Sustainable Practices

Your Handbook for Effective Action

2025 Edition

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At a Glance

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About This Handbook

The more you know, the more power you have to make our world better for everyone. You now have at hand powerful knowledge. Use it well!

We're constantly revising this handbook
to keep up with the best thinking in sustainability.

Visit our companion website for the most up-to-date revision,
along with comprehensive resources and apps for practical sustainability.

www.suspra.com

Acknowledgments

Thank you to all the customers and staff of F.W. Horch Sustainable Goods & Supplies, who asked great questions and accomplished inspiring projects that really did make a positive difference–this handbook started out as notes and observations I kept over many years, talking to people who were out there saving our planet, not just worrying about it. There was never a dull day in the store thanks to the parade of colorful characters who challenged everything I thought I knew and gave me unvarnished, honest reviews of every product and service we sold.

I also want to thank my family, especially my wife Hadley for putting up with my decades-long obsession with all things sustainable. There is no one I would rather bike 75 miles with and then climb into a tent with in the pouring rain so we could volunteer to sort garbage and compost the next day at the Common Ground Country Fair.

Thank you to all the reviewers of various versions of this manuscript, especially my father-in-law, Ray Wilson, for many conversations and close readings of draft after draft. His book, *Process Mastering*, was especially influential in my thinking through how to accomplish all of the sustainability projects I've done in residential and commercial properties. And speaking of those projects, thank you to my business partners, Pat Coon and Keith Barkhau, at Spark Applied Efficiency, who have carried our electrical contracting business while I've been distracted getting this handbook over the finish line more than twenty years after first conceiving the idea for it.

Finally, I want to acknowledge the influence that the *Whole Earth Catalog* and *The Hitchhiker's Guide to the Galaxy* had on me growing up in the 1970s as I imagined what life could be in the far future–the year 1999. We really thought we'd have flying cars and moon bases and humanoid robots by then. What happened to our imagination and optimism? While few practices that really challenge conventional culture made it into this edition, I remain a big fan of accepting ideas that are a bit out there and keeping a sense of humor as we go about our lives on a tiny planet in a vast universe of possibilities.

Here's to all the crazy people, saving our planet every day even though everyone is telling us we can't!

Foreword

If there's one handbook to own to know *how* to practice sustainability, this is it.

- Browse through it for ideas and inspiration.
- Study it on your own or as part of a class or team.
- Rely on it for real projects, for your own home or organization or for your clients.

Every practice in this handbook is science-based with measurable outcomes. Some practices apply to everyone, some apply only to homeowners or businesspeople. We attempt to provide everything you need to know to practice sustainability, no matter your stage of life or situation. The first section introduces practices and how to measure results. The bulk of this handbook are detailed guides explaining how to do each practice. Later sections help you understand concepts and history. Our aim is to provide you with a comprehensive and trustworthy source of sustainability knowledge so you can make wise decisions on matters important to you.

Visit our companion website at <www.suspra.com> for online tools, references, further reading, and resources. For each practice guide in this handbook, we have a page on that site where we keep an up-to-date list of relevant references and links.

This handbook is published by Sustainable Practice, a partnership between your humble author, Fred Horch, and my friend and editor, Peggy Siegle. As the former proprietor of a sustainable living retail store, I spent many years answering customer questions. My next venture, a mechanical contracting firm, provided a decade of insight installing LED lighting, heat pumps, solar arrays, batteries, electric vehicle chargers, and other high-performance equipment.

Our mission at Sustainable Practice is to use our knowledge to empower more people to make wiser decisions that better protect our planet's life support systems. These core values guide us:

Empathy	We believe that living a good life means leaving a legacy that shows concern for others. We imagine the world we want young people to inherit, then aim to make the best use of our own limited resources to help create that world.
Agency	We acknowledge that we have the ability to choose practices that have a more positive impact on our planet's ability to sustain human life.
Humility	We recognize that we have more to learn, and we admit when we're wrong. We forgive ourselves and others for being imperfect, letting go of guilt and resentment.
Democracy	We strive to lead by example to build broad support for sustainable public policies and laws.
Science	We make decisions based on verifiable evidence from scientific inquiry–rather than hearsay or wishful thinking.
Action	We use our knowledge to take action. We understand that our best intentions can't change our world, but our best actions can.
Honesty	We measure outcomes to keep ourselves honest. We acknowledge that Mother Nature doesn't give an A for effort; she grades on results.

Introduction

By virtue of the size of our planet and the number of people sharing it, we've each got a finite environmental budget. It's our most profound duty to decide how to spend it.

The goal of this handbook is to empower you to *practice sustainability wisely*–so you can improve practices in households, organizations, and communities to help create a better future for everyone. Our theme is "think globally and act locally" to go from good intentions to effective action. Inside you'll find a "cookbook" of "recipes" breaking down projects into achievable steps on pathways to sustainability, plus a full complement of scientific, technical, engineering, and financial knowledge.

What Is Sustainable?

Earth's surface is the only habitat in the known universe that provides the air, water, food, goods, and everything else we require. Dividing Earth's 15.77 billion acres of habitable land by 8.2 billion human inhabitants equals less than *two acres* (about three quarters of a *hectare*, or 75 meters by 100 meters). A sustainable future is possible if we meet our needs using 0.75 hectares of habitable land per person.

Science shows that our planet's life-support systems naturally operate in a *global safety zone*. For instance, the Stockholm Resilience Centre has identified "a set of nine planetary boundaries within which humanity can continue to develop and thrive for generations to come." Although excessive pollution and unwise consumption are causing climate change *and* ***eight more*** *global challenges*, choosing sustainable practices will protect and restore Earth's ability to sustain human beings.

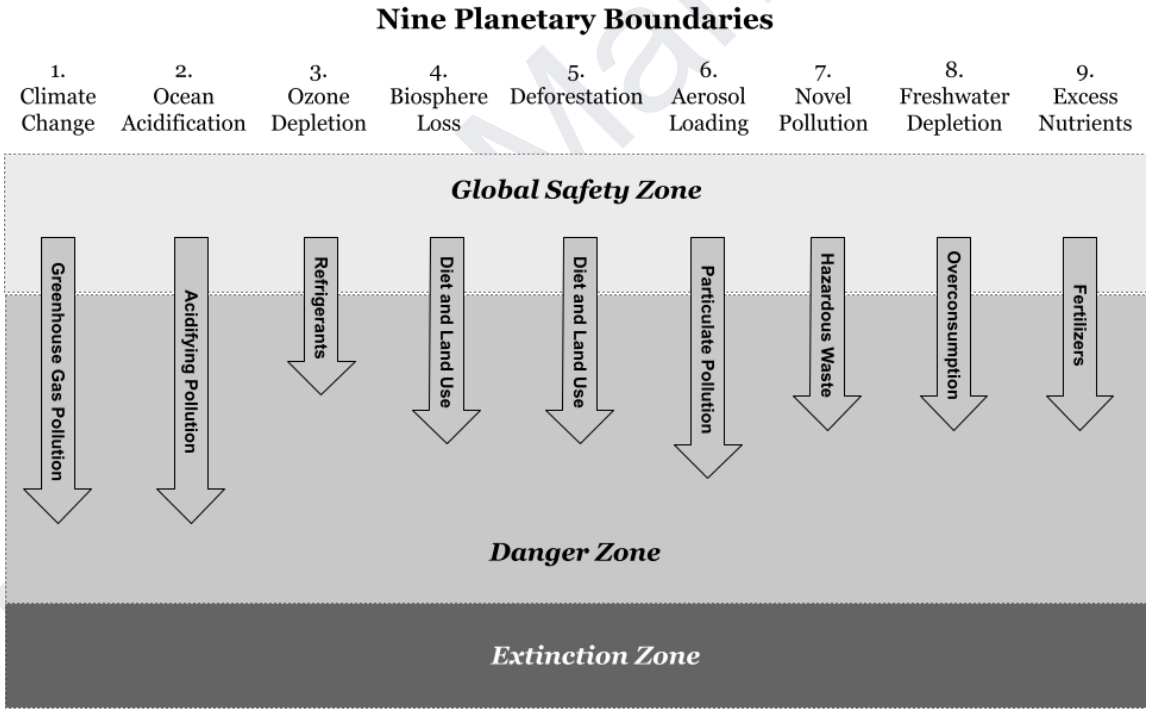

Figure adapted from the work of Johan Rockström et alia, as publicized by the Stockholm Resilience Centre

This handbook empowers you with practical, science-based strategies within your control that contribute to the collective shift needed to keep humanity's impacts within Earth's carrying capacity. Sustainable solutions to global challenges like deforestation are not political campaigns or corporate policies, but practices like eating more plant-based meals. Move beyond feeling helpless, hopeless, and

isolated by improving measurable indicators of your own sustainability. Take purposeful action for the benefit of your inner sense of agency, your immediate environment, and far beyond.

How Do You Practice Sustainability?

The food you will eat, the air you will breathe, the fresh water you will drink, and all the goods you will enjoy are being made somewhere on Earth–mostly by a complex system of living organisms. By your practices, choose whether to save or degrade the small part of our planet's lifegiving ecosystem that sustains you. Choose not only *whether* to protect your planet, but *how*.

Much needs to be done to create a more sustainable future. Advocacy, protest, and lobbying to influence laws and regulations is important work that aims to create social change that enables sustainability. But it doesn't replace the need for people to step up with a direct approach, making immediate beneficial progress in their own spheres of influence without waiting for policy shifts. Be a sustainability *practitioner*; don't wait for politicians to act. Improve practices in households and organizations in your community to reduce negative environmental effects and increase positive impacts.

This handbook focuses on the practical "how-to" of sustainability—how to plan projects, implement improvements, and measure results. Whether you're already deeply engaged in advocacy work and want to see more tangible results or simply are ready to make positive changes in your everyday life, these practical skills will empower you to create environmental benefits immediately while building toward larger community transformation. We assume you want to be improving your own community step by step from the ground up–if so, you're reading the right book!

How Affordable Are Sustainable Practices?

The more modest your needs, the easier to meet them in sustainable ways. The cheapest strategy is *conservation*: practices like turning down the thermostat or taking shorter showers conserve resources but sacrifice some comfort or convenience for the common good. Everyone can financially afford that.

A much harder challenge is to raise your standard of living while lowering your environmental impacts. That requires a different strategy: *efficiency*. Invest time or money in better techniques or technology. For example, an LED light bulb costs more than an incandescent bulb but uses less power to provide the same amount of light for much longer.

Many sustainable practices save money over the long run, but some don't. Whether you should spend to be more sustainable depends on your values. For instance, if you're burning fossil fuel, you are turning a valuable natural resource into pollution and not paying the full price of your pollution. Your emissions only cost you a guilty conscience–and you can sidestep even that moral burden if you ignore the consequences of your actions, convince yourself that your pollution does no harm, or point the finger at someone else who is burning more fuel than you are. You can decide whether you want to take steps to stop polluting, keep polluting yourself but pay someone else to stop polluting, or just keep on polluting and devote your time and money to other priorities. What you choose to believe and how you choose to spend your own time and money shows what you truly value.

This comprehensive handbook helps you practice sustainability wisely whether you want to *save* money, live more simply, and conserve resources, or *invest* money, enjoy more creature comforts, and use resources more efficiently. You'll find out which sacrifices really make a difference and which just make life more difficult for insignificant environmental benefit. You'll discover a comprehensive system for measuring your environmental impacts, so you can avoid the trap of tunnel vision: rather than myopically obsessing over devilish details that do little to improve your sustainability score, you can turn your attention to easy opportunities for massive gains. You'll learn which investments earn a financial return over time, and which are charitable gifts for future generations, not resulting in pecuniary rewards but creating lasting positive change in the world.

Twenty Pivotal Practices

Twenty sustainable practices turn households and organizations into true leaders for positive change. Here they are, arranged in a logical order so you can start confidently on your journey to sustainability. If you are new to these practices, first work on them in your *own* home and organizations to get hands-on experience. Then as a sustainability coach or professional practitioner you can work to help improve these practices in *other* people's homes and organizations.

1. Grow a community that practices environmental sustainability.
2. Compost biodegradable solid waste.
3. Walk, cycle, or take public transit for local errands.
4. Eat more plants and little or no domesticated red meat (beef, lamb, etc.).
5. Plant a food garden or buy from local farmers who grow regeneratively.
6. Drink more water and fewer bottled beverages.
7. Clean with safe products in minimal packaging.
8. Recycle metal, clean cardboard, and glass; avoid plastic.
9. Seal and insulate attics, basements, and exterior walls.
10. Use LED lighting with motion sensors and daylight dimming.
11. Landscape with native plants using organic methods.
12. Wash clothes in cold water in an efficient machine.
13. Heat domestic water using electric heat pumps.
14. Dry clothes in a condensing dryer or on drying racks or lines.
15. Keep food cold in energy-efficient refrigerators and freezers.
16. Cook with induction ranges and circulating-fan convection ovens.
17. Drive electric vehicles when you can't walk, bike, or take transit.
18. Use electric heat pumps for space heating.
19. Generate solar electricity on-site or subscribe to a solar farm.
20. Flush water-efficient toilets.

Practices Along Pathways

These essential practices guide a household or organization along seven *pathways to sustainability*:


Community


Food


Water


Movement


Energy


Goods


Habitat

For each pathway, measure science-based sustainability indicators and score them against safe environmental limits according to the latest research. *Negative* scores show that practices are *unsustainable*–needs are being met in ways that drag Earth's life support systems down out of the safety zone, beyond planetary boundaries, into the danger or extinction zone. *Positive* scores mean that needs are being met in *sustainable* ways, keeping environmental impacts within the safety zone. On your sustainability journey, consider both the milestone scores you aim to achieve, and the next steps required to reach them.

Why These Twenty

In 1989, the Earth Works Group published *50 Simple Things You Can Do to Save the Earth*. In the decades since, thousands of people have made similar lists. (We just asked an AI how many such lists it can find on the Internet–it says 23,500.) What makes our list different is science. Of the myriad action steps you could take to save our planet, some really do make a huge positive difference, while others barely register an impact. Here are the twenty most important practices to do well in every household and organization on Earth.

1. **Grow a community that practices environmental sustainability.**
   Understand sustainability, demonstrate best practices, and interact in positive ways with other people.

   Start with the end in mind. The fact that sustainability is really a group effort is why growing a community that practices environmental sustainability is #1 on our list. We can keep global environmental impacts within safe limits when everyone is living in a sustainable home, interacting in sustainable organizations, and enjoying a sustainable community. Community indicators you can measure are how well people in your community understand sustainability (by testing knowledge), how many sustainable practices they demonstrate in their own households and organizations (by surveying practices), and how well they interact with other people (by evaluating interactions).

   On the community pathway, your starting point is your immediate family. The ultimate milestone is including everyone on Earth in your community, since your actions have larger ripple effects as you grow your community. The global total of everyone's environmental impacts is what matters in the end.

2. **Compost biodegradable solid waste**.
   Compost paper, cardboard, wood, food scraps, and yard trimmings to keep garbage trucks off the roads and organic material out of landfills.

   While the practice of "learning, doing, interacting" to grow community is very broad, the second practice on our list, composting biodegradable solid waste, is much more focused, at least in terms of action. But an interesting thing about composting is that it naturally encourages you to think more deeply about the goods you bring into your home and eventually must discard. Once you get into the habit of composting, you'll start carefully considering things like whether packaging can be composted and whether it contains toxic materials. Composting also affects sustainability indicators along the food pathway, being an essential practice to grow healthy farms and gardens.

3. **Walk, cycle, or take public transit for local errands.**
   Use your muscles to get around. Bicycles are best: you can go faster and farther and carry more weight riding a bike than walking.

   Active transportation–walking, cycling, or taking public transit–is another practice which is very focused in terms of your personal action, but has profound impacts on your community and our planet. In terms of how you move your body, the primary sustainability indicator is very simple: what is your average speed? If you keep track of the total distance you walk, cycle, drive, and fly in a year, you can easily calculate your average miles per hour. This single number packs in a tremendous amount of inferable data: how often you fly and how often you drive for travel, work, shopping, socializing, and other activities. A low-speed life indicates lower environmental impacts than a high-speed life.

4. **Eat more plants and little or no domesticated red meat (beef, lamb, etc.).**
Eat fruits, vegetables, and mushrooms; limit non-game red meat. A plant-based diet can feed four times as many people per square meter of land as a meat-based diet.

Your diet is a daily choice with perhaps even more profound environmental impacts than how you move about the world. Of course, food is the primary pathway to consider here, and sustainability indicators include how much and which types of food you buy. As with the choices you make for movement, what you choose to eat not only has direct impacts on your own health, but also on the health of our shared environment.

5. **Plant a food garden or buy from local farmers who grow regeneratively.**
Grow your own food or buy directly from local organic farms in season to protect our food supply and reduce processing, packaging, and shipping impacts.

A practice closely related to what you eat is what you accept in terms of how your food is produced. Whether you choose to eat a meat-based or plant-based diet is only half the story. The other half is who grows the crops and raises the animals, and what impacts do their practices have on our environment? We're fortunate to have food labeling laws so we can determine the source of our food and know a little bit about the practices used to produce it. But you can have even more assurance about the provenance of your protein when you can talk directly with the farmers and growers yourself. Keeping a food journal that records what you choose to eat with details about the source and certifications (i.e., organic, fair trade, etc.) measures results along the food pathway.

6. **Drink more water and fewer bottled or brewed beverages.**
Drink filtered tap water, rather than hot drinks or bottled beverages, to save money, conserve energy, and reduce plastic pollution.

Drinking more tap water is probably the easiest way to save money and the planet at the same time. This is something everyone can do; the results are easy to quantify. How much less money are you spending, how much less garbage are you making, and how many delivery trucks are you keeping off the road? Bottle your own tap water at home in reusable bottles, for literally pennies on the dollar compared to buying bottled water in a store. Beyond infancy, healthy people can meet all of their hydration needs by eating good food and drinking water. All other beverages are luxuries–to be savored, for sure! Because this practice is about water for drinking, we note its connection to the food pathway, but it has implications for the goods pathway, by eliminating unnecessary plastic packaging, as well as the energy pathway, especially if you eliminate the energy demands of brewing a pot of coffee every morning.

7. **Clean with safe products in minimal packaging.**
Choose biodegradable cleaning products free of perfumes, dyes, and synthetic antibacterial chemicals. Buy in bulk for less packaging.

Our seventh pivotal practice, choosing safe, plant-based cleaning products in minimal packaging, has impacts measured by indicators on the goods pathway: how many goods and which types of materials are flowing through your home or organization? The goods pathway is about consuming goods in a sustainable way. When you really examine what you are doing when you are cleaning, you are moving material from inside a building to the outdoors. When you vacuum or sweep, all the detritus you collect, you put outside, either to compost or landfill. When you wipe off a counter or mop the floor, you pour the cleaning water down the drain, where it goes into a septic tank and then a leach field in your yard, or travels through a sewer system to a wastewater treatment plant and then is discharged into your local river, lake, or ocean.

8. Recycle metal, clean cardboard, and glass; avoid plastic.
Recycle paper, metal, clean cardboard, and glass if you can. Rather than filling your bin with "wish-cycling," buy less plastic.

Most of the goods you bring into your home you will eventually discard. Then you have five choices: reuse, compost, recycle, divert, or landfill. Unfortunately, reuse is not a practical option for most items, since it requires coordination among manufacturers, retailers, and consumers. We've already listed composting as #2 on our list of twenty pivotal practices. Recycling comes in here at #8.

The point of recycling is to put material back into productive use. Recycling companies do this very well for metal and clean cardboard, but glass is more of a challenge. It's actually helpful to add recycled glass to make new glass; however, shipping glass is expensive. Where crushed glass can't be recycled, it can be put in bags to mitigate beach erosion or used as an aggregate for construction projects. Turning a high-value product, like a glass bottle, into a lower-value product, such as sand, is called "downcycling."

Plastic recycling is almost impossible because there are thousands of ways to combine carbon, hydrogen, oxygen, nitrogen, chlorine, and sulfur into plastics, but each one of those plastic materials has a different melting point and requires a different process to recycle. For example, polyethylene terephthalate (PET) and polyethylene naphthalate (PEN) can't be recycled together. And you'll need completely different equipment to recycle high-density polyethylene (HDPE) versus low-density polyethylene (LDPE); both are often contaminated with per- and polyfluoroalkyl substances (PFAS).

Most "recycling" programs for plastic pick out one or two types of resin from the dozen you might have tossed together for recycling, and then burn or bury the rest. Although burning plastic does generate electricity, it also creates toxic air pollution and produces ash that contains dangerous compounds that must be managed carefully.

Reducing your use of plastic is the wiser course than trying to recycle it. In most situations, putting plastic waste in a recycling bin is really "wish-cycling," not recycling. Most plastic waste is buried, burned, or downcycled–no matter how much you wish it could all be recycled.

9. Seal and insulate attics, basements, and exterior walls.
Use caulk, foam, and other methods to keep conditioned air from leaking out through walls, ceilings, floors, and around doors.

In homes that have heating or cooling systems to provide comfortable indoor conditions, keeping conditioned air from immediately leaking out is the single best way to get more value from your energy.

10. Use LED lighting with motion sensors and daylight dimming.
Illuminate with light-emitting diodes (LEDs) for five times more light per joule compared to incandescents. Install and program motion sensors and automatic dimmers to save even more energy.

While stuffing insulation or squirting caulk into holes in your basement and attic is a low-tech practice to increase your energy efficiency, upgrading your lighting is an effective high-tech practice. For the same amount of energy, you can get ten times as much light from an LED as you can from a tungsten filament (incandescent lamp). And forget fluorescent lighting, which contains toxic mercury! You'll probably use less

energy per day after you upgrade to LED lighting (unless you decide to install more lights or leave them on all the time). And you'll also notice an improvement along the goods pathway, as you no longer need to replace light bulbs every year or two. On average, LEDs last for ten years or more in a typical residential lighting fixture.

In addition to being inherently energy efficient and durable, LEDs are also easy to control–if you select dimmers and motion sensors that are designed to work with LEDs. Adding sensors to turn down or turn off lights when they are not needed saves even more energy, which will be reflected in your average power when you measure your sustainability indicators.

11. Landscape with native plants using organic methods.
Plant and cultivate species native to your area to conserve biodiversity; practice organic landscaping to protect our environment from synthetic hazards.

If you have a yard, you can make it a haven for wildlife. This is a case where thinking globally but acting locally really kicks in. What can you do about endangered species? You can protect your little piece of the biosphere, allowing the ecosystem that evolved in your area to persist and continue to evolve naturally. What can you do about deforestation? You can ensure that trees growing on your land reach maturity so they can produce and disperse seeds to sustain future forests. What can you do about aerosol loading? You can maintain deep-rooted vegetation that naturally keeps soil in place and produces clean air. What can you do about pollution from novel chemicals? You can avoid the use of synthetic pesticides. What can you do about excess nutrients in waterways? You can avoid using synthetic fertilizer.

The world is a big puzzle, but you can carefully consider how your little piece fits into the big picture. To mark your milestone on the habitat pathway, you can measure the amount of habitable land that you control, what you allow to live on your land, and what substances you spread on your land.

12. Wash clothes in cold water in an efficient machine.
Clean clothes in cold water, using biodegradable cold-water enzymes to remove stains and odors. Install a filter to trap microfibers to reduce microplastic pollution.

Washing in cold water works best if you use a detergent with biodegradable enzymes to remove stains and odors. Which types of detergents you use and what you do about microplastics–small pieces of synthetic fabrics that break off when you do your laundry–are two factors you can measure to indicate your environmental impacts on water systems. And washing in cold water consumes less energy and lowers your average power, indicating progress on the energy pathway.

13. Heat domestic water using electric heat pumps.
Heat water with an electric heat pump water heater to be up to four times more energy efficient than using conventional electric or gas water heaters.

Water for showers, sinks, and washing inside a home is called "domestic water." Heating this water is typically the second largest energy expense in a home after space heating and cooling. That's why choosing heat pump technology, which is much more energy efficient than burning fuel or sending current through a heating element, can lower your average power by a lot.

14. Dry clothes in a condensing dryer or on drying racks or lines.

Wash and dry clothes efficiently without venting using an all-in-one washer-dryer. Hang clothes to air dry to save even more energy.

You can burn fuel, use electricity, or wait for natural evaporation to dry your clothes. Choosing natural evaporation is the most energy efficient, but least time efficient. In general, whether you spend your time watching TV, writing a spy novel, or hanging clothes to dry does not have a measurable impact on the ability of our planet to support human life. But whether you choose to burn fossil fuel or use solar electricity to dry your clothes does have a measurable impact.

In terms of energy, how you choose to dry your clothes will show up in your average power. Out of all your clothes-drying options, hanging your clothes to dry will have the biggest environmentally positive impact on your average power (i.e., lower it the most). Choosing a super-efficient condensing or heat pump dryer will help nudge you forward along the energy pathway compared to using a conventional vented dryer. An all-in-one washer / condensing dryer allows you to throw in a load of dirty laundry and take out a load of clean and dry laundry, using about half the energy as you'd need to put your dirty laundry in a conventional washing machine, and then transfer it to dry in a conventional vented dryer.

15. Keep food cold in energy-efficient refrigerators and freezers.

Remove or replace older refrigerators and freezers. Refrigeration technology has become four times more energy-efficient since the 1970s.

For decades, you probably have had a heat pump in your home: your refrigerator. The advances in technology that are making heat pumps popular for space heating and water heating have also helped make modern refrigerators much more energy efficient. Like the energy impacts of many other practices, your choice of refrigerator will be reflected in your average power score. Whatever portion of your average power that is due to keeping food and other things cold, you can cut it in half or more if you have an older refrigerator and upgrade to the newest, most efficient technology. And if you have an old refrigerator in a basement but don't really need it, that would be a great appliance to unplug to take an easy step forward on the energy pathway.

16. Cook with induction ranges and circulating-fan convection ovens.

Upgrade to electric induction stoves and convection ovens to cook faster and more efficiently than gas or conventional electric stoves.

If you prepare your own meals, you can choose a high-efficiency electric induction stove top and a convection oven to save time and energy. These technologies, along with microwave ovens, are safer and faster than old-fashioned electric coils or gas burners. After making the upgrade, you can check your average power to confirm that you have made a step forward along the energy pathway.

17. Drive electric vehicles when you can't walk, bike, or take transit.

Drive (or hail) a battery-electric vehicle when you can't walk, ride a bike, or take transit.

If you can't walk or cycle, you can drive an electric vehicle. Like cooking with induction, this leap to better technology will improve your average power sustainability indicator.

18. Use electric heat pumps for space heating.

Use electric heat pumps rather than burning fuel for space heating. Heat pumps are much more efficient than combustion and can be powered by clean energy.

Heat pumps are another technology to move you forward along the energy pathway, with your average power the key sustainability indicator to watch. If you're switching to electric heat pumps from a fuel-burning heating system, you'll also see your electricity energy percentage indicator improve.

19. Generate solar electricity on-site or subscribe to a solar farm.

Generate electricity from sunlight on your own property or at a remote site. Solar power is becoming even more practical as batteries improve.

Anywhere you've decided to maintain a building, a sidewalk, a driveway, or a road, you've cleared away plants that would be making productive use of the sunshine that reaches that part of our planet. It's just common courtesy to use modern technology to harness that free energy to meet your needs, rather than destroying more of our planet's ecosystem to meet your demand for electricity. The sustainability indicator to measure is the percent of your electricity that comes from solar power. The good news is that it is very easy to start on the pathway to 100% clean power–get a $10 solar charger for your cell phone, then work your way forward step by step from there until you're generating all your electricity from sunlight.

20. Flush water-efficient toilets.

Install water-efficient sanitation. What uses the most water inside your home? Probably flushing toilets: North Americans flush toilets five times a day per person.

Last and least, the lowly toilet is the single biggest water user in most homes. In North America, we treat and supply water clean enough to drink to almost every home, only to flush most of it down the drain in a toilet bowl. You can buy a flush toilet that uses less than a gallon per use, or really get serious about sustainability and try a composting or sawdust toilet that uses no water at all.

Glossary

New words can yield new sensitivity, for vocabulary filters experience, shapes perception, and guides understanding.

– *William R. Catton, Jr.*
OVERSHOOT: The Ecological Basis of Revolutionary Change

Acidification: a reduction in pH
Ocean water is becoming less basic and more acidic, primarily as a result of absorbing carbon dioxide from the atmosphere, which makes it more difficult for shellfish, coral, and calcareous plankton to grow calcium carbonate shells.

Aerosol loading: adding particles, such as smoke, soot, dust, to the atmosphere

Ambient air: air at its natural temperature, not actively heated or cooled

Anthropogenic climate change: changes to long-term weather patterns due to human activity

Bioaccumulate: to pervade the environment and be found in greater concentrations in biological tissues over time and at higher trophic levels in the food web

Biodegradable: materials that naturally decompose to safe and inert substances

Carbon dioxide: a *greenhouse gas* that is accumulating in our atmosphere primarily as a result of burning fossil fuel
Besides warming our planet, more carbon dioxide in our atmosphere causes *acidification* of rivers, lakes, and oceans.

Carbon footprint: the amount of *greenhouse gasses* emitted as a result of activities over a period of time, expressed in units of *global warming potential* with carbon dioxide as the base unit
GHG Protocol defines three scopes: 1) direct emissions, 2) indirect emissions from electricity, and 3) indirect "upstream" and "downstream" emissions as a result of all other activities.

Carbon pollution: carbon pollution is carbon monoxide and carbon dioxide emitted into the atmosphere by burning carbohydrates (such as wood) or hydrocarbons (fossil fuel)
Burning carbohydrates or hydrocarbons produces both carbon monoxide, which is immediately dangerous to human life or health at 1,200 parts per million, and carbon dioxide, which is immediately dangerous to human life or health at 40,000 parts per million and contributes to both global warming and ocean acidification. Carbon monoxide is oxidized to carbon dioxide within a few years; carbon dioxide persists in air for centuries.

Carcinogenic: causing cancer

Circular economy: an economic system designed to eliminate waste and continually reuse resources
Materials are kept in use through reuse, repair, remanufacturing, and recycling, minimizing resource inputs and waste generation. Unlike the traditional linear "take-make-discard" model, a circular economy keeps products and materials in productive cycles for as long as possible.

Composting: using oxygen-breathing microbes, fungi, and other organisms to decompose organic waste into a nutrient-rich soil amendment

Conservation: a reduction in the consumption of a resource; may lower living standards

Decomposition: breaking down organic matter into simpler substances by microorganisms, fungi, and other decomposers

Digesting: using anaerobic microbes in air-tight vessels sealed off from atmospheric oxygen to decompose organic waste into biogas (mostly methane, carbon dioxide, and water)
Biogas can be directly burned for electricity or scrubbed of carbon dioxide and other impurities to produce methane that meets standards for distribution in natural gas pipelines.

Diminishing (non-renewable) resource: a resource, such as petroleum, that does not replenish naturally; as this type of resource is consumed, the amount remaining diminishes

Downcycling: taking a waste material and recycling it in a way that produces a less valuable material than the virgin material
Recycled plastic waste is most often downcycled rather than recycled.

Ecological footprint: a measure of the biologically productive surface area of the Earth required to produce resources and absorb waste

Efficiency: reducing consumption of a resource without lowering living standards

Egregiously unsustainable: practices that have much worse environmental impacts than close substitutes, such as eating domesticated beef compared to wild-caught venison

Energy: the ability to change temperature, accelerate mass, compute calculations, and convert one form of energy to another
The scientific unit of energy is the *joule*, but a common unit is the *kilowatt hour*: the energy of one thousand *watts* of *power* expended for one hour.

Environmental impacts: changes to natural processes as a result of human activities

Energy productivity: a measure of how effectively energy resources are being used to create value
The closely related term, energy efficiency, emphasizes the technical aspects of reducing energy input for the same amount of work output. Reducing energy waste through technological improvements and system optimization can increase both energy efficiency and energy productivity.

Enzymes: biodegradable proteins that remove stains and odors by catalyzing reactions to break down molecules to pieces that are more easily removed by surfactants and detergents

Eutrophication: an increase in the concentration of plant nutrients in water
If excessive, this can lead to algae blooms and die-offs that deplete oxygen and kill aquatic animals.

EV: an electric vehicle, either a battery electric vehicle (BEV) or a plug-in hybrid electric vehicle (PHEV)

Forever chemicals: synthetic substances that do not decompose naturally and therefore tend to persist and bioaccumulate

Global warming potential: how much heat a type of gas traps in our atmosphere, expressed in relation to the global warming potential of carbon dioxide

Green building: designing and constructing buildings in ways that minimize negative environmental impacts while maximizing resource efficiency
Green building uses sustainable materials and methods, reduces energy and water consumption, and creates healthy indoor environments. Common green building standards include LEED (Leadership in Energy and Environmental Design), Living Building Challenge, and Passivhaus.

Greenhouse gasses: gasses that trap heat in our atmosphere, warming Earth's surface

Habitable land: Earth's solid surface area that is not covered by water, glaciers, deserts and other barren land; land that humans can inhabit

Incandescent lighting: lighting that produces light by heating a metal filament until it glows, converting only about 5% of input energy to visible light while the rest becomes heat

Integrated pest management: monitoring for, identifying, observing, and controlling pests using interventions that have the least environmental harm

Hazardous: activities or substances that can cause harm, especially hazardous waste

Jevons paradox (or Jevons effect): increasing the efficiency of resource use can lead to greater consumption rather than conservation of the resource due to induced demand
For example, improving energy efficiency lowers energy costs which induces demand for energy. Taking efficiency measures may counter-intuitively result in more energy being consumed.

Joule: a unit of energy equal to the work done when a force of one newton moves an object one meter, or when one watt of power is applied for one second

kWh: kilowatt hour, the energy of a thousand watts of power for one hour

Life-cycle analysis: a systematic assessment of the "cradle-to-cradle" environmental impacts associated with a product, service, or system, including extracting raw materials, manufacturing, distributing, using, and disposing of or recycling finished goods and supplies

Microplastics: small pieces of plastic debris less than 5,000 microns in size (the size of a pencil eraser or smaller)

Mutagenic: causing genetic mutations

MWh: megawatt hour, the energy of a million watts of power for one hour

Natural: processes that occur without human intervention

Nominal dollars: prices *not* adjusted for inflation

Organic matter: material that comes from living organisms, containing carbon

Parsimony: the inverse of the rate of resource consumption; expressed as time per unit
The units of parsimony depend on the resource. *Energy parsimony* is measured in seconds per joule (or minutes per kWh). It is the inverse of *power* (which is measured in joules per second).

Pescatarian diet: a diet that includes vegetables, fruits, grains, legumes, nuts, seeds, and aquatic animals including fish and shellfish, but excludes other animals
A pescatarian diet may or may not include eggs and dairy products. The prefix "pesca-" derives from "piscis," the Latin word for fish. See also, *vegan diet*, *vegetarian diet*

Permeable surfaces: ground coverings that allow water to pass through to underlying soil

PFAS: per- and polyfluoroalkyl substances that are *forever chemicals* of concern

Planetary boundaries: "safe limits for human pressure on the nine critical processes which together maintain a stable and resilient Earth," as defined by the Stockholm Resilience Centre
Environmental scientists in 2009 at the Stockholm Resilience Centre and Australian National University developed a science-based framework to quantify how far human activities can push Earth systems before triggering catastrophic changes.

Power: energy per time
The unit of power is the watt, one joule per second.

Pumped hydropower: an energy storage system that uses two water reservoirs at different elevations, pumping water to the higher reservoir when excess electricity is available and releasing it through turbines to the lower reservoir to generate electricity when needed

Photovoltaic (PV): producing electricity from light

Real dollars: *nominal dollars* adjusted for inflation
Pricing in real dollars allows meaningful comparisons of consumption between time periods.

Recyclable: materials that can be recycled
Reasonable people disagree about what is recyclable, especially plastics. For waste plastic to achieve the same material properties as virgin plastic, the polymer must be completely broken down to the monomer, all contaminants must be removed, and the polymer must be reassembled from the monomer, which is not practical to do. Instead, plastic waste is *downcycled* or *wish-cycled*.

Recycling: collecting and processing waste material so that it can be reused for an equivalent purpose

Regenerative: farming methods that ensure land remains agriculturally productive in perpetuity

Renewable: a resource, especially energy, that replenishes naturally

Resource: a material, energy source, or natural system that can be used to meet human needs
Resources can be renewable (naturally replenishing within human timescales) or diminishing (non-renewable, with finite available quantities).

Restorative process: a process by which a natural environment returns to a healthy, self-sustaining state by rebuilding soil health, water quality, biodiversity, or other ecological functions
Restorative processes go beyond merely reducing negative impacts to actively improving environmental conditions, such as regenerative agriculture practices that build soil fertility.

Safe share: each person's share of consumption and pollution that stays within planetary boundaries; calculated by taking safe limits at a planetary scale and dividing by the number of people on Earth

Sequestered carbon: carbon that is chemically in a solid state, such as coal, rather than in a gaseous state, such as carbon dioxide
Burning fossil fuel releases carbon from a sequestered state. *Sequestration* is chemically reacting carbon dioxide or carbon monoxide gas with another substance to produce a solid product that becomes part of a living organism or part of the Earth's crust.

Solar year: approximately 365.25 days; Earth's annual orbit time around the sun
Leap years occur every fourth year because the Earth's annual orbit time is approximately 365 and one quarter days.

Suspra App: a web app for practical sustainability, published by Sustainable Practice

Suspra Certification Exam: a test of knowledge across a full range of practical sustainability topics

Suspra Score: a score that quantifies the sustainability of practices along seven pathways
A *negative* Suspra Score indicates that practices have impacts that exceed planetary boundaries, so they are *unsustainable*; a *positive* score indicates that practices are *sustainable*.

Sustainability: the ability to meet current needs in ways that allow our posterity to meet their needs

Sustainability indicators: measurements of the rate and type of resource use and pollution emissions in a system
These measurements for a home or organization indicate whether the environmental impacts of practices are within or exceed the ability of natural systems to regenerate and persist.

Teratogenic: causing birth defects

Trophic level: the functional distance from the primary energy source of an ecosystem
Sunlight is primary energy. Plants that use sunlight directly are at the first trophic level; herbivores are at a higher trophic level; and carnivores on up to apex predators are at the highest trophic level.

Toxic: substances that are especially hazardous to humans or other life
Toxins can be poisonous, radioactive, explosive, *carcinogenic* (causing cancer), *mutagenic* (causing genetic mutations), or *teratogenic* (causing birth defects).

Upcycling: taking a waste material and recycling or reusing it in a way that produces a more valuable product than the virgin material
An example is upcycling old sails into expensive bags.

Vegan diet: eating everything except animal-derived food products
Vegans avoid eating meat, fish, poultry, dairy, and eggs. *Entovegans* eat insects but no other animal food products. Some vegans avoid eating honey because bees produce it.

Vegetarian diet: eating everything except animals
Animals include mammals, reptiles, amphibians, birds, and fish. Some vegetarians also avoid eating multicellular invertebrates like insects, but eat substances that insects produce, such as honey. A *lacto-ovo vegetarian diet* is a plant-based diet that includes eggs and dairy and mushrooms, but excludes meat, fish, and poultry. See also, *vegan diet*, *pescatarian diet*

Watt: a unit of power equal to one joule of energy per second
Power is the rate at which energy is transferred or work is done.

Wish-cycling: putting items in a recycling bin even though they won't actually be recycled
Wish-cycling soothes the guilt of over-consumption or buying disposable products for convenience. Plastic waste is often wish-cycled.

***Xeriscape*:** a landscaping approach that minimizes water usage
The term combines "xeros" (Greek for "dry") with "landscape."

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What did we miss?
SustainablePractice.Life/feedback

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