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It Starts at Home

By Peter Miller

Not long ago, my wife, PJ, and I tried a new diet—not to lose a little weight but to answer a nagging question about climate change. Scientists have reported recently that the world is heating up even faster than predicted only a few years ago, and that the consequences could be severe if we don't keep reducing emissions of carbon dioxide and other greenhouse gases that are trapping heat in our atmosphere. But what can we do about it as individuals? And as emissions from China, India, and other developing nations skyrocket, will our efforts really make any difference?

We decided to try an experiment. For one month we tracked our personal emissions of carbon dioxide (CO_2) as if we were counting calories. We wanted to see how much we could cut back, so we put ourselves on a strict diet. The average U.S. household produces about 150 pounds of CO_2 a day by doing commonplace things like turning on air-conditioning or driving cars. That's more than twice the European average and almost five times the global average, mostly because Americans drive more and have bigger houses. But how much should we try to reduce?

For an answer, I checked with Tim Flannery, author of *The Weather Makers: How Man Is Changing the Climate and What It Means for Life on Earth.* In his book, he'd challenged readers to make deep cuts in personal emissions to keep the world from reaching critical tipping points, such as the melting of the ice sheets in Greenland or West Antarctica. "To stay below that threshold, we need to reduce CO_2 emissions by 80 percent," he said.

"That sounds like a lot," PJ said. "Can we really do that?"

It seemed unlikely to me too. Still, the point was to answer a simple question: How close could we come to a lifestyle the planet could handle? If it turned out we couldn't do it, perhaps we could at least identify places where the diet pinched and figure out ways to adjust. So we agreed to shoot for 80 percent less than the U.S. average, which equated to a daily diet of only 30 pounds of CO_2. Then we set out to find a few neighbors to join us.

John and Kyoko Bauer were logical candidates. Dedicated greenies, they were already committed to a low-impact lifestyle. One car, one TV, no meat except fish. As parents of three-year-old twins, they were also worried about the future. "Absolutely, sign us up," John said.

Susan and Mitch Freedman, meanwhile, had two teenagers. Susan wasn't sure how eager they would be to cut back during their summer vacation, but she was game to give the diet a try. As an architect, Mitch was working on an office building designed to be energy efficient, so he was curious how much they could save at home. So the Freedmans were in too.

We started on a Sunday in July, an unseasonably mild day in Northern Virginia, where we live. A front had blown through the night before, and I'd opened our bedroom windows to let in the breeze. We'd gotten so used to keeping our air-conditioning going around the clock, I'd almost forgotten the windows even opened. The birds woke us at five with a pleasant racket in the trees, the sun came up, and our experiment began.

Our first challenge was to find ways to convert our daily activities into pounds of CO_2. We wanted to track our progress as we went, to change our habits if necessary.

PJ volunteered to read our electric meter each morning and to check the odometer on our Mazda Miata. While she was doing that, I wrote down the mileage from our Honda CR-V and pushed my way through the shrubs to read the natural gas meter. We diligently recorded everything on a chart taped to one of our kitchen cabinets. A gallon of gasoline, we learned, adds a whopping 19.6 pounds of CO_2 to the atmosphere, a big chunk of our daily allowance. A kilowatt-hour

(kWh) of electricity in the U.S. produces 1.5 pounds of CO2. Every 100 cubic feet of natural gas emits 12 pounds of CO2.

To get a rough idea of our current carbon footprint, I plugged numbers from recent utility bills into several calculators on websites. Each asked for slightly different information, and each came up with a different result. None was flattering. The Environmental Protection Agency (EPA) website figured our annual CO2 emissions at 54,273 pounds, 30 percent higher than the average American family with two people; the main culprit was the energy we were using to heat and cool our house. Evidently, we had further to go than I thought.

I began our campaign by grabbing a flashlight and heading down to the basement. For most families, the water heater alone consumes 12 percent of their house's energy. My plan was to turn down the heater's thermostat to 120 F, as experts recommend. But taking a close look at our tank, I saw only "hot" and "warm" settings, no degrees. Not knowing what that meant exactly, I twisted the dial to warm and hoped for the best. (The water turned out to be a little cool, and I had to adjust it later.)

When PJ drove off in the CR-V to pick up a friend for church, I hauled out gear to cut the grass: electric lawn mower, electric edger, electric leaf blower. Then it dawned on me: All this power-sucking equipment was going to cost us in CO2 emissions. So I stuffed everything back into the garage, hopped in the Miata, and buzzed down the street to Home Depot to price out an old-fashioned push reel mower.

The store didn't have one, so I drove a few miles more to Lawn & Leisure, an outfit that specializes in lawn mowers. They were out too, though they had plenty of big riding mowers on display. (The average gasoline-powered push mower, I'd learned, puts out as much pollution per hour as eleven cars—a riding mower as much as 34 cars.) My next stop was Wal-Mart, where I found another empty spot on the rack. I finally tried Sears, which had one manual mower left, the display model.

I'd seen advertisements for the latest reel mowers that made them sound like precision instruments, not the clunky beast I pushed as a teenager. But when I gave the display model a spin across the sales floor, I was disappointed. The reel felt clumsy compared with my corded electric model, which I can easily maneuver with one hand. I got back in the car empty-handed and drove home.

As I pulled into the driveway, I had the sinking realization I'd been off on a fool's errand. I didn't know exactly how foolish until the next morning, when we added up the numbers. I'd driven 24 miles in search of a more Earth-friendly mower. PJ had driven 27 miles to visit a friend in an assisted-living facility. We'd used 32 kWh of electricity and 100 cubic feet of gas to cook dinner and dry our clothes. Our total CO2 emissions for the day: 105.6 pounds. Three and a half times our target.

"Guess we need to try harder," PJ said.

We got some help in Week Two from a professional "house doctor," Ed Minch, of Energy Services Group in Wilmington, Delaware. We asked Minch to do an energy audit of our house to see if we'd missed any easy fixes. The first thing he did was walk around the outside of the house, looking at how the "envelope" was put together. Had the architect and builder created any opportunities for air to seep in or out, such as overhanging floors? Next he went inside and used an infrared scanner to look at our interior walls. A hot or cold spot might mean that we had a duct problem or that insulation in a wall wasn't doing its job. Finally his assistants set up a powerful fan in our front door to lower air pressure inside the house and force air through whatever leaks there might be in the shell of the house. Our house, his instruments showed, was 50 percent leakier than it should be.

One reason, Minch discovered, was that our builder had left a narrow, rectangular hole in our foundation beneath the laundry room—for what reason we could only guess. Leaves from our yard had blown through the hole into the crawl space. "There's your big hit," he said. "That's your open window." I hadn't looked inside the crawl space in years, so there could have been a family of monkeys under there for all I knew. Sealing up that hole was now a priority, since heating represents up to half of a house's energy costs, and cooling can account for a tenth.

Air rushing in through the foundation was only part of the problem, however. Much of the rest was air seeping out of a closet on our second floor, where a small furnace unit was located. The closet had never been completely drywalled, so air filtered through insulation in the roof to the great outdoors. Minch recommended we finish the drywalling when the time comes to replace the furnace.

Minch also gave us tips about lighting and appliances. "A typical kitchen these days has ten 75-watt spots on all day," he said. "That's a huge waste of money." Replacing them with compact fluorescents could save a homeowner $200 a year. Refrigerators, washing machines, dishwashers, and other appliances, in fact, may represent half of a household's electric bill. Those with Energy Star labels from the EPA are more efficient and may come with rebates or tax credits when you buy them, Minch said.

There was no shortage of advice out there, I discovered, about ways to cut back on CO2 emissions. Even before Minch's visit, I'd collected stacks of printouts and brochures from environmental websites and utility companies. In a sense, there's almost too much information.

"You can't fix everything at once," John Bauer said when I asked how he and Kyoko were getting along. "When we became vegetarians, we didn't do it all at once. First the lamb went. Then the pork. Then the beef. Finally the chicken. We've been phasing out seafood for a few years now. It's no different with a carbon diet."

Good advice, I'm sure. But everywhere I looked I saw things gobbling up energy. One night I sat up in bed, squinted into the darkness, and counted ten little lights: cell phone charger, desktop calculator, laptop computer, printer, clock radio, cable TV box, camera battery recharger, carbon monoxide detector, cordless phone base, smoke detector. What were they all doing? A study by the Lawrence Berkeley National Laboratory found that "vampire" power sucked up by electronics in standby mode can add up to 8 percent of a house's electric bill. What else had I missed?

"You can go nuts thinking about everything in your house that uses power," said Jennifer Thorne Amann, author of *Consumer Guide to Home Energy Savings*, who had agreed to be our group's energy coach. "You have to use common sense and prioritize. Don't agonize too much. Think about what you'll be able to sustain after the experiment is over. If you have trouble reaching your goal in one area, remember there's always something else you can do."

At this point we left home for a long weekend to attend the wedding of my niece, Alyssa, in Oregon. While we were gone, the house sitter caring for our two dogs continued to read our gas and electric meters, and we kept track of the mileage on our rental car as we drove from Portland to the Pacific coast. I knew this trip wasn't going to help our carbon diet any. But what was more important, after all, reducing CO2 emissions or sharing a family celebration?

That's the big question. How significant are personal efforts to cut back? Do our actions add up to anything meaningful, or are we just making ourselves feel better? I still wasn't sure. As soon as we returned home to Virginia, I started digging up more numbers.

The United States, I learned, produces a fifth of the world's CO2 emissions, about six billion metric tons a year. That staggering amount could reach seven billion by 2030, as our population and economy continue to grow. Most of the CO2 comes from energy consumed by buildings, vehicles, and industries. How much CO2 could be avoided, I started to wonder, if we all tightened our belts? What would happen if the whole country went on a carbon diet?

Buildings, not cars, produce the most CO2 in the United States. Private residences, shopping malls, warehouses, and offices account for 38 percent of the nation's emissions, mainly because of electricity use. It doesn't help that the average new house in the United States is 45 percent bigger than it was 30 years ago.

Companies like Wal-Mart that maintain thousands of their own buildings have discovered they can achieve significant energy savings. A pilot Supercenter in Las Vegas consumes up to 45 percent less power than similar stores, in part by using evaporative cooling units, radiant floors, high-efficiency refrigeration, and natural light in shopping areas. Retrofits and smart design could reduce emissions from buildings in this country by 200 million tons of CO2 a year, according to researchers at Oak Ridge National Laboratory. But Americans are unlikely to achieve such gains, they say, without new building codes, appliance standards, and financial incentives. There are simply too many reasons not to.

Commercial building owners, for example, have had little incentive to pay more for improvements like high-efficiency windows, lights, heating, or cooling systems since their tenants, not they, pay the energy bills, said Harvey Sachs of the American Council for an Energy-Efficient Economy. For homeowners, meanwhile, efficiency takes a backseat whenever money is tight. In a 2007 survey of Americans, 60 percent said they didn't have enough savings to pay for energy-related renovations. If given an extra $10,000 to work with, only 24 percent said they would invest in efficiency. What did the rest want? Granite countertops.

After buildings, transportation is the next largest source of CO2, producing 34 percent of the nation's emissions. Carmakers have been told by Congress to raise fuel economy standards by 40 percent by 2020. But emissions will still grow, because the number of miles driven in this country keeps going up. One big reason: Developers keep pushing neighborhoods farther into the countryside, making it unavoidable for families to spend hours a day in their cars. An EPA study estimated that greenhouse gas emissions from vehicles could increase 80 percent over the next 50 years. Unless we make it easier for Americans to choose buses, subways, and bikes over cars, experts say, there's little chance for big emissions cuts from vehicles.

The industrial sector represents the third major source of CO2. Refineries, paper plants, and other facilities emit 28 percent of the nation's total. You would think such enterprises would have eliminated inefficiencies long ago. But that isn't always the case. For firms competing in global markets, making the best product at the right price comes first. Reducing greenhouse gases is less urgent. Some don't even track CO2 emissions.

A number of corporations such as Dow, DuPont, and 3M have shown how profitable efficiency can be. Since 1995, Dow has saved seven billion dollars by reducing its energy intensity—the amount of energy consumed per pound of product—and during the past few decades it has cut its CO2 emissions by 20 percent. To show other companies how to make such gains, the Department of Energy (DOE) has been sending teams of experts into 700 or so factories a year to analyze equipment and techniques. Yet even here change doesn't come easily. Managers are reluctant to invest in efficiency unless the return is high and the payback time is short. Even when tips from the experts involve no cost at all—such as "turn off the ventilation in unoccupied rooms"—fewer than half of such fixes are acted upon. One reason is inertia. "Many changes don't happen until the maintenance foreman, who knows how to keep the old equipment running, dies or retires," said Peggy Podolak, senior industrial energy analyst at DOE.

But change is coming anyway. Most business leaders expect federal regulation of CO2 emissions in the near future. Already, New York and nine other northeastern states have agreed on a mandatory cap-and-trade system similar to the one started in Europe in 2005. Under the plan, launched last year, emissions from large power plants will be reduced over time, as each plant either cuts emissions or purchases credits from other companies that cut their emissions. A similar scheme has been launched by the governors of California and six other western states and the premiers of four Canadian provinces.

So how do the numbers add up? How much CO2 could we save if the whole nation went on a low carbon diet? A study by McKinsey & Company, a management consulting firm, estimated that the United States could avoid 1.3 billion tons of CO2 emissions a year, using only existing technologies that would pay for themselves in savings. Instead of growing by more than a billion tons by 2020, annual emissions in the U.S. would drop by 200 million tons a year. We already know, in other words, how to freeze CO2 emissions if we want to.

Not that there won't still be obstacles. Every sector of our economy faces challenges, said energy-efficiency guru Amory Lovins of the Rocky Mountain Institute. "But they all have huge potential. I don't know anyone who has failed to make money at energy efficiency. There's so much low-hanging fruit, it's falling off the trees and mushing up around our ankles."

By the last week in July, PJ and I were finally getting into the flow of the reduced carbon lifestyle. We walked to the neighborhood pool instead of driving, biked to the farmers market on Saturday morning, and lingered on the deck until dark, chatting over the chirping of the crickets. Whenever possible I worked from home, and when I commuted I took the bus and subway. Even when it got hot and humid, as it does in Virginia in July, we were never really uncomfortable, thanks in part to the industrial-size ceiling fan we installed in the bedroom in late June.

"That fan's my new best friend," PJ said.

Our numbers were looking pretty good, in fact, when we crossed the finish line on August 1. Compared with the previous July, we slashed electricity use by 70 percent, natural gas by 40 percent, and reduced our driving to half the national average. In terms of CO2, we trimmed our emissions to an average of 70.5 pounds a day, which, though twice as much as we'd targeted as our goal, was still half the national average.

These were encouraging results, I thought, until I factored in emissions from our plane trip to Oregon. I hadn't expected that a modern aircraft packed with passengers would emit almost half as much CO2 per person as PJ and I would have produced if we'd driven to Oregon and back in the CR-V. The round-trip flight added the equivalent of 2,500 pounds of CO2 to our bottom line, more than doubling our daily average from 70.5 pounds of CO2 to 150 pounds—five times our goal. So much for air travel.

By comparison, the Bauers did significantly better, though they also faced setbacks. Since their house is all electric, Kyoko Bauer had tried to reduce her use of the clothes dryer by hanging laundry on a rack outside, as she and John had done when they lived in arid Western Australia. But with their busy three-year-olds, Etienne and Ajanta, she was doing as many as 14 loads a week, and it took all day for clothes to dry in Virginia's humid air. "It wasn't as convenient as I hoped," she said. "I had to race home from shopping a couple of times before it started to rain." Their bottom line: 97.4 pounds of CO2 a day.

For the Freedmans, driving turned out to be the big bump in the road. With four cars and everyone commuting to a job every day—including Ben and Courtney—they racked up 4,536 miles during the month. "I don't know how we could have driven less," Susan said. "We were all going in different directions and there wasn't any other way to get there." Their bottom line: 248 pounds of CO2 a day.

When we received our electric bill for July, PJ and I were pleased that our efforts had saved us $190. We decided to use a portion of this windfall to offset the airline emissions. After doing a little homework, we contributed $50 to Native Energy, one of many companies and nonprofits that save CO2 by investing in wind farms, solar plants, and other renewable energy projects. Our purchase was enough to counteract a ton of jet emissions, roughly what we added through our trip and then some.

We can do more, of course. We can sign up with our utility company for power from regional wind farms. We can purchase locally grown foods instead of winter raspberries from Chile and bottled water from Fiji. We can join a carbon-reduction club through a neighborhood church, Scout troop, Rotary Club, PTA, or environmental group. If we can't find one, we could start one.

"If you can get enough people to do things in enough communities, you can have a huge impact," said David Gershon, author of *Low Carbon Diet: A 30-Day Program to Lose 5,000 Pounds.* "When people are successful, they say, Wow, I want to go further. I'm going to push for better public transportation, bike lanes, whatever. Somebody called this the mice-on-the-ice strategy. You don't have to get any one element to work, but if you come at it from enough different directions, eventually the ice cracks."

Will it make any difference? That's what we really wanted to know. Our low carbon diet had shown us that, with little or no hardship and no major cash outlays, we could cut day-to-day emissions of CO2 in half—mainly by wasting less energy at home and on the highway. Similar efforts in office buildings, shopping malls, and factories throughout the nation, combined with incentives and efficiency standards, could halt further increases in U.S. emissions.

That won't be enough by itself, though. The world will still suffer severe disruptions unless humanity reduces emissions sharply—and they've risen 30 percent since 1990. As much as 80 percent of new energy demand in the next decade is projected to come from China, India, and other developing nations. China is building the equivalent of two midsize coal-fired power plants a week, and by 2007 its CO2 output surpassed that of the U.S. Putting the brakes on global emissions will be more difficult than curbing CO2 in the United States, because the economies of developing nations are growing faster. But it begins the same way: By focusing on better insulation in houses, more efficient lights in offices, better gas mileage in cars, and smarter processes in industry. The potential exists, as McKinsey reported last year, to cut the growth of global emissions in half.

Yet efficiency, in the end, can only take us so far. To get the deeper reductions we need, as Tim Flannery advised—80 percent by 2050 (or even 100 percent, as he now advocates)—we must replace fossil fuels faster with renewable energy from wind farms, solar plants, geothermal facilities, and biofuels. We must slow deforestation, which is an additional source of greenhouse gases. And we must develop technologies to capture and bury carbon dioxide from existing power plants. Efficiency can buy us time—perhaps as much as two decades—to figure out how to remove carbon from the world's diet.

The rest of the world isn't waiting for the United States to show the way. Sweden has pioneered carbon-neutral houses, Germany affordable solar power, Japan fuel-efficient cars, the Netherlands prosperous cities filled with bicycles. Do Americans have the will to match such efforts?

Maybe so, said R. James Woolsey, former director of the CIA, who sees a powerful, if unlikely, new alliance forming behind energy efficiency. "Some people are in favor of it because it's a way to make money, some because they're worried about terrorism or global warming, some because they think it's their religious duty," he said. "But it's all coming together, and politicians are starting to notice. I call it a growing coalition between the tree huggers, the do-gooders, the sodbusters, the cheap hawks, the evangelicals, the utility shareholders, the mom-and-pop drivers, and Willie Nelson."

This movement starts at home with the changing of a lightbulb, the opening of a window, a walk to the bus, or a bike ride to the post office. PJ and I did it for

only a month, but I can see the low carbon diet becoming a habit.

"What do we have to lose?" PJ said.