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Prescription for the Planet

The Painless Remedy for our Energy & Environmental Crises

Tom Blees

This book is dedicated to my parents,
who taught me never to take no for an answer,
even though it sometimes made their parenting job
a lot more difficult, and who instilled in me
the confidence to look for answers
no matter how elusive they might seem.

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Introduction

No problem can be solved from the same consciousness that created it.
We must learn to see the world anew.
— Albert Einstein

I'D LIKE TO invite you to a revolution.

Don't worry, you're not going to get hurt. As a matter of fact, for the vast majority of the people involved it's going to feel really good. So good, in fact, that you'll wonder why this revolution isn't already underway.

The tensions that are leading up to it are visible all around us. Anyone who reads, listens to the radio or watches TV is barraged with dire warnings of environmental, political, and economic stresses almost mind-numbing in their complexity and portent. So how, one may ask, are the pressing problems of the day to be solved? Any revolution promising to deliver humanity from such disparate threats as global warming and resource wars will have to combine technical transformation on a par with the Industrial Revolution along with unprecedented political vision. As formidable as that sounds, it is entirely within the realm of possibility.

The political and technological solutions to a host of our

planet's most pressing problems are inextricably entwined. The common threads that unite many of them are energy and raw materials. Energy, in particular, is a nettlesome concern. The ways in which we source and use energy have profound effects on geopolitics, economics, and the environment. In the face of overwhelming evidence that business as usual is simply not going to work much longer, the search is clearly on for alternatives. Passionate advocates of various energy systems tout the virtues of their favorites in the media, most often with conveniently hazy statistics and projections. Whereas there seems to be a developing consensus that energy production and use are deadly serious issues, most of the purported solutions to energy problems continue to fall woefully short of the mark.

If this situation finds you frustrated or devoid of hope as you contemplate mankind's future, take heart. It will probably surprise you to know that there is a virtually inexhaustible source of energy that is safe, clean, and economical that will require no recourse to mining, drilling, or other extraction processes for literally hundreds of years. Far from being another pie in the sky, this technology was developed at one of America's national laboratories over more than a decade by a veritable army of PhDs. As the project reached its triumphant conclusion in the mid-90s, it was suddenly terminated and its facilities dismantled. The scientists who'd succeeded so spectacularly in their efforts were scattered, and word came down from the U.S. Department of Energy that the project was not to be publicized.

This is but one of a trio of little-known technologies that are capable — when coupled with prudent leadership — of solving a surprising array of seemingly intractable global problems. We'll start off with a brief discussion of the problems we seek to solve and then examine the pros and cons of the various purported solutions that have been suggested to remedy them. Beyond that we'll be breaking new ground, at least compared to what passes for conventional wisdom in today's public discourse.

When I speak of a revolution, I use the term advisedly. The course of action proposed herein will change the world every bit as profoundly as technological and political revolutions of the past. Unlike those social transformations, however, we are uniquely capable of planning this revolution in order to minimize the negative impacts of the changes it will bring about, and maximize its benefit to all of humanity.

By the time you've traversed these pages I believe you'll agree that we stand on the threshold of a new era in the evolution of human society. If we look back at the historical record, there's an unbroken and rather bleak consistency in the struggle for power over others, with wars of conquest evincing little substantive difference over the ages save for the methodology of slaughter. The thirst for riches and resources took a new turn once the Age of Exploration played itself out. From then on, there were no new lands to discover. Control over resources became a matter of wresting them away from someone else. Such a course was pursued with vigor during the era of colonization, but the end of World War II brought a new twist as warmaking technology — most obviously atomic weaponry — made wars of conquest a much dicier endeavor.

The proxy wars between the nuclear powers during the Cold War era can be seen as a relic of the old pattern, outmoded but alas, not yet abandoned. Even before the end of the Cold War it was clear that the struggle for control over ever more crucial supplies of resources would be played out on the stage of international economic relations. While we can still unfortunately see the brute force methods being used in the current war in Iraq, the relative stability of international borders portends a future where international trade and economic alliances decide who controls the world's raw materials. We can clearly see new tensions developing as China's burgeoning growth has made it a force to be reckoned with in the global struggle over energy supplies, even as those resources are revealing their limits as never before.

Do not despair. The struggle for control among an ever-increasing population for an ever-dwindling stockpile of needed materials is about to take on a new and encouraging dimension. We'll see in the pages to come not only how we can tap a limitless supply of environmentally benign energy already ours for the taking, but how to effortlessly recycle nearly everything that provides us with the comforts of life we now enjoy.

Ever since our planet's physical limitations were recognized, the relationship between nations was based on the concept known today as zero-sum. As the most advanced industrialized nations consume an inordinately large share of the world's resources, the threat that the rest of the countries of the world will eventually demand their fair share looms on the horizon. A zero-sum world can be likened to sharing a pie: if you take a bigger slice, somebody else is going to have to take a smaller one. The lack of enthusiasm for helping to lift the poorest nations out of their misery can be traced to the nagging fear that enlarging their piece of the pie will inevitably diminish what's left for the rest of us.

This resigned acceptance of the zero-sum paradigm is still in evidence virtually everywhere we look today. Neither the public nor the political class has yet recognized that this way of thinking is already obsolete. Few are yet aware that the pie hasn't just gotten bigger. We're looking through the window of the pie shop, just waiting for the world's leaders to show up with the keys. Inside there's more than enough for everybody.

Mankind is poised on the brink of a new age of plenty. The wealthiest nations need not fear that elevating the poor of the world will diminish their own standard of living. On the contrary, improving the condition of the poorest among us will improve everyone's situation if only because it will greatly diminish the inevitable tensions resulting from gross inequality. Access to abundant and affordable energy supplies will no

longer be the prerogative of the fortunate, but will finally be recognized as a basic human right.

This invitation to revolution is not a call to arms. It is a call to action. We have the means to radically transform human society for the better while solving some of the most formidable problems humanity has ever faced. What we need is the vision and the will to implement this global revolution, one whose effects will impact the lives of all the world's people in unexpected and gratifying ways. Let us begin…

CHAPTER ONE

A World of Hurt

There are good people… who hold this at arm's length because if they acknowledge it and recognize it then the moral imperative to make big changes is inescapable.

— Al Gore, *An Inconvenient Truth*

As the twentieth century drew to a close there was much talk about the challenges facing mankind as we began the new millennium. Now just eight years past that milestone, many of those issues have taken on a startling urgency. While the end of the Cold War brought relief at the diminished threat of nuclear annihilation, new threats until recently only dimly perceived have taken its place. The danger of nuclear warfare between two great powers has been supplanted by the specter of nuclear proliferation. And the dilemma of human-caused global warming is regarded by virtually every nation as a grim reality and one of the most daunting challenges humankind has ever faced.

The greatest difficulties we face today are nearly all of our own making. We have burdened the planet not only with our sheer numbers but with the ability to profoundly influence our environment with advanced technology. Our booming

population exacerbates the situation in both industrialized and undeveloped countries. In the former the deleterious effects of development pollute both air and water, sometimes to unprecedented degrees. In undeveloped nations, the sheer demand for living space and simple fuel leads to extensive deforestation and both indoor and outdoor pollution. It has gotten to the point where we have the very real possibility of despoiling our planet so severely that human life itself, if not imperiled in its very existence, seems to be approaching the point of serious social disruption.

For most of the twentieth century, there was a widespread belief in science's ability to unravel and solve our world's technological and environmental problems. The irony is that scientific advancements were creating whole new problems that had never existed before, leading many to question whether science has been a panacea or a Pandora's box. Today the number of people who blithely assume that scientists will be able to sort it all out in time seems to be inexorably diminishing. Indeed, a backlash of anti-science forces have found, at the time of this writing, a sympathetic administration in Washington which at least pretends—for the sake of their votes—to share their antipathy to what many of them see as the scientific priesthood.

Like an environmentalist driving his SUV to a global warming conference, America's neo-Luddites avail themselves of the comforts of their technological cocoon even as they attempt to eat it away from the inside. Such inconsistency and irrationality would hardly be worth confronting except for the political results that are postponing the recognition and solution of serious environmental problems. An improbable alliance of anti-science zealots on the one hand and environmentally callous corporations on the other has thwarted progress on a host of issues which frankly can't afford to be ignored any longer.

Dozens of books and countless articles have been written about the grave challenges briefly described below. My intention in this book is not to expound on and lament the problems that bedevil us but to offer realistic solutions. But first we must identify the targets. This first chapter will briefly present the issues that cry out for solutions. Every one of them, as incurable as they may seem, will be addressed in the chapters to come with a comprehensive plan to remedy them in the near future without resorting to technological leaps of faith.

Be forewarned: Once you finish this book and realize that there are actually completely feasible near-term solutions to these problems, it may drive you nuts listening to the pundits and "experts" on radio and TV pontificating on these issues and how they propose to address them. You'll read an article on global warming or alternative energy systems or clean coal or biofuels and it will sound remarkably akin to that old story about the blind men and the elephant. Early readers of this manuscript have told me they're tearing their hair out at the barrage of gloom and doom and solemn pronouncements, now that they've discovered the planetary prescription. Don't say I didn't warn you.

Global Warming: The elephant in the room

Climate change seems an amorphous and intangible concern to most people. But the Inuit people of Baffin Island, which sits atop Canada just west of Greenland, have gone beyond debating the reality of global warming. While politicians in their comfortable offices dicker over the science, the way of life of the Inuit who've lived on Baffin Island since time immemorial is being destroyed by unprecedented warming of their environment. Where once they hunted on the ice for ten months a year, now their hunting season has been reduced to about half that time. The evidence of a drastically altered climate is all around them, and it is altering their

culture to a profound degree.[1]

Further south, however, the evidence is somewhat less immediate and thus the implications of global warming have taken longer to recognize. Nevertheless, concern over the possible threat of human-caused climate change led to the establishment of the Intergovernmental Panel on Climate Change (IPCC) in 1988. A collaboration between the United Nations Environment Program and the World Meteorological Organization, the IPCC was created to assess the risk of human-induced climate change based on the best scientific and technical information available.

Nearly two decades after its creation, the IPCC's pronouncements find themselves the focus of world attention. In February of 2007 the panel issued the first installment of their report on climate change, the culmination of the last six years' work of some 2,500 scientists around the world. Their "Summary for Policymakers" reported the verdict that it is "very likely" that human activities (in particular the burning of fossil fuels) account for most of the warming in the past fifty years. "Very likely" translates as at least a 90% degree of certainty.[2]

Nevertheless there were dissenters. Of the 113 countries participating in the IPCC conference in Paris that issued the report, there were unsuccessful attempts to water it down by Saudi Arabia (the world's largest oil exporter) and China, which has recently overtaken the USA as the world's worst offender in emissions of greenhouse gases (GHGs). The difficulties of crafting a consensus among so many nations resulted in an inevitable softening of the report's nonetheless compelling conclusions. Much of what is discussed freely and credibly among the scientific community never made it into the final draft, despite considerable sound science underpinning substantially scarier observations:[3]

- Emerging evidence of potential feedback effects and "tipping points" that could rapidly accelerate global climate change;
- Growing proof that the Greenland ice sheet is melting at an increasing rate and could collapse entirely;
- Findings that temperatures in Antarctica are rising "faster than almost anywhere on the planet" and that the ice there is also in increasing danger of breaking up;
- Measurements of the Atlantic Gulf Stream, which plays a major role in the climate of Western Europe, revealing a 30% slowing between 1957 and 2004;
- The potential effects of accelerating release of greenhouse gas in the Arctic from thawing soil, permafrost and seabed deposits;
- The potential for dramatic and extreme rises in sea level should ice sheets continue to break up.

Undeterred by the consensus of some 2,500 of the world's top scientists, the incorrigible ExxonMobil quickly came up with a bounty of $10,000 to any scientist willing to poke holes in the report, albeit under the nearly transparent cover of a company-funded neocon think tank.[4] It would be futile to expect unanimous agreement about the realities and dangers of global warming among politicians. Yet a majority of those with the most comprehensive training in the subjects involved (oceanographers, climatologists, paleobotanists, etc.) appear to agree that mankind is affecting the cli-

[1] Will Steger, *Global Warming 101.Com* (Will Steger Foundation, 2006 [cited 2007]); available from http://www.globalwarming101.com/content/view/545/88889028/.

[2] Working Group 1 of the IPCC, "Climate Change 2007: The Physical Science Basis," (Geneva, Switzerland: Intergovernmental Panel on Climate Change (IPCC), 2007).

[3] David L. Brown, *What the IPCC Report Didn't Tell Us* (2007 [cited 2007]); available from http://starphoenixbase.com/?p=353.

[4] Ian Sample, "Scientists Offered Cash to Dispute Climate Study," *The Guardian,* Feb 2, 2007.

mate in serious and potentially irreversible ways. They differ mainly in degree (no pun intended) when it comes to just what point we find ourselves at now and what the future holds, but you'd be hard pressed to find any of them who'd suggest that solutions to the problem are something we can afford to put off till tomorrow.

The belief that anthropogenic (human-caused) emissions of global warming gases are causing or exacerbating global warming is not absolutely universal among scientists. The subject is extremely complex, and some perfectly sincere scientists, not just paid shills of fossil fuel corporations, look at the evidence they have in hand and come to different conclusions. That the earth is experiencing a warming trend is hardly refutable, and the vast majority of scientists would find no quarrel with the evidence. Just how much of that warming trend is due to anthropogenic emissions, however, evokes less unanimity, though dissenters from that view are in a distinct minority. Nevertheless, this is a classic example of the scientific method at work. Evidence continues to accumulate, and by now it's gotten to the point that the leaders of many countries are sounding the alarm.

This book will frequently refer to the urgency of climate change as a reason to take decisive action to revolutionize the world's energy systems. While this is consistent with the views of the majority of scientists, some may beg to differ. Global warming is not the only reason, however, for the energy revolution that will be explained and encouraged in these pages. There are, in fact, a host of compelling reasons to initiate and carry out the program recommended here. If anthropogenic emissions end up being inconsequential (and it wouldn't be the first time that a large number of people, scientists included, may have had a shared misconception), we'll still have proceeded along a path that leaves us in a much better condition than if we had not, with substantial improvement on a host of other issues.

If we took the proposed path and the people on the planet suddenly had a change of heart en masse and decided to limit the size of their families, AND anthropogenic emissions turned out to be inconsequential, AND if the current warming we're experiencing halted and reversed itself, then would this course of action have been for naught? Not at all. As we shall see in the pages to come, we still would have spent less than if we'd taken a business-as-usual approach, we'd still have remedied the deadly problem of air pollution, and we'd still have more than enough energy resources for everyone on the planet. Ultimately the rationale for pursuing this course stands firmly on its own merits. If the reader looks with skepticism at forthcoming references to the urgency of global warming, please bear in mind that it is but one of many compelling reasons to pursue this energy revolution.

In the event that anthropogenic emissions are indeed as consequential to our climate dilemma as most scientists believe, then taking prompt action will certainly turn out to be the wisest course. In the unlikely case that mankind is not at least partly responsible, should the current warming trend persist for much longer there will be ample reason to pursue an energy strategy like the one that will be proposed herein. For the human population of the planet is growing toward a predicted peak of about ten billion,[5] even as glaciers that supply water to hundreds of millions of people are rapidly retreating. Not only will we have to supply billions more with fresh water (which will require a lot of energy), but there's a very high likelihood that hundreds of millions will soon find themselves displaced because of vanishing water supplies.

The accelerated melting of glaciers all over the globe is probably the most visible sign of global warming. To cite just one example, up to 64% of China's glaciers are projected to dis-

[5] "Total Midyear Population for the World: 1950-2050," (U.S. Census Bureau, 2007).

appear by 2050, putting at risk up to a quarter of the country's population who are dependent on the water released from those glaciers.[6] That's about the same number of people as inhabit the entire United States.

A look at almost any area of the world today where there are glaciers and/or ice caps reveals a rate of melting unprecedented in history.[7] From China to the Arctic, from the Andes to the Himalayas, the rate of glacial retreat is so dramatic that entire regions are in danger of losing their glaciers altogether. The water supplies which depend on those glaciers as their source will disappear, in many cases causing catastrophic disruptions among the countless millions of people who depend on them. Peru and Bolivia, which together account for more than 90% of the world's tropical glaciers, have lost about a third of the surface area of their glaciers between the 1970s and 2006. With three-quarters of Peru's population living on the arid west side of the Andes where less than 2% of that nation's water resources are found, the consequences of diminishing runoff are already starting to be felt.[8]

The economic costs of global warming are already visible, but the projections as global warming continues are truly staggering. Insurance industry estimates predict that climate-change related damages might cost $150 billion annually within a decade.[9] If the connection between the increased frequency and severity of hurricanes in recent years is partly a result of global warming, as many climatologists claim, then

[6] Renato Redentor Constantino, "With Nature There Are No Special Effects," in *TomDispatch.com* (June 3, 2004).

[7] Robert S. Boyd, "Glaciers Melting Worldwide, Study Finds," *Contra Costa Times,* Aug 21, 2002.

[8] James Painter, "Peru's Alarming Water Truth," in *BBC News International Edition* (Mar 12, 2007).

[9] Constantino, "With Nature There Are No Special Effects."

the tens of billions of dollars worth of damage from the hurricane strikes of 2005 alone in the United States is already pushing that estimate far closer than that decade estimate would suggest.

There are disturbing signs that we may have already reached a tipping point beyond which serious disruptions to the global climate are irreversible. Melting of previously stable permafrost is but one of the warning signs.

> Western Siberia is undergoing an unprecedented thaw that could dramatically increase the rate of global warming. Researchers recently returned from the region found that an area of permafrost spanning one million square kilometers—the size of France and Germany combined—is melting for the first time since it formed 11,000 years ago at the end of the last ice age. British and Russian scientists report that the melting permafrost is releasing hundreds of millions of tons of methane, which is 20 times more potent than the carbon dioxide currently driving the worldwide warming crisis.[10]

Sergei Kirpotin, a botanist at Tomsk State University, Russia, describes an "ecological landslide that is probably irreversible and is undoubtedly connected to climatic warming." He says that the entire western Siberian sub-Arctic region has begun to melt, and this "has all happened in the last three or four years."[11]

To anyone who pays attention to scientific periodicals or even general news sources, the number of studies attesting to

[10] Ian Sample, "Warming Hits 'Tipping Point'," *The Guardian,* Aug 11, 2005.

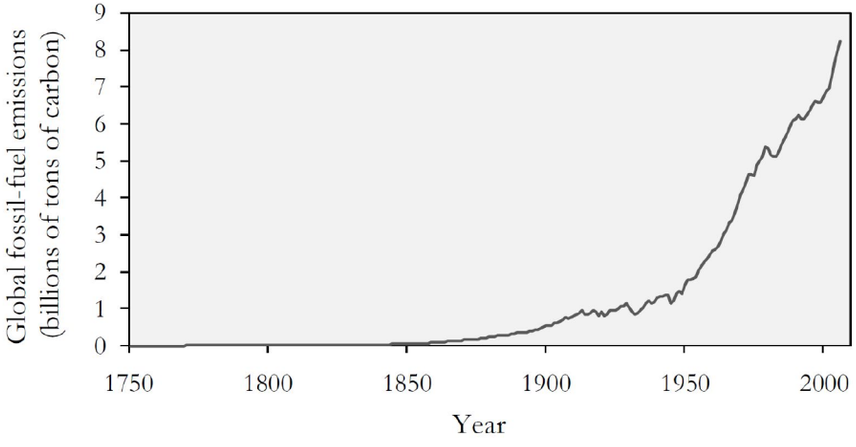
[11] Fred Pearce, "Climate Warning as Siberia Melts," *New Scientist,* Aug 11, 2005.

the reality and urgency of global warming is overwhelming. Reports by scientists from a variety of disciplines continue to pour in from around the globe. One day it's a story of an Antarctic ice sheet the size of Texas starting to disintegrate. Then a story that the glacier on Mount Kilimanjaro that started growing almost 12,000 years ago will probably be gone within a decade or two. Polar bears are dying because they can't navigate the ever-widening gaps in the ice floes as the Arctic ice melts away. The Atlantic thermohaline circulation, which is responsible for the currents that warm northern Europe, may even be slowing down.[12] These are hardly subjective assessments. Cold hard data is pouring in from around the world, bringing incontrovertible evidence that we've created a problem the likes of which mankind has never before had to face.

> The European Project for Ice Coring in Antarctica (EPICA) team has spent years drilling the ice core in Antarctica's Ice Dome Concordia. They had previously analyzed its record of global temperatures, but have just completed the detailed analysis of the trapped air. The bubbles record how the planet's atmosphere changed *over six ice ages and the warmer periods in between* [my italics]. But during all that time, the atmosphere has never had anywhere near the levels of greenhouse gases seen today. Today's level of 380 parts per million of carbon dioxide is 27% above its previous peaks of about 300 ppm, according to the team led by Thomas Stocker of the University of Bern in Switzerland.[13]

[12] Michael Mann Gavin Schmidt, "Decrease in Atlantic Circulation?," in *Real Climate* (Nov 30, 2005).

[13] David L. Chandler, "Record Ice Core Reveals Earth's Ancient Atmosphere," *New Scientist,* Nov 24, 2005.



A thoroughly modern problem[14]

Global warming alone is reason enough to warrant a radical and comprehensive overhaul of energy production and use throughout the world. Whether the potentially disastrous effects of climate ochange can be reversed or at least halted somewhere short of disaster is an open question. At this point we can only do as much as possible to halt the human practices that are contributing to the ever-deteriorating climate situation.

One study after another, whether by international groups of esteemed scientists or studies done by the scientists of individual nations, points to the same conclusion. Despite the protests of intransigent politicians in the United States and their apologists, along with their often uninformed believers among the general populace, global warming is not really a question of if but rather of how seriously and how quickly it will manifest.

Those who choose to believe a small minority of the scientific community when their views contradict the evidence and studies of the vast majority have no business formulating

[14] Dr. Barry Brook, The Environment Institute, University of Adelaide, Adelaide, Australia 2010

public policy that will impact the entire human race. Yet several powerful politicians — to our global shame, mostly in the United States — still pretend that global warming is an environmentalist conspiracy. Senator James Inhofe (R-Oklahoma), who ironically chaired the Senate Environment and Public Works Committee until mercifully being ejected from that position by the 2006 elections, has called global warming "the greatest hoax ever perpetrated on the American people."

Many have castigated the U.S. government for dismissing the Kyoto Accords on Global Warming, resisting for years even the most rudimentary admission of the reality of climate change, much less the causes. To be sure, the signal this sends to the rest of the world is deplorable, yet the Kyoto Accords were only a very feeble first step that, even if embraced, would hardly turn the tide. We must go far beyond the reach of Kyoto to address global warming, and we have to do it faster than that agreement would have demanded. Alas, many of our politicians seem to be headed in the opposite direction.

While many hoped for real progress at the 2006 U.N. climate summit in Nairobi, Kenya, it ended instead with disappointment and failure. The intransigence of the United States and China, the two most egregious producers of greenhouse gases, doomed the conference despite the high hopes of its other participants. It's now generally recognized among the world community that the Bush administration is determined to shirk its responsibility. "Everyone is waiting for the [U.S.]," said Paal Prestrud, head of Oslo's Center for International Climate and Environmental Research. "I think the whole process will be on ice until 2009 [when Bush will be replaced]."[15] It is not known whether Mr. Prestrud appreciated the cold irony of his choice of words.

[15] The End Is Sigh (Grist Environmental News & Commentary, Nov 20, 2006 [cited); available from http://www.grist.org/news/daily/2006/11/20/.

Shortly after this book goes to print, George Bush will be leaving the White House. Those who have decried U.S. foot-dragging on global warming will find herein a comprehensive plan to halt anthropogenic emissions of greenhouse gases much faster and more thoroughly than any international plan to date. But that is only one of the issues we will address. A surprising array of seemingly intractable problems facing us today can actually be solved with a small suite of bold actions that fit together like the workings of a classic timepiece. Arresting global warming would simply be icing on the cake.

Nuclear Proliferation

Americans who grew up in the Fifties and Sixties developed a particular knack for relegating worries about nuclear weapons to our mental closet of horrors. Never before had a whole generation of children been forced to undergo nuclear attack drills, rushing out of our classrooms to hunker down in the hall, sit on the floor and, as the macabre joke of the time described it, "put your head between your legs and kiss your ass goodbye." One wonders how much the threat of imminent annihilation contributed to the culture of hedonism which came to prevail in the hippie era of the Sixties and Seventies. It seems incongruous to think that "Eat, drink, and be merry, for tomorrow we die" originated in the Old Testament, since it could well have been the motto of young Americans who came of age in those perilous years.

Even though most of that generation is grown now with children and even grandchildren of their own, nuclear proliferation is still one of those awesome threats that most people refuse to contemplate. The end of the Cold War seemed to bring a welcome relief from such concerns, yet the nuclear bogeyman refuses to go away. Not only is the "nuclear club" growing, but terrorism has worked its way to the forefront of international concerns, along with the very real possibility that eventually a

terror attack will include the horrific prospect of a city suddenly vanishing in a nuclear explosion.

Some needed attention has focused on the lax control over nuclear weapons stockpiles as a result of the breakup of the Soviet Union. But as North Korea elbowed its way into the nuclear club in 2006 a more insidious threat reared its head. For the Koreans had created their first nuclear weapons not from stolen weapons-grade material but, following India's example, by operating a small reactor in such a way as to produce weapons-grade plutonium. There are probably several hundred tons of weapons-grade plutonium in existence, most of it (one hopes all of it) in the weapons programs of the nuclear powers. However, the technology to extract plutonium from spent reactor fuel is available to at least thirty countries, and any reactor can be adapted (at a sacrifice in operating efficiency) to production of weapons-grade plutonium.[16]

The "waste" (used fuel) produced during the course of a year by a normally operating nuclear power plant contains about 200 kilograms of low-quality, "reactor-grade" plutonium. Since that material can theoretically be used to make a nuclear explosion, it should certainly be safeguarded. Yet the emphasis that has been placed on weapons proliferation from spent power plant fuel is exaggerated, for its isotopic composition makes it unsuitable for weapons. There are far easier ways of producing weapons-grade material.[17]

As this is being written, America is rattling its sabers loudly over the prospect of war with Iran. While there is a multitude of possible reasons why — not the least of which is oil — Iran's development of uranium enrichment technology is most often cited as a *casus belli* by the Bush administration. Even as stalled talks to convince North Korea to abandon its nuclear weapons

[16] Bernard L. Cohen, "The Nuclear Energy Option," ed. University of Pittsburgh (Plenum Press, 1990).

[17] Ibid.

program have finally begun to bear fruit, the Iranians threaten to unleash the nuclear genie. It's like we're playing nuclear Whack-a-Mole.

The threat of nuclear proliferation has been with us since World War II, but the spread of modern technology has made it all the more urgent. Like all the problems that will be discussed here, this too is within our power to solve. The question is whether the world's leaders are willing to make the unprecedented decisions necessary to get the situation under control. As we'll see in the chapters to come, the international structures needed to eliminate the threat of nuclear proliferation — and global warming, and air pollution, and nuclear waste — are destined to collide with an international corporatism that has spread its tentacles into every corner of the globe.

What we're faced with at the dawn of the twenty-first century is a struggle for our very survival, but the struggle is not against some hostile outside force. It is against our own institutions, our own inertia, a dearth of imagination, a fear of change, and a selfish timidity on the part of our leaders.

A refusal to confront problems head-on has rarely promised such dire consequences as today. Fossil fuels are being burned at an accelerating pace, and unless revolutionary changes are made we will all be punished for our indecisiveness. The spread of nuclear weapons likewise must be recognized as the grave threat that it is. If one of our cities suddenly disappeared in an unexplained nuclear explosion, proliferation would immediately be front and center and the hue and cry for action would be deafening. We have to muster the good sense and the boldness to deal with this threat before such a horrific event occurs. Without radical changes to the way nuclear materials are handled, it will only be a matter of time. The longer we wait, the harder and more dangerous it will be to prevent such a catastrophe. It's time we recognize its inevitability and do everything in our power to get the situation under control.

Humans have a long and inglorious history of locking the barn door after the horse is gone. How many times have you heard of some local people insisting on the installation of a traffic light at a dangerous intersection, only to have the authorities drag their feet until someone is killed in an accident that could have been so easily prevented? The new traffic light that immediately appears might as well be a flashing tombstone. The same sort of oblivious inaction has gripped the world at large when it comes to dire warnings of nuclear weapons proliferation. No, the solution is not as easy as installing a traffic light, it will require bold leadership and a willingness to break free of old ways of thinking. But if we fail to act, it won't be a single tombstone that we'll be planting.

Air Pollution

The center of Mexico City is the Zocalo, with the National Cathedral on one side and the National Palace on an adjacent side. It's a one square block open area, a big park for residents and visitors alike to stroll and mingle. In my repeated visits to Mexico City over the years I can remember many days when I would enter the Zocalo from the street opposite the side where the palace sits. Looking across at the great edifice that occupies the entire side of the square, I could see only its outline. The massive doors and windows facing the park — a mere block away — were completely indistinguishable because of the thick smog.

Take the most complacent anti-environmentalist you can find and plunk him down in the middle of Mexico City (or any of a huge number of cities around the world) on almost any day of the year. Even if he's blind he'll still be struck by the pollution assailing his nostrils and lungs. Whatever a person might believe or disbelieve about global warming and the effect of human activity on climate change, only a raving lunatic would deny that air pollution in our major cities is a serious problem.

Like many of the environmental dilemmas facing us today, air pollution is a product of both our technology (and paradoxically, often also a lack of technology) and our sheer numbers. The concentration of humanity in urban centers is an inescapable fact of life, and it is increasing every year. It would be wonderful but hopelessly naive to think that people around the world will recognize the limitations of our biosphere in the very near future and stop their excessive procreation. We can count on adding at least a few billion more bodies to our already overburdened planet before the tide of humanity has a realistic chance of subsiding. Barring widespread nuclear war, unprecedented famine, or a deadly pandemic — either natural or man-made — we're stuck with the task of solving grave pollution problems despite the burgeoning population of our planet.

The causes of our deteriorating air quality are many and varied. With seemingly no sense of irony, people decry pollution caused by automobiles and lament the death of the "environmentally friendly" electric car. Yet the electricity for charging it more likely than not would originate at a coal-fired power plant, belching not just global warming gases like carbon dioxide into the air, but a host of other nasty substances as well. Sulfur dioxide emissions from coal burning have decimated large expanses of forests and made some lakes so acidic that all their fish died off. Mercury and lead emissions wafting from the smokestacks of coal-fired power plants have long been a concern because of their potential impact on child development.[18]

The urgency of finding a quick solution to air pollution worldwide is graphically illustrated in the case of China. As formerly "Third World" China becomes an industrial powerhouse and its people acquire the level of wealth necessary for modern conveniences, China's energy appetite is soaring. Even

[18] Cat Lazaroff, "Coal Burning Power Plants Spewing Mercury," in *Environment New Service* (Nov 18, 1999).

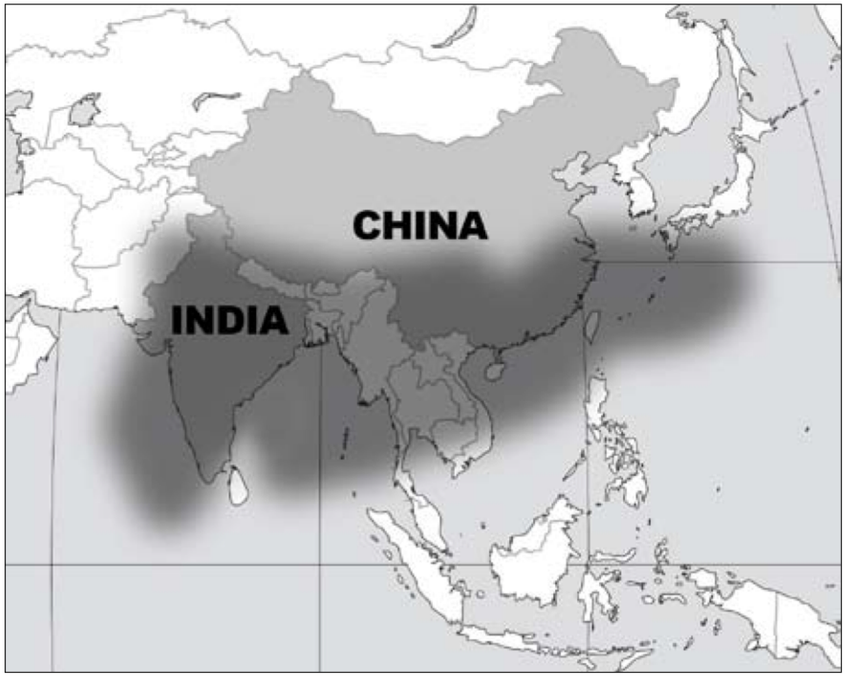
now, a third of China is bathed in acid rain on a regular basis due to coal-fired power plants, with over half its cities affected. Yet in order to meet their expected needs for electricity, China has dozens of coal-burning power plants on the drawing board to be built over the next few decades. If all these are brought on line as planned, the amount of pollution and global warming gases produced during their service lives will rival the entire world's current output. And India, whose population is set to outstrip China's during that time period, is likewise developing a ravenous energy appetite.

Even though coal burning tops the list, the most visible villain in the air pollution drama is the automobile. Despite strict emission control regulations and state-of-the-art systems on modern cars, the sheer number of vehicles on the road in many urban areas results in dangerous amounts of air pollution, especially when natural weather patterns conspire to create inversions. Climatic inversions occur when a warm body of air moves in over a cooler, denser body of air closer to the ground. The result is almost as if a lid were put over the area, trapping pollution in the cooler ground layer, often for days at a time. It's even worse in countries that lack the legal or financial means to enact and enforce emissions controls.

My experience on a recent trip to India can serve as one small example of the problem. I'd hired a car in Agra, home of the Taj Mahal, to take my son and me to the Himalayas. Agra has enacted more stringent auto emissions standards than almost anywhere else in India because of the very real possibility of acid rain slowly dissolving the stone of the Taj Mahal. Midway through our trip our driver's diesel car (very common in India) developed a problem with its catalytic converter, an integral part of a car's pollution control system. How did the mechanic deal with the problem? He removed the catalytic converter, smashed and emptied its innards, and placed the empty shell of it back on the car. Could one

realistically expect that this expensive part would be replaced any time in the near future? Doubtful at best. Multiply that vignette — or worse — repeatedly in developing countries around the world.

Things have gotten so bad in south Asia that we've seen the development of what has been termed The Asian Brown Cloud. (When representatives of countries under the cloud complained that the term unfairly stigmatized them, the P.C. police renamed it the Atmospheric Brown Cloud, apparently so they could keep the catchy ABC acronym. In the interest of clarity and at the risk of seeming politically incorrect, I will refer to it hereafter by its original moniker, since it simply indicates the cloud's location.) A team of over 250 scientists from the U.S., Europe, and India completed intensive field observations in south Asia in 1999 and were stunned at what they found.



> When the researchers first began noticing this smoggy haze, they thought it might be confined to major cities. As it turns out, it's an enormous blanket covering much of the area around the northern Indian Ocean. This part of the world is home to nearly 3 billion people, or about half the world's population, and it's industrializing rapidly. And because these countries can't afford state-of-the-art, energy-efficient technology, most of the new industries there are using old-fashioned, highly polluting engines and fuels.[19]

For at least a few months every year this brown haze hangs over most of south Asia, from Afghanistan in the west to the south of Japan. Not only is it hazardous to the health of the people living beneath the two-mile thick layer, but the haze scatters sunlight and reduces evaporation from the ocean, leading to less rainfall in an area of the world that can hardly afford it.

> "It's made of a variety of nasty substances, including fly-ash, sulfuric acid, particles from the burning of diesel and other fuels... it is extremely unhealthy and is also having quite important impacts on weather systems."
> — *Nick Nuttall, UN Environment Program*[20]

What may seem surprising to inhabitants of modern industrialized nations is the fact that a large part of the brown cloud comes from millions of people burning wood or dung in their homes for cooking.[21] Clearly the problem of air

[19] Bob Hirshon, "Asian Brown Cloud," in *Science Netlinks* (AAAS) (Jan 12, 2003).

[20] Radio Netherlands, "Brown Pall over Asia," (Aug 12, 2002).

[21] Ibid.

pollution, while differing in its sources and composition depending on the country and the season, is a deadly serious one for most of earth's inhabitants. A 1997 joint study of the World Health Organization (WHO), the World Resources Institute (WRI) and the US Environmental Protection Agency (EPA) estimated that annually nearly 700,000 deaths worldwide are related to air pollution and that this number may escalate to 8 million deaths by 2020.[22]

Nuclear Waste

The term nuclear waste is actually somewhat of an ironic misnomer. Most people assume that the reason it's considered waste is because all its usable material has been removed. In reality, not even 1% of the uranium ore's potential energy is used in a conventional light water reactor (LWR) or heavy water reactor (HWR), variations of which comprise nearly all of the reactors in use today.[23] If this seems like an incredible waste, then you can see the double entendre of the term quite clearly. The problem lies not only in the fact that we're throwing away so much fuel, but that what we're discarding creates an environmental legacy that will be hazardous to our progeny virtually forever.

In addition to the nuclear waste from reactors, the countries of the world that possess nuclear weapons have amassed a large quantity of weapons-grade material that has been recycled out of old warheads and is in need of disposal. So far about 260 tons of it have been produced, mostly by the nations of the "nuclear club," with more being produced all the

[22] UNEP (United Nations Environment Program) Assessment Report, 2002. *The Asian Brown Cloud: Climate and Other Environmental Impacts*

[23] George S. Stanford, "Integral Fast Reactors: Source of Safe, Abundant, Non-Polluting Power," in *National Policy Analysis* (Dec 2001).

time.[24] Some has been reprocessed into so-called MOX fuel to burn in nuclear reactors, but between that and the much greater quantity in spent fuel from nuclear plants we face a dilemma hitherto unknown to mankind.

The United States is the reluctant owner of much of the world's nuclear waste. After World War II the U.S. started its Atoms For Peace program, exporting nuclear technology for peaceful purposes (and undoubtedly for the benefit of the U.S. nuclear industry). Not wanting to have all that nuclear material scattered around the globe, however, the Americans stipulated that the 41 countries that participated in the program would have to ship their waste back to the USA.[25] It sounds more than a little naïve (and uninformed) when cries of alarm are heard about moving nuclear material around within the country, since we've been shipping the stuff all around the world with relative impunity for half a century. At this point, between its own production and the leftovers from its atomic client states, the U.S. is trying to come to grips with about 50,000 tons of used nuclear fuel.[26] Though the Atoms For Peace program was abandoned long ago, the policy of using the United States as a dumping ground for the countries involved continues to this day.

Despite this grim situation, an ever-increasing number of people are advocating a wholesale embrace of nuclear power regardless of the waste it generates, out of sheer desperation to stop the progress of global warming. Even some longtime icons of the environmental movement are now speaking up as advocates of nuclear power, and of course the nuclear industry

[24] William M. Arkin Robert S. Norris, "World Plutonium Inventories–1999," *Bulletin of the Atomic Scientists* Sept-Oct 1999.

[25] "Spent Nuclear Fuel Returned to the United States from Germany," ed. U.S. Dept of Energy (National Nuclear Security Administration, Sept 2004).

[26] Public_Citizen, *New Nuclear Power Plants = More Nuclear Waste* (Aug 2003 [cited); available from **http://tinyurl.com/5lps7a.**

is doing its best to be there with designs for a new generation of reactors. Nevertheless, disposing of the prodigious amounts of nuclear waste that we've already produced is a tall order that's generated immense controversy.

Even the newly converted are largely unaware that nuclear waste need not be a problem any longer. The grudging acceptance of the hazards of long-lived nuclear waste in exchange for addressing the global warming crisis is a Faustian bargain that need not be transacted. We'll see in the pages to come how we can avoid leaving a legacy of nuclear waste to future generations by turning a worrisome liability into a valuable asset.

Oil Shocks

At the time of this writing (and hopefully not at the time of your reading), the United States is deeply immersed in war in Iraq. Despite the obvious involvement of oil as a major factor in this war, there are some who would argue that the oil involved — generally reported as the second largest oil reserves of any nation — was not a causative factor in America's aggression. Be that as it may, it is clear that numerous wars have been fought over fossil fuel resources, either as the main reason (as in the first Gulf War under Bush Sr.) or, more frequently, as an undeniable element in either the progress or the triggering of hostilities, such as the Japanese invasion of the Dutch East Indies early in WWII.

Even when not contributing to all-out warfare, the unequal distribution of natural resources contributes disproportionately to international tensions, and few such resources create more tension than energy supplies. Just witness the political stresses between the USA and the government of Venezuela, one of the Americans' major suppliers of oil. President Hugo Chavez claimed that the failed coup against him in 2002 transpired with the cooperation, if not the instiga-

tion, of the United States.[27] Protestations to the contrary by the Bush administration were rendered somewhat suspect by the alacrity with which the USA recognized the coup's leaders, who held power for only two days before Chavez was reinstated.

Even as futurists are predicting wars that will be fought over water in the not too distant future, we have already been embroiled in fossil fuel wars for decades. The geopolitical instability caused by a desire for control of such resources is arguably one of the greatest impediments to peace in the world. As industrialization and prosperity spread to previously undeveloped nations, the competition for energy grows ever more serious.

> We are on the cusp of a new kind of war — between those who have enough energy and those who do not but are increasingly willing to go out and get it. While nations have always competed for oil, it seems more and more likely that the race for a piece of the last big reserves of oil and natural gas will be the dominant geopolitical theme of the 21st century.
>
> Already we can see the outlines. China and Japan are scrapping over Siberia. In the Caspian Sea region, European, Russian, Chinese and American governments and oil companies are battling for a stake in the big oil fields of Kazakhstan and Azerbaijan. In Africa, the United States is building a network of military bases and diplomatic missions whose main goal is to protect American access to oilfields in volatile places such as Nigeria, Cameroon, Chad and tiny Sao Tome — and, as important, to deny that access to China and other thirsty superpowers.[28]

[27] "Profile: Hugo Chavez," in *BBC News International Edition* (Dec 3, 2007).

[28] Paul Roberts, "The Undeclared Oil War," *Washington Post,* June 28, 2004.

There are other shocks besides resource wars that can be attributed to fossil fuels, though. The immense volatility of fuel prices creates economic shocks that can drive the entire world's economies into recession on almost a moment's notice. The very recognition of that fact only tends to exacerbate the wild price swings of oil and other such commodities whenever fighting, or even the threat of fighting, breaks out in one of the world's major oil producing regions.

On a personal level, too, price swings affect people in very direct ways. When gasoline prices passed three dollars per gallon in the USA in 2006 (my apologies to all those in Europe and elsewhere who find such whining contemptible), sticker shock at the pump was all too serious for the working poor who had no other way to get to work than driving. Now, as this goes to print, gas prices are pushing $5/gallon. Unfortunately it is all too easy to direct one's rage at the seeming source of the problem, which demagogues are often happy to point out is the Middle East and its wealthy potentates (or that pesky Chavez). Never mind that generations of politicians have failed to create a mass transit infrastructure in the USA that could provide alternative modes of transport. We're a car nation, thank you very much.

Oil prices aren't the only thing to hit people hard in the pocketbook, however. Natural gas prices go as wild as oil, and heating bills have gotten so high sometimes that people end up shivering through winters trying to keep from going broke. It would be one thing if the supplies were actually as variable as price swings would lead one to believe, but there is ample evidence that crass manipulation of the energy markets is often more to blame than any actual supply shortfall. The most egregious example that comes to mind is the case of Enron, which cost consumers in the state of California many billions of dollars. But similar shenanigans have gone on for decades in both the oil and natural gas industries, and why not? The en-

ergy companies have insinuated themselves so deeply into the pockets of America's lawmakers (or vice versa) that they can be assured of nothing more than a slap on the wrist on the rare occasions when they're caught shaking down consumers. Meanwhile they rake in obscene billions in profits, with wars and unrest only serving to enhance their ill-gotten gains.

At the height of oil shocks, you could ask anybody at a gas pump if they'd like to be able to kiss OPEC goodbye if there was a realistic alternative, and their answer would be quite predictable. Of course the fossil fuel industry employs legions of workers, and the abandonment of an entire industry would have a serious impact. Yet the coal industry, in the course of a few decades, experienced a downsizing of some 90% of its workforce due in large part to automation and the closure of obsolete mines. The oil and gas industries—and what remains of the coal industry—are bound to pass into history as well. The march of progress makes the end of fossil fuel use an inevitability. How soon will such an energy revolution happen, and how fast will the transformation come to pass?

Poring over some of the thousands of articles in print and on the Internet, or listening to countless energy experts on television, one gets only a hazy impression of an elusively distant future when energy production and use will be transformed into a clean and affordable part of our lives. But the technology is not really the problem. Political will and the repudiation of the most powerful industrialists in the world are the main impediments to progress. A world of energy independence free of manipulation, and free of facile rationales for gouging consumers, is within our grasp in the immediate future.

Water Wars

The human population of the world stands today at about 6.7 billion. A great many of those people have difficulty obtaining sufficient fresh water for their needs. By mid-century

the earth is expected to be home to some ten billion people. Where will all that extra fresh water come from?

This demographic horror story has resulted in predictions from many quarters of future wars being fought not just over energy supplies but over the most basic of human needs: water. Such wars have already been fought many times in the past, and international (and intranational) frictions that stop short of warfare are constantly at play around the world as populations struggle to appropriate water supplies sufficient for their needs.

Giant aquifers such as the Ogallala aquifer underlying several states in the middle of the USA are being pumped dry, far faster than their capacity to regenerate. Rivers are diverted for cities and irrigation, resulting in environmental catastrophes like the shrinking of the Aral Sea. It's sobering to imagine the pressures that will increase exponentially as earth's human population continues to expand, even as the glaciers that supply so many millions of people with their fresh water disappear under the relentless warming of the planet.

The deforestation and destruction of pristine habitat that is a corollary of overpopulation likewise destroys watersheds and further diminishes fresh water supplies. The impending water crises of the twenty-first century are as certain as the sun rising in the east, with the possible exception of massive disasters that would cull the human herd to more manageable numbers. With or without such catastrophes, things are looking pretty grim.

But don't give up hope. For the solutions to all these problems we've discussed—and more—are within our grasp, interwoven in a manner that may sound, at first, too good to be true. Yes, it will involve a paradigm shift and the boldness to embrace a global revolution. But it will be a joyful revolution, promising a more prosperous and peaceful world for everyone in the human family. Take heart. We're almost there.

CHAPTER TWO

Pie In The Sky

Who can cloy the hungry edge of appetite
by bare imagination of a feast?

— William Shakespeare, Richard II

VOICES FROM ALL sides are eagerly proffering solutions to the quandaries discussed in the previous chapter. Even the best of them, however, rarely attempt to fully remedy even a single one of these seemingly overwhelming challenges. Frequently the ideas are applicable to merely a portion of the world's population, usually those that are technologically more developed and which already possess substantial infrastructure for production and distribution of energy.

Unless one is unconvinced of the seriousness of global warming, nuclear proliferation, massive air pollution, nuclear waste, and political and economic instability caused by our dependence on fossil fuels, then it must be acknowledged that nibbling around the edges of these problems with half-hearted "solutions" is clearly insufficient. However well-intentioned they may be, virtually every proposal for addressing these urgent crises falls far short of its mark. Those who envision an environmentally benign technological utopia are usually, either intentionally or not, showing only half the cards in their hand, or

badly misreading them.

In the previous chapter we only briefly touched on serious global problems that have already been the subject of numerous books, articles, and televised exposition and commentary. Since the intention of this book is to offer solutions, we will again be brief in discussing the remedies that are being proposed and how most fall regrettably short of even their modest goals. For those who pay close attention to these issues, much of this may not be new. But this background information is necessary to understand both the seriousness of the issues and the often deplorable shortcomings of their proposed fixes.

It is not my intention to question the earnestness or sincerity of those countless people who are attempting to analyze and solve some of the most pressing problems of our time. Yet it does a disservice to all to pretend that good intentions or limited goals will turn the tide. The global crises confronting us in the 21st century require solutions that will include everyone, from the most advanced city to the poorest village. This is not because of a question of fairness and social justice, though it would be wonderful if that was a sufficient incentive. The fact is that these environmental, political, and economic dilemmas already involve everyone in the world and cannot be solved except by solutions with global participation and applicability.

Most of the proposals that we will touch on here have merit, and are steps in the right direction. Added together, if we could implement many of them simultaneously, our situation would clearly be better than if we ignore the dire straits in which we find ourselves. But moving in the right direction isn't always sufficient, especially when the destination is far beyond the horizon. Sometimes we need a quantum leap, and this is one of those times. Yet since at least some of the proposals being bandied about purport to be The Big Answer, let's take a look at them and see if they're hiding an Achilles heel somewhere beneath their rosy scenarios.

If this preview has awakened an interest in solving the serious issues facing humanity today, I hope you'll consider reading Prescription For The Planet in its entirety, and sharing your opinions with the author (via the website listed at the beginning of the book) or with potential readers via a reader review at amazon.com.