standard way of doing this yet, so you need to be creative. It is also possible to install a black solar wall on the south side of any building.

Wood and Biofuels

For the home-owner, a super-efficient woodstove that burns firewood or a pellet stove that burns pellets made from compressed sawdust are carbon-neutral options as long as the wood or pellets have been harvested sustainably, because the timber absorbs the CO_2 before it is released in the burning. Wood smoke is a local pollutant that can be an irritant to nearby residents, however, so a wood stove is really only a rural option, and even then, you need to be mindful of your neighbors. It is important to use a super-efficient stove and to burn only dry, sustainably harvested wood. Another option is to ask for a 20% biodiesel mix in regular heating oil, which Columbia Fuels offers on Vancouver Island, reducing the CO_2 emissions by 16%.

If none of this seems easy, you are right. Retrofitting our homes to make them carbon neutral is a big challenge that needs generous financial incentives, carbon taxes and tax breaks to persuade people to make the necessary investments. This is one reason why we need to become engaged at a political level to push for this kind of change. (See Solution #10.)

Actions

- Call a solar hot water company and ask for a quote, to see what it would cost
- Consider your heating options, and if any seem possible, follow up with phone calls

6

Change the Way You Travel

There is no science on how we are going to adapt to 4 degrees warming. It is actually pretty alarming.
— Professor Neil Alger, Tyndall Centre for Climate Change Research

A hundred years ago, everyone traveled by foot, horse or bicycle. Today, thanks to the magic of fossil fuels, there are 700 million vehicles on the planet. Together, they are responsible for 2.8 billion tonnes of CO_2 a year, producing 7.6% of the world's CO_2 emissions.

Every time your car burns a liter of gas, it releases 2.34 kg of CO_2 into the atmosphere. Every time it burns a gallon, it releases 19.56 lbs.

If you are an average motorist, driving 20,000 kilometers (13,500 miles) a year in a car that consumes 9 liters per 100 km (26 mpg), you'll burn 2,222 liters (587 gallons), adding 5.2 tonnes of CO_2 to your carbon footprint. Can you reduce this and still get where you need to go?

MARTIN GOLDER

Victoria architect Martin Golder sits on his summer chopper. Originally a kid's bike, it sports a 750w wheel motor running on 48 volts, and is capable of some very exciting speeds.

Walk or Cycle

Our ancestors walked around the world: our legs are designed by evolution for walking. For every mile that you walk or cycle instead of driving, you'll eliminate that much CO_2, while becoming generally fitter and happier. For shopping and deliveries, there are backpacks and bicycle trailers. If you cycle to work each day instead of driving a 20 mile round trip, you'll reduce your carbon footprint by 1.7 tonnes a year.

Ride an Electric Bike or Scooter

An electric bikes uses almost no power, so your running costs will be close to zero, and they can zip along at 35 km/hr (22 mph), with a range of up to 50 km. An electric bike kit costs $400 to $1400. If you use green electricity, you'll have no emissions at all. The Vectrix electric motorbike can travel at up to 100 km/hr (62 mph) with a range of 55–90 km (35–55) miles, for only pennies per kilometer.

Take the Bus

In some cities, the bus service is superb, with electronic timetables that tell you when the next bus is coming. In others, it's an embarrassment, and you'll need a lot of citizen pressure to make it effective and reliable. (See #25.) For longer distances, inter-city coaches can be great, especially when they have laptop plug-ins and serve cappuccinos — and when nextbus.com tells you when the bus is coming.

Take the Train

This is a very comfortable way to reduce your emissions, and a great alternative to flying up to 800 kilometers (500 miles.)

- Carpool savings: carpool.ca/calculator.asp
- Carpooling (Canada): carpool.ca
- Carsharing: carsharing.net
- Electric bikes: electric-bikes.com
- Liftshare UK: liftsharesolutions.com
- Nextbus: nextbus.com
- Public Transit Calculators: publictransportation.org
- Ridesharing: erideshare.com
- SPUD: spud.ca
- Teleconferencing: tinyurl.com/y3q9vq
- Top Ten Reasons to Buy an Electric Bike: squidoo.com/electricbicycle

Ridesharing

If you share a ride with one other person, you'll cut your emissions in half. Share with four people, you'll reduce them by 75%. For one-off rideshares or regular commuting, search on erideshare.com or Craigslist, with the name of your city. In Britain, Liftshare has become hugely popular, with more than 300,000 members in 2009.

Carsharing

In 2007, 200,000 people in North America were members of car share groups — 300,000 in Europe, where carsharing started. Philadelphia's PhillyCarShare, has 35,000 members, 10,000 of whom have given up their cars. Carsharing gives you the choice to use a car when you need it, while also using other ways to get around.

Teleconferencing

If you fly economy class from Los Angeles to Washington DC, a round-trip of 4600 miles, you'll produce 1.8 tonnes of CO_2e . (See #9) If you organize a teleconference, you will avoid the emissions as well as the time and hassle. If six people teleconference instead of flying, they'll save $2,400 in return tickets, which could be put toward the cost of a top-of-the-line teleconferencing room.

Shopping without the Car

Carless people do it all the time. Your options include joining a carshare group; renting or buying a bicycle trailer; shopping locally so that you can walk home with a wheeled cart or a backpack; and joining a home delivery service such as Small Potatoes Urban Delivery (SPUD) in Western Canada.

Actions

- Start a travel diary, and see how many trips you could do without a car
- Visit a bike shop and research the choices
- Research electric bikes on the Internet
- Research local ridesharing and carcharing possibilities

CO_2 emissions from travel[1]	Grams per passenger km
Walk/Bike	0
Electric bike	6
Electric scooter	12
Rideshare, EV	23
Bus, full	23
Electric motorbike	25
Inter-city coach[2]	29
Train, full	40
Rideshare 4 people	55
Bus, average	76
Train, average	92
Car, 9.5 litres/100km (25 mpg) driving alone	220

7

Drive a Greener Car

For the sake of our security, our economy and our planet, we must have the courage and commitment to change.

— President Barack Obama

So which is the best car to drive? The only truly green car is an electric vehicle (EV) powered by renewable energy. We need a flood of EVs to meet the pent-up demand. Having said that, which are the least harmful? In Europe, the way to compare carbon emissions is grams per kilometer (g/km), which will soon become the global standard. The chart shows some of the best cars, not all of which are available yet in North America.

In Europe the goal for all new cars is 120 g/km by 2015. California's goal is 127 g/km by 2016. In 2007 more than 200 European cars produced less than 120 g/km, so they are making good progress.

How Much CO2?[1]	g/km
EV green power	0
Biodiesel SVO B-100	0
Plug-in Prius, green power[2]	56
Smart fortwo	88
EV grid power[3]	94
Ford Fiesta Econetic	98
VW Polo BlueMotion	99
Toyota iQ 2	99
Toyota Prius	104
Mini One Cooper	104
Toyota Aygo	108
Peugot 107	109
Honda Civic	109
Ford Fiesta	110
Fiat 500	110
Plug-in Prius, grid power	114
Average sedan	165
Hummer H3	346

Biodiesel Cars

Biodiesel is controversial, because the biodiesel you can buy at the pump (B-5, B-20) comes from crops or crop by-products that create CO_2 and nitrous oxide emissions during farming. Some Indonesian biodiesel produces 28 times more CO_2 than gasoline, because rainforest is cleared to grow the crop. Even straight veggie oil from restaurant wastes is not fully green. The CO_2 is carbon neutral because the oil-producing plants absorbed CO_2 while growing, but while most biodiesel emissions are far lower than those of a regular car, the nitrogen oxide emissions, which contribute to smog, are higher.

Electric Cars

The Plug-In Hybrid EV (PHEV) is generating excitement because it runs on both fuel and electricity, eliminating battery constraints. If the electricity is green, it has very low carbon emissions, with typical North American electricity it produces 114 g/km, compared to the Prius at 104 g/km.

When an EV runs on green power, its lifetime carbon emissions are only from its manufacturing, at 6 tonnes of CO_2. When it runs on coal-fired electricity, they are almost as much as a regular car, at 23 tonnes. The best of all options is a DIY EV conversion.

Is it Worth Buying a New Car?

For a Ford Taurus, assuming 22 mpg and a 14-year vehicle lifetime, 10% of its lifetime energy use

Actions

- Calculate your car's CO_2 emissions, using a carbon calculator
- Consider your options. Is it time to buy a greener vehicle?
- Practice climate friendly eco-driving
- Buy a Scan Gauge, for real-time MPG data
- Buy 4 LED tire pressure lights (search Amazon)

occurs during manufacturing, and 90% during use.[4] Renault estimates that the CO_2 from manufacturing their cars comes to 6 tonnes — the equivalent of driving 40,000 kilometers (25,000 miles).[5]

EcoDriving Questionnaire

Ecodriving can reduce your emissions by up to 30%. Score 0–10 for each question:

1. Do you cut your car's weight by removing roof racks, trailer hitches and assorted junk? ___
2. Do you check your tire pressure regularly? With too little air, you'll use more fuel. ___
3. Do you avoid driving distances less than three kilometers (two miles?) A cold engine produces 40% more emissions. ___
4. Do you avoid revving up like a Formula 1 car when you start the engine? ___
5. Do you drive straight off and not waste energy waiting for the engine to warm up? ___
6. Do you accelerate gently rather than pushing your foot to the floor? ___
7. Do you try to optimize your speed at 55 mph / 90 kph? For every 5 mph you travel faster, you burn 5–10% more fuel. ___
8. Do you avoid idling by switching off if you have to wait more than 10 seconds? ___
9. Do you coast up to a red traffic light, to minimize braking? ___
10. Do you keep a safe driving distance from other cars, to minimize braking? ___

Your Eco-Driving Score: _____

- 15 Green Cars: grist.org/feature/2007/08/13/cars
- CalCars (PHEVs): calcars.org
- Car Fuel Data (UK): vcacarfueldata.org.uk
- DIY Electric Car: diyelectriccar.com
- EcoDriving: ecodrivingusa.com
- EV World: evworld.com
- Fuel Economy Guide: fueleconomy.gov
- Greener Cars: greenercars.org
- Green Car Congress: greencarcongress.com
- Green Vehicle Guide: epa.gov/autoemissions
- Hypermiling: hypermiling.com
- New Car CO_2 emissions (UK): dft.gov.uk/ActOnCO2
- New vehicles guide (Canada): oee.nrcan.gc.ca/transportation/personal
- Scan Gauge: tinyurl.com/47tkee
- Solar Vehicles: builditsolar.com/Projects/Vehicles/vhehicles.htm
- The Green Car Guide (UK): carpages.co.uk/co2

GILLIAN DAVIDSON

Dr. Mary-Wynne Ashford enjoying her Smart car. Mary-Wynne is author of Enough Blood Shed: 101 Solutions to Violence, Terror and War *(New Society Publishers).*

8

Take a Climate-Friendly Vacation

Nobody made a greater mistake than he who did nothing because he thought he could only do a little.
— Edmund Burke

Hands up who has never flown to visit a loved one. And what about that oh-so-tempting holiday in Paris or Costa Rica?

It's a dilemma that we all face, once we learn how flying contributes to global warming. On a one-way flight from San Francisco to New York, a distance of some 4,200 km (2,600 miles), your share of the aircraft's kerosene will produce 426 kg of CO_2.

This is not the whole story, however. When a plane flies at altitude, its exhaust produces methane, water vapor, ozone and soot, all of which trap heat. It also produces contrails, which create high-level clouds, trapping more heat. When you include these, the overall impact (or radiative forcing) is up to 2.7 times greater than the CO_2 alone — so that one-way flight really produces 1.15 tonnes of CO_2e, or 2.3 tonnes for the return flight.[1] Short flights use more fuel per passenger, because an aircraft needs proportionally more fuel to rise to altitude than to cruise at altitude.

What are the solutions? For shorter distances, use a bus or train. Don't fly unless you really have to. A friend in Canada with a granny in Holland found that talking to her every week using Skype and a webcam, so that her granny could see her face, removed the pressure to fly so often.

When you do fly, be sure to buy offsets to neutralize your emissions. (See #10). This requires the use of a good carbon calculator, and most, alas, are *not* good when it comes to flying. Most count only CO_2, not the full radiative forcing, and even the plain CO_2 numbers can vary by as much as 100%. The two best calculators are at chooseclimate.org/flying and atmosfair.de.

Because a first class seat takes up more space than an economy seat, its share of an aircraft's emissions is 1.5 times more, which is reflected

Solar Sailor's 100-passenger charter vessel on Sydney harbour, Australia

CO_2e from Flying **Short — under 1000 km** **Medium — up to 5,000 km** **Long — more than 5,000 km**	**Grams of CO_2e per passenger-kilometer**
Short, economy class	400
Short, business class	600
Medium, economy class	250
Medium, business class	375
Long, economy class	270
Long, business class	405

only in the chooseclimate.org calculator. Toronto to Ottawa return (708 km) will produce 283 kg of CO_2e in economy, or 424 kg in first class. The same journey by train will produce 65 kg of CO_2, or 34 kg if the train is full. For the longer-term solutions for flying, see Solution #50.

Climate-Friendly Holidays

Cycling, hiking, camping or lazing in the sun by a local beach or lake all have a zero carbon footprint: this kind of holidaying will almost certainly reduce your carbon footprint by more than if you had stayed at home.

If you like boating, the most climate-friendly ways to travel on water are sailing boats, kayaks, canoes, rowboats and boats with an electric motor powered by solar or other green energy. The Canadian Electric Boat Company produces the Fantail 217, a very graceful inland-waters boat that can run for eight hours before it needs a recharge. For motorboats, the two-stroke engines are terrible water polluters and really should be phased out: one liter of spilt oil can contaminate up to two million liters of water.

Other holiday habits have a larger carbon footprint. An hour of jet-skiing will burn about 7.5 liters (2 gallons) of gas and produce 17.55 kg of CO_2. A week on a cruise ship will burn 454 liters (120 gallons) of fuel, producing 1.4 tonnes of CO_2.[2]

If you like to go RVing, a large vehicle may burn 31 liters per 100 km (7–8 mpg), so every 1,000 kilometers that you travel will produce 725 kg of CO_2. A smaller RV might produce half of this. The less you travel and the more you laze, the smaller your footprint will be.

- Atmosfair Flight Calculator: atmosfair.de
- Biodiesel/SVO Discussion Forum: biodiesel.infopop.cc
- Boat Carbon Footprint: boatcarbonfootprint.com
- Choose Climate Flight Calculator: chooseclimate.org/flying
- Electric boats, Canada: electricboats.ca
- Electric Boats, UK: electricboats.co.uk
- Electric Boat Association (UK): electric-boat-association.org.uk
- Straight vegetable oil: journeytoforever.org/biodiesel_vehicle.html

Actions

- List all the flights you took last year, and calculate their carbon footprint
- Plan your close-to-zero carbon vacation

CO_2 per hour of travel	Kg of CO_2
Boat — 10 HP 4-stroke[3]	5.9
Boat — 200 HP 4-stroke	118
Boat — 1000 HP 4-stroke	590
Car — 20 mpg/11.4 liters per 100 km (90 kph/55 mph)	11
Car — 50 mpg/4.7 liters per 100 km	4

If you power your RV — or any diesel vehicle — with biodiesel in the form of straight veggie oil (SVO) from waste restaurant fats, your carbon footprint will be effectively zero. Keith Addison and Midori Hiraga from Japan are engaged in an overland "Journey to Forever" educational tour from East Asia to southern Africa, linking schools and communities along the way and sharing their knowledge about a practical sustainable innovations — while driving two 30-year-old Land Rovers powered by biodiesel SVO.

9

Change Your Consumer Habits

Besides the noble art of getting things done, there is the noble art of leaving things undone. The wisdom of life consists in the elimination of non-essentials.

— Lin Yutang

What a fabulous world. The shops are stuffed with everything a person could ever want. But where does it come from? From Earth's forests, fields and oceans. And where does it go when it's no longer wanted? If not recycled, to Earth's landfills and incinerators. Earth has only 1.8 hectares of available productive biological capacity for every human, but our average footprint is 2.7 hectares, and Earth's other species have to live as well.

We worry about financial debt, but not ecological debt. Our lifestyles have overdrawn our account with the Earth by 28% — and our debt increases every year. Each American, on average, is responsible for 11 tonnes of CO_2 a year from the manufacture and delivery of the things we consume.[1] Creating and shipping junk mail in the USA produces more CO_2 than 9 million cars, and 44% goes straight to the landfill, unopened.[2]

- Carbon Rally Challenge: carbonrally.com
- Change Everything: changeeverything.ca
- Conscious Consumer: newdream.org/cc
- Ecological Footprint Quiz: myfootprint.org
- Ecological Footprint (UK): ecologicalfootprint.com
- Freecycle Network: freecycle.org
- New Road Map Foundation: financialintegrity.org
- North West Earth Institute: nwei.org
- Red Dot Campaign: reddotcampaign.ca
- Simple Living America: simplelivingamerica.blogspot.com
- Simple Living Network: simpleliving.net
- Simplicity Scorecard: simplelivingamerica.org/survey
- Stop Junk Mail: 41pounds.org
- Sustainable Travel International: sustainabletravelinternational.org
- *The Story of Stuff* (20-minute video): storyofstuff.com
- *YES! Magazine, A Journal of Positive Futures:* yesmagazine.org

The Carbon Impact of Small Things

Item	CO_2e
100 Google searches	20 grams[3]
Plastic shopping bag	45 grams[4]
Small packet of chips	75 grams[5]
Liter plastic bottle	80 grams [6]
Paper shopping bag	135 grams[7]
Liter of imported water	250 grams[8]
Daily paper	326 grams[9]
Large carton orange juice	1.7 kg[10]
1 kg of beef	16 kg[11]
One year's junk mail	42 kg[12]
52 bags of garbage a year	338 kg[13]

Five Ways To Reduce your Carbon Footprint

- Use cloth shopping bags instead of plastic and paper: save 30 kg a year.[14]
- Cancel all your junk mail: save 42 kg a year.[15]
- Recycle five bottles a week: save 117 kg a year.[16]
- Recycle one newspaper a day: save 41 kg a year.[17]
- Buy 100% post-consumer recycled paper, instead of virgin paper: save 1.48 kg per kg of paper.[18]

… must we create so much garbage?

Live More Simply

There's a quiet revolution happening called voluntary simplicity. By reorganizing their priorities and spending less on stuff, people are reclaiming their lives, discovering nature, art, families, local communities and time for meaningful activity. One way to explore the movement is to join or form a Northwest Earth Institute study group.

Are You Winning the War against Stuff?

Score yourself on each question from 0 –10.

1. Do you take time each day to pause, breathe in and be grateful? ___
2. Do you know how big your ecological footprint is? ___
3. Do you avoid buying bottled water? ___
4. Do you always use cloth shopping bags? ___
5. Do you recycle everything you can? ___
6. Do you Freecycle or give away stuff you want to get rid off? ___
7. Do you compost food and garden wastes? ___
8. Have you eliminated your junk mail? ___
9. Do you sell or give something away to balance each new purchase? ___
10. Have you visited your local landfill? ___

Total: ___

Invest in a Climate-Friendly World

Which would you rather invest in: Tobacco? Oil? Or companies working to develop solutions to global warming? 1,000 mutual funds specialize in socially responsible investment. You can invest in a green mutual fund or choose from the Top 20 Sustainable Stocks listed on the Sustainable Business website.

Ask your investment adviser to green up your investments. If he or she tells you they won't make money, it's time to change your advisor, for the sector is exploding, with $117 billion invested in renewable energy in 2007 — a 20-fold increase since 1995.

You can also invest in community funds, which bring capital and financial services to low-income areas. In 2007 the Self-Help Credit Union had a foreclosure rate of only 0.62%, compared to a market average of 8% for sub-prime mortgage lenders.

If your savings are with a pension fund, get together with your colleagues and ask your employer, college or labor union to divest itself of businesses that contribute to global warming and switch to socially responsible stocks.

- CERES, Investors and Environmentalists: ceres.org
- Climate Friendly Banking (Canada): climatefriendlybanking.com
- Community Investing: socialinvest.org/projects/communityinvesting.cfm
- Green Money Journal: greenmoneyjournal.com
- Social Funds: socialfunds.com
- Social Investment Forum: socialinvest.org
- Social Investment Organization, Canada: socialinvestment.ca
- Socially Responsible Mutual Fund Performance Chart: socialinvest.org/resources/mfpc
- Sustainable Stocks: sustainablebusiness.com/Stocks

Actions

- Take the Ecological Footprint Quiz
- Take the Carbon Rally Challenge
- Fill in Simplicity Scorecard
- Ask your financial adviser about moving your investments into green funds

10
Become a Climate Champion

When people ask me what they should do, I reply "Get informed, get outraged, and then get political."
— Joseph Romm

Finally! If you have worked your way through these Personal Solutions, you deserve a warm handshake of appreciation. You should have no problem in reducing your carbon footprint by 10% — or more. So now two questions arise. First, what else can I do? And second, can I offset my remaining emissions in a reliable manner?

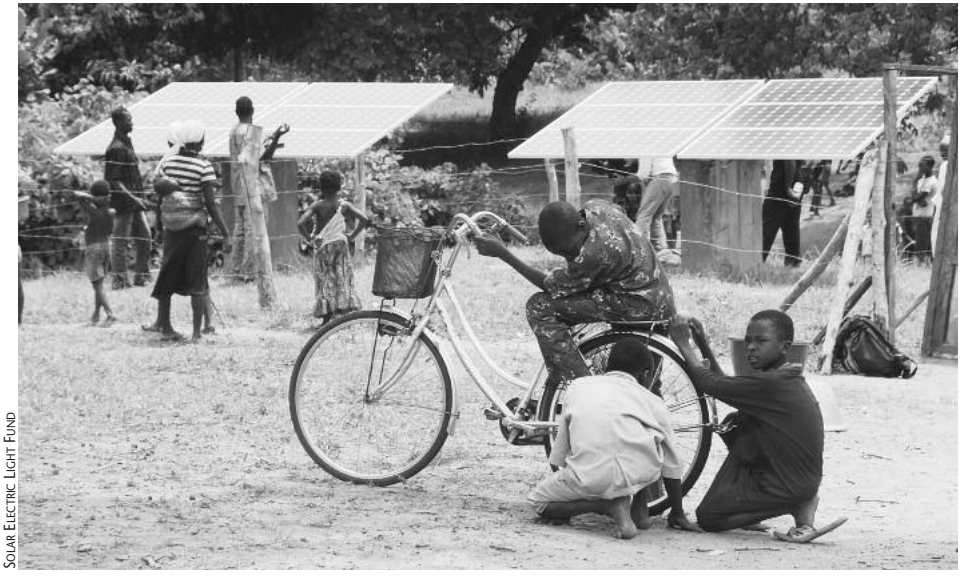
The answer to the first question opens a door to a whole new landscape, with several paths that you could take. One leads to a living room, where you invite a group of neighbors to organize an eight-week Climate Challenge Circle, based on these Solutions. (See #11.)

Another leads to a meeting in your school (#12), college (#13), place of worship (#14) or workplace (#32), where you discuss setting up a Climate Action Team, following the ideas laid out in the pages that follow. Both of these paths will bring you new friends, deepen your learning and lead you into new areas of understanding and change.

A third path leads to an existing group, either a local independent group or one connected to a larger network such as the Sierra Club, Step It Up or Focus The Nation (see #20), which will introduce you to the amazing network of groups all over the world that are working to make a difference.

As you proceed along these paths, your creativity will come alive and you will hopefully get a sense that it is possible to change the world. One day you may hear someone refer to you as a champion, and you'll think "Me?" And the answer will be "Yes — you."

The Solar Electric Light Fund helps villagers in the developing world install their own solar systems, replacing the use of kerosene, for which it also sells carbon offsets. self.org



SOLAR ELECTRIC LIGHT FUND

Actions

- Choose a carbon offset organization, and buy offsets to neutralize your emissions
- List five reasons why you should become a Climate Champion, and five reasons why not. Decide which list carries the most weight
- Congratulate yourself on having come this far, and invite some friends over to tell them what you've been doing

Offset Your Personal Emissions

Before we move on, there is an important piece of business to take care of. Even if you are doing your best, you will still have a carbon footprint. Can you "offset" it and become carbon neutral?

As author of this book, I work to reduce my emissions, but I also fly to conferences where I speak about the solutions to global warming, hopefully inspiring people to act. Each January, I tally up my emissions and pay $15 a tonne to the Solar Electric Light Fund (SELF), based in Washington DC.

SELF is a non-profit organization that brings solar power to villages in Bhutan, Nigeria and elsewhere. When a family installs a 50-watt solar system they stop using kerosene to light their lamps. This ends the air pollution and risk of fire associated with kerosene and stops the use of a fossil fuel. SELF calculates how much CO_2 is saved by not burning kerosene, and it makes the saved emissions available as offsets.

SELF's offsets meet two critical requirements: (a) The carbon reduction *would not have happened otherwise*. If SELF had not made it possible for the villagers to install solar power, they would still be burning kerosene. (b) The reduction is real, and not something that might happen in the future.

Climate Care, based in Oxford, UK, is another good offset seller. They support projects in the developing world such as substituting treadle pumps for diesel pumps, and ovens that burn briquettes made from farm wastes instead of natural gas. Other good carbon offset organizations support energy efficiency in the developing world and low-income communities and protect tropical forests that would otherwise have been cut.

Tree-planting offsets sell the hope that the trees will absorb your emissions when they are big enough — provided they don't die from drought or are cut down for firewood. Offsets based on the sale of renewable energy certificates (RECs) are also questionable, because it is hard to understand how the income gathered is used to generate new green power that would not have happened otherwise.

This is the question that must be asked of every carbon offset project: "Would this project be happening anyway, without my offset?" If the answer is yes, you have a piece of paper, but not a valid offset. The best carbon offset programs are verified by a third party and approved by "The Gold Standard" so that you know they are for real. For an in-depth report, see the *Consumer's Guide*.

Good Carbon Offset Organizations

- AgCert/Driving Green: agcert.com
- Atmosfair: atmosfair.de
- Carbon Offset Companies: tufts.edu/tie/carbonoffsets/carboncompanies.htm
- Climate Care: climatecare.org
- Climate Trust: climatetrust.org
- Las Gaviotas: gaviotasoffsets.org
- Native Energy: nativeenergy.com
- Offsetters: offsetters.ca
- *Purchasing Carbon Offsets — a Guide for Canadians*: davidsuzuki.org/Publications/offset_vendors.asp
- Solar Electric Light Fund: self.org
- Voluntary Carbon Offsets: tufts.edu/tie/carbonoffsets/index.htm
- *A Consumer's Guide to Retail Carbon Offset Providers:* cleanair-coolplanet.org
- The Gold Standard: cdmgoldstandard.org