

BECOMING CARBON NEUTRAL



**HOW YOU CAN STOP CONTRIBUTING TO THE
GLOBAL CATASTROPHES OF CLIMATE CHANGE**

Becoming Carbon Neutral:

*How you can stop contributing
to the global catastrophes
of climate change*

By: John E. Hancock

Professor Emeritus of Architecture, University of Cincinnati

CONTENTS: *Becoming Carbon Neutral – In Five Steps*

Step ONE: UNDERSTAND the facts of the Climate Crisis.

Discover the scope of the problem, the role of fossil fuels, and the causes of delay and denial. Page 7

Step TWO: CALCULATE your household’s Carbon Footprint.

Learn your household’s carbon footprint, what’s contributing to it, and how to prioritize your actions. Page 17

Step THREE: REDUCE your household’s Carbon Emissions.

Plan short and long term actions, think into the future, and consider the costs. Page 25

Step FOUR: OFFSET to achieve “Net Zero” Neutrality.

Understand the principles of carbon offsetting, acknowledge its controversies, and select worthy projects. Page 34

Step FIVE: ADVOCATE for change and solutions. Reach out

to public and private leaders, join the movement, and address denial. Be persuasive. Page 40

Epilogue: SUMMARY structure of a Carbon Neutral Plan

Page 49

APPENDICES:

Page 51

Our Forever Home.

The Church’s Story

Sample Calculator Output

“Hope... is something you need to deserve – that you have actually done something.”

*-- Swedish climate activist Greta Thunberg**

ON BECOMING CARBON NEUTRAL (A PREFACE)

Green building design was not my academic focus while teaching architecture at the University of Cincinnati for forty years, but I learned a lot from my students. Their increasing sense of urgency about climate change, especially since the 1990s, inspired me to learn the facts about ***what our carbon emissions are doing to this planet of ours.***

Then, anticipating my retirement in 2015, my wife and I had the opportunity to design and build a house. This was an opportunity to “walk the talk” of energy-conscious living, and through much learning (thanks to my wife Marcia), and choices about location, orientation, design, materials, and systems, we found ourselves within reach of ***a fully “carbon neutral” way of life.***

Most recently, in a church context, a group of us has been working to enact necessary facility changes at a larger scale. We worked to approach carbon neutrality in our facility

* quoted in: *The New Yorker*, September 30, 2019, page 20.

operations, with waste reduction; new windows, lighting, and HVAC; and solar panels. And we've also been encouraging each other's efforts, in community and in reflection, to ***be the change we want to see in the world.***

Carbon induced climate change is a huge, complex, and terrifying problem – the biggest that humanity has ever faced. (That's explained here, in **STEP ONE.**) The facts, once we face them, can leave us in despair – but ***we need to hope.*** To “deserve” to hope, though, we need to have acted. And that needed action is simply stated: ***We all need to become carbon neutral.***

For most of us (at a moderate level of affluence and self-determination), that action is also, surprisingly, simply achieved. With some strategic adjustments in our life choices (**STEPS TWO AND THREE**), and some surprisingly modest contributions to climate mitigation projects (**STEP FOUR**), you too can ***stop putting (net) carbon into the atmosphere.***

Having done so, you can, with maximum credibility, help persuade others at all levels of society, commerce, and government (**STEP FIVE**), ***to do the same.***

This booklet is an expanded summary of the “Becoming Carbon Neutral” class held at Mount Auburn Presbyterian Church, in Cincinnati, Ohio, in the fall and winter of 2019-20. My thanks to the participants and organizers, to my wife Marcia Alscher, and to my Master of Architecture students of the past two decades who are too numerous to name. All have helped me to sharpen my commitment, my knowledge, and my message.

That said, I should emphasize that I am not an expert in climate science, political advocacy, or economic policy. The nearest thing to “expertise” you’ll find here are the bits that have to do with building design and urban planning, or the references to our own house-building and church-retrofitting experiences. Instead, I’m summarizing here my years of collecting, studying, and teaching several of the more thorough and expertise-based press articles on the subject. I cite several of them here, and summarize others. I commend them to you, along with as much “deeper diving” as you may find illuminating on this complex, urgent, and changing topic.

– Cincinnati, Ohio, May, 2022

INTRODUCTION

EYES ON THE PRIZE. The goal here is to help you to **“be the change”** that will help to end global warming. That does not mean just to “reduce your carbon footprint” or even to “install some solar panels” – that won’t do it. Specific (and often-discussed) actions, like recycling or food choices, are important but they should not be at the center of our thinking; they can, and have, too easily become distractions from the overall goal, which is to **“become carbon neutral.”** So set these small questions to the side, for now, and stay focused on the actual solution – the goal, the prize -- which is:

We – that’s all humans on earth – need to stop putting carbon (and other greenhouse gasses) into the atmosphere.

YOUR CARBON NEUTRAL PLAN. That means you have to look at everything in your life. It sounds like a big task, but the five steps outlined here are not as difficult or insurmountable as you may think. Follow this process, and you’ll have a plan that will make you a part of the solution, instead of the problem. (Especially as Americans, we are a BIG part of the global problem – with only 5 percent of the population, we produce 25 percent of the planet-warming greenhouse gasses.) Your CARBON NEUTRAL PLAN will eliminate your household’s greenhouse gas emissions, and position you to advocate persuasively for policy changes at all levels of society and government.

STEP ONE: UNDERSTAND the facts

The facts about carbon emissions, other greenhouse gases, and global warming; the related political, commercial, and economic contexts in which we find ourselves today on this planet; the sources and types of denial, obstruction, and pessimism that are preventing the solutions we need.

CLIMATE CHANGE TERMS. Let's open with the basics on the "how and why" of climate change and carbon emissions. First of all, should we call it "climate change" or "global warming?" The former is more technically correct, since there are other changes going on besides (or as a result of) increased temperatures in the atmosphere and oceans. But the latter is a bit more frightening, which, with the right approach, may motivate us better. Maps of global average temperatures make it completely clear: over recent decades, rising temperatures predominate across the planet, and they cause, either directly or indirectly, all of the other extreme climate consequences that are now so prominent and frequent in the news.

CLIMATE CHANGE IMPACTS. Almost every week, we hear news of another catastrophe caused by our warming planet: rising sea-levels, monster storms and floods, wildfires, heat waves, disappearing arctic ice, dying coral, threatened species and ecosystems. Many, many months over these past few years have been "the hottest on record" at the time. Twenty of the hottest years in history have occurred in the last thirty years. Scientific predictions (at least since the 1970s) have generally

been wrong only in that these changes are accelerating faster than expected. And:

It will take decades, even centuries, to reverse what has already occurred, no matter what we do.

CLIMATE CHANGE IS LOCAL. In some regions, like here in southern Ohio, we might be tempted to dismiss the problem. After all, what's not to like about our new, mild winters? I didn't shovel my driveway in two of the past three years. We've got plenty of fresh water flowing by in the Ohio River. Monster Asian typhoons, record numbers and intensities of Gulf hurricanes, extreme-drought-induced wildfires in California, or vanishing glaciers in Montana or the Alps, all seem so far away. But it is happening here: in Cincinnati, one single year, 2019, brought us three "50-year" and two "100-year" storms: concentrated rain water overwhelmed outdated sewage infrastructure and repairing the landslides bankrupted city funding that was earmarked for a new police station.

We (again, that's "we humans on this planet") are not protected, no matter where we live.

UNDERSTANDING THE BASICS. A concise and accurate summary of the climate change situation appeared in the September 24, 2017, issue of the *New York Times*. Justin Gillis, in "Your Questions about Climate Change, Answered," explains the basic facts, in three categories: What is Happening? (Rapidly rising greenhouse gas emissions are warming the atmosphere and oceans.) What Could Happen? (More of what's already happening, but much worse, and soon.) And What Can We do? (See below.) In other words, what are the mechanisms of the warming planet, how bad could it get in the future, and

what's the prognosis. Pertinent to our challenge here, the key phrase – the essential take-away fact – from this general summary, is this:

The warming will slow to a potentially manageable pace only when human emissions are reduced to zero.

(To remain concise here, I will only briefly cite or summarize resource articles; to learn more, you can search for them (or other reliable materials) online. A deeper understanding of these basic facts and issues will be helpful, especially for becoming an effective advocate for change.)

FOCUSING ON CARBON. The “emissions” we’re concerned with are mainly carbon (carbon dioxide, CO₂). Other human-caused “greenhouse gases” are also trapping excessive solar heat in the atmosphere – methane from oil refineries, landfills, and industrial feedlots is one that we should also be concerned about (it is 23 times more potent than CO₂, but there’s much less of it). So most of our focus should be on carbon, and that’s why the best descriptive phrase for the problem is, in my view, ***“carbon-induced global warming.”*** Carbon dioxide from the burning of fossil fuels accounts for about 80 percent of our problem. Other greenhouse gas emissions, when calculated, are referred to in “carbon-equivalent” units.

IMAGINING THE SOLUTION. We live in the “carbon economy” – or call it “fossil fuel civilization.” We are all contributing, in many ways and all the time, to the accelerating climate catastrophes around our planet – through every chimney, exhaust pipe, and smokestack. Much of the global population understands the situation, at least vaguely. So what to do? It bears repeating here that “recycling” or “changing your diet” or

even “putting solar panels on your house,” for example – all common assumptions – are not correct statements of the solution we need.

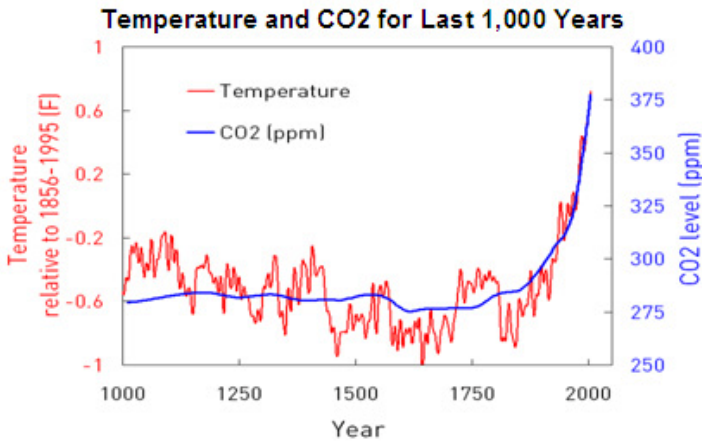
The process outlined in this booklet will help you avoid jumping to any of these conclusions, EXCEPT as part of the necessary, overall goal, which is:

We must stop putting carbon into the atmosphere. While zero carbon is not feasible if we are participating in civilization at all, we can still achieve “net zero” or “carbon neutrality.”

MOTIVATION BY THE NUMBERS. To move ahead with this, we’ll need, first of all, to be motivated. Carbon-induced global warming is a huge and truly dire situation, and to begin our work to “*stop putting carbon into the atmosphere,*” we need to have a way of grasping its severity and urgency. The scientific facts of climate change emerge clearly and powerfully in Bill McKibben’s writing, which I first encountered in a 2012 issue of *Rolling Stone*. It’s impactful mainly because he boils the situation down to hard numbers. Three numbers, specifically: First, **2 degrees Celsius**, the temperature rise “allowed” by the Paris Climate Accord. Second, **565 Gigatons**, the remaining “budget” amount of carbon (by weight, as of 2012) that could be added to earth’s atmosphere that **will produce that 2 degree rise**. Third, **2,795 Gigatons**, the amount of carbon that will go into the atmosphere if the current (as of 2012) known reserves of the world’s fossil fuel producers **is sold to us, and we burn it**. That’s FIVE TIMES the “budget” we (once again, we earthlings) can afford if we’re taking the Paris Accord’s target seriously. The article is aptly titled, “Global Warming’s Terrifying New Math.” It’s shocking to realize:

The fossil fuel industry’s financial future depends on destroying the planet as we know it. The known reserves they want to sell us will warm the planet by a horrifying eleven degrees Farenheit by later in this century.

HOW CARBON IS MEASURED. Atmospheric carbon is measured in two ways. One is by weight, in gigatons: one gigaton is a billion metric tons, each of which is 1000 kilograms. That means a gigaton of carbon is 1 trillion kilograms, or 2.2 trillion pounds. The second way we can measure carbon in the atmosphere is by PPMs: parts per million. This is the proportional amount of carbon relative to all other components of the atmosphere. It’s this latter method that gives us a good way of visualizing the changes over eons (which have been measured in ice cores, for example), since the start of the Industrial Revolution in 1751.



The “Hockey-Stick Graph” – the slant hundred years compared to prior normal or natural cycles of global temperatures; the correlation of rising temperature and carbon dioxide levels. Source: Environmental Defense Fund online.

THOSE “HOCKEY STICK” GRAPHS. For hundreds of thousands of years, until about 1950, the PPMs of carbon went through periodic fluctuations, but stayed generally below 300. But by 2019, we were all the way up to 420 – that’s an increase of 40 percent in only seven decades. We add 2 more PPMs every single year at the current (and still accelerating) rates. The graphs of atmospheric carbon and average global temperatures coincide exactly; both have risen together, precipitously and dramatically, far above their millennia-long norms and cycles, only since the 1950s – producing that frightening “hockey-stick” profile. They are still sky-rocketing, now far above anything in the period of our planet’s history to which current life is adapted.

ENVIRONMENTAL JUSTICE. The world’s poor populations are the most affected by the accelerating climate catastrophes that rising carbon levels produce. They are the least able to adapt to the situation, and it is not mainly their doing. In the global south, and low-lying regions, their farmland is being flooded or parched, their summers are becoming uninhabitable, their water sources are drying up. And they can’t just buy larger air-conditioners like we can. In our developed countries, it’s the already disadvantaged who are most affected by all forms of environmental degradation, including both the production and waste byproducts of fossil fuels. These factors reveal the “social justice” dimension, and motivation, for climate action.

By buying and burning fossil fuels, WE (especially we affluent Americans, with our grotesque carbon footprints) are inflicting these catastrophes ON THEM.

ENVIRONMENTAL ETHICS. That said, there is another dimension to environmental justice. A movement called

“environmental ethics” shifts the horizon of moral concern out beyond humans. The notion of “justice” is no longer merely “social;” the natural world is seen as having “rights” to be considered in our reflections on what is “good.” That ethical horizon has been expanding since the days when it only included land-owning, white males – adding other races, then women, for example, towards all of humanity. Because we now live in the “Anthropocene” era of our planet (in which we are impacting and damaging the earth so powerfully), many see this ethical leap as necessary – even if only for our own survival as a flourishing, civilized species.

THE PROBLEMS OF DOUBT, DENIAL, AND DESPAIR

PUBLIC DOUBT AND DENIAL. The general public has been very slow to recognize, or face up to, the facts and urgency of carbon-induced global warming. Vice President Al Gore’s 2006 film, “An Inconvenient Truth,” was clear enough in its message, but too easy to dismiss or ignore; given the messenger, many saw the issue, wrongly, as “politics” instead of “physics.” Otherwise intelligent people still find, somewhere, and despite overwhelming facts, grounds for climate denial (more detail on this later). Part of this is certainly that grasping the reality means we have to face a huge and complex moral dilemma; everybody recognizes that we still need our cars, airplanes, and electricity. It is also, of course, an economic dilemma, since our way of life depends on these things. We seem trapped, for now, in the “fossil fuel economy.”

A HISTORICAL ANALOGY. That phrase, “*Our way of life depends on it,*” has a disturbing history. We users of polluting fossil fuels are comparable (more than we’ll want to admit) to

the slave holders of the ante-bellum South, whose way of life depended on America's "peculiar institution." Even those who recognized slavery as a moral abomination created justifications for not giving it up. Doing so just felt impossible. In the same way, even when we grasp the great evil our fossil-fuel dependence is for the planet, just "giving it up" still seems too far out of reach. So, like many of our slave-holding ancestors did, we may "worry" or "care" about the situation, but most of us have not "acted" yet. It seems too difficult, or like too big a sacrifice. It's easy to judge history's participants who, in their day, didn't manage to do the right thing. But how will future generations judge us? What things are we still getting terribly wrong, but not recognizing or admitting, or not yet feeling like we're "able" to fix? Have no doubt about the answer:

Our burning of fossil fuels is the greatest abomination of our time, even if not yet widely recognized as such.

INDUSTRY-SPONSORED DOUBT. Much of the public doubt has also been artificially and deliberately manufactured. The fossil fuel industry has known since the 1970s that the products they sell are warming the atmosphere and melting the polar ice caps: that "will make it easier to drill the Arctic," the now-leaked, internal Exxon-Mobil memos explain! They implemented public relations initiatives to make sure the emerging scientific facts would be shrouded in uncertainty. This doubt, and the governmental inaction it enables, continue – even though carbon-induced global warming is now as firmly established by scientific agreement as gravity. Its facts and implications are fully understood by the insurance industry, by investment analysts, and by our military planners, for example.

POLITICALLY-INDUCED DENIAL. Yet our government has been paralyzed on this issue. Too many members of congress remain firmly committed to the profit interests of the fossil fuel industry, over the need for planetary climate stability. On Sunday June 4, 2017, *The New York Times* printed a cover story (“How G.O.P. Leaders Came to Reject Climate Science: A Shift in Positions Is a Tale of Big Money and Democratic Hubris,” by Coral Davenport and Eric Lipton). The article recounts, in detail, the “campaign carefully crafted by the fossil fuel industry” and their allies to influence elected officials, and to create doubt about the science of climate change. Pro-fossil-fuel lobby groups like the “American Petroleum Institute” and “Americans for Prosperity” continue to fund our leaders’ re-elections, to threaten them with massively-funded primary challenges if they support climate action, and to foster climate denial and complacency among the voting public.

THE CLAIMS OF CLIMATE DENIAL. To encourage all of this doubt and denial, and to prevent policy solutions (even free market ones like a carbon fee and dividend), right wing media and industry propaganda have been successfully exploiting both the anti-government and the anti-science biases in much of society. Yet the positions of the deniers have been shifting under the weight of the facts. First, they said that global warming was not happening – but it soon became obvious. Then they claimed it was not caused by human activity – but scientific dissent on that has also vanished. They still occasionally say the science is not settled – but it is. With all those positions gone, they now claim to prefer free market solutions – but the market is not “free” while fossil fuels remain massively subsidized, and their gigatons of harmful

wastes are still being dumped freely into the atmosphere. They also say that new technologies might save us – but waiting to depend on future inventions is a long-odds gamble, with nearly everything at stake. (You may still hear one or more of these fallacies, even the earliest ones, from some of our elected representatives. More on this at STEP FIVE below.)

IT'S NOT POLITICS, ITS PHYSICS. The facts of carbon-induced global warming consist of chemical and physical processes that have been, and can continue to be, observed, measured, calculated, and predicted. Taken in the aggregate, the broader scientific predictions of the impacts of these processes on global weather patterns and temperatures, over recent decades, have erred only by being too conservative – that is, by underestimating the speed of change, and the rise in devastation. The only “politics” in the situation involve the doubt and denial still being manufactured by the fossil fuel industry (and their legislative, media, and lobbying allies), seeking deliberately to prevent policy solutions that would threaten their planet-wrecking business model, future profits, and stock prices.

THE QUESTION OF HOPE AND DESPAIR. Clearly, the problem of carbon-induced global warming is huge, and dire. It is easy to feel overwhelmed and, especially with these political contexts, helpless to effect change. But losing hope is not an option – that would be debilitating. To resist falling into despair, we must have faith that it's not too late for us humans to redeem ourselves and the planet. To do the necessary work, we need to hope – to believe that it's possible to succeed, in our own lives, and for change at all levels. In both, greater hope can come from being in a community, and in alignment with an organized movement that is getting something done, that is

moving toward the solution. Recall: Greta Thunberg's statement that:

“Hope... is something you need to deserve – that you have actually done something.”

TWO VOICES OF HOPE. Jared Diamond, in a review of McKibben's latest book, *Falter: Has the Human Game Begun to Play Itself Out?* (*The New York Times Book Review*, April 21, 2019, page 13), cites reasons for hope appearing in corporate, political, and economic contexts, and recommends hope, and not just fear, as a motivator of action. (He also explores how to be persuasive, rather than shrill, when talking to people not yet convinced about global warming and its remedies.) In a similarly optimistic vein, but with more detail, Al Gore suggests (in, “It's Not Too Late: The Climate Crisis is the Battle of Our Time and We Can Win,” *The New York Times*, September 22, 2019, pages 1, 4) that the political will, as well as the technology, for climate action is turning a corner. Like Thunberg, Gore recognizes the importance of maintaining hope by rooting it in action. Both Gore and Diamond emphasize examples of the now-rapidly-shifting economics: for example, renewable energy sources are now the cheapest ways of generating electricity.

STEP TWO: CALCULATE your footprint

An introduction to carbon-equivalent calculators; looking at home, car, travel, food, and secondaries, in our individual households; and by extension in the companies

and institutions we care about, buy from, belong to, or support.

HOW TO GET STARTED. The facts of carbon-induced climate change are frightening. Embrace the *fear* – it can be a good motivator. And if it takes you on to *action*, then you can *deserve to hope*. Ending net carbon emissions can be both local and global, both individual and political, but we should begin by showing, in our own lives, that it can be done. So, the first step is calculating your contributions to the problem – the carbon footprint of your individual household. To do that, explore some of the online Carbon Calculators; I’ll recommend a few of the most prominent and useful ones here.

THERE ARE MANY VARIABLES. In the calculation process, you will discover that there are many pieces to the puzzle: some of your actions have a far larger impact than others do. Some will surprise you with their relative impacts, so before necessarily deciding to give up air travel, or stop eating meat (although both would help some, and either could be done for other reasons), it is important to translate ALL of your choices into their specific, comparable “carbon” or “carbon-equivalent” impact numbers. This will give you a better-informed basis for making decisions about what to change. You can only prioritize wisely after a detailed calculation process, reviewing most of your everyday life activities and choices.

EXPLORE BACKGROUND RESOURCES. Carbon calculations can be a complex process, and there is a lot of seemingly non-aligned information out there. For background, consult a few of the general sources that appear under the Google phrase, “become carbon neutral.” Publications like *The Guardian*, *The Huffington Post*, and *Scientific American*, have offered good,

general reviews of the process. There's enough variation among the carbon calculators themselves that you'll want to work with several to get a clearer perspective. If you can, work together with others and compare notes and outcomes. The calculators that I describe and evaluate below were among the top eight that appeared in a Google search as of November, 2019.

ON-GOING VS. ONE-TIME COSTS. The calculators mainly deal with on-going sources of carbon emissions associated with our way of life. They obviously include the carbon cost of energy and transportation, but also of the production of our food and other everyday goods and services (called "secondaries") that we consume. The calculators will not reflect the carbon cost of manufacture for major items like furniture and cars. If we did look into that, we may discover that it is better to buy used cars, equipment, products, etc., instead of new ones, and to extend the life of everything we own for as long as possible. (That's the "re-use" part of the adage, "reduce, re-use, recycle.") To calculate your annual carbon footprints, though, you'll be looking mainly at the carbon costs we can measure on a "per year" basis.

EVERYTHING IS A CHOICE: Among all the variables in our life choices, the calculators will show us a rather bewildering array of opportunities for reductions and trade-offs. Later, in **STEP THREE**, we'll look at how to think about these potential decisions in the short term, medium term, and long term. These choices will include: where and how to live; how to select, design, or retrofit our dwellings; what to buy or eat; how to travel; and so on. Except for the very poor, all of these things are choices – in one time-horizon or another – even though heavily culturally conditioned. This process will

suggest new, carbon-reducing changes for your life; whether they will feel like “sacrifices” or just “critical improvements” may be mainly a matter of perspective.

GATHER AND INTERPRET YOUR DATA. Here are the basic facts about your household that you’ll need to get started. From your utility bills, add up how many “CCFs” of natural gas you used in the past year (one CCF is a hundred cubic feet, also called a Therm). Then add up how many “KWHs” (kilowatt-hours) of electricity you used over the year. If your household uses cars (Don’t we all; what realistic choice do we have!?), estimate your annual total miles driven, and divide by the car’s rated miles-per-gallon. (Or, to be more accurate, you can tally how many gallons of gasoline you purchased during the year; each gallon burned creates 20 pounds of CO₂.) If you travel by air, identify an average year’s itineraries; some calculators will ask for air-miles, others merely airport codes.

SKIM THROUGH SOME CALCULATORS FIRST. Some of the finer-grained data requirements will become clearer after you’ve started looking at how the calculators work – especially for the categories of food and “secondaries.” For food choices, spend some time with the BBC calculator (see below); it will show you which categories of food to estimate, and will reveal the high-impact items like industrial beef. The Cool Climate calculator may be the best to help you understand the “secondaries” (all other goods and services you use in a year), and which kinds of data in various categories you’ll need to gather.

WATCH THE UNITS CAREFULLY. As you begin to work with the different calculators, you will find that their units for measuring quantities of product, or of carbon, don’t always

match. In some, you can select the units, so be sure to stay consistent. The most common unit for carbon emissions is the metric ton (1,000 kilograms, or 2,200 pounds). Convert everything to metric tons before making comparisons. For example, the EPA calculator gives the answers in pounds, so convert that to metric tons by dividing by 2,200. The BBC food calculator charts impacts in kilograms, so divide by 1,000.

COMPARE DIFFERENT CALCULATORS. Use at least three calculators to begin your work. Enter your data (with comparable units of measurement) in each one, and see if they yield similar carbon results, per category. Explore the detailed variables in some of them, especially for food and secondaries. Keep a list of any ideas they suggest for carbon savings that you may not have already thought of, noting the potential impact on your total. Your carbon footprint in some categories may look quite different from one calculator to the next; I'll describe below what to do about that problem. (Among some of these calculators, you'll run into information about "OFFSETS" too, but save that topic for STEP FOUR in our process.) So, here are several helpful calculators to work with, probably still there in the top tier of an online search:

THE US-EPA CALCULATOR. This was archived on the last day of the Obama administration, the day before our federal government stopped acknowledging the reality of human-caused climate change. (It returned in 2021.) It is straightforward and easy to use. When your basic data go in, it sets you at the national average (which is very high), but then it takes you through any "planned actions," and some of these you may have done already. Once you have entered all of your "already done" items on its detailed list, these adjustments get you to a more reasonable number. This calculator allows you

to see the impacts of any new actions you might take (for example, line-dry 1/3 of your laundry and save 0.23 metric tons per year). Replacement windows (or interior storms or thermal drapes), if you now have single-pane leaky ones, could save five metric tons per year. Recycling everything possible reduces the carbon-equivalent emissions from your trash by one-half.

CARBONFOOTPRINT.COM. Based in the UK, this one is written for both industry and domestic situations. Here you will find a detailed list of “secondaries” (goods and services besides fuels and food), projecting carbon emissions tied to how much you spend on each category. This can be a very large part of your carbon footprint, as it tries to reflect the carbon cost (including the cost of production) of everything you regularly buy, and from whom you buy it. The calculators that include these “secondaries” are not very transparent about how these numbers are derived, but it is still useful to help you identify opportunities for carbon reductions. (Generally, that answer seems to be: just consume less!)

THE NATURE CONSERVANCY (NATURE.ORG). This is a simple calculator to use, with results consistent with most others. Again, this one lumps “Goods and Services” together by dollars spent, without much detail. (Sites like this one are using an “under the hood” calculation program that is shared by many; you’ll probably notice that at a certain point several of them function similarly.) Two more that seem comparable are CONSERVATION.ORG and TERRA-PASS. The first of these is from Conservation International, while the second is an offset vendor – both are also easy to use but don’t cover secondaries.

COOL CLIMATE. From the University of California Berkeley, this is one of the best calculators overall. A helpful feature here is a set of interactive green bar charts for every data entry: you can adjust them to visualize in real time the relative impact of different variables. It offers you a choice of “simple or advanced” secondary calculations, and then a list of recommended actions. This is also the only one where I saw “water usage” accounted for, at 1.5 metric tons per year. (If you are curious, you can look more deeply into any of these calculators to find the sources of their shared data and assumptions. The background structure for this one comes from the “Comprehensive Environmental Data Archive for Economic and Environmental Systems Analysis” – CEDA 3.0 Climate).

THE UNITED NATIONS. A calculator offered by the “United Nations Framework Convention on Climate Change” (climateneutralnow.org) comes out generally consistent with the others. It is short and simple, and does not cover the secondaries. Their factors are based on background sources like the US-EPA and Climate-Watch in case you want to dig deeper. What’s unique here is that you can explore a fascinating array of international offsetting opportunities – global projects to reduce future carbon that you can invest in for as little as \$1.50 per ton! (Is this too good to be true? We’ll see in the next step.)

CLIMATE CHANGE FOOD CALCULATOR. (bbc.com/news/science-environment-46459714) This tool from the BBC gives detailed information on the carbon impacts of our food choices. It shows how it is not just your choice of food types (beef vs. chicken vs. beans, for example) but the source that matters. High impact industrial beef is by far the worst food product,

although beef overall, and many other foods, have a wide range of carbon footprints depending on the processes used to create and transport them. This shows that there are not absolute requirements for a climate-friendly diet – it is a matter of choice and judgment, always in consideration of your total carbon footprint. (So for example: If you enjoy beef, buy it from a farmer whose beautiful, regenerative, carbon-capturing pastures you admire. It costs more, so eat less, and enjoy its better flavor. Not everything here is a sacrifice!)

FINDING YOUR TOTAL FOOTPRINT. To make sense of all these not-always-aligned calculators, make yourself a simple chart: down the side, list all the main categories of carbon spewing actions (car, airplanes, food, gas, electricity, secondaries, etc.). Across the top, name the calculators you used. Fill in the chart. Not every calculator will offer a number in every category. Some may be way out of line with the others. Ignore the empty boxes, eliminate the outliers, and select the best “consensus” results as your metric tons of emissions for each category. Then total those up.

For even moderately affluent Americans, the average carbon footprint will very likely be in the range of 10 – 15 metric tons per person per year, or more.

YES IT’S ALARMING, SO WHAT NEXT? You are now in a position to make informed choices about things you can do differently in your life, and re-evaluate things you are already doing. EVERY action that you think is helping with the climate crisis should now have a CARBON NUMBER – how many annual metric tons of CO₂ it produces. That’s how you should judge the impact of composting your food waste, for example, or driving your hybrid car. In this process of “becoming carbon

neutral,” the impact of your choices in carbon emissions is the only thing that matters.

YOUR CARBON NEUTRAL PLAN. The calculators will have shown you many ways to cut your carbon footprint – some quick and easy, others long-term. And yes, some would be quite expensive. With a carbon-impact number in hand for each of these options, you are ready for the next steps: reducing and offsetting. Your plan will organize these choices, both the immediate ones and things you can commit to over time, towards becoming a “net-zero carbon” household.

Your projected (and hopefully declining) annual CO2 emissions can then be matched each year with offset purchases, bringing your net carbon footprint to zero.

STEP THREE: REDUCE your footprint

Taking action to cut your carbon footprint; short, medium, and long term choices and decisions; evaluating the impacts; thinking innovatively about the required investments; organizing an overall CARBON NEUTRAL PLAN.

GETTING TO SPECIFIC ACTIONS. You probably had many ideas about how to make your life choices more “green” or “sustainable” before you did your calculations. Several usually come to mind, based on our initial assumptions about what the big, carbon-heavy choices are – for example, to recycle, fly less, eat local food, give up plastic bags, buy a hybrid car, and so on. From the calculations, your biggest carbon-culprits are

probably clear: typically home heating and cooling (and the home's condition), driving a car, certain food choices, air travel, and our overall consumption of "secondary" goods and services. It's normal to feel trapped: our culture and our pre-carbon-aware life choices have us dependent on the fossil-fuel economy. How can we escape?

CHOICE AND SACRIFICE. To save this planet as we know it, we all have to get our carbon numbers down, and big sacrifices might be required. Begin by recognizing that (again, except for the very poor) everything is a choice. Even though there are things you think you will not (or cannot) change, put them "on the table" for this process. The ideas I mention here offer many possibilities; they don't all need to appear in your household's CARBON NEUTRAL PLAN – you can choose what to sacrifice (and you can choose whether it feels like a sacrifice). You won't be able to get to zero-carbon, but you can compensate with offsets later (in STEP FOUR).

STRUCTURING YOUR PLAN. Working with the calculators gave you many ideas for life changes that could lower your footprint. Divide any of these ideas that you haven't already done into three time frames: short, medium, and long-term. Some changes will seem quick and easy. The last category will probably be the higher cost items, or more difficult, or involve longer-range decision-making. Spread them out over the foreseeable future, and include possible major long-term choices like where and how to live, and what to drive. The ideas here are organized in those time-frames, and across the major areas of carbon-expenditure.

SHORT TERM REDUCTIONS, HOME. The calculators probably showed you many everyday life choices that are "low hanging

fruit” for getting a carbon-reduction impact relatively easily. The well-known mantra “*reduce, reuse, recycle*” covers some of these steps – buy less, buy used, use longer, limit trash. Next, substitute LEDs in all lighting (buy well-known or well-reviewed brands, not the cheapest ones; the payback is quick anyhow). Set or program your thermostat to a wider daily and seasonal range, say 62 to 82 instead of 72 degrees all the time. Tighten your home’s “building envelope” by installing thermal membranes or interior shutters on any single-pane windows, and caulking any leaks. Get an energy audit (utility companies usually offer a rudimentary version), and follow its recommendations.

SHORT TERM REDUCTIONS, CAR AND TRAVEL. Change driving habits by consolidating trips, shopping closer to home, performing routine maintenance, keeping tires inflated, and carpooling or taking public transit (or walking or biking) whenever possible. Carefully compare the impacts of jet travel with any feasible alternatives (we’re all Zoom experts now, or try a virtual “faux-cation!”). Anticipate when you’ll be replacing your current vehicle (and research new options), or changing your dependence on it (by where you live). More on these long-term choices below.

SHORT TERM REDUCTIONS, FOOD AND OTHER. Adjust your food choices to reduce or eliminate high-carbon-equivalent impact items like industrial beef and out-of-season produce. Conserve water; capture rain water. Compost or recycle everything possible. Grow food or buy local as much as possible. Resist consumerism (“reduce, re-use”) by buying less stuff; buy used items when at all possible, such as your furniture, kitchenware, equipment, and clothing. Review the detailed “secondaries” lists in the calculators for more ideas

about the areas of expenditure and general “consumption” that are adding to your footprint.

MEDIUM TERM REDUCTIONS. Some of the biggest carbon culprits are the medium or long-term choices of housing and transportation. Generally in America, what we think we need for a “house,” and our dependence on the private car, are heavily culturally conditioned. But they are also subject to fairly frequent turnover. People move on an average of every 5 years (every 13 years after age 45). People replace their cars on an average of every few years. So within a medium time-frame of 5 to 10 years, you may have (or could initiate) an opportunity to improve your carbon footprint substantially. Plan and project these changes in your CARBON NEUTRAL PLAN as your current choices reach the “end of their useful lives” – or sooner.

MEDIUM TERM REDUCTIONS, HOME LOCATION. In thinking about where to live, there are two sets of factors: the location and the unit itself. Choose a location that resists sprawl, shortens trips to frequent destinations, and offers neighborhood density and proximity to reduce overall car-dependency. By choosing areas with these features (usually older ones), you will also be limiting the destruction of farms and forests, and improving the density and walkability of more urban districts. City centers and inner-ring suburbs, where more of daily life can be lived on foot and with public transit, are trending now. Increasing demand for these places offers the best resistance to the wasteful planning patterns that have been dominant in this country since the 1950s. (That demand is also increasing their prices, and values.)

MEDIUM TERM REDUCTIONS, DWELLING UNIT. Choose a dwelling that will have a low carbon impact. Multi-unit or common-wall (row house) buildings can be better, with less exterior exposure. New and/or high-efficiency construction is better, in either multiple or single-family configurations. If it's a condo, influence the board to do green retrofits. Or if buying a free-standing house, choose one that either has or will lend itself well to green retrofits. No matter the dwelling type, it should have minimum square-footage – an efficient layout, or one that can be remodeled into one. If it will need green retrofits, include their costs in your financial plan along with the purchase price. The most important things to ensure you will have are: complete-envelope insulation, thermal windows, highly-efficient HVAC, and good exposure for both passive (south windows) and active (photovoltaic arrays) solar energy.

MEDIUM TERM REDUCTIONS, CAR AND TRAVEL. When the time comes, choose a different type of vehicle, or depending on your (current or eventual) dwelling location, no vehicle at all. Hybrids are a big improvement, especially for in-town driving. But electrics (EV's, and their charging infrastructure) are now here to stay, and for new car buyers they are better economically already. Their cost-per-mile is one quarter that of the average gasoline model, counting both their simpler maintenance and cheaper energy cost. At a lower price-point compared to new cars, high-quality used hybrids are also reliable and available at great savings; just know a good mechanic. Use public transit as much as possible (see "Home Location" above).

LONG TERM REDUCTIONS. For most of us, our medium-term carbon-reduction plans will reflect the average turnover rates of houses and cars. But you may be, as we were a few years

ago, at the point of making even longer-term, lifetime commitments – mainly affecting your dwelling situation. With that choice, you can achieve ***an optimal solution to low-carbon living for the long-term future***. Cleaning up the atmosphere and reversing climate destruction is for our children’s generation and beyond, after all. You can give up industrial beef tomorrow, start composting next week, and replace all your light bulbs by next month. You may be able to move to a more compact, better-insulated apartment or home in a few years, and trade for a hybrid or electric car sooner than that.

Optimal low-carbon living, by implementing all possible reductions, will need long-term planning and preparation, and long-term approaches to the costs involved.

LONG TERM THINKING. For us householders, the economics of this long view may present challenges, although new ways of thinking about it may help (I describe some below). But for our church project, this long-term, multi-generational thinking was built in to the situation: we had just celebrated our one-hundred-and-fiftieth anniversary, so it was natural to envision the next hundred and fifty with a commitment to ***“be the change”*** that the world needs, far into the future. Such long term thinking can shine new and favorable light on the costs and impacts, even for our individual households.

FINANCIAL TIME HORIZONS. Many of the carbon-neutral choices we need to make will cost more, at least in the short term. That’s because our economy is built on the obsolete assumption of cheap fossil-fuel energy, and on the dubious assumption of quick profits and paybacks. Many of our short-term choices are defined by these factors: locally pastured beef

costs double industrial beef, so we have to choose to eat half as much; good LED lights are expensive, but last 20 years and use 1/8 of the electricity. Our longer-term choices involve similar cost differences, and the amounts are much bigger. So, here are some of the ways you might think about those costs; the key for all of them is to look at longer time horizons:

LONG TERM UTILITY COSTS. Over the next 20 years you will spend a lot on utility bills. Estimate this total cost, including likely increases, and then compare that number with the cost of making changes that would significantly reduce or eliminate them. (The church projected nearly \$1 million in gas and electric bills over two decades, but that figure will be reduced now by much more than the cost of doing the work.) Think of it as the same money: if you don't use it to buy green improvements now, you'll spend it (and more) on higher fuel bills indefinitely. Even if, as a homeowner, you don't stay put for the whole twenty (or even ten) years, you will find that the added value of your green improvements and low utility costs will amount to equity. Over time, these features will only get more attractive to prospective buyers.

LONG TERM CAR COSTS. This type of long-term thinking also reveals the economic advantage of an electric vehicle (EV), even now in the early days of the industry's inevitable transition. Over ten years of ownership, your new EV's much lower per-mile cost of operation will more than cancel out the higher purchase price compared to a similar gasoline car. (And those purchase prices will be dropping as more models come on the market, and battery technology continues to improve.) We run our EV on about ten dollars per month worth of electricity, about one fifth of what we were spending on gasoline for the same miles driven.

PAYBACK ON A UNIFIED PLAN. You can view this type of long-term financial thinking in terms of “payback periods” or “return on investment.” How many years of fuel (and other) savings to equal the cost of your improvements? LED lighting is the best performer in this respect (just a few years), with solar panels next (a few more years). The electric vehicle might be between six and ten years. Other improvements like high-efficiency or geothermal HVAC systems, or replacement windows, will take quite a bit longer. To more easily persuade yourself to “do the right thing now,” try combining all of your new, green choices together and consider them as a single investment (like the church’s twenty-year scenario, which will pay back well even including the really long-term items like new windows). Of course, your financial payback is not the only consideration here, or even the main one, since thinking only of the costs and paybacks, in our carbon economy, will continue to favor the destruction of the planet’s ecosystems.

Beyond our financial benefit, other rationales and modes of resistance are required – for example, a morally-driven desire to BOYCOTT the fossil fuel industry.

INVESTMENT PERFORMANCE. Similar to thinking about “payback periods,” you could compare these expenditures and their resulting savings to funds that you may have invested. If you expect a return of, say, 4 percent per year, compare that with your annual fuel savings if you used (some of) that money for your green retrofit plan. Purchasing LED lighting and a solar array, for example, and maybe other carbon-cutting improvements, could improve on that investment by reducing your fuel (and offset) costs by more than 4 percent. And you would retain the principal, now transformed into equity.

THE GREEN PREMIUM. A rule of thumb in construction is that near-optimal, comprehensive, energy-conscious design (either for retrofits or new buildings) will add about 15-20% to the overall cost. That's compared with typical, short-term-profit-driven construction. This difference covers high-performance insulation and windows, efficient HVAC systems like geothermal heat pumps, solar electricity generation, low-impact lighting and plumbing fixtures, locally-sourced materials and finishes, and non-turf landscaping, among other things. Whether in remodeling or new construction, good architectural design (careful orientation, efficient planning, and attention to detail) can probably recoup that 15-20% and/or create other added values.

SOME DIRECT COST COMPARISONS. Another way to think about the larger cost investments of green design is to compare them to other typical purchases that many people make. The cost of our solar array, for example, was equal to the simple difference between buying a new or a used version of the same car model (back in 2012). It was a choice. With our house project, we could have compared it to the cost of constructing the 100 square feet or more of wasted space that would have been in a typical builder's house-plan, or installing fashionable but un-necessary finishes like granite countertops. From a moderate level of affluence on up, Americans make many choices at this monetary level that could just as well go to carbon-reduction commitments – some may feel like sacrifices (like, maybe forgoing a couple of overseas trips!), but they don't have to. Our old car was completely comfortable and reliable!

YOUR CARBON NEUTRAL PLAN. Naturally, not all these ideas are possible for everybody to implement; they reflect a range

of categories and directions for thinking about what it will take to eliminate carbon emissions, within all of the time-horizons. From the calculators, and elsewhere in the literature, you may find many other ideas, better suited to your situation, that could help you become carbon neutral. But the goal is unchanged: ***We must stop putting carbon into the atmosphere.*** Working with the calculators and the three time-horizons, develop your list of current and future actions that will pull your carbon footprint down as close to zero as possible. Estimate your carbon emissions in each of the years during the unfolding of your plan. That's the "REDUCE" step in our process; next we'll discover how to "OFFSET" our remaining carbon.

STEP FOUR: OFFSET your carbon footprint

What offsets are, and how they work; why they are often controversial; how they impact future carbon emissions; how we can be sure our offset purchases are having the desired impacts.

CALCULATE AND REDUCE, THEN OFFSET. Calculating and itemizing our carbon footprint numbers has helped you set specific goals for significant reductions – on short, medium, and long-term timelines. Yet even after all this planning, and making or projecting all possible reductions (short of withdrawing from modern civilization!), our life choices will inevitably continue creating carbon emissions. So, the next step in your CARBON NEUTRAL PLAN is to purchase annual offsets

to compensate the planet and its atmosphere for this remainder.

WHAT OFFSETS ARE AND DO. With carbon offsets, you are paying money to support projects that will reduce future CO₂ (or equivalent) emissions somewhere in the world. For example, you will be paying for some dirty fuel energy capacity to be replaced with renewables; some methane from feedlots or landfills to be captured; some amount of forest lands to be preserved; or some high-efficiency stoves to be distributed in the developing world to replace wood fires. All of these actions will reduce the amount of carbon entering the atmosphere, from the time of, and because of, your offset purchase. Many of these projects also have significant social progress or poverty reduction benefits, especially when implemented in the developing world or in our own disadvantaged neighborhoods.

WATCH OUT FOR SCAMS. Carbon offsets are sold on global retail markets, populated by many players, many options, and many claims. Not everything you find online will have the effects you want. To know you are getting what you are paying for, any offset program that you contribute to should have several key characteristics: First, the action they are describing must be **verified and monitored** by a third party, or implemented directly by an agency you trust. Second, it must be **additional**, meaning that it would not have happened without your purchase. And third, it must be **permanent**, meaning that it cannot be easily undone at any time in the foreseeable future. (This makes it seem difficult to figure out

how to buy your offsets, but there is also a simpler approach; more on this below.)

CERTIFICATION SYSTEMS. Since you probably can't confirm all of these factors on your own, turn to the certification programs, of which there are several. *Climate Action Reserve* sets rules and writes protocols for offset projects. *Green-e Climate* and *The Gold Standard* verify marketing and sales in the retail offset market – the latter in collaboration with the World Wildlife Fund. *Cool Effect* is a large, nonprofit, crowdfunded platform offering transparency and reliability for offset projects worldwide. You can also work through a major non-profit like *The Nature Conservancy*, which will use your donation for offset-worthy goals, and manage the equivalent of the certification process internally.

WHAT DO OFFSETS COST? Depending on the type and location of projects, carbon offsets can run as little as \$10 per metric ton of emissions, or even less. That means even our carbon-spewing “average American” households can each become carbon neutral for as little as \$300 per year. One way to think about this expense would be as “Voluntary Taxation” – that is, if we are unhappy that our government is not doing more to solve the climate crisis (and so far, they aren't), and if we would willingly pay higher taxes if they were, we can start by just making sure we're doing it ourselves. (It's so inexpensive, apparently, that many of us could probably afford to cover for a few of our neighbors who aren't doing it.)

WHY ARE OFFSETS CONTROVERSIAL? There are at least three reasons: The first argument is that they are scams and don't really deliver the benefits. So stick with certified projects, or give your offset dollars to agencies you know directly (and for

projects that are **monitored, additional, and permanent**). The second argument is that offsets are mere “indulgences” that allow us to keep on “sinning” – we’re just paying somebody else to do the reductions we’re not willing to do ourselves. So maximize your own carbon reductions first, through an aggressive program of life-changes as described above. The third argument is that voluntary offsets are not enough to solve the climate crisis. Well, of course they aren’t. So also get to work advocating for the necessary policy changes (that’s our next step). A possible fourth question about offsets is that they are only for the future; my way of life is spewing carbon into the atmosphere now, but my offsets will only reduce carbon in the future, so how is that good enough? This one is a bit complex, so let’s look at that “future” question in two ways:

OFFSETS AND “CARBON MITIGATION WEDGES.” The Carbon Mitigation Initiative (CMI) out of Princeton University has devised the principle of “stabilization wedges” that can help us appreciate the value of these future impacts. The atmosphere is like a bathtub, and the tap is on: carbon is flowing into it at a certain rate (about 8 billion tons per year). That rate is increasing; the tap is being opened wider each year. If current trends continue, it will be gushing at 16 billion tons per year by 2050. A graph of that rate increase along a timeline is a steep upward line. Under that steep angle, imagine a number of “wedges” that represent possible carbon reduction measures – various actions that could bring the angle down to some extent, theoretically beginning today. Your offsets implement some portion of one of those action-wedges, adding permanent carbon-mitigation effects and lowering the angle. The reductions continue indefinitely into the future, so that over time the impact of small changes will be substantial.

OFFSETS AND “PROJECT DRAWDOWN.” For an inventory of 100 well-researched, climate crisis solutions, consult Paul Hawken’s book, *Drawdown*. Each one is proven effective, cost-conscious, and potentially scalable now. Visit the website “drawdown.org” for this inventory of future-oriented solutions, plus information on specific programs and partnerships. They cross many categories, from locally-based renewable energy, to tropical forest preservation, to food waste redistribution, to refrigerant management, to some unexpected ones like educating girls. The site offers clarity about how each of these works, what is most effective, and what is most urgent. Links go to specific US and global nonprofits who are doing the work, and to press articles on many related topics. Here you will find a wide variety of ideas for where your offsetting investments might go. Each of them will reduce carbon emissions indefinitely into the future. (*Drawdown* was the inspiration and resource behind our city’s *Green Cincinnati Plan*.)

When everybody cuts the wedges, or implements drawdown, the wedges will disappear and the rate of carbon additions will level off, and then decline.

SHOULD YOU BUY A FOREST? Trees absorb carbon as they grow. One acre of established (50-year) hardwood forest will absorb 14 metric tons of carbon from the atmosphere per year, just about the average American per-person emissions. Brand new forest (or tree planting efforts) will capture about one fifth of that amount. Remember: to be an offset, your trees would need to be “additional,” meaning that they are only being planted (or preserved from imminent destruction) because of your offset purchase. Your forest also has to remain perpetually preserved. With these characteristics assured, it would offset your carbon indefinitely as it grows, provided it is

reasonably well-managed. This would be expensive (though it is a one-time cost) compared with other offsetting opportunities.

THERE'S A LOT TO LEARN. All the major newspapers have good online articles explaining offsets and how they work: the *New York Times*, the *Washington Post*, and *The Guardian*, for example. Check the websites of the certification and nature agencies named above, many of which describe and link to a diverse array of offset projects and categories. Consider what other values you may wish to support in your choice of offset projects – close to home, in the developing world, effecting poverty reduction, forestry projects, or renewable energy, for example.

BUT YOU CAN KEEP IT SIMPLE. The pursuit of carbon offsets can really be as complex or as simple as you make it. The best way to make sure you are carbon neutral, even if you don't want to wade into all this complexity, is to pull some simple averages and rules of thumb from the calculators and then make sure you are investing enough funds every year to compensate for your carbon and carbon-equivalent emissions. Remember that even the "average" American household can offset for as little as \$300 per year. The simplest approach to making sure you are covered would probably be to arbitrarily double this number, and then send your check to the Nature Conservancy or some other completely reliable, worthy, non-profit agency or project.

THE SOCIAL COST OF CARBON. Beyond all these offsetting programs, though, is a larger number: the entire estimated cost of ALL the consequences of carbon emissions, both environmental and social. During the Obama administration,

an interagency panel of economists, climate scientists, lawyers, and other experts estimated the overall monetary value of all damages due to the release of carbon (CO₂) which, at that time, they placed at about \$50 per ton – about five times the price of the offset itself. This line of thinking, and the tools of enforcement and financial risk-assessment that would logically follow, would go a long way towards accelerating the necessary transition to renewable energy. In the meantime, you may wish to reflect this amount in your thinking about how to compensate for your emissions.

STEP FIVE: ADVOCATE for policy changes

Political advocacy and action; boycotts and economic activism; organizations and issues locally, nationally, and globally; the types and motives of denial; telling people you have become carbon neutral, and how you did it, and why.

DECADES OF INACTION. Our political leaders (administrations of both parties) have done little. The situation becomes more dire each year (as those PPMs surge on upwards), but other problems and priorities always seem more urgent. Public opinion on this topic continues to be hobbled and misled by self-interested industry propaganda. An entire issue of *The New York Times Magazine* (Sunday, August 18, 2018, “Thirty Years Ago, We Could Have Saved the Planet”) described this failure in massive detail. Ever since the 1970s and 1980s, when NASA scientist James Hansen first testified before a congressional committee, the scientific facts and dire

predictions have been out in the open, yet we read of the saddening, and maddening methods and motives by which every US administration since then has avoided dealing with the situation adequately. Courageous efforts by some of our elected leaders continue to be stifled by others.

WE ARE THE PROBLEM. The USA holds five percent of the world's population, but produces 25 percent of the globe's greenhouse gasses. The per-capita footprint of the average American is five times that of a person living in France. India and China are rising fast in the carbon-pollution rankings, but only because their citizens want to have a life more like ours. Other developing countries, where global poverty rates have been plummeting due to globalization, will aspire to the same: every newly-middle-class family will want a refrigerator and a car. Meanwhile, "we" Americans have been failing to provide the necessary global leadership on this issue. Europe is doing better (mandating timetables for electric vehicles, for example), but that's also much less than what is needed.

IT NEEDS TO BE A MOVEMENT. We are so deep into the problem now, after decades of relative inaction, that ***individual lifestyle changes will not save us***. Even if the tiny percentage of the world's population who understands and cares about the situation, at this point, were to become net-zero carbon tomorrow, the outcome would not be appreciably affected. Reversing climate change requires political and regulatory action on a vast scale. And that will only come about through ***an organized movement***. Greta Thunberg offers leadership on this, and the apparent commitment of the younger generation globally offers encouragement. Bill McKibben's "350.org" is a long-standing global platform for resistive action of many types. Other organizations, mentioned

above and below, offer opportunities to get involved, stay informed, and have a collective impact.

AND MOVEMENTS NEED ENEMIES. Recall those 2,795 gigatons of carbon that the fossil fuel industry needs for us to dump into the atmosphere, in order to sustain their stock values and business plans. Combine that with their now-proven conspiracy to perpetuate doubt about the damage their products cause, and to ensure the election of friendly politicians. (It's a familiar script: remember the tobacco industry?) As McKibben has pointed out, movements gain the best traction when they have clear enemies, and we do have one at hand. To paraphrase Pogo: "*We have met the enemy, and he is... the fossil fuel industry*" – that means the Exxon-Mobil's and the Shell's, plus their lobbying and campaign-financing arms, and also the petroleum-producing countries that behave like companies.

Today the fossil fuel industry is a reckless and destructive force like no other on earth – but "the enemy" is also "us" as long as we are buying and burning their products.

TAKE ACTION AS CITIZENS. Contact your elected leaders at all levels, and do it repeatedly. E-mailing with your views is fine, or send postcards (pre-print a stack with the address on them). But phone calls work best, the experts say. Try to talk to someone "live" and have a concise prepared version of your request for what they should do or support. If it's personal for you, say how (for example, you've proven that carbon neutrality is attainable!). Visit their local offices. Work at both state and federal levels. Sign up to be notified of their Town Halls, and go, again with prepared questions and with

somebody to record their answer; then post the video and send it to the press.

TAKE ACTION AS CONSUMERS. Don't buy dirty or carbon-tainted products. Use your purchasing power to support companies that have made significant commitments to becoming carbon neutral. Buy products that have low carbon impacts (we've already talked about food choices; choose paper over single-use plastics). Call out or boycott companies that have not made that commitment, and avoid their products. Tell other people you're doing this, and why. At the top of that list, of course, aim your life changes as much as possible toward a full-on boycott of "the enemy" – fossil-fuel producers, and fossil-fuel reliant utility companies. And, vote with your investment dollars by divesting; a growing array of green mutual funds are available now.

THE DIVESTMENT MOVEMENT. In another historical analogy, McKibben reminds us of the successful struggle, just a few decades ago, against another great evil. As with slavery in nineteenth-century America, too many people were too willing to live with South African Apartheid, and for too long. A certain "way of life depended on it." Apartheid was "good for business" – until it wasn't: the system fell in large part because widespread, international divestment channeled moral outrage into effective action. Similarly today, there are pension funds, municipalities, churches, and universities ridding themselves of fossil fuel holdings, and the financial sector is becoming more attentive to the risks inherent in the world's continued dependence on their products. By finding ways to reduce our individual carbon footprints, something approaching a "boycott" of the fossil fuel extractors can begin to take shape.

We can join in the essential rallying cry “Keep it in the ground” without hypocrisy.

MASTER THE MESSAGING. Most of the articles and websites that I’ve cited here offer good ideas of specific actions needing our advocacy, as citizens of this planet, to confront the climate crisis. To persuade others, prepare yourself with the facts, and work with a “problem-solution” format. (I learned in academic administration that you should never complain to someone in authority about a problem unless you are also offering them the solution!) So, you might try these main points: 1/ carbon emissions are causing climate change and there are hard numbers that prove it; 2/ fossil fuel lobbying and self-interest are destroying the planet as we know it for all our children and grandchildren; 3/ there are known-effective solutions that are already economical and scalable; and 4/ the problem is so large it requires governmental and global action. As a bonus point, mention that you have become CARBON NEUTRAL; yes, it can be done.

It seems tragically ironic that so many “conservatives” in our political system today oppose conserving the planetary ecosystems and climate stability on which we all depend.

UNDERSTAND DENIAL AND RESISTANCE. The “hopeful” essays by Jared Diamond and Al Gore cited above both emphasized that hope lies in action, and that action requires persuasion. Near the end of “Step One” above, I briefly ran through the climate-deniers’ playbook – what we’re still up against. An intriguing essay in *Quartz* (Iain Walker & Zoe Leviston’s “Heads in the Sand: Three types of climate change denier...” October 15, 2019) organized these shades of denial into three layers. The first type is ***Literal denial***, the claim that

it's not happening. ("But we had some really cool weather recently!") This is now almost universally recognized as false.

INTERPRETIVE DENIAL. The next type is when some folks can admit that the climate is changing, but they interpret it incorrectly. ("It's part of natural cycles." or "It's happened before."). With the facts in view – those hockey-stick graphs – this ***Interpretive denial*** is also fundamentally untenable. Both Literal and Interpretive denial have been important since the 1980s in the fossil fuel industry's program to perpetuate public doubt and prevent government action. Only a declining percentage of the population still adheres to them, but the industry's grip on our nation's public policy remains strong. And that continues, despite mounting direct evidence, and mountains of undeniable, global climate data – and much loss of life, land, and property from climate-caused disasters.

IMPLICATORY DENIAL. Walker and Levinston describe a third type of denial. Their title continues: "...and most of us are at least one." More insidious, ***Implicatory denial*** understands the facts of carbon-induced global warming well enough, but still fails to act as would be necessary to solve it. ("It's just too overwhelming; I can't make all these changes in my life right now.") This is most of us. We mean well, and probably do the small things like turn down the thermostat, recycle, use cloth grocery bags, and so on. But far too few have become carbon neutral. To overcome this third type of denial:

We need to act on the implications of carbon emissions in our own lives, which means to stop putting carbon into the atmosphere. And to ask others, at all levels, to do the same.

JOIN WORLD WAR ZERO. There are ways to join the movement. The scope and urgency of the situation is captured in the name of this global advocacy effort, a broad-based organization co-founded by John Kerry (recently appointed as “Climate Czar” in the Biden administration), Arnold Schwarzenegger, and John Kasich, among others. Its leadership comes from both US political parties, and from many disciplines, as well as internationally. Its mission is to engage, inform, and persuade voters and policymakers of the urgency of climate action, and of the opportunities for effective solutions. It welcomes members, contributions, and participation.

JOIN CITIZENS CLIMATE LOBBY. With active local chapters nationwide, this well-organized, bi-partisan effort is working to influence our US Congress to enact a carbon cost and dividend system. The plan would tax carbon-based products at their source, and then pass those proceeds along to us citizens as a dividend, raising the cost of fossil fuels but at no net cost to consumers. It would encourage more folks to choose clean energy. In effect, this is a “free market” correction; it simply helps the market price of carbon-polluting products reflect more accurately the true costs of the damage they are causing. (In a way, it reminds me of how proceeds from the taxation and litigation of the tobacco industry were used to pay for the medical consequences among their smokers. It’s the same general principle: charge the long-denying industries for the damage their products cause.)

ALSO THINK LOCALLY. Climate change is a global problem, obviously, and we tend to focus on national policies (or lack of them) when we engage it politically. But impacts are also local, and solutions can be too. After the mid-2017 announcement

that the US was going to withdraw from the Paris Climate Accord, many mayors, including ours in Cincinnati, affirmed commitments that their cities would keep or exceed the Paris goals. Cities have a majority of the population, infrastructure, and carbon footprint, so they can do much on their own. As you noticed when calculating, if you live in Cincinnati, for example, the carbon footprint of your electricity is nil because of the city's green aggregation program. The 2018 "Green Cincinnati Plan" is multi-faceted and ambitious – its many already-successful programs are based on Hawken's *Drawdown*.

SAVE NET METERING. Homeowners and businesses that install solar panels are, at certain times, producing more electricity than they are using. This excess flows back into the grid where utility companies can sell it to other customers. At these times, the "meter runs backwards" reducing the net amount of electricity the owner needs to buy. This adds substantially to the economic incentive for installing solar arrays. But it reduces utility company profits, so in many states they have lobbied successfully to ban Net Metering. So explain to your state legislators that this is unfair and not in the public interest, that there is inherent efficiency and value in decentralized, private electricity generation, and that without Net Metering one of our most vibrant new job-creating industries (solar installers) will be hobbled.

OTHER LOCAL ADVOCACY ISSUES. Some important climate mitigation projects and policies can be determined locally. Work to end disincentives for electric vehicle purchasers and support the development of EV charging infrastructure. Seek bans on the manufacture and use of single-use plastics. Support mass-transit improvements and urban planning measures that help prevent suburban sprawl. Incentivize

landlords to engage in long-term thinking for their properties. Support financing, educational, and charitable solutions that help our lower-income fellow-citizens enact green improvements. Other references I've cited here would suggest other local policies and programs that will help to end global warming.

EPILOGUE: SUMMARY STRUCTURE OF A CARBON NEUTRAL PLAN

Here's a summary of what we've covered, the five steps toward becoming carbon neutral. Don't lose hope, just get to work. Our planet needs you. The five steps are: *UNDERSTAND*, *CALCULATE*, *REDUCE*, *OFFSET*, and *ADVOCATE*.

FIRST. Get a grip on the carbon-climate facts: *To motivate your own actions and to persuade others, including policymakers, know the facts of what greenhouse gasses are doing to the planet's atmosphere, oceans, climate, and ecosystems. Be prepared to refute the lingering (and motivated) denials.*

SECOND. Calculate your carbon footprint: *Gather your data and with several of the online calculators, estimate the annual metric tons of carbon-equivalent emission from your utilities, car, food, travel, and other lifestyle choices and purchases. Note the reduction ideas suggested by this process.*

THIRD. Plan your short- and longer-term reductions: *List the simpler things you can do in the short term, and plan for higher-impact changes you can implement over several years, like a more efficient vehicle, or a better-located or more efficient dwelling; calculate your declining footprint over those years.*

FOURTH. Select and purchase carbon offsets: *Match your declining annual carbon footprint with plans to purchase offsets, reducing your net-carbon emissions to zero. Select projects or agencies you trust, matching your other social or environmental priorities. And, if you can afford it, round way up.*

FIFTH, Join the advocacy movement and tell your story:

Besides your family, friends, and neighbors, contact elected and corporate leaders and advocate for effective policies. Mention that you are now carbon-neutral. Join the national and global movement; stay abreast of developments. Boycott fossil fuels.

APPENDIX 1: TWO STORIES OF GETTING TO ZERO

OUR FOREVER HOME. My wife’s and my learning curve on this topic was tied to our design of a new home. As I approached retirement, we needed to change our living situation and wanted it to be something that could serve us the rest of our lives. Through a combination of opportunities, decisions, and techniques, we were able to implement much of what I have described here as medium- and long-term planning. On a small vacant lot in an established nineteenth-century neighborhood, we brought together all the design features we could think of to minimize future utility bills – among them: large, deeply-shaded south-facing windows; clerestory and diagonal ventilation; compact floor-planning; foam-insulated 2x6 framing; geothermal heating and cooling; solar panels; and rainwater harvesting. The detailed “LEED for Homes” (Leadership in Energy and Environmental Design) checklists, and some fortunate features of the lot and location, helped. When the first utility bills arrived, in 2015, the “carbon neutral” goal seemed to be within reach, so we gave new attention to other factors, like food choices, gardening, and recycling. By 2019, long-range EV’s became more affordable, so we plugged in a new Tesla Model 3 in the garage, never to buy gasoline again. Finally, we offset our remaining carbon simply and locally through an organization (The Arc of Appalachia Preserve System) that saves southern Ohio forest lands. Everyone’s opportunities and choices will differ, but this is how we got to a carbon-neutral way of life.

MOUNT AUBURN PRESBYTERIAN CHURCH. The facility portion of the church’s road to carbon neutrality is complete, as of the end of 2020. It involved four key components: First, we replaced all lighting in the four-building complex (spanning

a century in age and style) with LED fixtures, and many switches with programmed or motion-sensing controls. Second, we replaced all the aging HVAC systems (old, gas-fired boilers and leaky window air conditioners) with high-efficiency, zoned, electric heat pumps. Third, we replaced 84 century-old, single-pane, wood windows with historically accurate, high-quality, aluminum-clad-wood units. Finally, we covered every available roof surface with a 63-kilowatt solar panel system that now provides more than two-thirds of the church's electricity needs. These actions were planned as a comprehensive, long-term commitment; every component was selected for a useful life span of 30 to 100 years. As a unified package, they will outlast their initial payback period many times over, and free up the operating budget for other uses.

APPENDIX 2: SAMPLE CALCULATOR OUTPUT

IT'S AN APPROXIMATION. Since navigating the carbon footprint calculators can be a bit complicated and confusing, let me share a few of the numbers, discoveries, and insights I gained from my own attempts. First of all, know that you will never get to a perfectly "accurate" final number; everything is an approximation, based on generic formulas and assumptions. That's why it's important, if you can, to "round up" when you are finished.

NATURAL GAS AND ELECTRICITY. In our new home, we use natural gas only for the stove-top burners, so that's less than 1 CCF (hundred cubic feet, or one "therm") per month, emitting a mere 0.06 metric ton of CO₂ per year. Our home heating and cooling is geothermal, which means it only uses electricity for

the heat pump and fans; no gas is consumed. We buy an average of 360 KWH (kilowatt-hours) of electricity per month. Our usage is much more, but the rest comes without cost or carbon emissions from our solar array. Those 360 KWH would yield 1.52 metric tons of CO₂ per year if our local utility grid was powered by fossil fuels. In Cincinnati though, all of our grid power is also “green” so this amount essentially disappears. (In a worst-case scenario, if we did NOT have 27 solar panels, and if we bought fossil-fuel-generated electricity, our electric usage would produce 5.23 metric tons of CO₂ per year.)

DRIVING OUR CAR, THEN AND NOW. That old, used Acura TL got 22 miles per gallon, so our 7,500 miles per year produced about 3.50 metric tons of CO₂. If we drove a Prius instead, that would have been 1.46 metric tons. Now we have a long-range electric vehicle, and we charge at home so its power almost always comes from the zero-carbon electricity sources described above. If we charged it regularly at public chargers using fossil-fuel generated electricity, our annual driving would produce 1.11 metric tons of CO₂.

JET TRAVEL AND SECONDARIES. We average a round-trip to New York, to see family and friends, once per year; that’s 0.26 metric tons. Our former round-trip flights to Europe each produced 2.44 metric tons. In the calculators that include them, the “secondaries” (all other goods and services) remain rather mysterious; the one take-away seems to be: economize as much as possible on everything.

FOOD CHOICES. As you could guess from some of my earlier references, we do enjoy a good steak every now and then, despite the fact that beef, generally, is a significant climate-killer. The main issue is with “industrial beef” – that

inexpensive “pink in plastic” in the supermarket that comes from vast, polluting feedlots in the west, or from rainforest-destroying ranchlands in Amazonia. If the two of us each consume an 8-ounce serving of supermarket beef, just once every two weeks, that produces 0.67 annual metric tons of CO₂. That’s a lot, and four times the impact of the same amount of pork, or six times that of chicken.

LOW-HANGING FRUIT. Here are some savings opportunities I noticed while reviewing the calculators (draw up your own list of possible actions you haven’t already taken): Setting your thermostat to 62 in the winter and 82 in the summer saves 0.34 metric tons annually, compared with a constant 72 degrees. If you replace 50 incandescent light bulbs in your house with LEDs, you’ll save 1.15 metric tons every year. Cold wash and line dry 1/3 of your laundry to save 0.23 metric tons. If you recycle everything possible, you’ll shave 0.28 metric tons off your footprint, compared with throwing all your trash away. Each of these are relatively small impacts, but they add up. But here’s a big one: if you have leaky or single-pane windows, you have an opportunity to save as much as 5.00 metric tons per year (in a temperate climate) – not necessarily replacements or storms, but just with caulk and interior thermal drapes or shutters.

“TO BE PROPHETIC, TO BECOME THE CHANGE WE KNOW IS NECESSARY, TO DO THE RIGHT THING NOW, WE WILL TAKE STEPS TOWARD BECOMING A CARBON-NEUTRAL AND WASTE-FREE CHURCH. WE WILL SEEK NEW APPROACHES TO OUR CHURCH FACILITIES THAT WILL HELP THE PLANET RATHER THAN HARM IT. WE WILL TAKE SPECIFIC STEPS TO TRANSFORM CONSCIOUSNESS THROUGH THE LIFE PRACTICES OF BOTH THE CONGREGATION AS A WHOLE AND OUR INDIVIDUAL HOUSEHOLDS THROUGH INFORMED COMMITMENTS AND FAITHFUL ACTIONS.”

EARTH CARE POLICY, ADOPTED JANUARY 25, 2017



PUBLISHED BY THE CONGREGATION OF
MT. AUBURN PRESBYTERIAN CHURCH

103 William Howard Taft Road Cincinnati, Ohio 45219

Website: mtauburnpresby.org
Email: office@mtauburnpresby.org

SUGGESTED DONATION: \$10