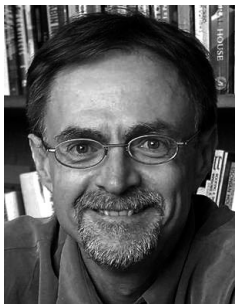
# Navigating peak everything to secure societies



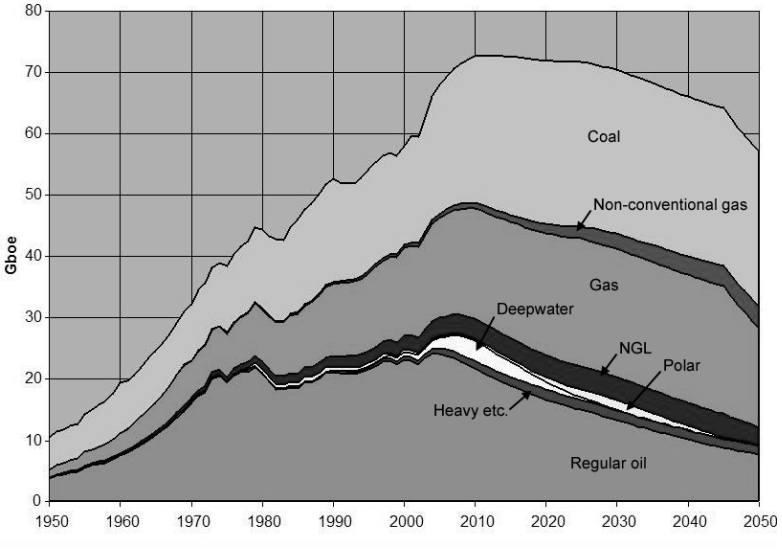
The 21st century will see decline in many major resources including fossil fuels and an end to the growth which sustains current societies. We can avert the worst-case scenario of global economic and ecological meltdown, and the tragic consequences, by strengthening our sense of community, cooperation and solidarity and proactively reducing our reliance on oil, gas, and coal ahead of depletion and scarcity. Solving the task of energy transition is a future worth working for as it will contribute to solving many problems created by industrial society. Will societies contract and simplify intelligently or in an uncontrolled, chaotic fashion with resource wars, death and destruction? **RICHARD HEINBURG** summarises his new book, *Peak Everything: Waking Up to the Century of Declines*.

Peak Oil refers to the time when the world will achieve its maximum possible rate of oil extraction. From then on, the amount of petroleum available to society on a daily or yearly basis will begin to dwindle. Informed analysts agree this will happen during the next two or three decades; an increasing number believe it's happening now, that conventional oil production peaked in 2005–2006 and the flow to market of all hydrocarbon liquids together will start to diminish around 2010.[1] Consequences, as they begin to accumulate, are likely to be severe in a world overwhelmingly dependent on oil for transportation, agriculture, plastics, and chemicals; thus a lengthy process of adjustment is required. According to a recent U.S. government-sponsored study, if the peak does occur soon, replacements are unlikely to appear quickly enough and in sufficient quantity to avert what it calls "unprecedented" social, political, and economic impacts.[2]

This book is not an introduction to the subject of Peak Oil; several existing volumes serve that function (including my own *The Party's Over: Oil, War and the Fate of Industrial Societies*).[3] Instead my new book addresses the social and historical context in which the event is occurring, and explores how we can reorganize our thinking and action in several critical areas to better navigate this perilous time.

Over the present century we will see an end to growth and decline begin in many parameters

On first encountering Peak Oil, most people assume it's a single isolated problem with a simple solution, perhaps an eco-friendly option (more renewable energy) or otherwise (more coal). But deeper reflection erodes the sense of the viability of such "solutions," as one contemplates how humans have so quickly become so deeply dependent on the cheap, concentrated energy of oil and other fossil fuels, it's difficult to avoid the conclusion we have caught ourselves on the horns of the Universal Ecological Dilemma, in the interlinked elements of population pressure, resource depletion, and habitat destruction, on a scale unprecedented in history.




OIL, GAS AND COAL PRODUCTION PROFILES

**A host of converging peaks**

Petroleum is not the only important resource quickly depleting. Readers already acquainted with Peak Oil literature, know regional production peaks for natural gas have already occurred, and that, over the short term, the economic consequences of gas shortages are likely to be even worse for Europeans and North Americans than those for oil. While coal is often referred to as an abundant fossil fuel, with reserves capable of supplying the world at current use rates for two hundred years into the future, a recent study updating global reserves and production forecasts concludes global coal production will peak and begin to decline in ten to twenty years.[4] Because fossil fuels supply about 85% of the world's total energy, peaks in these fuels virtually ensure the world's energy supply will begin to shrink within a few years, regardless of any efforts to develop other energy sources.

The vital question is whether societies will contract and simplify intelligently or in an uncontrolled, chaotic fashion?

Nor does the matter end with natural gas and coal. Scanning the horizon, a frightening array of peaks comes into view. Over the present century we will see an end to growth and decline commence in many parameters:

- Population
- Grain production (total and per capita)
- Uranium production
- Climate stability
- Fresh water availability per capita
- Arable land in agricultural production
- Wild fish harvests
- Yearly extraction of some metals and minerals (including copper, platinum, silver, gold, and zinc)

This book does not systematically go through these peak-and-decline scenarios one by one. Some peaks are more speculative than others: fish harvests are already in decline, so this is hardly arguable; however, projecting extraction peaks and declines for some metals requires extrapolating current rising rates of usage many decades into the future.[5] The problem of uranium supply beyond mid-century is well researched, but has not received sufficient public attention.[6] Nevertheless, the general picture is inescapably one of mutually interacting factors of over-consumption and emerging scarcity.

**From temporary abundance to contraction**

Our starting point is to realise we are living today at the end of the period of greatest material abundance in human history, based on temporary sources of cheap energy that made all else possible. Now the most important of the sources are entering their inevitable sunset phase, we are at the beginning of a period of overall societal contraction. It's not mere chance so many peaks are occurring together as the peaks are related in the historic reality that, for the past 200 years, cheap, abundant energy from fossil fuels has driven technological invention, increases in total and per-capita resource extraction and consumption (including food production), and population growth. We are enmeshed in a classic self-reinforcing feedback loop:

**Fossil fuel extraction**

more available energy
↳ increased extraction of other resources, and production of food and other goods
↳ population growth
↳ higher energy demand
↳ more fossil fuel extraction (and so on)

Self-reinforcing feedback loops sometimes occur in nature (population blooms are evidence of some sort of reinforcing feedback loop), but they rarely continue for long. They usually lead to population crashes and die-offs. The simple fact is growth in population and consumption cannot continue unabated on a finite planet. If increased availability of cheap energy has historically enabled unprecedented growth in extraction rates of other resources, then the coincidence of Peak Oil with the peaking and decline of many other resources is entirely predictable. Also, as availability of energy resources peaks, this will also affect social welfare parameters:

- Per-capita consumption levels
- Economic growth
- Easy, cheap, quick mobility
- Technological change and invention
- Political stability

These factors are clearly related to availability of energy and other critical resources. Once we accept that energy, fresh water, and food will become less freely available over next few decades, it's hard to escape the conclusion that, while the 20th century saw the greatest and most rapid expansion of the scale, scope, and complexity of human societies in history, the 21st will see contraction and simplification. The vital question is whether societies will contract and simplify intelligently or in an uncontrolled, chaotic fashion.

**Positive insights from other societies**

It's difficult to discuss these concerns in polite company, as the suggestion we are at or near the peak of

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population and consumption levels for the entirety of human history and that it's all downhill from here isn't likely to win votes, lead to a better job, or make for pleasant dinner banter. Most people turn off and tune out when conversation moves in this direction; advertisers and news organizations take note and act accordingly. The result: a general, societal pattern of denial. Where might we find solace in the gloom? It could be argued, some not-so-good things will also peak this century:

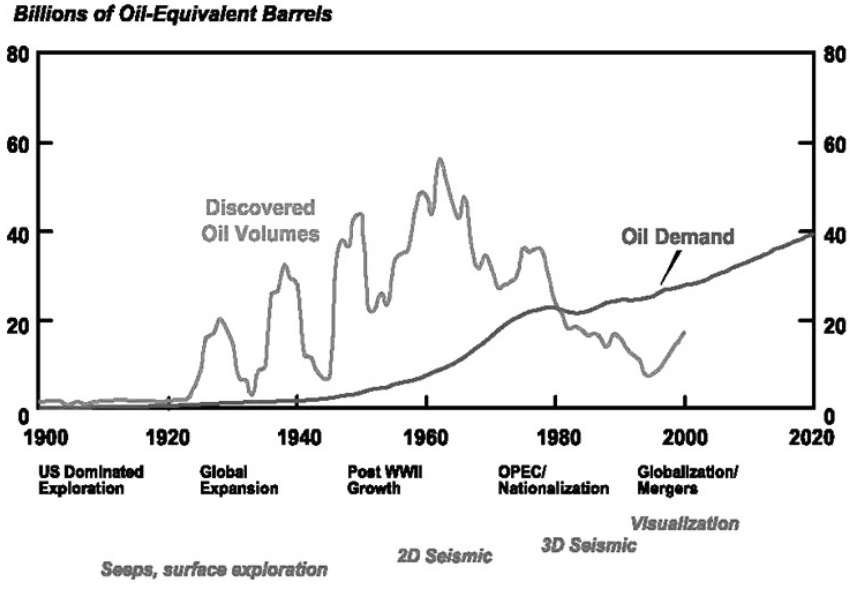
- Economic inequality
- Environmental destruction
- Greenhouse gas emissions

Why economic inequality? The late, great social philosopher Ivan Illich argued in his 1974 book *Energy and Equity,* that inequality increases with the flow of energy through a society. "[O]nly a ceiling on energy use," he wrote, "can lead to social relations that are characterized by high levels of equity."[7] Hunters and gatherers, who survived on minimal energy flows, also lived in societies nearly free from economic inequality. While some forager societies were better off than others because they lived in more abundant ecosystems, the members of any given group tended to share equally whatever was available. Their's was a gift economy, not the barter, market, and money economies we are familiar with.

With agriculture and full-time division of labor came higher energy flow rates as well as widening economic disparity between kings, their retainers, and the peasant class. In the 20th century, with per-capita energy flow rates soaring far above any in history, some humans also enjoyed unprecedented material abundance, so they expected poverty could be eliminated once and for all if only the political will could be summoned. In the middle years of the 20th century progress was seemingly being made on these lines. Yet for the century in total, inequality actually increased. The Gini index, invented in 1912 as a measure of economic inequality within societies, has risen substantially within many nations (including the U.S., Britain, India, and China) in the past three decades, and in the world as a whole.[8] In the decades just prior to the 20th century, the average income in the world's wealthiest country was about ten times more than that in the poorest; now it is over forty-five times more. According to a study released in December 2006 ("The World Distribution of Household Wealth,") the richest one percent of people now controls 40 percent of the world's wealth, while the richest two percent control fully half.[9] If this correlation between energy flow rates and inequality holds, it seems likely, as available energy decreases during the 21st century, we are likely to see a reversion to lower levels of inequality. This is not to say we will be living in an egalitarian socialist paradise by century's end, merely that today's inequality levels will become unsupportable.

**Peak environmental destruction**

Levels of humanly generated environmental destruction are also likely to peak and begin to recede in future decades. As available energy declines, our ability to alter the environment will also decline. But if we make no deliberate attempt to control our impact on the biosphere, the peak will be very high and we will do an immense amount of damage along the way. On the other hand, we could make a deliberate and intelligent effort to minimize environmental impacts, so the peak will be at a lower destruction level. This peak




GLOBAL OIL DISCOVERIES (EXXONMOBIL 2003)

is likely to lag behind others discussed, because many environmental harms involve reinforcing feedback loops as well as delayed and cumulative impacts that will continue to reverberate for decades after human population and consumption levels start to diminish. As a prime example of this, greenhouse gas emissions will undoubtedly peak this century, whether as a result of voluntary reductions in fossil fuel consumption, or depletion of the resource base, or societal collapse. However, the global climate may not stabilize until many decades later. Various reinforcing feedback loops set in motion, may play themselves out, such as melting of the north polar icecap, which would expose dark water that would in turn absorb more heat, would exacerbate the warming effect. The melting of tundra and permafrost, releasing stored methane would also greatly exacerbate warming. Indeed, the climate may not return to a phase of relative equilibrium for centuries.

**Positive factors not at limits**

So, are there any really good things not at or near their historic peaks? Here are some:

- Community
- Personal autonomy
- Satisfaction from honest work well done
- Intergenerational solidarity
- Cooperation
- Free time or leisure
- Happiness
- Ingenuity
- Artistry
- Beauty of the built environment

Some of these qualities are hard to quantify, but a few can be measured. Efforts to do so often yield surprising results. Leisure time is perhaps the element on this list that lends itself most easily to measurement. The most leisurely societies were those of hunter-gatherers, who worked about 1,000 hours yearly, though they seldom thought of dividing "work time" from "leisure time," as all activities were considered pleasurable in their way. For U.S. employees, hours worked peaked in the early industrial period, around 1850, at about 3,500 hours per year.[10] This was up from 1,620 hours worked annually by the typical medieval peasant. However, the two situations are not directly comparable: a typical medieval workday stretched from dawn to dusk (sixteen hours in summer, eight in winter), but work was intermittent, with breaks for breakfast, midmorning refreshment, lunch, a customary afternoon nap, mid-afternoon refreshment, and dinner; moreover, there were dozens of holidays and festivals scattered throughout the year. Today the average U.S. worker spends about 2,000 hours on the job, a figure somewhat higher than a couple of decades ago (in 1985 it was closer to 1,850 hours). Nevertheless, a long historical overview suggests the time-intensiveness of human labor seems to peak in the early phase of industrialization, and that a simplification of the modern economy could result in a reversion to older, pre-industrial norms.

In recent years the field of happiness research has flourished, with scores of studies published and several books devoted to statistical analysis of what gives people a sense of overall satisfaction in their lives. International studies of happiness levels show that, once basic survival needs are met, there is little correlation between happiness and per-capita rates of consumption of fossil fuels. According to surveys, people in Mexico, who use fossil fuels at one-fifth the rate of U.S. citizens, are just as happy.

Opportunities to continue to enjoy current (or elevated) levels of happiness and reduce work hours may seem pale comforts in view of the enormous social and economic challenges implicit in the peaks discussed earlier. Yet it's worth remembering the qualities above details things that matter very much to most people in their real, lived experience. A sense of community and the experience of intergenerational solidarity are literally priceless: no amount of money can buy them. Life without them is bleak - especially in times of social stress and there are many reasons to think these two factors have declined significantly during the past few decades of rapid urbanization and economic growth.

In contrast with these indices of personal and social well-being, Gross Domestic Product (GDP) per capita is easily measured and shows a mostly upward trend for the world as a whole over the past two centuries. But it accounts for only a narrow set of data, the market value of all final goods and services produced within a country in a given time. GDP growth tells us we should be feeling better about ourselves and our world, but it doesn't take into account a wide range of other factors, including damage to the environment, wars, crime and imprisonment rates, and trends in education. Many economists and non-governmental organizations have criticized governmental reliance on GDP for this reason, promoting instead use of a Genuine Progress Indicator (GPI), which includes these factors. While a historical GDP chart for the U.S. shows general ongo-

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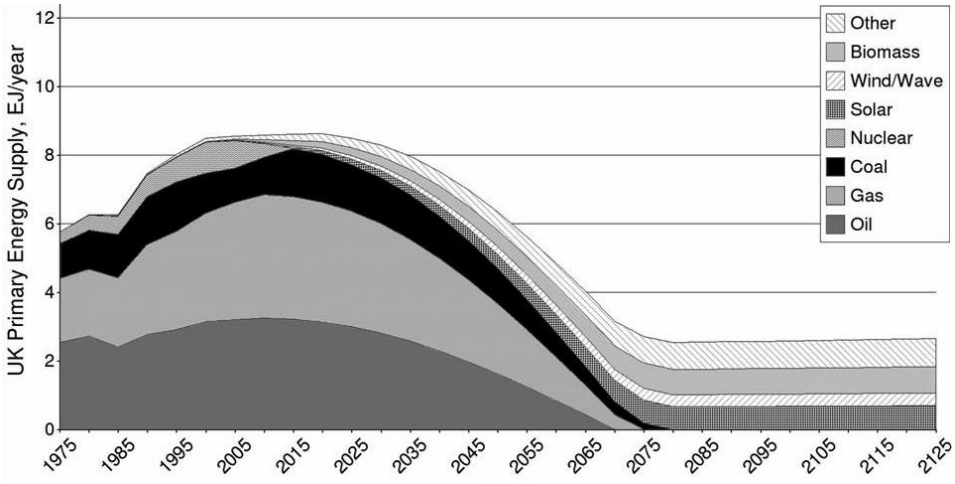
ing growth up to the present (GDP correlates closely with energy consumption), GPI calculations show a peak around 1980 followed by a slow decline.[11]

We must begin paying more attention to the seeming intangibles of life and less to GDP and the apparent benefits of profligate energy use, if as a society we are to adjust agreeably with minimal social disruption to lower rates of energy flow, less travel and transport. This is no mere palliative.




DEVELOP RENEWABLES (FROM PAUL MOBBS)

**Could a better society emerge?**

Addressing the economic, social, and political problems ensuing from the various looming peaks will require an enormous collective effort. To be successful, the effort must be coordinated, presumably by government. Enlisting people will require educating and motivating them in numbers and at a speed not been seen since World War II. Part of that motivation must come from a positive vision of a future worth striving toward. People will need to feel there will be an eventual reward for what will amount to many years of hard sacrifice. The reality is we are approaching a time of economic contraction where consumptive appetites, stoked for decades by ubiquitous advertising messages promising "more, faster, and bigger" must be reined in. People will not willingly accept the new message of "less, slower, and smaller," without new goals to attain. People must feel their efforts will lead to a better world, with tangible improvements in life for themselves and their families. The required massive public education campaigns must be credible, and will be much more successful if they give people a sense of investment and involvement in formulating the goals. Democracy is a much-abused word describing the necessary process.

To overcome a sense of paralyzing horror at seeing our society's future as one of decline in so many respects, we should ask: decline in what? Are we facing a complete disintegration of everything we hold dear, or merely a reversion to lower levels of complexity, consumption and population? The answer is unknowable at this stage. We could be at the brink of a collapse worse than any in history, for example, The Millennium Ecosystem Assessment, a four-year analysis of the world's ecosystems released in 2006, in which 1,300 scientists participated, concluded that 15 out of 24 ecosystems identified as essential to human life, are "being pushed beyond their sustainable limits," toward a state of collapse that may be "abrupt and potentially irreversible."[12] The signs are not good.

Yet, a decline in population, complexity, and consumption could, at least in theory, result in a stable society with characteristics many people would find quite desirable. Reverting to the normal pattern of human existence, based on village life, extended families, and local production for local consumption, especially if augmented by a few frills of the late industrial period, like global communications, could provide future generations will the kind of existence many modern urbanites wistfully dream about.

For the worst-case scenario to materialize, all that is required is for world leaders to continue with current policies

My new book is not necessarily one of doom, but of inevitable change with a need for deliberate engagement with the process of change on a scale and speed beyond anything in previous human history. Crucially: We must focus on and use intangibles that are not peaking (such as ingenuity and cooperation) to address the problems arising from our overuse of substances.

**Our great task: energy transition**

A few core trends have driven many others in producing today's global problems, including population growth and increasing consumption rates. Our central survival task for the decades ahead, as individuals and as a species, must be to make a transition away from the use of fossil fuels and to do this as peacefully, equitably, and intelligently as possible.

Globally, there are two problems whose potential consequences far outweigh most others: climate change and energy resource depletion. These two problems are potentially lethal; and are first-priority ailments. If we solve them, we will then be able to devote our attention to other human dilemmas, many of which have been with us for millennia: war, disease, inequality, and so on. If we do not solve these two problems, then in a few decades our species may be in no position to make any progress whatever on other fronts; indeed, it will likely be engaged in a struggle for its very survival. We'll be literally and metaphorically burning the furniture for fuel and fighting over scraps.

The reality of cars, television, and fast food, is calmly taken for granted; if life has been like this for decades, why shouldn't it continue, with incremental developmental changes, indefinitely?

If we do nothing to dramatically curtail emissions of greenhouse gases soon, there is a strong likelihood we will set in motion two self-reinforcing feedback loops mentioned previously: the melting of the north polar icecap, and the melting of tundra and permafrost releasing stored methane. If set in motion, this would lead to an averaged global warming not just of a couple of degrees, but perhaps six or more degrees over the remainder of the century. This in turn could make much of the world uninhabitable and agriculture impracticable in many if not most places, and could result not only in the extinction of thousands or millions of other species but the deaths of hundreds of millions or billions of human beings.

If our dependence on these fuels continues unabated, the post-peak decline in availability of oil, natural gas, and coal, could trigger economic collapse, famine, and a general war over remaining resources. The world is currently as reliant on hydrocarbons as it is on water, sunlight, and soil. Without oil for transportation and agriculture; without gas for heating, chemicals, and fertilizers; and without coal for power generation, the global economy would sputter to a halt. While no one envisions these fuels disappearing instantly, we can avert the worst-case scenario of global economic meltdown, and all the human tragedy it implies, only by proactively reducing our reliance on oil, gas, and coal ahead of depletion and scarcity. For the worst-case scenario to materialize, all that is required is for world leaders to continue with current policies.

Not only are the two great crises, closely related (peak oil and climate change stem from our dependence on fossil fuels), but, as already noted, many if not most of our other modern crises converge around fossil fuels. Even long-standing and perennial problems like economic inequality have been exacerbated by high energy-flow rates. Pollution is no different. We humans have polluted our environments in various ways for a very long time; activities like the mining of lead and tin have produced localized devastation for centuries. However, the problem of chemical pollution spread generally throughout the environment is a relatively new one and has grown much worse over the past decades. Many of the most dangerous pollutants are fossil fuel derivatives (pesticides, plastics, and other hormone-mimicking chemicals) or by-products from the burning of coal or petroleum (nitrogen oxides and other contributors to acid rain).

War might at first seem to be a problem completely independent of our modern thirst for fossil energy sources. However, as security analyst Michael Klare underscores in his book *Blood and Oil*,[1] many recent wars have turned on competition for control of petroleum; as oil grows scarcer in the post-peak environment, further wars and civil conflicts over black gold are almost assured. Also, fossil fuel used to prosecute war has made state-authorized mayhem far more deadly. Most modern explosives are made from fossil fuels, even the atomic bomb, which relies on nuclear fission or fusion rather than hydrocarbons for its horrific power, depends on fuel for its delivery systems.

In summary: We have used plentiful, cheap energy from fossil fuels predictably to expand our power over nature and one another. Doing so has produced a laundry list of environmental and social problems. We have tried to address these one by one, but our efforts will be much more effective if directed at their common root, by ending our dependence on fossil fuels. Many problems rightly deserve attention, but the problem of our dependence on fossil fuels is central to human survival, and as long as that dependence continues to any significant extent we must make its reduction the centerpiece of our collective efforts, whether to feed ourselves, resolve conflicts, or maintain a functioning economy. Some positive results of addressing our dependence on fossil fuels are:

- If we focus our collective efforts on the central task of energy transition, we may find ourselves contributing to the solution of a wide range of problems much harder to solve if we confront each one in isolation.
- With a coordinated and voluntary reduction in fossil fuel consumption, we could see substantial progress in reducing many forms of environmental pollution.
- Decentralization of economic activity which we must pursue as transport fuels become more scarce could lead to more local jobs, more fulfilling occupations, and more robust local economies.

- A controlled contraction in global oil trade could lead to a reduction of international political tensions.
- A planned conversion of farming to non-fossil fuel methods could mean a decline in environmental devastation caused by agriculture and economic opportunities for millions of new farmers.
- All these efforts together could increase equity, community involvement, intergenerational solidarity, and the other intangible goods listed earlier.

Surely this is a future worth working towards!

**The (rude) awakening**

The subtitle of my book, "Waking Up to the Century of Declines," reflects my impression that even those of us who have been thinking about resource depletion for many years are just awakening to its full implications. If we are all in various stages of waking up to the problem, we are also waking up from the cultural trance of denial in which we are embedded.[14]

This awakening is multi-dimensional. The reality of cars, television, and fast food, is calmly taken for granted; if life has been like this for decades, why shouldn't it continue, with incremental developmental changes, indefinitely? But how profoundly different this "normal" life is in a typical modern city from the lives of previous generations of humans! And the fact it's built on a foundation of cheap, finite fossil fuels means future generations must and will live differently. The awakening I am describing is an ongoing visceral and intellectual reassessment of every facet of life: food, work, entertainment, travel, politics, economics, and more. The experience is so all-encompassing, it defies linear description. Yet we must make the attempt to describe and express it; we must turn our multi-dimensional experience into narrative, because this is how humans process and share our experiences of the world.

The great transition of the 21st century will entail enormous adjustments by every individual, family and community. To be made successfully, rational planning will be needed. Implications and strategies will have to be explored in nearly every area of human interest: agriculture, transport, global war and peace, public health, resource management, etc. Books, research studies, television documentaries, and every imaginable form of information transfer will be needed for each of these areas. We will also need citizen organizations to turn policy into action, and artists to create cultural expressions that can help fire the collective imagination. Within this whirlwind of analysis, adjustment, creativity, and transformation, perhaps there is need for a book that tries to capture the overall spirit of the time into which we are headed, that ties the many cultural changes to the science of global warming and peak oil in hopefully surprising and entertaining ways, and begins to address the psychological dimension of our global transition from industrial growth to contraction and sustainability.

Most of the peaks we face cannot be avoided, but there are many things we can do to navigate around them to enhance human sanity, security, and happiness. Let's do these things. Let's work to make a future world from whose vantage point, decades on, we can look back on these premonitions as having been far too gloomy. PE

**Richard Heinberg is a journalist, educator, and author of eight books, including: *The Party's Over; Oil, War and the fate of industrial societies; Powerdown: Options and action for a post-carbon world*. He works fulltime for the Post Carbon Institute as a Senior Fellow and until December 2007 was a member of the core faculty of New College of California, Santa Barbara, where he taught on Culture, Ecology and Sustainable Communities. He writes and publishes the monthly Mewsletter at www.museletter.com. This article is an adaptation of the introduction to his new book, *Peak Everything: Waking Up to the Century of Declines*.**

## NOTES

1. From the *OPEC Bulletin*, Nov.–Dec., 2006: "[A]ll in all, most would appear to agree that peak oil output is not very far away for all of us. It could take place sometime within the next decade or so, which in fact means that there is not much time left for a world economy to be driven largely by oil." Meanwhile, Claude Mandil, Executive Director of the International Energy Agency, speaking on the IEA *World Energy Outlook 2006*, had this to day: "WEO-2006 reveals that the energy future we are facing today, based on projections of current trends, is dirty, insecure and expensive." http://www.energybulletin.net/22042.html
2. Robert Hirsch et al., "Peaking of World Oil Production: Impacts, Mitigation and Risk Management" (2005) http://www.projectcensored.org/newsflash/the_hirsch_report.pdf
3. See also: Kenneth S. Deffeyes, *Beyond Oil: The View from Hubbert's Peak* (Hill and Wang, 2005), and Roger D. Blanchard, *The Future of Global Oil Production: Facts, Figures, Trends and Projections, by Region* (McFarland, 2005).
4. Energy Watch Group, "Coal: Resources and Future Production," http://www.energywatchgroup.org/files/Coalreport.pdf. See also Richard Heinberg, "Burning the Furniture," http://globalpublicmedia.com/richard_heinbergs_museletter_179_burning_the_furniture
5. http://kontentkonsult.com/blog/2006/01/peak_metals.html
6. Energy Watch Group, "Uranium Resources and Nuclear Energy," Dec 2006 http://ww.energiekrise.de/news/docs/specials2006/REO-Uranium_5-12-2006.pdf
7. Ivan Illich, *Energy and Equity* (Calder & Boyars, 1974), p. 17.
8. See http://en.wikipedia.org/wiki/Gini_coefficient
9. *The World Distribution of Household Wealth 2006–2007*, James B. Davies, Susanna Sandstrom, Anthony Shorrocks, Edward N. Wolff.
10. Data for this paragraph are taken from from *The Overworked American: The Unexpected Decline of Leisure*, by Juliet B. Schor (Basic Books, 1993); see also http://www-swiss.ai.mit.edu/~rauch/worktime/hours_workweek.html
11. *Why Bigger Isn't Better: The Genuine Progress Indicator 1999 Update* – Redefining Progress 1999, http://www.rprogress.org
12. See http://www.maweb.org, http://article.wn.com/view/2007/01/04/Global_warming_is_here_now_what/
13. Michael Klare, *Blood and Oil: The Dangers and Consequences of America's Growing Dependency on Imported Petroleum* (Metropolitan Books, 2004).
14. Thanks to my friend Chellis Glendinning, for her book titled *Waking Up in the Nuclear Age* (1987), which was an inspiration in more ways than one.