



NATURAL CAPITALISM SOLUTIONS

The Business Case for Climate Protection

L. Hunter Lovins

Drivers of Change

Humans love to predict the future. Few succeed. Those who come closest do so by understanding the trends that are driving change. In a meeting of experts convened to create a “Green Print” to guide the City of Denver, this author stated that there exist global forces that will drive change that cities must be aware of. As these begin to impact cities like Denver, they could dramatically shift the metrics by which a Mayor judges whether a program to save energy is cost effective or not. Mayor John Hickenlooper answered by recounting his visit to New Orleans a year following Hurricane Katrina. “It is an awesome experience,” he stated, “for a big city Mayor to drive for blocks and see no one living in a city. We lost a major American city. The unthinkable is no longer unthinkable.”

One hurricane is not a trend. But as the impacts of the trend of global warming become more obvious, Mayor Hickenlooper’s reaction will become more common. And climate change is only one of the drivers facing us.

This paper discusses some of those drivers. They will bring change to your community, whether you like it or not. This may make them seem outside of your control, but if you can understand the nature of these drivers you can put in place the sorts of programs that can enable you to cope with them. Understanding these drivers can also enable you to create new businesses, reduce costs for existing companies and capture an array of opportunities that will arise as the future unfolds.

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- Denver, CO
Mayor John
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You can ride the waves of change instead of being engulfed by them by exploring:

- How larger forces may make “business as usual” difficult or impossible;
- How you can take action to minimize these negative impacts; and
- How larger forces may create opportunities that can enhance the success of your programs.

The list of trends that follows is far from a comprehensive accounting of the challenges facing us, but it covers the primary drivers that will shape the future.

Today’s major drivers include:

1. Global Warming: Undeniable Science
2. Loss of Natural Capital
3. Strategic Resource Trends: Peak oil, water scarcities and other constraints
4. LOHAS: The Sustainability Imperative

1. Global Warming: Undeniable Science

When asked to name a global trend many people reply, “terrorism.” That is indeed a phenomenon of modern life. But terrorism is far less likely to impact you personally than an array of other changes sweeping the planet.

Munich Re, the world’s largest reinsurance company after assessing the total insurance losses due to the September 11 events, stated that it is more concerned about climate change than future terrorist risks.

As the climate changes, what had been considered “natural” disasters like flooding and hurricanes are increasing. The changing climate is forcing cities to deal with such acute challenges as storms, heatwaves and water shortages. It also imposes a wide array of long-term impacts such as droughts, the spread of diseases and the demise of historically important industries.

In December 2005, at the International Climate Conference in Montreal, Munich Re Foundation released figures showing \$200 billion in weather related losses that year, breaking the previous record from 2004 of \$145 billion.¹ In contrast, the World Trade Center losses were less than \$40 billion.²

The frequency of major natural disasters is now *three times* what it was in the 1960s. CGNU, the largest insurance company in the UK, forecasts that at the current rate of increase of the property damages, by the year 2065, the cost of these disasters will be higher than the entire world economic production.³

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The following figure shows the evolution of the economic costs, and insured costs of natural disasters worldwide over the past decades.



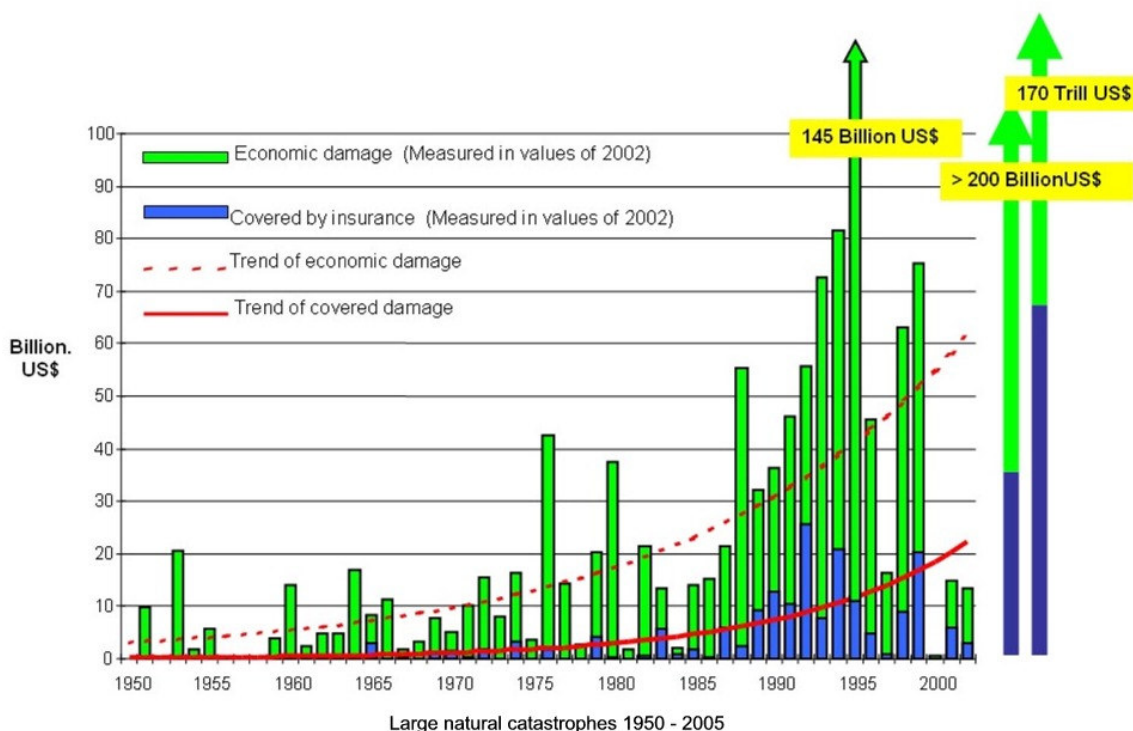


Figure 1⁴

In 2005 insurers faced claims for seven of the ten most expensive hurricanes in history. In response, insurers like AIG, one of the world's largest, announced that they would give customers who reduce their carbon emissions a break on their rates.⁵

National Oceanic and Atmospheric Administration (NOAA) Administrator D. James Baker says, "Our climate is warming at a faster rate than ever before recorded. Ignoring climate change and the most recent warming patterns could be costly to the nation. Small changes in global temperatures can lead to more extreme weather events including, droughts, floods and hurricanes."⁶ Hurricane Katrina, which in 2005 destroyed much of New Orleans, may cost insurers as much as \$60 billion.⁷

A stable climate is of inestimable value to companies, to residents of cities and ultimately to all life on earth. But we are losing this foundation for a successful economy.

In March 2006, the UN's weather agency, the World Meteorological Organisation (WMO) warned that greenhouse gases (GHGs) including carbon dioxide—the cause of global warming and climate change—had reached their highest levels in the atmosphere ever in human history. Such emissions, WMO stated, must be slowed and reduced if the earth is to avoid climatic havoc with devastating heat waves, droughts, floods and rising sea-levels sinking low-lying island states and hitting seaboard cities.⁸

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This report is only one in a rising chorus of concern. The prestigious American Geophysical Union (AGU) is an apolitical international organization of scientists. Its 35,000 members include most of the foremost specialists who study both historical and current evidence of global climate change in the atmosphere, glaciers, oceans, forests and deserts. In a 1999 report, the AGU concluded that,

Greenhouse gases rising into the atmosphere from burning fossil fuels and other pollutants will increase the pace of global warming and disrupt many regions of the world. Those gases could persist in the atmosphere for thousands of years, and despite uncertainties about just how high worldwide temperature might go and how to combat the climate changes, new strategies must be developed to deal with the problem.⁹

People have increased the carbon dioxide content of the atmosphere (one main cause of global warming) by 20 percent in the last four decades, and today add three times more annually than in 1960.¹⁰ The levels of carbon dioxide have leapt abruptly over the past two years, suggesting that climate change may be accelerating out of control. The International Energy Agency projects global emissions to climb another 60 percent by 2030.¹¹

“We have found the smoking gun. There can no longer be substantial doubt that human-made gases are the cause of most observed warming.”

- 2005 NASA study

In January, 2005, Dr. Rajendra Pachauri, the chairman of the Intergovernmental Panel on Climate Change (IPCC), the international scientific body charged with establishing the science of climate change, told an international conference attended by 114 governments that the world has “already reached the level of dangerous concentrations of carbon dioxide in the atmosphere,” and called for immediate and “very deep” cuts in emissions. He cited a multi-year study by 300 scientists showing that the Arctic was warming twice as fast as the rest of the world, and that its ice cap had shrunk by up to 20 percent in the past three decades. Remaining ice is 40 percent thinner than it was in the 1970s and is expected to disappear altogether by 2070. As he spoke, arctic temperatures were eight to nine degrees centigrade higher than normal.¹²

Pachauri stated that because of inertia built into the earth’s natural systems, the world is now only experiencing the result of pollution emitted in the 1960s, and much greater effects would occur as the increased pollution of later decades works its way through. Carbon released into the atmosphere today will still be insulating the earth for decades. Pachauri concluded, “Climate change is for real. We have just a small window of opportunity and it is closing rather rapidly. There is not a moment to lose. We are risking the ability of the human race to survive.”¹³

In April 2005, a NASA study demonstrated a rise in the temperature of the deep oceans that matched the predictions of computer models. Announcing the results, Dr. Jim Hansen, the chief scientist on the NASA study stated, “We have found the smoking gun.



There can no longer be substantial doubt that human-made gases are the cause of most observed warming.” The study also found that the ocean is slowly releasing this stored heat, worsening the changes in climate already measured. Previously, skeptics had claimed that the models that linked human emissions of carbon dioxide and other GHGs to observed changes in the temperature of the world’s atmosphere could not account for all of the warming that should be taking place if the connection between human activity and climate change were as strong as some scientists claimed.¹⁴

Stabilizing atmospheric carbon dioxide levels will not be easy, but it can be done. Using a combination of energy efficiency and renewable energy, communities can shift from an economy based on hydrocarbons to one running on carbohydrates.

Indeed, recent science has raised the concern that global warming may be happening faster than the models predicted, raising the threat that abrupt climate change could occur. This increases the urgency of corporate and societal action.¹⁵

Many scientists now claim that to stabilize climate, the world will need to reduce emissions of carbon and other GHGs 60-70 percent below current levels. The United Kingdom has already pledged to implement such cuts and sees the economic feasibility of doing so. California Governor Arnold Schwarzenegger has called for that state to achieve an 80 percent reduction by 2050.¹⁶

The planet faces unprecedented perils. However, the answers exist and are cost effective. The problem is that we have failed so far to implement them.

Stabilizing atmospheric carbon dioxide levels will not be easy, but it can be done. Using a combination of energy efficiency and renewable energy, communities can shift from an economy based on hydrocarbons to one running on carbohydrates. Such technologies as far more efficient hybrid-electric cars and efficient diesels using bio-diesel, wind machines, solar electric and thermal collectors can enhance community prosperity, reduce vulnerability and protect the environment. All of the

technologies exist to shift from coal and oil to much more benign sources of energy. In his book, *Plan B 2.0: Rescuing a Planet Under Stress and a Civilization in Trouble*, Lester Brown describes a policy to cut carbon emissions in half by 2015.¹⁷ An analysis by the German Environment Agency showed that World GHG emissions could be halved by 2050 at a cost of just 1 percent of global gross domestic product. Without action to restrain emissions, the cost of global warming-linked weather changes could cut 10 percent of world GDP, it warned.¹⁸



2. Loss of Natural Capital

A stable climate is an important contributor to economic stability, but it is only one of the many services that intact ecosystems provide to our economy. Healthy ecosystems provide the provision of clean water, productive soils, the ability to detoxify society's wastes and dozens of other services that we take for granted, but which we would sorely miss if they were to cease to function. Such scientists as Dr. Gretchen Daly and economists like Dr. Robert Costanza estimate that the economic value these services provide to our economy is at least \$30 trillion dollars a year, or the same as the entire value of the economy that *is* counted.¹⁹ None of this "capital" appears on conventional balance sheets, so "business as usual" treats these "ecosystem services" as having a value of zero. Because the way in which people around the world meet their needs does not make protection of the environment as a priority, every major ecosystem on the planet is in decline. The loss of the services that these ecosystems used to provide to us for free will force businesses and communities to pay for replacements; assuming that humans are even capable of creating substitutes for the contributions that intact ecosystems deliver.

Lester Brown of the Earth Policy Institute points out that.

Accounting systems that do not tell the truth can be costly. Faulty corporate accounting systems that leave costs off the books have driven some of the world's largest corporations into bankruptcy. The risk with our faulty global economic accounting system is that it so distorts the economy that it could one day lead to economic decline and collapse.

...Capitalism may collapse because it does not allow the market to tell the ecological truth.

Brown also quotes Øystein Dahle, former Vice President of Exxon for Norway and the North Sea, who stated: "Socialism collapsed because it did not allow the market to tell the economic truth. Capitalism may collapse because it does not allow the market to tell the ecological truth."²⁰

In 1992, 1,600 scientists, including a majority of living Nobel Prize winners in the sciences, issued the warning that:

A great change in stewardship of the Earth and the life on it is required if vast human misery is to be avoided and our global home on this planet is not be irretrievably mutilated...If not checked, many of our current practices may so put at serious risk the future that we wish for human society and the plant and animal kingdoms, and may so alter the living world, that it will be unable to sustain life in the manner that we know. Fundamental changes are urgent if we are to avoid the collision our present course will bring about.²¹

In 1998, the American Museum of Natural History surveyed professional biologists. A striking 69 percent of them agree that we are living now through the "sixth extinction." This species extinction seems to be happening more rapidly and affecting a wider range



of biodiversity than any of the previous five. It is even faster than the last extinction, over 60 million years ago, when the dinosaurs disappeared. The scientists claim that we will lose between 30 percent and 70 percent of the planet's biodiversity within a time span of only 20 to 30 years.²² The difference from all previous extinctions is that this one is due to the actions of one species—our own—the species that claims to be endowed with intelligence and consciousness.

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In April 2005, the United Nations released the Millennium Ecological Assessment.²³ The study by 1,360 experts in 95 nations drew on the work of 22 national academies of science from around the world. It reported that a rising human population has polluted or over-exploited two-thirds of the ecological systems on which life depends, ranging from clean air to fresh water, in the past 50 years.

“At the heart of this assessment is a stark warning,” said the 45-member board of the Millennium Ecosystem Assessment. “Human activity is putting such strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted.”²⁴

UN Secretary-General Kofi Annan observed, “The Assessment shows how human activities are causing environmental damage on a massive scale throughout the world, and how biodiversity—the very basis for life on earth—is declining at an alarming rate.”

Asked what we should do now and what we should plan to do over the next 50 years, the Assessment's Director, Dr Reid, replied that there must be a fundamental reappraisal of how we view the world's natural resources. “The heart of the problem is this: protection of nature's services is unlikely to be a priority so long as they are perceived to be free and limitless by those using them.”

“We simply must establish policies that require natural costs to be taken into account for all economic decisions,” he added.

The Board of Directors of the Millennium Assessment stated:

The overriding conclusion of this assessment is that it lies within the power of human societies to ease the strains we are putting on the nature services of the planet, while continuing to use them to bring better living standards to all...Achieving this, however, will require radical changes in the way nature is treated at every level of decision-making and new ways of co-operation between government, business and civil society. The warning signs are there for all of us to see. The future now lies in our hands.



3. Strategic Resource Trends: Peak Oil and Sweet Water

There are two key resources that business has taken for granted for at least a century: cheap fossil energy and the availability of sweet water. There is a growing consensus that the availability and cost of these two vital resources are going to significantly change over the next decades.

Geologist M.K. Hubbert, who worked for Shell Oil, predicted in the 1950s that the U.S. production of fossil energy would peak in the 1970s, and that world production would peak in the decade of 2010. This forecast was denied by the oil industry until recently. However, the U.S. production did peak during the 1970s, despite massive investment in exploration and new extraction techniques. Many signs indicate that Hubbert's forecast will be true for the world as a whole.²⁵

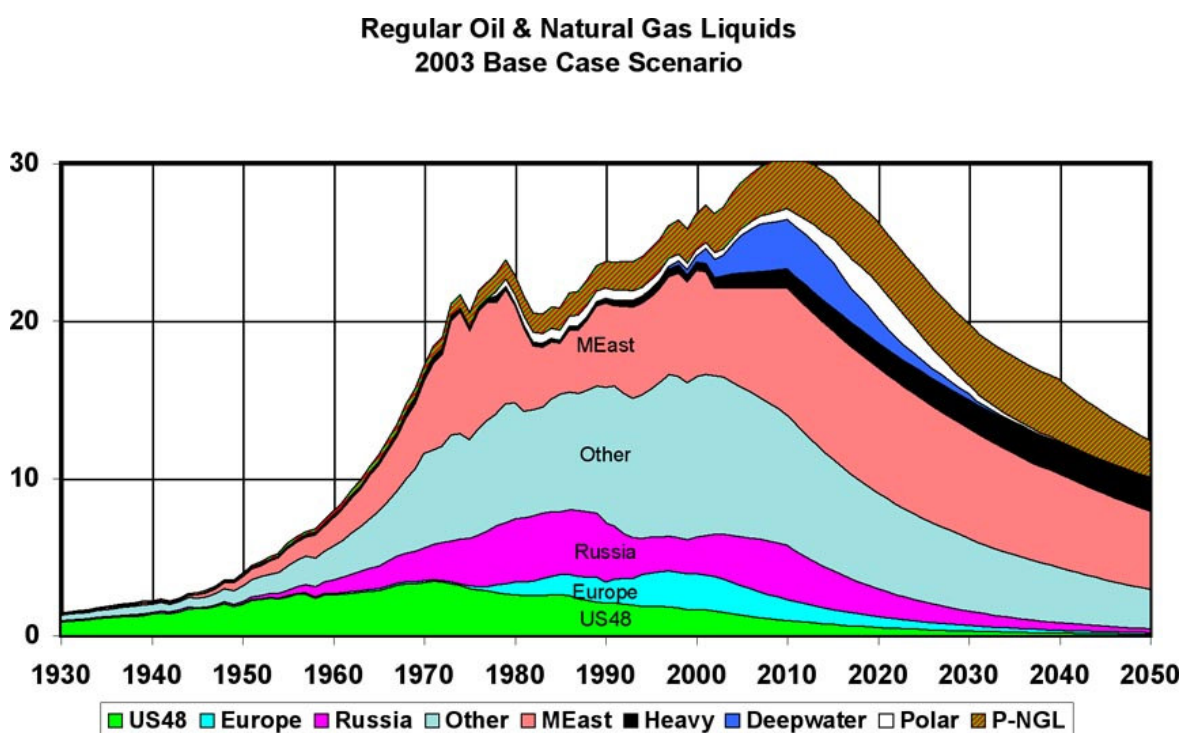


Figure 2 Hubbert's Needle—Peak forecast of fossil energy sources

This is bad news for economies that depend on fossil fuels. Authors like James Kuntsler, in his book, *The Long Emergency*, predict that peak oil literally will result in the end of civilization as we know it.²⁶ High and rising energy prices are already devastating many developing countries.

Part of the reason that the world oil prices are now at record heights is that China has entered the world oil market. If the Chinese use oil at the same rate as Americans, and continue to grow their economy at their current rate, by 2031 China will need 99 million barrels of oil a day. The world currently extracts 89 million barrels per day and may not be able to lift more.

Combined with the challenge of climate change, peak oil is very worrisome for many communities. In the 1950s, the Paley Commission of the U.S. government recommended an urgent transition to renewable energy. An increasing number of communities are deciding that the time has come to heed this advice.²⁷ As described more below, there is a great deal that individuals and communities can do to extract themselves from the globalized energy market.

Around the world, energy efficiency is the fastest growing way of meeting people's needs, followed by using the sun to produce heat, followed by wind power, followed by solar electricity. In good sites, bringing wind on line costs less than running an existing coal or gas plant. A number of studies have shown that it will be possible for communities or countries to make the shift to renewable energy.²⁸

An increasing number of homes are being equipped with solar electricity and heat.²⁹ It is not uncommon now to have homes that produce their own energy or interconnect to the grid at will. Individuals and communities are setting up small-scale biodiesel production facilities, using waste vegetable oil, or the output from special crops.³⁰ The University of Colorado runs its bus fleet on biodiesel, and the program spun-off a for profit company to make the fuel. Biodiesel is also being co-produced with ethanol. In Brazil, 77 percent of new cars can run on locally produced ethanol, which supplies over half of the country's need for vehicle fuel.³¹ Even poor communities like Curitiba, Brazil, have created public transportation systems that enable people to get everywhere they need to go and are affordable. Communities like Austin, Texas are encouraging "plug-in hybrid" vehicle programs. There are hundreds of hundreds of programs that you can implement to increase the amount of renewable energy in your community.

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Far more challenging than shifting to renewable energy will be providing sufficient drinking, or "sweet," water to all of the world's population. Drinkable water, vital to businesses as well as individuals, has been taken for granted in modern society for many decades. Water scarcity is already serious in many areas of the world and there is a growing consensus that it will become a critical issue for only more cities and countries.

In 1999 the World Bank reported that 2 billion people, or 40 percent of the world's population, lacked access to clean drinking water or sanitation. Worldwide demand for water is doubling every 21 years, more in some regions. Water supply cannot remotely keep pace with demand, as populations soar and cities explode.³² The report stated:



Population growth alone does not account for increased water demand. Since 1900, there has been a six-fold increase in water use for only a two-fold increase in population size. This reflects greater water usage associated with rising standards of living. It also reflects potentially unsustainable levels of irrigated agriculture. World population has recently reached six billion and United Nation's projections indicate nine billion by 2050. What water supplies will be available for this expanding population?³³

In 2003, the United Nations Environment Programme released a report from 200 water experts around the world stating that within 50 years half of humankind will be living with water shortages, depleted fisheries and polluted coastlines. The severe water shortages that now affect people in 80 countries will affect 4 billion people by the middle of the century.³⁴

As the developing world seeks to lift itself out of poverty, it will not achieve its goal if it replicates industrialized countries inefficient use of resources

Obviously, these trends interact with each other: global warming worsens droughts around the world. Proposed solutions like desalination require large amounts of energy. Overuse of water is worsening the loss of intact ecosystems. Thus it is likely that any solution posed in isolation will fail. Communities must start to consider all of these trends together, and put in place whole-systems solutions that solve many problems at once.³⁵

Oil and water, of course, are only two resources. Similar challenges exist for all basic commodity resources. As the developing world seeks to lift itself out of poverty, it will not achieve its goal if it replicates industrialized countries inefficient use of resources. Doing this would require finding three more earth's worth of resources to meet the demands of the world's consumers.³⁶ By 2030, if China's use of coal equaled current U.S. levels (nearly 2 tons per person), China would use 2.8 billion tons annually—more than the 2.5 billion tons the *entire* world now uses.³⁷ Cement is already in short supply because of China's demand. As is steel. Such resource constraints are likely to persist.

The trends mentioned thus far are challenging, and scary. As described below, there are also trends that are hopeful, and which, together with the rapidly emerging solutions to the more worrisome trends, offer an array of business opportunities.



4. LOHAS: The Sustainability Imperative

There exists a large and growing market in the U.S. and Europe for goods produced in ways that do not harm the environment or people. Approximately 30 percent of the adults in the U.S., or 63 million people place significant value on buying goods that do not worsen the trends mentioned above or that help to solve them. These individuals are part of a tectonic shift in consumer awareness and behavior.³⁸

Research by sociologist Paul Ray found that this population comprises a growing market segment of educated consumers who make conscientious purchasing and investing decisions based on social and cultural values.³⁹

Identified in a research report by Conscious Medium, this industry has been named “Lifestyles of Health and Sustainability,” or “LOHAS.” LOHAS consumers are driving a number of market changes by demanding goods and services that meet their desires to enhance health, environment, social justice, personal development and sustainable living. The growing sustainability movement, combined with the instant access to information that the Internet provides, has resulted in a more educated and discerning consumer than may have been apparent in past surveys of the general market. LOHAS is a worldwide market conservatively estimated at \$228.9 billion, and growing. In the U.S. the market supporting what are called ecological lifestyles, including purchases of organic products, is at least \$81 billion a year.⁴⁰

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The emergence of this market segment as a driver is unparalleled in U.S. history, to the point where these consumers will determine the future of many businesses. Some analysts are now calling the sustainability movement the largest phenomenon in human history. Hundreds of thousands of organizations throughout the world are working to achieve social justice, alleviate poverty, enhance standards of living for all and achieve environmental protection—in short, a more sustainable world.⁴¹

This trend has driven even mainstream institutions to make major changes. In May 2005 Jeffrey Immelt, the man who replaced Jack Welch at the helm of General Electric (GE), stood with Jonathan Lash, the President of World Resources Institute, a leading environmental organization to announce the creation of GE Ecomagination. The two co-authored an article in the Washington Post titled, “The Courage to Develop Clean Energy.”⁴²

Immelt committed GE to implement aggressive plans to reduce emission of greenhouse gasses, spending \$1.5 billion a year on research in cleaner technologies. As part of the initiative, Immelt promised to double GE’s investment in environmental technologies to



\$1.5 billion by 2010, and reduce the company's GHG emissions by 1 percent by 2012. Without any action, GE's emissions would have gone up 40 percent.⁴³

GE is the sixth largest company in the world, and the only company, which had there been a Fortune 500 around in 1900, would have been on it then and is still on it today. So its announcement is significant. But it was rapidly followed by a major environmental commitment from Wal-Mart, now considered the largest company in the world. If Wal-Mart were a country it would be the 20th largest in the world. If it were a U.S. city, it would be the fifth largest. In 2006, the CEO of Wal-Mart, Lee Scott announced that his company would undertake a major effort to reduce its emissions of GHGs. He set a goal of supplying his stores with 100 percent renewable energy. Wal-Mart is experimenting with green roofs and green energy (which is now used to power four Canadian stores, for a total of 39,000 megawatts—the single biggest purchase of renewable energy in Canadian history). The company has pledged to become the largest organic retailer and to increase the efficiency of its vehicle fleet by 25 percent over the next three years. It will eliminate 30 percent of the energy used in store and invest \$500 million in sustainability projects.⁴⁴

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An unabashedly astonished article in the San Francisco Bay Guardian reflected, Wal-Mart's rationale for all of this, of course, has absolutely zero to do with any sort of deep concern for the planet (though it does make for good PR), nothing at all about actual humanitarian beliefs or honest emotion or spiritual reverence, and has absolutely everything to do with the corporation's rabid manifesto: cost-cutting and profit.

The reason Scott promised that Wal-Mart will double the fuel efficiency of their huge truck fleet within a decade? Not to save the air, but to save \$300 million in fuel costs per year. The reason they aim to increase store efficiency and reduce greenhouse gasses by 20 percent across all stores worldwide? To save money in heating and electrical bills, and also to help lessen the impact of global warming, which is indirectly causing more violent weather, which in turn endangers production and delivery and Wal-Mart's ability to, well, sell more crap. Ah, capitalism.⁴⁵

Hundreds of communities, states and even whole nations are setting sustainability indicators, promulgating sustainability plans and otherwise implementing measures to deal with the drivers of change identified above. In mid-2006 such magazines as Vanity Fair and Newsweek devoted cover stories to the surge in green lifestyles.

Perhaps most exciting, the business community is joining the effort to reduce global warming and to implement more sustainable practices.



The Business Case for Protecting the Climate

A No Regrets Strategy

Companies often start a program of greenhouse gas (GHG) reductions because they realize that acting now is actually a “no regrets” strategy: If climate change turns out to be real, they will already be in a leadership position by dealing responsibly with it. Even if the scientists are wrong, and there is no threat to the climate; these are actions that a well-managed business would want to take anyway, because doing so is profitable. Enormous opportunities exist to reduce costs by reducing the energy they use to run their operations. It just happens that this is exactly the same strategy they would employ to reduce their greenhouse gas emissions.

Many business leaders see a need to abate climate change for moral reasons. Lee Scott, CEO of Wal-Mart, stated in the pages of Fortune Magazine:

There can't be anything good about putting all these chemicals in the air. There can't be anything good about the smog you see in cities.

There can't be anything good about putting chemicals in these rivers in Third World countries so that somebody can buy an item for less money in a developed country. Those things are just inherently wrong, whether you are an environmentalist or not.⁴⁶

There is also a very solid business case for such a position. Adopting an aggressive program of GHG reductions can be highly profitable for companies and cost-effective for non-profit (including government) organizations.⁴⁷

Companies that reduce GHG emissions, especially in the context of a broader whole-system corporate sustainability strategy, will achieve multiple benefits for shareholders beyond reducing their contribution to global climate change. Governments that take a similar course will accrue similar benefits to their citizen stakeholders.⁴⁸ These benefits include:

1. Enhanced financial performance from energy and materials cost savings in:
 - industrial processes;
 - facilities design and management;
 - fleet management; and
 - government operations.

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2. Enhanced core business value:

- sector performance leadership;
- greater access to capital;
- first mover advantage;
- improved corporate governance;
- the ability to drive innovation and retain competitive advantage;
- enhanced reputation and brand development;
- market share capture and product differentiation;
- ability to attract and retain the best talent;
- increased employee productivity and health;
- improved communication, creativity, and morale in the workplace;
- improved value chain management; and
- better stakeholder relations

3. Reduced Risk:

- insurance access and cost containment;
- legal compliance;
- ability to manage exposure to increased carbon regulations;
- reduced shareholder activism; and
- reduced risks of exposure to higher carbon prices.

Businesses Face Growing Pressure to Reduce Emissions

Many American businesses have succumbed to the concerted media campaign that asserts that taking action against global warming will harm businesses and the economy. In fact, quite the opposite is true: reducing the amount of energy that a business uses reduces costs and directly enhances a company's bottom line. Failing to reduce energy use, and tolerating carbon emissions as part of "business as usual" is actually a high-risk strategy for a business or for a community.

Leading CEOs around the world know this. CEOs surveyed by the World Economic Forum in Davos in 2000, stated that for them, "The greatest challenge facing the world at the beginning of the 21st Century—and the issue where business could most effectively adopt a leadership role—is climate change."⁴⁹ The Climate Group website⁵⁰ lists case studies of companies and communities that are reducing their emissions and saving money.

In November 2004, the world agreed. Essentially all of the world's industrial nations ratified the Kyoto Protocol to reduce the emissions of greenhouse gasses (the U.S. and Australia are the only significant holdouts). The Protocol came into force 16 February 2005, launching a new "carbon-constrained" era for the 141 countries that ratified it.⁵¹ Among its many provisions, the accord established regulations limiting the amount of carbon that nations can emit, and created a carbon market through which companies that reduce further than they are required can sell this extra reduction to companies unable to meet their targets.



European countries, as members of the Kyoto Protocol, are now bound by this mandatory trading regime. The UK has pledged to reduce its emissions 60 percent by 2050, or close to the amount that scientists say will be necessary to abate climate change. The European Commission plans to cut energy use 20 percent by 2020 and increase European use of renewable energy to 12 percent by 2012. This should reduce Europe's emissions by a third. The program is projected to save 60 billion Euros, create millions of new jobs and increase European competitiveness. American businesses are at risk of losing ground to European competitors as they innovate to meet these goals.

For example, STMicroelectronics (ST), a Swiss-based \$8.7 billion semiconductor company, set a goal of zero net GHG emissions by 2010 while increasing production 40-fold.⁵² The main sources of ST's GHG emissions are 45 percent facility energy use, 35 percent industrial process (PFC⁵³ and SF6⁵⁴) emissions and 15 percent more efficient transportation. Its strategy is to reduce on-site emissions by investing in co-generation (efficient combined heat and electricity production⁵⁵) and fuel cells (efficient electricity production).

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By 2010 co-generation sources should supply 55 percent of ST's electricity with another 15 percent coming from fuel switching to renewable energy sources. The rest of the reductions ST is seeking will be achieved through improved energy efficiency (hence reducing the need for energy supply) and various projects to sequester carbon. ST's commitment has driven corporate innovation and improved profitability. During the 1990s its energy efficiency projects averaged a two-year payback (a nearly 71 percent after-tax rate of return).⁵⁶

Making and delivering on this promise has also driven ST's corporate innovation and increased its market share, taking the company from the number 12 micro-chip maker to the number six in 2004.⁵⁷ By the time ST meets its commitment it reckons that it will have saved almost a billion dollars.

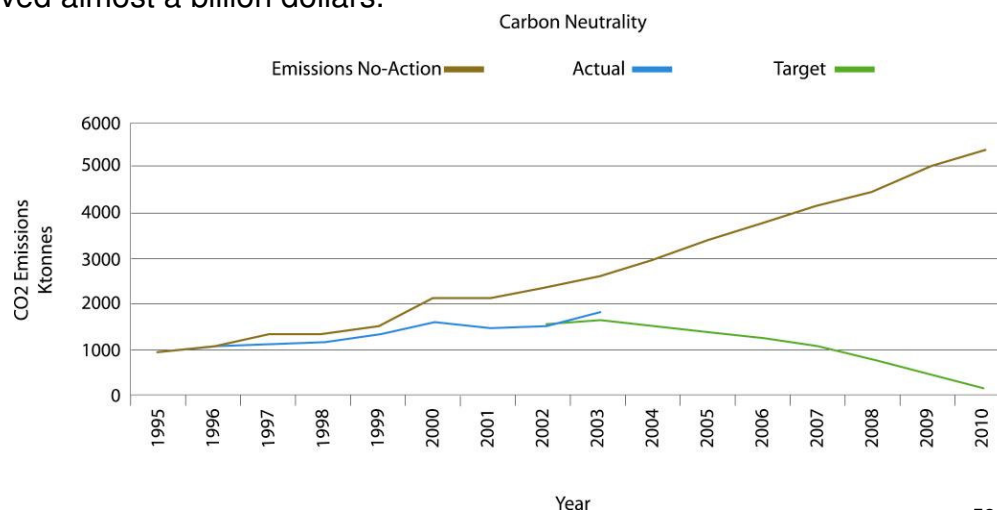


Figure 3 STMicroelectronics commitment to Carbon Neutrality⁵⁸



Cities and Companies—The New Leaders

In January 2005, an independent commission of businesspeople, politicians and scientists⁵⁹ released a report to the G8 meeting, urging member countries to cut carbon emissions, double their research spending on green technology and work with India and China to build on the Kyoto Protocol's mechanisms for carbon-saving projects. The report recommended that the major countries agree to generate a quarter of their electricity from renewable sources by 2025 and to shift agricultural subsidies from food crops to biofuels.

The report recommended wider international use of emission trading schemes, which are already in use in the European Union, under which unused carbon dioxide quotas are sold. The profit motive, stated the report, is expected to drive investment in new technology to cut emissions further.

The failure by the American federal government to take action on global warming has created a leadership vacuum that is rapidly being filled by cities, states and businesses. In the United States, over 280 cities have formally committed to take following three actions:

- Strive to meet or beat the Kyoto Protocol targets in their own communities, through actions ranging from anti-sprawl land-use policies to urban forest restoration projects to public information campaigns;
- Urge their state governments, and the federal government, to enact policies and programs to meet or beat the greenhouse gas emission reduction target suggested for the United States in the Kyoto Protocol—7% reduction from 1990 levels by 2012; and
- Urge the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emission trading system⁶⁰

Fortunately, American companies and communities can reduce their emissions of greenhouse gases through economic, technical and social means.

The Local Governments for Sustainability (ICLEI) "Cities for Climate Protection Program"⁶¹ offers a coherent program a community can follow to implement a global warming mitigation program.

The Emerging Greenhouse Gas Marketplace

While it is highly likely that some form of national regulation over greenhouse gas emissions will be introduced soon, companies should not wait until they are forced to limit their emissions. The early adopters gain substantial first mover advantages.

*...companies
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The advent of the Chicago Climate Exchange (CCX) carbon trading mechanism provides companies and other organizations emitting GHGs both the opportunity to systematically reduce their emissions, sell greater reductions in emissions, and participate in a proven risk-management system of futures contracts and financial derivatives.⁶²

The Chicago Climate Exchange (CCX) is North America's only, and the world's first, greenhouse gas emission registry, reduction and trading system for all six GHGs of which CO₂ dominates. It recently announced a partnership to create the Canadian Climate Exchange and is in negotiations with such countries as China and India. It also offers offset projects in the United States, Canada, Mexico and Brazil. It is a self-regulatory, rules-based exchange designed and governed by its members.

Members make a voluntary but legally binding commitment to reduce GHG emissions. By the end of Phase I (December, 2006) all members will have reduced direct emissions four percent below a baseline period of 1998-2001. Phase II, which extends the CCX reduction program through 2010, will require all members to reduce GHG emissions 6 percent below baseline. In the first year, members of the exchange collectively reduced their carbon emissions by 9 percent, or two percent more than would have been required had the U.S. been a member of the Kyoto Protocol. Companies undertaking such programs are finding that it can save significant amounts of money.

Opening with 16 members in December of 2004, CCX now has over 200 members (including such businesses as DuPont, and American Electric Power, IBM, Ford Motor Co, Motorola, Dow Corning, Waste Management and Baxter Health Care) representing over 8 percent of all direct U.S. greenhouse gas emissions. The State of New Mexico, cities such as Chicago and Boulder, universities such as Presidio School of Management, Tufts and University of Oklahoma, and a wide array of smaller businesses and non-profit groups are also members.

In August 2006, California became the first state in the nation to impose mandatory limits on greenhouse gas emissions, requiring a 25 percent cut in greenhouse gases by 2020...

CCX has proven that businesses can engage in reduction of emissions and remain profitable. But it is only the first of a growing number of efforts to create carbon markets in the United States. The seven Northeastern states have approved the Regional Greenhouse Gas Initiative, a mandatory regulatory scheme. Over 20 states have already either passed or proposed legislation on CO₂ emissions, or have developed carbon registries.

In August 2006, California became the first state in the nation to impose mandatory limits on greenhouse gas emissions, requiring a 25 percent cut in greenhouse gases by 2020 that would affect companies from automakers to manufacturers. The state is the



12th largest carbon emitter in the world despite leading the nation in energy efficiency standards and its lead role in protecting its environment.⁶³ The California Chamber of Commerce opposed the bill, but such business groups as A New Voice for Business⁶⁴ supported the measure stating that it would create jobs and help to launch a whole new industry in California. Many believe the legislation will be the turning point in the country's global warming policy.

There is now such a proliferation of inconsistent carbon reduction regimes that in early April 2006, a group of major businesses called on Congress to pass national legislation capping carbon emissions to relieve them of having to navigate the competing schemes.

The Senate Energy and Natural Resources Committee heard statements from leaders representing eight big energy companies, including GE, Shell and the two largest owners of utilities in the United States, Exelon and Duke Energy. Six of the eight said they would welcome or accept mandatory caps on their greenhouse gas emissions. Wal-Mart executives also spoke in favor of carbon caps. The companies stated that federal regulations would bring stability and sureness to the market. David Slump, the top marketing executive in GE's energy division, said at the hearing, "GE supports congressional action now." Two representatives from the energy sector, Southern Company and American Electric Power, called for a voluntary rather than mandatory program, but they acknowledged that regulations may be coming, and offered detailed advice on how they should be designed.⁶⁵

At subsequent Senate hearings on global warming, Senator Bingaman asked representatives of CCX whether there were any reasons that the U.S. should not simply implement CCX as the basis for a regulated U.S. carbon market.

The Business Case For Not Waiting for Regulation

As energy prices have risen, many companies have chosen to go ahead and implement energy savings measures. Over a 12-year period in the 1980s, Dow's Louisiana plant was able to save enough energy implementing worker suggested savings measures to add \$110 million each year to the bottom line. Each measure also reduced Dow's carbon footprint.⁶⁶

In 2000, as part of re-branding itself as "Beyond Petroleum," British Petroleum (BP) announced a corporate commitment to reduce its emissions of GHGs. In 1997, in a speech at Stanford University, California, group chief executive Lord Browne stated that "BP accepted that the problem was potentially very serious and that precautionary action was justified." BP then announced a target for 2010: that GHG emissions from its own operations would be 10 percent lower than emissions in 1990. BP achieved

*...four
engineers at
DuPont
recently
figured out
how to spend
less than
\$100,000 to
save nearly \$7
million per
year in energy
costs.*



that target at the end of 2001, nine years ahead of schedule, and gained around \$750 million in net present value through increased operational efficiency, the application of technological innovation and improved energy management. While returns on traditional investments average 40-50 percent, investments in increasing energy efficiency often return 70 percent or more.⁶⁷ BP is now one of the world's largest solar companies and sees its 50-year future as one of transition away from fossil fuels to becoming an energy company.

Financial savings are not the only reason that companies engage in such behavior. Rodney Chase, a senior executive at BP, subsequently reflected that even if the program had cost BP money, it would have been worth doing because it made them the kind of company that the best talent wants to work for.⁶⁸ It is reducing costs, gaining market share and attracting and retaining the best talent.⁶⁹

DuPont, an even earlier entrant into the field, committed itself to reducing its GHGs by 65 percent from 1990 to 2010. The company also set plans to raise revenues 6 percent per year from 2000-2010 with no increase in energy use, and by 2010 source 10 percent of its energy and 25 percent of its feed-stocks from renewable sources. The company announced these goals in the name of increasing "shareholder and societal value."

To date, DuPont has kept energy use the same and increased production by 30 percent. Globally, DuPont's emissions of GHGs are down 72 percent. Global energy use is 7 percent below 1990 levels, and the company is on track with its renewable energy targets. It estimates that this program has already saved the company \$3 billion.⁷⁰ In one example, four engineers at DuPont recently figured out how to spend less than \$100,000 to save nearly \$7 million per year in energy costs.⁷¹

Lighting retrofits often improve visual performance so significantly that they can lead to significant increases in labor productivity and reductions in error rates.

Under CEO Mike Eskew, United Parcel Service (UPS) has assembled one of the biggest alternative-fuel fleets, around 1,500 vehicles strong. In February 2006, UPS announced that it had placed an order for 50 new-generation hybrid-electric delivery trucks, which will reduce fuel consumption by 44,000 gallons over the course of a year.⁷²

Many participants in the voluntary U.S. EPA performance-challenge programs (such as 33/50⁷³ and Green Lights⁷⁴) reported that energy efficiency enabled them to capture multiple benefits. For example, Sony Electronics' U.S. and Mexican facilities voluntarily installed energy-efficient lighting where it was cost-effective and did not interfere with the quality of light. By the end of 1994, the organization had upgraded approximately 6.1 million square feet of floor space with new lighting fixtures, reduced its operating expenses by more than \$915,000 per year and lowered energy demand by almost 12 million kilowatt hours annually. In addition, these lighting changes indirectly prevented more than 7,300 tons of air pollution from being emitted by local utility companies.⁷⁵



Sony found its participation in the EPA's Green Lights program to be advantageous. Lighting retrofits often improve visual performance so significantly that they can lead to significant increases in labor productivity and reductions in error rates. The financial benefits from this far outweigh the value of the energy savings. For example, Boeing implemented a lighting system retrofit in its design and manufacturing areas. The program cut lighting energy costs by 90 percent with a less than 2-year payback, but because workers could see better they avoided rework—the error rate decreased 30 percent—which increased on-time delivery, and enhanced customer satisfaction.⁷⁶

Lockheed commissioned a new headquarters building for its Sunnyvale facility. The architects successfully argued that the “litterium” that provided day-lighting throughout the structure was not merely a worker amenity, but was essential to the performance of the building. They were right: the lighting system resulted in a 75 percent reduction in lighting energy usage. This contributed to enabling the building to use half the energy of a comparable standard building. The different design added \$2 million to the cost of the building—the reason the “value engineers” sought to eliminate it from the design. However, it is saving Lockheed \$500,000+ per year worth of energy, or a 4-year payback. The greatest benefit to Lockheed was the effect on their human capital: because workers enjoyed the space, absenteeism dropped by 15 percent and productivity increased 15 percent. The gains from this won Lockheed a very competitive contract, the profits from which paid-off the entire costs of the building.⁷⁷

It appears that people simply perform better in well-designed spaces. A study by PG&E showed that in good “green” buildings, day-lighting can enable students to achieve 20 to 26 percent higher test scores, and retail stores to have up to 40 percent higher sales than conventional stores.⁷⁸

In 1987, the former NMB Bank in The Netherlands completed a new 538,000 square foot headquarters. The bank's management, desiring to improve the somewhat stodgy image of the company, commissioned the creation of a “green headquarters.” The building uses 10 percent of the energy of a similar building constructed at the same time (90 percent savings). The annual energy savings of \$2.9 million required only \$700,000 additional building cost—a three-month payback on energy costs alone. Employees reported being more comfortable and absenteeism declined 15 percent, dramatically increasing project return on investment. The new headquarters achieved its goal: it dramatically improved the image of the bank—which became the second largest bank in the Netherlands. The bank renamed itself ING and subsequently bought Bearings.⁷⁹

Even the U.S. Army is getting onto the act. At Fort Detrick, an energy performance contract will save 33,000 tons of CO₂ and \$2.9 million annually.⁸⁰ Fort Carson's goal is 100% renewable energy by 2027; it is a 25 year plan initiated in 2002. Ft Carson also has interim goals to achieve 40% of electricity and 10% of facility heat from renewable sources by 2013.⁸¹



The Impact on Small Businesses

Community programs to reduce energy use are particularly good for small businesses. Back in the 1970s when energy prices were rising, communities began implementing programs to reduce their use of energy. The results were extraordinary, and can be replicated today.

In 1974, the Osage Municipal Utility was faced with the need to build a new power plant to meet growing demand. Its general manager, Wes Birdsall, realized that if he built the plant, it would increase everyone's rates. Instead, he stepped across the meter to his customers' side and helped them use less of his product, electricity. Why on earth would a businessman ever do that?

*Why on earth
would a
businessman
ever do that?*

Birdsall realized that what his customers wanted was not raw kilowatt-hours, but the energy "services" of comfort in their homes: shaft-power in factories, illumination, cold beer and the other services that energy delivers. People buy energy, but what they really want is the service. If they can get the same or improved service more cheaply using energy more efficiently or from a different source, they will jump at it. Birdsall realized that if he raised his prices, not only would he be doing his customers a disservice, but that they might turn to other options. By meeting their desires for energy services at lower cost, he retained them as customers, and began one of the most remarkable economic development stories in rural America.

Birdsall's program was able to save over a million dollars a year in this town of 3,800 people and generate over 100 new jobs. A report on the program found that, "Industries are expanding and choosing to remain in Osage because they can make money through employees who are highly productive and through utility rates that are considerably lower than neighboring cities."⁸² Birdsall was able to reduce electric bills to half that of the state average and unemployment to half that of the national average, because with the lower rates new factories came to town. He held electric growth level until 1984. The program was profiled in the *Wall Street Journal*, and was copied by other utilities.

According to a USDA study of Osage, "The local business people calculated that every \$1 spent on ordinary consumer goods in local stores generated \$1.90 of economic activity in the town's economy. By comparison, petroleum products generated a multiplier of \$1.51; utility services, \$1.66; and energy efficiency, \$2.23. Moreover, the town was able to attract desirable industries because of the reduced energy operating costs resulting from efficiency measures put in place. Energy efficiency has a long and successful track record in Osage as a key economic development strategy."⁸³

Thirty years later, a June 2006 article in *Business Week* pointed out that small businesses, the economic engine of growth, will be especially hard hit by climate change, and can disproportionately benefit from programs to reduce their emissions, stating:



It's increasingly likely that a mandatory program to reduce greenhouse gas emissions will come to pass. This prospect of further government regulation is one reason small business owners should pay attention. But it's not the only one. Small firms could well be among the hardest hit victims of climate change.

Extreme weather events, for example, can wipe out an entire region's small businesses in one fell swoop. And they can't readily bounce back from disruptions caused by natural disasters. Look at the impact of Hurricane Katrina on small businesses in the Gulf Coast region, where they constituted the backbone of the economy....

There's been virtually no research on what global warming means for small business, even though 23 million U.S. small businesses constitute one-half of the economy.

There is some good news for small businesses, however. To start with, reducing energy waste in U.S. homes, shops, offices, and other buildings must, of necessity, rely on tens of thousands of small concerns that design, make, sell, install and service energy-efficient appliances, lighting products, heating, air-conditioning, and other equipment.

What's more, devising technological fixes to curb greenhouse gas emissions must rely on the capacity of small business innovators and entrepreneurs to produce "clean-tech" breakthroughs in photovoltaics, distributed energy, fiber-optic sensors, and the like.

Finally, every single small business in the nation can profit by making its own workplace more energy-efficient. According to the EPA's Energy Star Small Business program, small firms can save (at least) 20% to 30% on their energy bills through off-the-shelf cost-effective efficiency upgrades. The job consists largely of installing the same few simple devices—programmable thermostats, for example—over and over again in millions of small business workplaces.⁸⁴

Small office buildings can achieve similar savings. A project to remodel a 2,800 square foot law office in Louisiana improved employee productivity with energy systems that saved over \$6,000 while eliminating 50 tons of CO₂ emissions per year.⁸⁵

Combining Energy Efficiency and Renewable Energy

In 1989, the municipal utility in Sacramento, California shut down its 1,000-megawatt nuclear plant. Rather than invest in any conventional centralized fossil fuel plant, the utility met its citizens' needs through energy efficiency and such renewable supply technologies as wind, solar, biofuels and distributed technologies like co-generation,



fuel cells, etc. In 2000, an econometric study showed that the program has increased the regional economic health by over \$180 million, compared to just running the existing nuclear plant. The utility was able to hold rates level for a decade, retaining 2,000 jobs in factories that would have been lost under the 80 percent increase in rates that just operating the power plant would have caused. The program generated 880 new jobs, and enabled the utility to pay off all of its debt.

Toyota's Torrance, California office complex, completed in 2003, combines energy-efficiency strategies such as roof color, photovoltaic solar electricity and 'little things' including an advanced building automation system, a utilities metering system, natural-gas-fired absorption chillers for the HVAC system, an Energy Star cool roof system and thermally insulated, double-paned glazing. The 600,000+ square foot campus exceeds California's stringent energy efficiency requirements by 24 percent at no additional cost than a conventional office building.⁸⁶

A recent article by utility regulator S. David Freeman, once Chair of the Tennessee Valley Authority, and Jim Harding of the Washington State Energy Office announced that a company called Nanosolar is building a \$100 million manufacturing facility in the San Francisco Bay area to produce solar cells very cheaply. The resulting solar panels would bring the cost of power to below that now available in a large part of the world.

Backed by a powerful team of private investors, including Google's two founders and the insurance giant Swiss Re, Nanosolar announced plans to produce 215 megawatts of solar energy next year, and soon thereafter capable of producing 430 megawatts of cells annually.

What makes this particular news stand out? Cost, scale and financial strength. The cost of the facility is about one-tenth that of recently completed silicon cell facilities.

Second, Nanosolar is scaling up rapidly from pilot production to 430 megawatts, using a technology it equates to printing newspapers. That implies both technical success and development of a highly automated production process that captures important economies of scale. No one builds that sort of industrial production facility in the Bay Area—with expensive labor, real estate and electricity costs—without confidence.

Thin solar films can be used in building materials, including roofing materials and glass, and built into mortgages, reducing their cost even further. Inexpensive solar electric cells are, fundamentally, a "disruptive technology," even in Seattle, with below-average electric rates and many cloudy days. Much like cellular phones have changed the way people

The 600,000+ square foot campus exceeds California's stringent energy efficiency requirements by 24 percent at no additional cost than a conventional office building.



communicate, cheap solar cells change the way we produce and distribute electric energy. The race is on.

The announcements are good news for consumers worried about high energy prices and dependence on the Middle East, utility executives worried about the long-term viability of their next investment in central station power plants, transmission, or distribution, and for all of us who worry about climate change. It is also good news for the developing world, where electricity generally is more expensive, mostly because electrification requires long-distance transmission and serves small or irregular loads. Inexpensive solar cells are an ideal solution.

Meanwhile, the prospect of this technology creates a conundrum for the electric utility industry and Wall Street. Can—or should—any utility, or investor, count on the long-term viability of a coal, nuclear or gas investment? The answer is no. In about a year, we'll see how well those technologies work. The question is whether federal energy policy can change fast enough to join what appears to be a revolution.⁸⁷

Renewable options are not only the best choice for developing countries; they are now the fastest growing form of energy supply around the world, and in many cases are cheaper than conventional supply. Solar thermal is outpacing all conventional energy supply technology around the world. Modern wind machines come second, delivering almost 8,000 megawatts of new capacity a year, or more than nuclear power did at the peak of its popularity. The next fastest growing energy supply technology is solar electric, even at current prices.⁸⁸

Renewables can also be cheaper than any conventional supply. Energy from wind turbines in good sites now costs 3¢ per kilowatt-hour (kWh).⁸⁹ And once the turbine is constructed, the fuel is free forever more. Just running an existing coal plant costs 5¢ to 6¢ per kWh. Solar electric is more expensive, although about a dozen companies are competing to deliver amorphous thin-film solar at 3¢ per kWh. Such renewable technologies lend themselves to construction and delivery by small to medium sized enterprises, the backbone of most economies around the world.

The Governor of Pennsylvania recently announced the opening of a factory to make wind machines. Creating 1,000 new jobs over the next five years, it is the biggest economic development measure for Johnstown, PA, in recent memory. The City of Chicago underwrote Spire solar to enable the company to open a manufacturing plant in Chicago. The City wanted the jobs and to be able to install solar on municipal buildings. California has announced that it will spend over \$8 million installing solar in 2006, and create a \$1.5 billion investment fund to help environmentally responsible companies that are developing cutting-edge clean energy technologies.



Ability to Capture Opportunities

Business success in a time of technological transformation demands innovation. Since the Industrial Revolution, there have been at least six waves of innovation in which the technologies that underpinned economic prosperity shifted. In the late 1700s textiles, iron mongering, water-power and mechanization enabled modern commerce to develop.

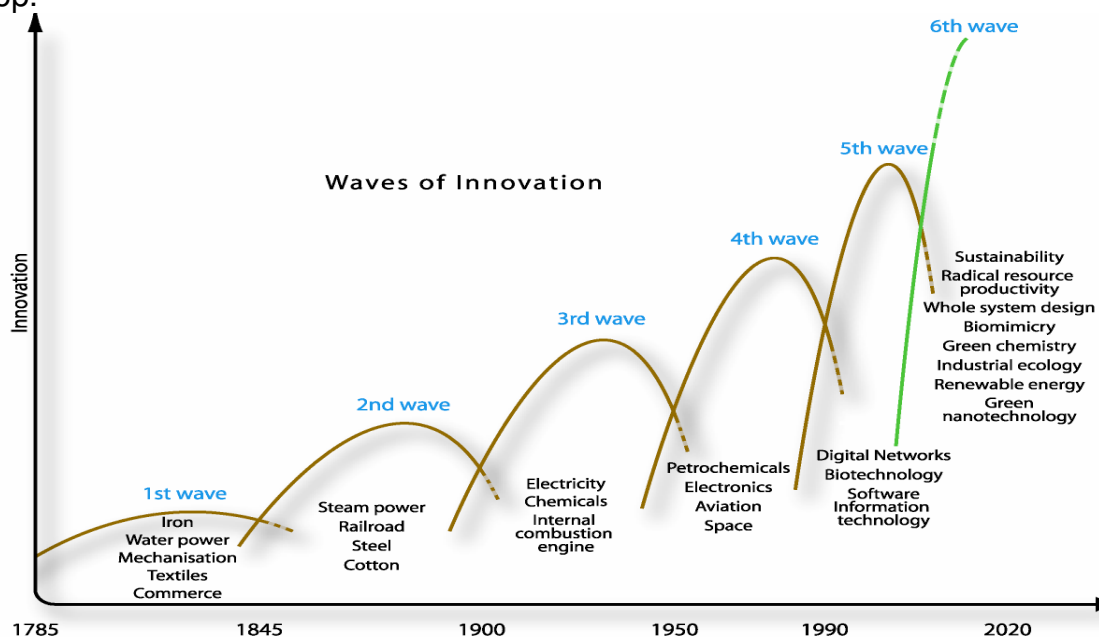


Figure 4 Waves of Innovation⁹⁰

The second wave saw the introduction of steam power, trains and steel. In the 1900s electricity, chemicals and cars began to dominate. By the middle of the century it was petrochemicals, and the space race, along with electronics. The most recent wave of innovation has been the introduction of computers, also known as the digital or information age. As the industrial revolution plays out and economies move beyond I-Pods, older industries will suffer dislocations, unless they join the increasing number of companies implementing the array of sustainable technologies that will make up the next wave of innovation.

Aidan Murphy, vice president at Shell International, stated in 2000:

The Kyoto treaty has prompted us to shift some of its [Shell's] focus away from petroleum toward alternative fuel sources. While the move has helped the company make early strides toward its goal of surpassing treaty requirements and reducing emissions to 10 percent less than 1990 levels, *Shell is being driven largely by the lure of future profits...* We are now involved in major energy projects involving wind and biomass, but I can assure you this has nothing to do with altruism... *We see this as a whole new field* in which to develop a thriving business for many years to come. Capital is not the problem, it's the lack of ideas and imagination.⁹¹



Sweden has set a national goal of an oil-free economy by 2020 without building any new nuclear plants. A report in the BBC stated, “The country aims to replace all fossil fuels with renewables before climate change damages economies and growing oil scarcity leads to price rises.” The program is driven in part by worry on the part of The Royal Swedish Academy of Sciences that oil supplies are peaking, and that high oil prices could cause global economic recession. In 2003, 26 percent of all energy consumed came from renewables.⁹²

To drive such innovation, Sweden, along with Germany and other European nations are experimenting with what is called “Tax Shifting.” This would increase the taxes on resource use, while lowering employment taxes and other disincentives to use more people. Lester Brown recently reported that, “A four-year plan adopted in Germany in 1999 systematically shifted taxes from labor to energy. By 2001, this plan had lowered fuel use by 5 percent. It had also accelerated growth in the renewable energy sector, creating some 45,400 jobs by 2003 in the wind industry alone, a number that is projected to rise to 103,000 by 2010.” Both Japan and China are now considering implementing such tax shifts.⁹³

Recently, 2,500 economists, including eight Nobel Prize laureates in economics, endorsed the concept of tax shifts. Harvard economics professor N. Gregory Mankiw wrote in Fortune:

Cutting income taxes while increasing gasoline taxes would lead to more rapid economic growth, less traffic congestion, safer roads and reduced risk of global warming—all without jeopardizing long-term fiscal solvency. This may be the closest thing to a free lunch that economics has to offer.⁹⁴

... jobless growth for major corporations worldwide is likely to remain not a forecast, but an established trend.

Without such a shift in policies, jobless growth for major corporations worldwide is likely to remain not a forecast, but an established trend. The world’s 500 largest corporations have managed to increase their production and sales by 700 percent over the past 20 years, while at the same time *reducing* their total workforce. The outsourcing of industrial jobs to China and service jobs to India has accelerated the impact of this process.⁹⁵

At the same time however, good people are increasingly critical for the functioning of any business that seeks to compete in the Knowledge Economy. Tom Peters, one of the world’s leading business authors, states:

We are in the midst of redefining our basic ideas about what enterprise and organization and even being human are—about how value is created and how careers are pursued. Welcome to a world where “value” (damn near all value!) is based on intangibles—not lumpy objects, but weightless figments of the Economic Imagination. ...We have entered an Age of Talent. People (their creativity, their intellectual capital, their entrepreneurial drive) is all there is. Enterprises that master the market for talent will do better than ever. But to attract and retain the Awesome Talent, an organization must offer up an Awesome Place to Work.⁹⁶



As stated above, this is driving such companies as BP to make public commitments to cut their emissions as a strategy for attracting and retaining the best talent.

Richard Florida, in his book, *The Rise of the Creative Class*,⁹⁷ points out that the cutting-edge businesses follow the knowledge workers, establishing corporate operations where they can access this new class of talent. He notes that regions that wish to be economically successful will do what it takes to attract the knowledge workers, which includes preserving the environment and establishing the sort of innovative cultural atmosphere that such people treasure.

Risk Minimization

the Sarbanes-Oxley Act makes it a criminal offense for the Board of Directors of a company to fail to disclose to shareholders information that might materially affect the value of the stock. This includes environmental liabilities (including GHG emissions)

In a world that overwhelmingly recognizes climate change as a serious threat, behavior that ignores it is increasingly seen as irresponsible. An aggressive business posture to reduce greenhouse gas emissions is becoming a proxy for competent corporate governance. A 2003 Columbia Journal of Environmental Law article demonstrated the legal feasibility of lawsuits holding companies accountable for climate change. Though the effects of such litigation on companies' market value and shareowner value remains to be seen, the first such suits have already been filed.⁹⁸

In the United States, the Sarbanes-Oxley Act⁹⁹ makes it a criminal offense for the Board of Directors of a company to fail to disclose to shareholders information that might materially affect the value of the stock. This includes environmental liabilities (including GHG emissions) that could alter a reasonable investor's view of the organization. In France, The Netherlands, Germany¹⁰⁰ and Norway, companies are already legally required to publicly report their GHG emissions.

For years the British NGO, the Carbon Disclosure Project, has sent a survey to the Financial Times 500, the largest companies in the world. Perhaps 10 percent of the recipients bothered to answer the survey. In 2005, 60 percent answered. Companies like Ford Motor Company produced a major report detailing its emissions. Why the change? Passage that year of Sarbanes Oxley clearly played a role. Perhaps more significantly, the Carbon Disclosure Project represents institutional investors with assets of over \$31 trillion. Increasingly companies that wish to limit their risk exposure, obtain insurance or get financing are implementing programs to reduce their emissions of greenhouse

gasses.



The FTSE Index, the British equivalent of Dow Jones, states,
 The impact of climate change is likely to have an increasing influence on the economic value of companies, both directly, and through new regulatory frameworks. Investors, governments and society in general expect companies to identify and reduce their climate change risks and impacts, and also to identify and develop related business opportunities.¹⁰¹

The banking industry is, itself, reducing its greenhouse footprint. In 2006, HSBC won the Financial Times' First Sustainable Banking Awards for being the first bank to become carbon neutral. It has purchased renewable energy for itself, and provided financing for renewable energy companies.¹⁰²

Wall Street's most prestigious investment bank, Goldman Sachs, is putting \$1 billion into clean-energy investments. It has also pledged to purchase more products locally.¹⁰³

In March 2006, the business and investment network CERES released a report showing that many major American companies were more potentially liable for lawsuits and other risks than their European counterparts because of their emissions of climate changing gasses. The New York Times stated,

Dozens of U.S. businesses in various climate-vulnerable sectors ... are still largely dismissing the issue or failing to articulate clear strategies to meet the challenge. Companies that disclose the amount of emissions of heat-trapping gases they produce and take steps to limit them cut their risks, including potential lawsuits from investors.¹⁰⁴

Perhaps the greatest pressure for change, however, will come from the insurance industry. As described above, the insurance companies are already being battered by losses from the increase in the violence of storms. In 2003 The Wall Street Journal reported in 2003 that,

With all the talk of potential shareholder lawsuits against industrial emitters of greenhouse gases, the second largest re-insurance firm, Swiss Re has announced that it is considering denying coverage, starting with directors and officers liability policies, to companies it decides aren't doing enough to reduce their output of greenhouse gases.¹⁰⁵

In March 2004, Reuters reported: "The world's second largest re-insurer, Swiss Re, warned ... that the costs of natural disasters, aggravated by global warming, are spiraling out of control, forcing the human race into a catastrophe of its own making."¹⁰⁶

The real challenges to companies are the enormous risks they face if they do not take aggressive action to protect the climate.



In the Fortune Magazine article "Cloudy with a Chance of Chaos,"¹⁰⁷ author Eugene Linden reported,

Already the pain of weather-related insurance risks is being felt by owners of highly vulnerable properties such as offshore oil platforms, for which some rates have risen 400% in one year. That may be an omen for many businesses. Three years ago John Dutton, dean emeritus of Penn State's College of Earth and Mineral Sciences, estimated that \$2.7 trillion of the \$10-trillion-a-year US economy is susceptible to weather-related loss of revenue, implying that an enormous number of companies have off-balance-sheet risks related to weather - even without the cataclysms a flickering climate might bring.

In 2004, Swiss Reinsurance, a \$29 billion financial giant, sent a questionnaire to companies that had purchased its directors-and-officers coverage, inquiring about their corporate strategies for dealing with climate change regulations. D&O insurance, as it is called, insulates executives and board members from the costs of lawsuits resulting from their companies' actions; Swiss Re is a major player in D&O reinsurance.

What Swiss Re is after, says Christopher Walker, who heads its Greenhouse Gas Risk Solutions unit, is reinsurance that customers will not make themselves vulnerable to global-warming-related lawsuits. He cites as an example Exxon Mobil: The oil giant, which accounts for roughly 1% of global carbon emissions, has lobbied aggressively against efforts to reduce greenhouse gases. If Swiss Re judges that a company is exposing itself to lawsuits, says Walker, "we might then go to them and say, 'Since you don't think climate change is a problem, and you're betting your stockholders' assets on that, we're sure you won't mind if we exclude climate-related lawsuits and penalties from your D&O insurance.'" Swiss Re's customers may be put to the test soon in California, where Governor Arnold Schwarzenegger is pushing to restrict carbon emissions, says Walker. A customer that ignores the likelihood of such laws and, for instance, builds a coal-fired power plant that soon proves a terrible bet could face shareholder suits that Swiss Re might not want to insure against.

Conclusion

There is a business case for aggressively moving to limit emissions of the gasses that are changing the climate, and companies are implementing it. Books like the international bestseller, *Natural Capitalism*¹⁰⁸ and a staggering array of others prove how the rapidly emerging best practice in sustainable technologies can meet basic human needs around the world and solve most of the environmental problems facing the planet *at a profit*.

The real challenges to companies are the enormous risks they face if they do not take aggressive action to protect the climate.



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