

Greenway College



How you can help build **OUR SUSTAINABLE FUTURE** *the school that engineers*

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1 A Sustaining Vision

Every revolutionary idea—in science, politics, art, or whatever—seems to evoke three stages of reaction. They may be summed up by the phrases: (1) “It’s completely impossible—don’t waste my time”; (2) “It’s possible, but it’s not worth doing”; (3) “I said it was a good idea all along.”

—Arthur C. Clarke, *The Promise of Space*, 1968

Greening Up

Somehow, certain technologies that once sounded suspiciously hippie-dippie—renewable energy, sustainability, and recycling—have become as mainstream as Old Glory. Despite a partisan divide on numerous issues, Americans today are largely united when it comes to renewable energy and other Earth-friendly technologies. For example, surveys by Pew Research Center,¹ USA Today/Gallup,² ORC International, the Public Policy Institute of California,³ the National

1 Cary Funk and Meg Hefferon, “U.S. Public Views on Climate and Energy,” November 25, 2019, accessed March 16, 2020, <https://www.pewresearch.org/science/2019/11/25/u-s-public-views-on-climate-and-energy/>.

2 Wendy Koch, “Polls: Americans Back EPA and Clean Energy,” USA Today, February 7, 2011, accessed May 18, 2012, <http://content.usatoday.com/communities/greenhouse/post/2011/02/americans-back-epa-solar-wind/1#.T1e8EJj59AY>.

3 Mark Baldassare et al., “Californians and the Environment,” Public Policy Institute of California, July 2011, accessed May 18, 2012, <http://www.ppic>.

Renewable Energy Laboratory,⁴ and other groups all find *bipartisan* majorities in favor of wind and solar power. In a USA Today / Gallup poll, 83 percent of Americans said they wanted the government to put a high priority on incentives for renewable power—more than favored overhauling the federal tax code (76 percent) or withdrawing faster from Afghanistan (72 percent).⁵ A Republican polling firm found that even recent partisanship had not weakened public support for clean energy: “Voters believe that the clean energy economy is here and is growing, and they want their state to have a part of it.”⁶ Decades of polls have shown that about 70 percent of Americans consistently support recycling,⁷ and 83 percent of polled consumers said that a company’s commitment to sustainability was “very or somewhat important” in their purchasing decisions.⁸

Did the hippies win our hearts and minds after all? They undeniably made their mark on matters from diet and music to education and religion, but it was the geeks—the engineers and scientists—who have for decades been steadily making

org/content/pubs/survey/S_711MBS.pdf.

4 “Consumer Attitudes About Renewable Energy: Trends and Regional Differences,” NREL/SR-6A20-50988, Natural Marketing Institute for the National Renewable Energy Laboratory, April 2011, accessed May 18, 2012, <http://apps3.eere.energy.gov/greenpower/pdfs/50988.pdf>.

5 Koch, op. cit.

6 Dave Metz and Lori Weigel, “Recent Research Insights into the Solyndra Issue,” Fairbank, Maslin, Maullin, Metz & Associates, September 26, 2011, accessed May 18, 2012, <http://online.wsj.com/public/resources/documents/SolyndraPoll.pdf>.

7 “Too Good to Throw Away: Recycling’s Proven Record,” Natural Resources Defense Council, accessed May 18, 2012, <http://www.nrdc.org/cities/recycling/recyc/recyint.asp>.

8 “Poll Shows Commitment to Sustainability Still Important to Consumers,” Capstrat, accessed May 18, 2012, <http://www.capstrat.com/insights/articles/poll-shows-commitment-to-sustainability-still-important-to-consumers/>.

green technologies more affordable, effective, and commonplace. In many sectors, green is the new normal.

Car vs. Cliff

Engineers apply the principles of physics to shape the machines and processes that make our industrial civilization possible. In its physical aspect, that civilization is itself a vast, elaborate machine that conjures the mechanical equivalent of ten laborers to serve each one of us. It has increased health and well-being for vast numbers of people over the past two centuries. Yet for all its power and ingenuity, and despite the recent rise of green technologies in many sectors, it is not “sustainable,” and cannot run forever in its current form. Why not? We are consuming subsurface ore, oil, and gas at an increasing rate while at Earth’s surface, there is less arable soil and clean water. The fossil fuels we take out of the ground we put into the air, creating pollution that kills millions of people every year⁹ and is changing Earth’s climate (as 97 percent of working climate scientists affirm).¹⁰ Total human demands already exceed the long-term carrying capacity of the biosphere by 20 percent.¹¹ At this point, we bypass the hippies and ask the engineers, “Short of returning to a tribal subsistence lifestyle, how can we ensure that our descendants will live decently, or at all?”

That our high-resource society has generated so much health and wealth so far is encouraging, but does not prove

9 “Air Quality and Health,” September 2011, World Health Organization, accessed May 24, 2012, <http://www.who.int/mediacentre/factsheets/fs313/en/>.

10 Justin Gillis, “Study Affirms Consensus on Climate Change,” *New York Times*, June 22, 2010, accessed May 24, 2012, <http://green.blogs.nytimes.com/2010/06/22/evidence-for-a-consensus-on-climate-change/>.

11 Mathis Wackernagel et al., “Tracking the Ecological Overshoot of the Human Economy,” *Proceedings of the National Academy of Sciences of the United States of America*, 99:14 (2002), 9266–9271, accessed May 24, 2012, <http://www.pnas.org/content/99/14/9266.long>.

that it can do so forever: a car accelerating toward a cliff edge performs superbly right up to the moment it launches into space (and perhaps a few seconds longer). How can our civilization preserve its gains without being doomed to crash and burn? We can figuratively hit the brakes—constraining consumption. But doing so could jeopardize some of the health and well-being achievements of the past two centuries. A better alternative would be to think like engineers and use applied science to make our civilization-machine *sustainable*. Build wings, bolt them on, and take off. Use technology to make the cliff irrelevant.

For too long, confronted with the evidence of trouble ahead, many people have shrugged and said, “Science will figure out something, someday,” or “Good old American ingenuity will see us through.” But those responses will no longer do, because “someday” has arrived. The good news is that science has figured out its “something”: affordable renewable energy, sustainable energy storage and energy carriers, dramatic efficiency improvements, and elegant zero-waste practices. These are the technical and human arts of sustainability. These will be our wings.

Enter Greenway College

Young Americans are eager to be part of the solution: two-thirds of prospective college students surveyed for the *Princeton Review*'s “College Hopes and Worries” feature said that a college’s “environmental commitment” would be a factor in where they applied.¹² According to *USA Today*, “College students are flocking to sustainability degrees, careers.”¹³

12 “2011 College Hopes & Worries Survey Report,” *The Princeton Review*, accessed March 13, 2012, http://www.princetonreview.com/uploadedFiles/Sitemap/Home_Page/Rankings/2011%20College%20Hopes%20and%20Worries%20Survey%20Report.pdf.

13 Jillian Berman, “College Students Are Flocking to Sustainability Degrees, Careers,” *USA Today*, August 3, 2009, accessed February 10, 2012,

A four-year engineering and science college dedicated to this demand—an institution of learning devoted entirely to sustainable technology and engineering—would have unique appeal. As the first of its kind anywhere in the world, it would be a focus of excitement, passion, high hopes. It would attract research talent, teaching talent, the most promising students. It would be a thought leader, an idea generator, and living, working proof that a better world is possible through the power of applied knowledge.

To succeed, such a college would have to do more than shuffle modestly toward sustainability: a solar panel here, a LEED-certified building there, regular meetings of a sustainability committee, a ten-year plan to lower environmental impact. Such measures do not inspire passion. A sustainability college would have to be *amazingly* greener (while being at least as well lit, comfortable, productive, workable, and academically rigorous as any other school). It would have to not merely push the envelope but reinvent the envelope, then push it again, then reinvent it again, and again, and again. It would have to be a standing challenge to the imagination.

We propose to build such a school: Greenway College, a *zero-sacrifice, totally green* four-year college. Greenway will be a stand-alone learning community entirely devoted to expanding and disseminating the technological bases of a sustainable civilization and to graduating learners rigorously equipped to further this goal wherever they go. It will be a driver of the sustainability knowledge revolution.

And Greenway will not just talk the talk. It will apply on its own campus the knowledge base that it gathers and enriches, and will foster programs across the nation and planet to shift society toward sustainability. It will be a model, a seedbed, a driver, a transformation factory, a bottomless bag of profit-

able tricks, and a gusher of insights into devices, materials, energy sources, and patterns of resource use and reuse.

People are going to love this place. With your help, we are going to build it. This book lays out how.

Four Goals, Three Tools

But first, a word about the “green” movement that has grown up since the 1960s and without which there would probably be no Greenway College. Despite our debt to the green subculture, the founders of Greenway College are not uncritical fans of it or any other way of thinking. In truth, there has been no monolithic movement toward greenness, no unified green ideology or cookbook. Rather, as Thomas Graedal has suggested, there is a loose, diverse cluster of movements, most of whose members share four basic goals: “1) maintaining the existence of the human species, 2) maintaining the capacity for sustainable development, 3) maintaining the diversity of living things, and 4) maintaining the aesthetic richness of the planet.”¹⁴

Not many people would reject any of the Four Goals, though people can and do argue endlessly about how to achieve them. No wonder such ideas have broad bipartisan support, even though 60 percent of Americans don’t want to be called “environmentalists.”¹⁵

The Four Goals have generally been pursued using three main tools, namely environmental legislation, simpler living, and technological innovation. The first is clearly indispensable, though the proper form and degree of legislative intervention can be debated: without some regulation, any polluter would be free to externalize their costs to whoever happened to be downstream and downwind, “costs” not just in dollars

14 Thomas Graedal, *Streamlined Life Cycle Assessment* (New Jersey: Prentice Hall, 1998).

15 Gillis, op. cit.

but in disease and death. A good law saves lives. Each year, reductions in air pollution from the 1990 amendments to the Clean Air Act—just one aspect of just one successful environmental law—prevent over 130 thousand heart attacks, 1.7 million asthma attacks, and 13 million lost workdays. The economic benefits of major environmental laws have wildly outweighed their costs, thanks primarily to savings in medical expenses.¹⁶

Yet legislation is inherently political: parties contend, regulations trigger pushback campaigns, enemies are made. The discourse around environmental regulation has become astonishingly bitter in the United States today. Greenway must not contribute to this bitterness or become a victim of it. Though its staff and students will, we hope, be active in democratic politics across a wide spectrum of views, the college itself must remain truly neutral. It must authentically welcome persons with any and all beliefs that are compatible with the basic standards of liberty and responsibility prevalent in our society. It will not be a liberal or conservative clubhouse, but constitutionally nonideological and nonpolitical.

The next popular tool for achieving the Four Goals is simpler living. We cannot utterly evade the question of lifestyle, though some people would prefer to. Is sustainability compatible with everyone on the planet having a house, an acre, and a car? How about three houses, two hundred acres, three cars, and a yacht? How much is too little, and how much is too much, and who gets to decide? One person's liberating simplicity is another's bitter sacrifice. What to one person is a mere technical tweak is to another an intolerable attack on personal liberty: consider the varied reactions to the transition from incandescent to compact fluorescent to LED lightbulbs.

16 US Environmental Protection Agency Office of Air and Radiation, "The Benefits and Costs of the Clean Air Act from 1990 to 2020," March 2011, accessed March 6, 2012, <http://www.epa.gov/air/sect812/feb11/fullreport.pdf>.

Building a dormitory or a dining hall is, then, at some level an unavoidably ideological act, because choices must be made and every choice implies some philosophy of what is decent or enough, and somebody, somewhere, is bound to disagree. By taking any specific form, by merely existing, Greenway is bound to please some and offend others.

Nevertheless, within realistic limits, Greenway College shall avoid lifestyle advocacy. We have no quarrel with persons who wish to consume less and persuade others to do the same, but our mission is not lifestyle change any more than it is legislative activism. Greenway is dedicated to the third tool, the technological approach, which is based on the assumption that there is, globally speaking, enough to go around. We maintain that within certain broad limits, and if we make intelligent use of its resources, this planet is capable of providing light, warmth, education, comfortable roomy spaces, hot showers, tasty food and drink, vivid entertainment, clean air and water, and vast wilderness to all its people. This is what we mean by “zero sacrifice.”

As an institution, therefore, Greenway will advocate not lifestyle change but *technical responses to technical opportunities*. Society wishes certain tasks to be done, certain services to be provided; very well; what is the absolute best way to fulfill those wishes? How can we supply an affordable, comfortable, industrial way of life with zero waste, sustainably, indefinitely, and in a manner that does not leave our grandchildren standing empty-handed atop a destroyed planet?

This book presents our vision and invites you to join us in making that vision a reality.

Glancing Ahead

In chapters 2, 3, and 4, we review relevant green technologies for energy generation, energy storage, and zero-waste engineering. We describe how these can be incorporated into the fabric of Greenway College. In chapter 5, we lay out our

vision of a real school, fleshing out a proposal for a totally green stand-alone campus that can be readily achieved with technologies available today (yet remain capable of endless improvement). Chapter 6 reviews college operations: how will Greenway be governed; what sort of school will it be? Chapter 7, last but not least, talks about money.

We hope that by the end of this book you will be as excited as we are about Greenway and as convinced that its determination to be zero sacrifice, zero waste, and self-sufficient in energy is anything but pie in the sky. We also hope that you will choose to become a part of this historic effort. There has never yet been a college like Greenway, but the time is ripe. Soon, with your help, Greenway will be spreading fresh, market-ready technologies, principles, and graduates across our nation and planet—helping to engineer our sustainable future.