

**Plan B 2.0: Rescuing a Planet Under Stress and a Civilization in Trouble<sup>1</sup>**  
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Our global economy is outgrowing the capacity of the earth to support it, moving our early twenty-first century civilization ever closer to decline and possible collapse. In our preoccupation with quarterly earnings reports and year-to-year economic growth, we have lost sight of how large the human enterprise has become relative to the earth's resources. A century ago, annual growth in the world economy was measured in billions of dollars. Today it is measured in trillions.

As a result, we are consuming renewable resources faster than they can regenerate. Forests are shrinking, grasslands are deteriorating, water tables are falling, fisheries are collapsing, and soils are eroding. We are using up oil at a pace that leaves little time to plan beyond peak oil. And we are discharging greenhouse gases into the atmosphere faster than nature can absorb them, setting the stage for a rise in the earth's temperature well above any since agriculture began.

Fortunately, there is a consensus emerging among scientists on the broad outlines of the changes needed. If economic progress is to be sustained, we need to replace the fossil-fuel-based, automobile-centered, throwaway economy with a new economic model. Instead of being based on fossil fuels, the new economy will be powered by abundant sources of renewable energy: wind, solar, geothermal, hydropower, and biofuels.

The throwaway economy will be replaced by a comprehensive reuse/recycle economy. Consumer products from cars to computers will be designed so that they can be disassembled into their component parts and completely recycled. Throwaway products such as single-use beverage containers will be phased out.

The good news is that we can already see glimpses here and there of what this new economy looks like. We have the technologies to build it—including, for example, gas-electric hybrid cars, advanced-design wind turbines, highly efficient refrigerators, and water-efficient irrigation systems. And with each wind farm, rooftop solar panel, paper recycling facility, bicycle path, and reforestation program, we move closer to an economy that can sustain economic progress.

### **The Nature of the New World**

We recently entered a new century, but we are also entering a new world, one where the collisions between our demands and the earth's capacity to satisfy them are becoming daily events. It may be another crop-withering heat wave, another village abandoned because of invading sand dunes, or another aquifer pumped dry. If we do not act quickly to reverse the

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trends, these seemingly isolated events will come more and more frequently, accumulating and combining to determine our future.

Resources that accumulated over eons of geological time are being consumed in a single human lifespan. We are crossing natural thresholds that we cannot see and violating deadlines that we do not recognize. These deadlines, determined by nature, are not politically negotiable.

Nature has many thresholds that we discover only when it is too late. In our fast-forward world, we learn that we have crossed them only after the fact, leaving little time to adjust. For example, when we exceed the sustainable catch of a fishery, the stocks begin to shrink. Once this threshold is crossed, we have a limited time in which to back off and lighten the catch. If we fail to meet this deadline, breeding populations shrink to where the fishery is no longer viable, and it collapses.

We know from earlier civilizations that the lead indicators of economic decline were environmental, not economic. The trees went first, then the soil, and finally the civilization itself. To archeologists, the sequence is all too familiar.

Our situation today is far more challenging because in addition to shrinking forests and eroding soils, we must deal with falling water tables, more frequent crop-withering heat waves, collapsing fisheries, expanding deserts, deteriorating rangelands, dying coral reefs, melting glaciers, rising seas, more-powerful storms, disappearing species, and, soon, shrinking oil supplies. Although these ecologically destructive trends have been evident for some time, and some have been reversed at the national level, not one has been reversed at the global level.

The bottom line is that the world is in what ecologists call an “overshoot-and-collapse” mode. Demand has exceeded the sustainable yield of natural systems at the local level countless times in the past. Now, for the first time, it is doing so at the global level. Forests are shrinking for the world as a whole. Fishery collapses are widespread. Grasslands are deteriorating on every continent. Water tables are falling in many countries. Carbon dioxide (CO<sub>2</sub>) emissions exceed CO<sub>2</sub> fixation everywhere.

Ecologists are intimately familiar with the overshoot-and-collapse phenomenon. Overshoot leads sometimes to decline and sometimes to a complete collapse. In the former, a remnant of the population or economic activity survives in a resource-depleted environment. For example, as the environmental resource base of Easter Island in the South Pacific deteriorated, its population declined from a peak of 20,000 several centuries ago to today’s population of fewer than 4,000. In contrast, the 500-year-old Norse settlement in Greenland collapsed during the 1400s, disappearing entirely in the face of environmental adversity.

The most recent mid-level U.N. demographic projections show world population increasing from 6.1 billion in 2000 to 9.1 billion in 2050. But such an increase seems highly unlikely, considering the deterioration in life-support systems now under way in much of the world. Will we not reach 9.1 billion because we quickly eradicate global poverty and lower birth rates? Or because we fail to do so and death rates begin to rise, as they are already doing in many African countries? We

thus face two urgent major challenges: restructuring the global economy and stabilizing world population.

Even as the economy's environmental support systems are deteriorating, the world is pumping oil with reckless abandon. Leading geologists now think oil production may soon peak and turn downward. This collision between the ever-growing demand for oil and the earth's finite resources is but the latest in a long series of collisions. Although no one knows exactly when oil production will peak, supply is already lagging behind demand, driving prices upward.

In this new world, the price of oil begins to set the price of food, not so much because of rising fuel costs for farmers and food processors but more because almost everything we eat can be converted into fuel for cars. In this new world of high oil prices, supermarkets and service stations will compete in commodity markets for basic food commodities such as wheat, corn, soybeans, and sugarcane. Wheat going into the market can be converted into bread for supermarkets or ethanol for service stations. Soybean oil can go onto supermarket shelves or it can go to service stations to be used as diesel fuel. In effect, owners of the world's 800 million cars will be competing for food resources with the 1.2 billion people living on less than \$1 a day.

Faced with a seemingly insatiable demand for automotive fuel, farmers will want to clear more and more of the remaining tropical forests to produce sugarcane, oil palms, and other high-yielding fuel crops. Already, billions of dollars of private capital are moving into this effort. In effect, the rising price of oil is generating a massive new threat to the earth's biological diversity.

As the demand for farm commodities climbs, it is shifting the focus of international trade concerns from the traditional goal of assured access to markets to one of assured access to supplies. Countries heavily dependent on imported grain for food are beginning to worry that buyers for fuel distilleries may outbid them for supplies. As oil security deteriorates, so, too, will food security.

As the role of oil recedes, the process of globalization will be reversed in fundamental ways. As the world turned to oil during the last century, the energy economy became increasingly globalized, with the world depending heavily on a handful of countries in the Middle East for energy supplies. Now as the world turns to wind, solar cells, and geothermal energy in this century, we are witnessing the localization of the world energy economy.

The globalization of the world food economy will also be reversed, as the higher price of oil raises the cost of transporting food internationally. In response, food production and consumption will become much more localized, leading to diets based more on locally produced food and seasonal availability.

The world is facing the emergence of a geopolitics of scarcity, which is already highly visible in the efforts by China, India, and other developing countries to ensure their access to oil supplies. In the future, the issue will be who gets access to not only Middle Eastern oil but also Brazilian ethanol and North American grain. Pressures on land and water resources, already excessive in most of the world, will intensify further as the demand for biofuels climbs. This geopolitics of scarcity is an early manifestation of civilization in an overshoot-and-collapse mode, much like

the one that emerged among the Mayan cities competing for food in that civilization's waning years.

You do not need to be an ecologist to see that if recent environmental trends continue, the global economy eventually will come crashing down. It is not knowledge that we lack. At issue is whether national governments can stabilize population and restructure the economy before time runs out. Looking at what is happening in China helps us to see the urgency of acting quickly.

### **Learning from China**

For many years environmentalists have pointed to the United States as the world's leading consumer, noting that 5 percent of the world's people were consuming nearly a third of the earth's resources. Although that was true for some time, it no longer is. China has replaced the United States as the leading consumer of basic commodities.

Among the five basic food, energy, and industrial commodities—grain and meat, oil and coal, and steel—consumption in China has eclipsed that of the United States in all but oil. China has opened a wide lead with grain, consuming 380 million tons in 2005 versus 260 million tons in the United States. Among the big three grains, China leads in the consumption of both wheat and rice and trails the United States only in corn.

Although eating hamburgers is a defining element of the U.S. lifestyle, China's 2005 meat consumption of 67 million tons is far above the 38 million tons eaten in the United States. While U.S. meat intake is rather evenly distributed between beef, pork, and poultry, in China pork totally dominates. Indeed, half the world's pigs are now found in China.

With oil, the United States was still solidly in the lead in 2004, using more than three times as much as China—20.4 million barrels per day versus 6.5 million barrels. But U.S. oil use expanded by only 15 percent between 1994 and 2004, while use in China more than doubled. Having recently eclipsed Japan as an oil consumer, China now trails only the United States.

Energy use in China also obviously includes coal, which supplies nearly two thirds of the country's energy. China's annual burning of 960 million tons easily exceeds the 560 million tons used in the United States. With this level of coal use and with oil and natural gas use also climbing fast, it is only a matter of time before China's carbon emissions match those of the United States. Then the world will have two major countries driving climate change.

China's consumption of steel, a basic indicator of industrial development, is now nearly two and a half times that of the United States: 258 million tons to 104 million tons in 2003. As China has moved into the construction phase of development, building hundreds of thousands of factories and high-rise apartment and office buildings, steel consumption has climbed to levels never seen in any country.

With consumer goods, China leads in the number of cell phones, television sets, and refrigerators. The United States still leads in the number of personal computers, though likely not for much longer, and in automobiles.

That China has overtaken the United States in consumption of basic resources gives us license to ask the next question. What if China catches up with the United States in consumption per person? If the Chinese economy continues to grow at 8 percent a year, by 2031 income per person will equal that in the United States in 2004. If we further assume that consumption patterns of China's affluent population in 2031, by then 1.45 billion, will be roughly similar to those of Americans in 2004, we have a startling answer to our question.

At the current annual U.S. grain consumption of 900 kilograms per person, including industrial use, China's grain consumption in 2031 would equal roughly two thirds of the current world grain harvest. If paper use per person in China in 2031 reaches the current U.S. level, this translates into 305 million tons of paper—double existing world production of 161 million tons. There go the world's forests. And if oil consumption per person reaches the U.S. level by 2031, China will use 99 million barrels of oil a day. The world is currently producing 84 million barrels a day and may never produce much more. This helps explain why China's fast-expanding use of oil is already helping to create a politics of scarcity.

Or consider cars. If China one day should have three cars for every four people, as the United States now does, its fleet would total 1.1 billion vehicles, well beyond the current world fleet of 800 million. Providing the roads, highways, and parking lots for such a fleet would require paving an area roughly equal to China's land in rice, its principal food staple.

The inevitable conclusion to be drawn from these projections is that there are not enough resources for China to reach U.S. consumption levels. The western economic model—the fossil-fuel-based, automobile-centered, throwaway economy—will not work for China's 1.45 billion in 2031. If it does not work for China, it will not work for India either, which by 2031 is projected to have even more people than China. Nor will it work for the other 3 billion people in developing countries who are also dreaming the "American dream." And in an increasingly integrated world economy, where countries everywhere are competing for the same resources—the same oil, grain, and iron ore—the existing economic model will not work for industrial countries either.

### **Listening for Wake-up Calls**

We are entering a new world. Of that there can be little doubt. What we do not know is whether it will be a world of decline and collapse or a world of environmental restoration and economic progress. Can the world mobilize quickly enough? Where will the wake-up calls come from? What form will they take? Will we hear them?

In the eyes of many, Hurricane Katrina was just such a wake-up call. Until recently, the most costly weather-related events on record were Hurricane Andrew, which struck Florida in 1992, and the flooding in China's Yangtze River basin in 1998, each causing an estimated \$30 billion in damage. When Hurricane Katrina hit the U.S. Gulf Coast in late summer 2005, devastating New Orleans, its estimated cost was \$200 billion—nearly seven times the previous record. Higher surface water temperatures helped make Katrina one of the most powerful storms ever to make landfall in the United States.

In 1995, an intense heat wave in Chicago claimed more than 700 lives, focusing U.S. attention on climate change, but it was a minor event compared with the record 2003 heat wave in Europe that claimed 49,000 lives. France reported 14,800 deaths; Italy more than 18,000. Unfortunately this tragic loss of life was never adequately reported simply because the death toll numbers dribbled out over several months and at different times for each country. Just as the destruction from Hurricane Katrina was several times the previous record, so too the fatalities from this heat wave broke all previous fatality records by severalfold.

Could a wake-up call take the form of a flood of environmental refugees? Political leaders in sub-Saharan Africa are talking about planting a 5-kilometer-wide and 7,000-kilometer-long belt of trees across the continent in front of the desert in an effort to stop its advance. Whether the African countries can establish a Great Green Wall, and do it quickly enough to halt the desert's advance, remains to be seen. If they fail, we are looking at millions of refugees as productive land turns to desert.

In September 2005, scientists reported that the melting of ice in the Arctic may have reached a "tipping point." We may have unknowingly crossed one of nature's thresholds. According to one article, the team of scientists "believe global warming is melting Arctic ice so rapidly that the region is beginning to absorb more heat from the sun, causing the ice to melt still further and so reinforcing a vicious cycle of melting and heating." If the ice in the Arctic Sea melts and the region's climate continues to warm, the ice sheet covering Greenland, in some places a mile and a half thick, will eventually disappear. It would raise sea level by 23 feet, inundating many of the world's coastal cities and rice-growing river floodplains.

If it becomes clear that we have set in motion a rise in sea level that we cannot arrest or reverse, how will this affect the way we think about ourselves as individuals and as a society? Will we face a social fracturing between generations, between those who caused the rise in sea level and those who must deal with its consequences?

Is the record price of oil in an aberration or does it reflect something more fundamental—a failure to plan for the depletion of the world's oil reserves? Is it a result of system failure? If so, can the international community pull itself together to stabilize oil prices and avoid both a possible oil-based global economic depression and spreading conflict over access to remaining oil reserves?

Are these wake-up calls? If so, they have not yet awakened us. Have we pushed the snooze button so we can sleep a while longer? Or are these issues just too complicated to comprehend?

### **Plan B—A Plan of Hope**

Even given the extraordinarily challenging situation we face, there is much to be upbeat about. First, virtually all the destructive environmental trends are of our own making. All the problems we face can be dealt with using existing technologies. And almost everything we need to do to move the world economy onto an environmentally sustainable path has been done in one or more countries.

### *Stabilizing Climate*

Although stabilizing atmospheric carbon dioxide levels is a staggering challenge, it is entirely doable. With advances in wind turbine design, the evolution of gas-electric hybrid cars, advances in solar cell manufacturing, and gains in the efficiency of household appliances, we now have the basic technologies needed to shift quickly from a fossil-fuel-based to a renewable-energy-based economy. Cutting world carbon emissions in half by 2015 is entirely within range. Ambitious though this goal might seem, it is commensurate with the threat that climate change poses.

The enormous potential for raising energy productivity becomes clear in comparisons of energy use among countries. Some nations in Europe have essentially the same living standard as the United States yet use scarcely half as much energy per person. But even the countries that use energy most efficiently are not close to realizing the full potential for doing so.

When the Bush administration released a new energy plan in April 2001 that called for construction of 1,300 new power plants by 2020, Bill Prindle of the Washington-based Alliance to Save Energy responded by pointing out how the country could eliminate the need for those plants and save money in the process. He ticked off several steps that would reduce the demand for electricity: Improving efficiency standards for household appliances would eliminate the need for 127 power plants. More stringent residential air conditioner efficiency standards would eliminate 43 power plants. Raising commercial air conditioner standards would eliminate the need for 50 plants. Using tax credits and energy codes to improve the efficiency of new buildings would save another 170 plants. Similar steps to raise the energy efficiency of existing buildings would save 210 plants. These five measures from the longer list suggested by Prindle would not only eliminate the need for 600 power plants, they would also save money. Although these calculations were made in 2001, they are still valid simply because there has been so little progress in raising U.S. energy efficiency since then.

Although there was an impressive round of efficiency gains in household appliances after the oil price jumps during the 1970s, the world generally lost interest as oil prices declined after 1980. Rising oil and natural gas prices are rekindling interest in this issue. Fortuitously, engineering advances since then have brought another wave of efficiency gains that promise to substantially reduce electricity use. If national governments raise appliance efficiency standards to fully exploit the latest technologies, it would sharply cut carbon emissions worldwide.

One simple energy-saving step is to replace all remaining incandescent light bulbs with compact fluorescent lamps (CFLs), which use only one third as much electricity and last 10 times as long. In the United States, where 20 percent of all electricity is used for lighting, if each household replaced the still widely used incandescents with compact fluorescents, electricity for lighting would be easily cut in half. The combination of greater longevity and lower electricity use greatly outweighs the higher costs of the CFLs, yielding a risk-free investment return of some 25–40 percent a year. Worldwide, replacing incandescent light bulbs with CFLs in, say, the next three years would facilitate the closing of hundreds of climate-disrupting coal-fired power plants.

A second obvious area for raising energy efficiency is automobiles. If over the next decade the United States, for example, were to shift from the current fleet of cars powered with gasoline engines to gas-electric hybrids with the fuel efficiency of the Toyota Prius, gasoline use could

easily be cut in half. Sales of hybrid cars, introduced into the U.S. market in 1999, reached an estimated 88,000 in 2004. Higher gasoline prices and mounting climate change worries are driving sales upward. With U.S. auto manufacturers coming onto the market with several new models, hybrid vehicle sales are projected to exceed 1 million by 2008.

As we shift to these cars, the stage is set for reducing gasoline use through the use of wind-generated electricity. If we add to the gas-electric hybrid a second battery to increase its electricity storage and a plug-in capacity so the batteries can also be recharged from the grid, motorists could then do their commuting, grocery shopping, and other short-distance travel largely with electricity, saving gasoline for the occasional long trip. Even more exciting, recharging batteries with off-peak wind-generated electricity would cost the equivalent of gasoline at 50¢ per gallon. This modification of hybrids could reduce remaining gasoline use by perhaps another 40 percent (or 20 percent of the original level of use), for a total reduction of gasoline use of 70 percent.

Unlike the widely discussed fuel cell/hydrogen transportation model, the gas-electric hybrid/wind model does not require a costly new infrastructure, since the network of gasoline service stations and the electricity grid are already in place. Moving to the highly efficient plug-in gas-electric hybrids, combined with the construction of thousands of wind farms across the country to feed electricity into a strong, integrated national grid, could cut U.S. gasoline use by 85 percent. It would also rejuvenate farm and ranch communities and shrink the U.S. balance-of-trade deficit. Even more important, it could cut automobile carbon emissions by some 85 percent, making the United States a model for other countries.

### *Cities for People*

Throughout the modern era, budget allocations for transportation in most countries—and in the United States, in particular—have been heavily biased toward the construction and maintenance of highways and streets. Creating more livable cities and the mobility that people desire depends on reallocating budgets to emphasize the development of rail- or bus-based public transport and bicycle support facilities.

Some cities are far better at planning their growth than others. They plan transport systems that provide mobility, clean air, and exercise—a sharp contrast to cities that offer congestion, unhealthy air, and little opportunity for exercise. When 95 percent of a city's workers depend on the automobile for commuting, as in Atlanta, Georgia, the city is in trouble. By contrast, in Amsterdam only 40 percent of workers commute by car; 35 percent commute by bike or walk, while 25 percent use public transit. Copenhagen's commuting patterns are almost identical to Amsterdam's. In Paris, just under half of commuters rely on cars. Even though these European cities are older, often with narrow streets, they have far less congestion than Atlanta.

There are many ways to restructure the transportation system so that it satisfies the needs of all people, not just the affluent, so that it provides mobility, not immobility, and so that it improves health rather than damaging it. One is to eliminate the subsidies, often indirect, that many employers provide for parking. For example, parking subsidies in the United States that are worth an estimated \$85 billion a year obviously encourage people to drive to work.

Scores of cities are declaring car-free areas, among them Stockholm, Vienna, Prague, and Rome. Paris enjoys a total ban on cars along stretches of the Seine River on Sundays and holidays and is looking to make much of the central city traffic-free starting in 2012.

In addition to ensuring that subways are functional and affordable, the idea of making them attractive, even cultural centers, is gaining support. In Moscow, with works of art in the stations, the subway system is justifiably referred to as Russia's crown jewel. In Washington, D.C., Union Station, which links the city's subway system with intercity train lines, is an architectural delight. Since its restoration was completed in 1988, it has become a social gathering place, with shops, conference rooms, and a rich array of restaurants.

### ***Getting the Price Right***

The question facing governments is whether they can respond quickly enough to prevent threats from becoming catastrophes. The world has precious little experience in responding to aquifer depletion, rising temperatures, expanding deserts, melting polar ice caps, and a shrinking oil supply. These new trends will fully challenge the capacity of our political institutions and leadership. In times of crisis, societies sometimes have a Nero as a leader and sometimes a Churchill.

The central challenge, the key to building the new economy, is getting the market to tell the ecological truth. The dysfunctional global economy of today has been shaped by market prices that do not incorporate environmental costs. Many of our environmental travails are the result of severe market distortions.

One of these distortions became abundantly clear in the summer of 1998 when China's Yangtze River valley, home to 400 million people, was wracked by some of the worst flooding in history. The resulting damages of \$30 billion exceeded the value of the country's annual rice harvest.

After several weeks of flooding, the government in Beijing announced in mid-August a ban on tree cutting in the Yangtze River basin. It justified the ban by noting that trees standing are worth three times as much as trees cut. The flood control services provided by forests were three times as valuable as the lumber in the trees. In effect, the market price was off by a factor of three! With this analysis, no one could economically justify cutting trees in the basin.

A similar situation exists with gasoline. In the United States, the gasoline pump price is now around \$3 per gallon. But this reflects only the cost of pumping the oil, refining it into gasoline, and delivering the gas to service stations. It does not include the costs of tax subsidies to the oil industry, such as the oil depletion allowance; the subsidies for the extraction, production, and use of petroleum; the burgeoning military costs of protecting access to oil supplies; the health care costs for treating respiratory illnesses ranging from asthma to emphysema; and, most important, the costs of climate change.

If these costs, which in 1998 the International Center for Technology Assessment calculated at roughly \$9 per gallon of gasoline burned in the United States, were added to the \$3 cost of the gasoline itself, motorists would pay about \$12 a gallon for gas at the pump. Filling a 20-gallon tank would cost \$240. In reality, burning gasoline is very costly, but the market tells us it is

cheap, leading to gross distortions in the structure of the economy. The challenge facing governments is to calculate such costs and to incorporate them as a tax on the product to make sure its price reflects the full costs to society.

If we have learned anything over the last few years, it is 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, costing millions of people their lifetime savings, retirement incomes, and jobs. Distorted world market prices that do not incorporate major costs in the production of various products and the provision of services could be even costlier. They could lead to global bankruptcy and economic decline.

### ***Tax Shifting***

The key to building a global economy that can sustain economic progress is the creation of an honest market, one that tells the ecological truth. The market is an incredible institution, allocating resources with an efficiency that no central planning body can match. It easily balances supply and demand, and it sets prices that readily reflect both scarcity and abundance.

The market does, however, have some fundamental weaknesses. It does not incorporate into prices the indirect costs of providing goods or services into prices, it does not value nature's services properly, and it does not respect the sustainable-yield thresholds of natural systems. It also favors the near term over the long term, showing little concern for future generations.

The need for tax shifting—lowering income taxes while raising levies on environmentally destructive activities—in order to get the market to tell the truth has been widely endorsed by economists. For example, a tax on coal that incorporated the increased health care costs associated with breathing polluted air, the costs of damage from acid rain, and the costs of climate disruption would encourage investment in renewable sources of energy such as wind or geothermal. With this concept in hand, it is a short step to tax shifting. A number of countries in Western Europe are already shifting taxes in a process known there as environmental tax reform.

Among the various environmentally damaging activities taxed in Europe are carbon emissions, the generation of garbage (so-called landfill taxes), and the excessive number of cars in cities. 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.

In 2001, Sweden launched a bold new 10-year environmental tax shift designed to convert 30 billion kroner (\$3.9 billion) of taxes on income to taxes on environmentally destructive activities. Much of this shift of \$1,100 per household is levied on road transport, including substantial hikes in vehicle and fuel taxes. Electricity is also picking up part of the shift. As of 2005, Sweden is running slightly ahead of its 10-year tax-shifting plan, making it the world leader in environmental tax reform.

Among the other European countries with strong tax reform efforts are Spain, Italy, Norway, the United Kingdom, and France. There are isolated cases elsewhere. A number of countries,

including Malaysia, Thailand, and Turkey, have used a tax on lead emissions to eliminate lead as an additive in gasoline. The United States imposed a stiff tax on chlorofluorocarbons to phase them out in accordance with the Montreal Protocol of 1987 and its subsequent updates. At the municipal level, when Victoria, the capital of British Columbia, adopted a trash tax of \$1.20 per bag of garbage in 1992, it reduced its daily trash flow 18 percent within one year.

Cities that are being suffocated by cars are using stiff entrance taxes to reduce congestion. First adopted by Singapore some two decades ago, this tax was later introduced by Oslo, Melbourne, and, most recently, London. The London tax of £5, or nearly \$9, first enacted in February 2002 by Mayor Ken Livingstone, was raised to £8, more than \$14, in July 2005. The resulting revenue will be invested in improving the bus network, which carries 2 million passengers a day. The goal of this congestion tax is a total restructuring of the London transport system to reduce congestion, air pollution, and carbon emissions and to increase mobility.

While London and other cities are taxing cars that enter the central city, others are simply imposing a tax on automobile ownership. In Denmark, the tax on the purchase of a new car is larger than the price of the car itself. A new \$25,000 car costs the buyer more than \$50,000! In 2000, partial rebates were introduced for energy-efficient vehicles. Other governments are moving in this direction. *New York Times* reporter Howard French writes that Shanghai, which is being suffocated by automobiles, “has raised the fees for car registrations every year since 2000, doubling over that time to about \$4,600 per vehicle—more than twice the city’s per capita income.”

Asia’s two leading economies—Japan and China—are now considering the adoption of carbon taxes. For the last few years, many members of the Japanese Diet have wanted to launch an environmental tax shift, but industry has opposed a carbon tax. China, which is experiencing near-record explosive growth in energy use and carbon emissions, is working on an environmental tax restructuring that will discourage fossil fuel use. Wang Fengchun, an official with the National People’s Congress, says, “Taxation is the most powerful tool available in a market economy in directing a consumer’s buying habits. It is superior to government regulations.” If Chinese policymakers can engineer an environmental tax reform, it will be a landmark development not only for China but for the world.

Environmental tax shifting usually brings a double dividend. In reducing taxes on income—in effect, taxes on labor—labor becomes less costly, creating additional jobs while protecting the environment. This was the principal motivation in the German four-year shift of taxes from income to energy. By reducing the air pollution from smokestacks and tailpipes, the incidence of respiratory illnesses, such as asthma and emphysema, is reduced—and thus overall health care costs are as well.

With forests, ecologists can calculate the values of services that trees provide. Once these are determined, they can be incorporated into the price of trees as a stumpage tax of the sort that Bulgaria and Lithuania have adopted. Anyone wishing to cut a tree would have to pay a tax equal to the value of the services provided by that tree, such as flood control. The market for lumber would then be telling the ecological truth. The effect of this is to reduce tree cutting and to encourage wood reuse and paper recycling.

Tax shifting also helps countries gain the lead in producing new equipment, such as new energy technologies or those used for pollution control. For example, the Danish government's tax incentives for wind-generated electricity have enabled Denmark, a country of only 5 million people, to become the world's leading manufacturer of wind turbines.

Some 2,500 economists, including eight Nobel Prize winners in economics, have endorsed the concept of tax shifts. Harvard economics professor N. Gregory Mankiw wrote in *Fortune* magazine: "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."

### ***Mobilizing to Save Civilization***

Mobilizing to save civilization means restructuring the economy, restoring the economy's natural support systems, eradicating poverty, and stabilizing population. We have the technologies, economic instruments, and financial resources to do this. The United States, the wealthiest society that has ever existed, has the resources to lead this effort. Jeffrey Sachs of Columbia University's Earth Institute sums it up well: "The tragic irony of this moment is that the rich countries are so rich and the poor so poor that a few added tenths of one percent of GNP from the rich ones ramped up over the coming decades could do what was never before possible in human history: ensure that the basic needs of health and education are met for all impoverished children in this world. How many more tragedies will we suffer in this country before we wake up to our capacity to help make the world a safer and more prosperous place not only through military might, but through the gift of life itself?"

It is not possible to put a precise price tag on the changes needed to move our twenty-first century civilization off the overshoot-and-collapse path and onto a path that will sustain economic progress. What we can do, however, is provide some rough estimates of the scale of effort needed.

The additional external funding needed to achieve universal primary education in the more than 80 developing countries that require help, for instance, is conservatively estimated by the World Bank at \$12 billion per year. Funding for an adult literacy program based largely on volunteers will take an estimated additional \$4 billion annually. Providing for the most basic health care in developing countries is estimated at \$33 billion by the World Health Organization. The additional funding needed to provide reproductive health care and family planning services to all women in developing countries is less than \$7 billion a year.

Closing the condom gap by providing the additional 9.5 billion condoms needed to control the spread of HIV in the developing world and Eastern Europe requires \$2 billion—\$285 million for condoms and \$1.7 billion for AIDS prevention education and condom distribution. The cost of extending school lunch programs to the 44 poorest countries is \$6 billion. An estimated \$4 billion per year would cover the cost of assistance to preschool children and pregnant women in these countries. Altogether, the cost of reaching basic social goals comes to \$68 billion a year.

A poverty eradication effort that is not accompanied by an earth restoration effort is doomed to fail. Protecting topsoil, reforesting the earth, restoring oceanic fisheries, and other needed measures will cost an estimated \$93 billion of additional expenditures per year. The most costly activities, protecting biological diversity at \$31 billion and conserving soil on cropland at \$24 billion, account for over half of the earth restoration annual outlay.

Combining social goals and earth restoration components into a Plan B budget yields an additional annual expenditure of \$161 billion, roughly one third of the current U.S. military budget or one sixth of the global military budget. (See Table 1.)

Unfortunately, the United States continues to focus on building an ever-stronger military, largely ignoring the threats posed by continuing environmental deterioration, poverty, and population growth. Its proposed defense budget for 2006, including \$50 billion for the military operations in Iraq and Afghanistan, brings the U.S. projected military expenditure to \$492 billion. (See Table 2.) Other North Atlantic Treaty Organization members spend \$209 billion a year on the military. Russia spends about \$65 billion, and China, \$56 billion. U.S. military spending is now roughly equal to that of all other countries combined. As the late Eugene Carroll, Jr., a retired admiral, astutely observed, “For forty-five years of the Cold War we were in an arms race with the Soviet Union. Now it appears we are in an arms race with ourselves.”

No one can argue today that we do not have the resources to eradicate poverty, stabilize population, and protect the earth’s natural resource base. We can get rid of hunger, illiteracy, disease, and poverty, and we can restore the earth’s soils, forests, and fisheries. Shifting one sixth of the world military budget to the Plan B budget would be more than adequate to move the world onto a path that would sustain progress. We can build a global community where the basic needs of all the earth’s people are satisfied—a world that will allow us to think of ourselves as civilized.

This economic restructuring depends on tax restructuring, on getting the market to be ecologically honest. The benchmark of political leadership in all countries will be whether or not leaders succeed in restructuring the tax system as, for example, Germany and Sweden have done. This is the key to restructuring the energy economy—both to stabilize climate and to make the transition to the post-petroleum world.

It is easy to spend hundreds of billions in response to terrorist threats, but the reality is that the resources needed to disrupt a modern economy are small, and a U.S. Department of Homeland Security, however heavily funded, provides only minimal protection from suicidal terrorists. The challenge is not to provide a high-tech military response to terrorism, but to build a global society that is environmentally sustainable and equitable—one that restores hope for everyone. Such an effort would more effectively undermine the support for terrorism than any increase in military expenditures, than any new weapons systems, however advanced.

As we look at the environmentally destructive trends that are undermining our future, the world is desperately in need of visible evidence that we can indeed turn things around at the global level. Fortunately, the steps to reverse destructive trends or to initiate constructive new trends are often mutually reinforcing or win-win solutions. For example, efficiency gains that reduce oil

use also reduce carbon emissions and air pollution. Steps to eradicate poverty simultaneously help eradicate hunger and stabilize population. Reforestation fixes carbon, increases aquifer recharge, and reduces soil erosion. Once we get enough trends headed in the right direction, they will often reinforce each other.

### **You and Me**

One of the questions I am frequently asked when I am speaking in various countries is, Given the environmental problems that the world is facing, can we make it? That is, can we avoid economic decline and civilizational collapse? My answer is always the same: it depends on you and me, on what you and I do to reverse these trends. It means becoming politically active. Saving our civilization is not a spectator sport.

We have moved into this new world so rapidly that we have not yet fully grasped the meaning of what is happening. Traditionally, concern for our children has translated into ensuring their health care and getting them the best education possible. But if we do not act quickly to reverse the deterioration of the earth's environmental systems, eradicate poverty, and stabilize population, their world will be declining economically and disintegrating politically. Today, securing our children's future means not only investing in their education and health care, but also investing in a program to reverse the trends that are undermining their future.

As individuals, we should continue our memberships in environmental and population organizations. We need to improve local recycling programs. We need to vote with our pocketbooks. For example, buying Green Power certificates helps drive investment in renewable energy. We need to do all the things we are now doing to protect the environment. But they are not enough. We have been doing these things for the last 35 years. We have won a lot of local battles, but we are losing the war.

The two overriding challenges are to restructure taxes and reorder fiscal priorities. Saving civilization means restructuring the economy—and at wartime speed. It means restructuring taxes to get the market to tell the ecological truth. And it means reordering fiscal priorities to get the resources needed to restore the earth, eradicate poverty, and stabilize population. Write or e-mail your elected representative about the need for tax restructuring to create an honest market. Remind him or her that corporations that left costs off the books appeared to prosper in the short run, only to collapse in the longer run.

Or better yet, meet with your elected representatives to discuss why we need to raise environmental taxes and reduce income taxes. Work with like-minded friends and associates toward this goal. Put together a delegation to meet with your elected representative. Feel free to download the information on tax restructuring from our Web site to use in these efforts. If we cannot restructure the tax system to enable the market to tell the truth, we almost certainly will not make it.

Let your political representatives know that a world spending nearly \$1 trillion a year for military purposes is simply out of sync with reality in a situation where the future of civilization is in question. Ask them if \$161 billion per year is an unreasonable expenditure to save

civilization. Ask them if diverting one sixth of the global military budget to saving civilization is too costly.

If you like to write, try your hand at an op-ed piece for your local newspaper on the need to raise taxes on environmentally destructive activities and offset this with a lowering of income taxes. Try a letter to the editor. Organize a letter writing campaign, urging people to contact their elected representatives and local media outlets on this issue.

Push for the inclusion of poverty eradication, family planning, and reforestation in international assistance programs. Lobby for an increase in these appropriations and a cut in military appropriations, pointing out that advanced weapons systems are useless in dealing with the new threats to our civilization. Someone needs to speak on behalf of our children and grandchildren because it is their world and their futures that are at stake.

Educate yourself on environmental issues and on what happened to earlier civilizations that also found themselves in environmental trouble—and help your friends to become better informed. On this subject I recommend *Collapse* by Jared Diamond and *A Short History of Progress* by Ronald Wright. To understand the case for eradicating poverty, read “Can Extreme Poverty Be Eliminated?” by Jeffrey Sachs in the September 2005 issue of *Scientific American*. To gain a sense of the enormous potential for boosting energy efficiency, read “More Profit with Less Carbon” by Amory Lovins in the same issue.<sup>38</sup>

Remember, challenging though the situation may be, there are signs of the new economy emerging all over the world. We see them in the wind farms of Europe, the fast-growing U.S. fleet of gas-electric hybrid cars, the reforested hills of South Korea, the family planning program of Iran, the massive eradication of poverty in China, and the solar rooftops of Japan.

What we need to do is doable. Sit down and map out your own personal plan and timetable for what you want to do to move the world from a path headed toward economic decline to one of sustained economic progress. Sketch out a plan for the next year of the things you want to do, how you hope to do them, and whom you can work with to achieve the only goal that really counts—the preservation of civilization. What could be more rewarding?

It is decision time. Like earlier civilizations that got into environmental trouble, we can decide to stay with business as usual and watch our modern economy decline and eventually collapse, or we can consciously move onto a new path, one that will sustain economic progress. In this situation, no action is actually a decision to stay on the decline-and-collapse path.

It is hard to find the words to convey the gravity of our situation and the momentous nature of the decision we are about to make. How can we convey the urgency of this moment in history? Will tomorrow be too late? Do enough of us care deeply enough to turn the tide now?

Will someone somewhere one day erect a tombstone for our civilization? If so, how will it read? It cannot say we did not understand. We do understand. It cannot say we did not have the resources. We do have the resources. It can only say we were too slow to respond to the forces undermining our civilization. Time ran out.

**Table 1: Plan B Budget: Additional Annual Expenditures Needed to Meet Social Goals and to Restore the Earth**

<b>Goals</b>	<b>Funding</b>
	(billion dollars)
<b>Basic Social Goals</b>	
Universal primary education	12
Adult literacy	4
School lunch programs for 44 poorest countries	6
Assistance to preschool children and pregnant women in 44 poorest countries	4
Reproductive health and family planning	7
Universal basic health care	33
Closing the condom gap	2
	====
Total	68
<b>Earth Restoration Goals</b>	
Reforestation of the earth	6
Protecting topsoil on cropland	24
Restoring rangelands	9
Stabilizing water tables	10
Restoring fisheries	13
Protecting biological diversity	31
	====
Total	93
	=====
<b>Grand Total</b>	<b>161</b>

**Table 2. Comparison of Military Budgets by Country and for the World with Plan B Budget**

<b>Country</b>	<b>Budget</b>
	(billion dollars)
United States	492
Russia	65
China	56
United Kingdom	49
Japan	45
France	40
Germany	30
Saudi Arabia	19
India	19
Italy	18
All other	142
World Military Expenditure	975
Plan B Budget	161

Note: The U.S. number is the budget estimate for FY2006 (including the \$50 billion for military operations in Iraq and Afghanistan); Russia and China data are for 2003.