Natural Capitalism Advantage Index

Next Advantage _____is Modern Capitalism

__Modern notions of capitalism and consumption will assure any number of catastrophic and devastating ends—biotic impoverishment, climate disruption, toxification, population pressures, peak oil, economic and political instabilities, terrorism, nuclear proliferation, the risks of various 21st century technologies, and the list goes on.
Gus Speth, Dean of the School of Forestry at Yale University, *The Bridge at the Edge of The World, 2008 (http://www.rachel.org/en/node/6956)*

Human societies are moving, rapidly now, between the two worlds. The movement began slowly, but now we are hurtling toward the world directly ahead. The old world, nature 's world, continues, of course, but we are steadily closing it down, roping it off. It flourishes in our art and literature and in our imaginations. But it is disappearing.

Economic historian Angus Maddison reports that in the year 1000 there were only about 270 million people on earth -- fewer than today's U.S. population. Global economic output was only about $120 billion. Eight hundred years later, the man-made world was still small. By 1820, populations had risen to about a billion people with an output of only $690 billion. Over this eight hundred years, per capita income increased by only a couple of hundred dollars a year. But shortly thereafter the take-off began. By 2000, populations had swelled by an additional five billion, and, astoundingly, economic output had grown to exceed forty trillion dollars.[19] The acceleration continues. The size of the world economy doubled since 1960, and then doubled again.

World economic activity is projected to quadruple again by mid-century.

Historian J. R. McNeill has stressed the phenomenal expansion of the human enterprise in the twentieth century. It was in the twentieth century, and especially since World War II, that human society truly left the moorings of its past and launched itself on the planet with unprecedented force. McNeill observes that this exponential century "shattered the constraints and rough stability of old economic, demographic, and energy regimes." "In environmental history," he writes, "the twentieth century qualifies as a peculiar century because of the screeching acceleration of so many of the processes that bring ecological change."[20] We live now in a full world, dramatically unlike the world of 1900, or even that of 1950.

Physicists have a precise concept of momentum. To them momentum is mass times velocity, and velocity is not just speed but also direction.

Today the world economy has gathered tremendous momentum -- it is both huge in size and growing fast. But what is its direction?

I am seated in my study as I write this, looking at a stack of books about two feet high. They share a common theme, and it is not a happy one to contemplate. We can see this theme immediately in their titles.[21]

By a conservative jurist: Richard A. Posner, Catastrophe: Risk and Response

By the president of the Royal Society in the United Kingdom: Martin Rees, Our Final Hour: How Terror, Error and Environmental Disaster Threaten Humankind's Future

By a leading American scholar: Jared Diamond, Collapse: How Societies Choose to Fail or Succeed

By a British scientist: James Lovelock, The Revenge of Gaia: Why the Earth Is Fighting Back and How We Can Still Save Humanity

By an American expert: James Howard Kunstler, The Long Emergency: Surviving the End of Oil, Climate Change, and Other Converging Catastrophes of the Twenty-first Century

By a U.S. expert on conflict: Michael T. Klare, Resource Wars: The New Landscape of Global Conflict

By an Australian diplomat and historian: Colin Mason, The 2030 Spike: The Countdown to Global Catastrophe

That is but a sample of the "collapse" books now on the market. Each of these authors sees the world on a path to some type of collapse, catastrophe, or breakdown, and they each see climate change and other environmental crises as leading ingredients of a devil's brew that also includes such stresses as population pressures, peak oil and other energy supply problems, economic and political instabilities, terrorism, nuclear proliferation, the risks of various twenty-first- century technologies, and similar threats. Some think a bright future is still possible if we change our ways in time; others see a new dark ages as the likely outcome. For Sir Martin Rees, "the odds are no better than fifty-fifty that our present civilization on earth will survive to the end of the present century."[22] Personally, I cannot imagine that the risks are so great, but Rees is a thoughtful individual. In any case, it would be foolish to dismiss these authors.

They provide a stark warning of what could happen.

The escalating processes of climate disruption, biotic impoverishment, and toxification that continue despite decades of warnings and earnest effort constitute a severe indictment, but an indictment of what exactly? If we want to reverse today's destructive trends, forestall further and greater losses, and leave a bountiful world for our children and grandchildren, we must return to fundamentals and seek to understand both the underlying forces driving such destructive trends and the economic and political system that gives these forces free rein. Then we can ask what can be done to change the system.

The underlying drivers of today's environmental deterioration have been clearly identified. They range from immediate forces like the enormous growth in human population and the dominant technologies deployed in the economy to deeper ones like the values that shape our behavior and determine what we consider important in life. Most basically, we know that environmental deterioration is driven by the economic activity of human beings. About half of today's world population lives in abject poverty or close to it, with per capita incomes of less than two dollars a day. The struggle of the poor to survive creates a range of environmental impacts where the poor themselves are often the primary victims -- for example, the deterioration of arid and semiarid lands due to the press of increasing numbers of people who have no other option.

But the much larger and more threatening impacts stem from the economic activity of those of us participating in the modern, increasingly prosperous world economy. This activity is consuming vast quantities of resources from the environment and returning to the environment vast quantities of waste products. The damages are already huge and are on a path to be ruinous in the future. So, a fundamental question facing societies today -- perhaps the fundamental question -- is how can the operating instructions for the modern world economy be changed so that economic activity both protects and restores the natural world?

With increasingly few exceptions, modern capitalism is the operating system of the world economy. I use "modern capitalism" here in a broad sense as an actual, existing system of political economy, not as an idealized model. Capitalism as we know it today encompasses the core economic concept of private employers hiring workers to produce products and services that the employers own and then sell with the intention of making a profit. But it also includes competitive markets, the price mechanism, the modern

corporation as its principal institution, the consumer society and the materialistic values that sustain it, and the administrative state actively promoting economic strength and growth for a variety of reasons.

Inherent in the dynamics of capitalism is a powerful drive to earn profits, invest them, innovate, and thus grow the economy, typically at exponential rates, with the result that the capitalist era has in fact been characterized by a remarkable exponential expansion of the world economy. The capitalist operating system, whatever its shortcomings, is very good at generating growth.

These features of capitalism, as they are constituted today, work together to produce an economic and political reality that is highly destructive of the environment. An unquestioning society-wide commitment to economic growth at almost any cost; enormous investment in technologies designed with little regard for the environment; powerful corporate interests whose overriding objective is to grow by generating profit, including profit from avoiding the environmental costs they create; markets that systematically fail to recognize environmental costs unless corrected by government; government that is subservient to corporate interests and the growth imperative; rampant consumerism spurred by a worshipping of novelty and by sophisticated advertising; economic activity so large in scale that its impacts alter the fundamental biophysical operations of the planet -- all combine to deliver an ever-growing world economy that is undermining the planet's ability to sustain life.

Hydrogen economy creates 'natural capitalism' that will reform economics away from competitive economics toward interdependence and sustainability

James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 33[illegible]-332)

In the past, what we consider resources—things like minerals, forests, and fish in the sea—were plentiful. When market-based economics took form, resources were treated as though they were inexhaustible and had no intrinsic value. The only thing accounted for was the cost of extraction. At that time, it was money and manufacturing infrastructure to drive the economic engine that was in short supply. That circumstance has now been turned on its head. It is resources that have become increasingly scarce. Moreover, the processes used to extract and convert resources to products often have a high negative consequence for society. Standard economic practice treats those negative consequences as if they don't exist. They are externalized and not accounted for on economic balance sheets. The greenhouse pollutants that flood the atmosphere from the consumption of fossil fuels burden society with hundreds of billions of dollars in health costs, in environmental costs, and in the military costs of defending foreign energy supplies. Those costs are not reflected in the producer's price for extracting and converting oil to consumer products like gasoline and fertilizer, and they are not included in what consumers actually pay. The rules of economics, which are rooted in seventeenth-century industrialism and have changed little since then, simply ignore these very real costs of doing business and leave the bill for the public to pay.

Paul Hawken, author of an article titled "Natural Capitalism," which appeared in *Mother Jones* magazine in March 1997, put it this way:

> Everyone is familiar with the traditional definition of capital as accumulated wealth in the form of investments, factories, and equipment. "Natural capital," on the other hand, comprises the resources we use, both nonrenewable (oil, coal, metal ore) and renewable (forests, fisheries, grasslands). Although we usually think of renewable resources in terms of desired materials, such as wood, their most important value lies in the services they provide. These services are related to, but distinct from, the resources themselves. They are not pulpwood but forest cover, not food but topsoil. Living systems feed us, protect us, heal us, clean the nest, let us breathe. They are the "income" derived from a healthy environment: clean air and water, climate stabilization, rainfall, ocean productivity, fertile soil, watersheds, and the less-appreciated functions of the environment, such as processing waste—both natural and industrial.[3]

Economics as currently practiced encourages tremendous resource waste. The amount of waste produced in the United States amounts to about a million pounds per person annually. Only about one percent of the materials used in the United States actually end up in products still in use six months after sale.[4] Recycling and modest improvements in industrial processes are improving resource productivity, but there is still far too much waste.

__Natural capitalism will solve for the negative and aggressive notions of capitalism through reinvention of capitalism

Gus Speth, Dean of the School of Forestry at Yale University, *The Bridge at the Edge of The World, 2008 (http://www.rachel.org/en/node/6956)*

The question whether we would then have an operating system other than capitalism or a reinvented capitalism is largely definitional. In the end, the answer is probably not important. I myself have no interest in socialism or centralized economic planning or other paradigms of the past. As Robert Dahl has quipped, "Socialist programs for replacing market capitalism [have] fallen into the dustbin of history."[23] The question for the future, on the economic side, is how do we harness economic forces for sustainability and sufficiency?

The creativity, innovation, and entrepreneurship of businesses operating in a vibrant private sector are essential to designing and building the future. We will not meet our environmental and social challenges without them. Growth and investment are needed across a wide front: growth in the developing world -- sustainable, people- centered growth; growth in the incomes of those in America who have far too little; growth in human well-being along many dimensions; growth in new solution-oriented industries, products, and processes; growth in meaningful, well- paying jobs, including green-collar ones; growth in natural resource and energy productivity and in investment in the regeneration of natural assets; growth in social and public services and in investment in public infrastructures, to mention a few. These are the things we should be growing, and it makes good sense to harness market forces to such ends. As I discuss in Chapter 5, even in a "post-growth society," many things still need to grow.

I believe Paul Hawken, Amory Lovins, and Hunter Lovins have it right when they propose these strategies for the new economy in their book Natural Capitalism:

Radically increased resource productivity in order to slow resource depletion at one end of the value chain and to lower pollution at the other end.

Redesigned industrial systems that mimic biological ones so that even the concept of wastes is progressively eliminated. (This is what the new field of industrial ecology is all about.)

An economy based on the provision of services rather than the purchase of goods.

Reversal of worldwide resource deterioration and declines in ecosystem services through major new investments in regenerating natural capital.[24]

The good news is that impressive thinking and some exemplary action have occurred on the issues at hand. Proposals abound, many of them very promising, and new movements for change, often driven by young people, are emerging.[25] These developments offer genuine hope and begin to outline a bridge to the future. The market can be transformed into an instrument for environmental restoration; humanity's ecological footprint can be reduced to what can be sustained environmentally; the incentives that govern corporate behavior can be rewritten; growth can be focused on things that truly need to grow and consumption on having enough, not always more; the rights of future generations and other species can be respected.

__Now is the key time – we can reclaim the environment but not without action. Words and rethinking aren't enough to escape the urgency of now.
Gus Speth, Dean of the School of Forestry at Yale University, *The Bridge at the Edge of The World, 2008 (http://www.rachel.org/en/node/6956)*

In the end, then, despite the large volume of bad news, we can conclude with an affirmation. We can say with Wallace Stevens that "after the final no there comes a yes." Yes, we can save what is left.

Yes, we can repair and make amends. We can reclaim nature and restore ourselves. There is a bridge at the edge of the world. But for many challenges, like the threat of climate change, there is not much time.

A great American once said: "We are now faced with the fact that tomorrow is today. We are confronted with the fierce urgency of now. In this unfolding conundrum of life and history there is such a thing as being too late. Procrastination is still the thief of time. Life often leaves us standing bare, naked and dejected with a lost opportunity. The 'tide in the affairs of men' does not remain at the flood; it ebbs. We may cry out desperately for time to pause in her passage, but time is deaf to every plea and rushes on. Over the bleached bones and jumbled residue of numerous civilizations are written the pathetic words: 'Too late.'" -- Martin Luther King, 4 April 1967, Riverside Church, New York City.

Let us turn, then, to the costs of being too late.

Rising Prices = Rich Poor Gap

OIL PRICES CAUSING THE POOR TO BE POORER

States News Service, July 1, 2008, Information released by The UN Economic and Social Council *CALLS FOR CONCRETE ACTION TO ADDRESS PROBLEMS AFFLICTING INTERNATIONAL SYSTEM MARK OPENING OF ECONOMIC AND SOCIAL COUNCIL'S 2008 GENERAL DEBATE,* ln

ROSALINA YNOA GONZALEZ, Director-General for Multilateral Cooperation, Ministry of to which required will and creativity, as well as, above all, immediate action on the part of the entire international community. The lack of solidarity and cooperation by certain population sectors was regrettable. There was a need to strengthen national capacity, but that effort must be tailored to the global situation. The combination of oil price hikes and rising food costs was putting all development efforts at risk and making poor people even poorer, she said. The rising costs threatened not only the Millennium Goals but all national development targets, putting development increasingly beyond the reach of those needing it most. The current situation should mobilize political will and prompt action by all countries to meet their commitments to the attainment of sustainable development. In the past, big change had sometimes produced progress. From darkness, light could indeed be born. But for light to shine throughout the planet, it was necessary to ensure that globalization was an act of solidarity.

INCREASING OIL COSTS ARE WIDENING THE GAP BETWEEN THE RICH AND THE POOR

The Houston Chronicle, February 29, 2008, *Notable Absences Can Mean Nothing Good for Our Energy Future,* BUSINESS; Pg. 1, (Loren Steffy)

That could have dire economic consequences by the time the next president takes office in January.

"They're likely to walk into $120-a-barrel oil," Robert Kelly, chairman of DKRW Energy, which is developing coal-to-liquids and other alternative fuels, told me after he spoke on a panel with other executives. "They're likely to walk into people being very dissatisfied with having to pay a lot more for gasoline."

And, he added, consumers are likely to grow frustrated with the intransigence of Washington on energy issues.

"We're shelling out a half a trillion dollars a year that's going overseas for oil, and somebody needs to address this," he said.

Don't look to the current crop of presidential hopefuls. They favor feel-good political pablum such as "green energy" and conservation.

Renewable energy initiatives are important, and some of Clinton's ideas - and those of no-show Barack Obama - have merit. John McCain hasn't even gone that far, barely mentioning energy aside from an endorsement of nuclear power.

Green energy programs are years, perhaps decades, from making a sizable dent in our oil consumption. So what, then, does our next president do in the meantime?

How about $150? Kelly's scenario could be conservative. After all, oil prices have doubled in the past year, and they've risen fivefold in four years.

If oil continues on its recent trajectory, prices could be at $150 a barrel or more by the inauguration.

"What do we say to the low-income driver who today is putting $3 gasoline in his tank?" Shell Oil President John Hofmeister asked the audience at the start of the event. "We face continuing, eroding social and economic justice."

Oil, in other words, is an economic issue. As prices rise, it's in danger of becoming a fuel of the affluent, forming a wedge that widens the gap between rich and poor.

Rising Prices= Rich Poor Gap

RISING OIL PRICES IN IRAN CAUSE A WIDENING GAP BETWEEN RICH AND POOR

The Washington Post, **June 30, 2008**, *Oil Cash May Prove A Shaky Crutch for Iran's Ahmadinejad*, Pg A1

Oil wealth, which funds 60 percent of the national budget, has allowed Iran's government to exercise its power to cut interest rates and ignore warnings from the country's Central Bank that overspending will worsen inflation.

Iran earned $80 billion from oil and gas sales in the fiscal year that ended March 20, up from $35 billion three years ago. But the increasing oil revenue is causing a widening gap between rich and poor, as some businesspeople prosper while inflation eats away at consumers' purchasing power. These developments jeopardize Ahmadinejad's populist appeal and could hurt his campaign for reelection in 2009.

RISING FUEL COSTS HURT DEVELOPING COUNTRIES

The New York Times, **October 1, 2000**, *The World: In Poor Countries, High Oil Prices Cost Even More*, Page 16; Column 1; Week in Review Desk

In much of the developing world, in countries without oil of their own, rising fuel prices can not only cripple public transportation or gut slender national budgets that could otherwise be used to improve living standards and services. They also can weaken crucial sectors of fledgling private economies that are supposed to hold out hope for national growth.

Furthermore, developing countries with no oil, gas or large-scale hydroelectricity, especially small or landlocked nations, are in the hands of importers and transporters who show no mercy. Big lending institutions don't make it easy for them to get credit for alternative sources of energy. And to compound all this, prices for commodities produced in the third world have fallen disastrously over the last decade.

OIL COMPANIES ARE DRIVING PEOPLE INTO BANKRUPTCY

Mobile Register (Alabama), **April 27, 2008**, *Sound Off*, Section A Pg 2

Oil companies spinning profits. The oil companies are flooding the airwaves with messages about what great people they are and what they're providing us with while they're dipping deep into our pockets, driving everybody into bankruptcy. They're taking all the money they're getting from us and trying to sell to us that they are good guys and they're doing everything they can to help us out. Yeah. And look at the profits they're making. We are poor people who can't even afford to buy food or medicine.

Rising Prices = Starvation

RISING OIL PRICES RESULT IN MALNUTRITION AND STARVATION

Chattanooga Times Free Press (Tennessee), **April 18, 2008**, *Dangerous global food crisis*, Page B6

The world is caught in a perfect storm of increasing fuel costs, higher prices for the grains that are the basic foodstuffs of many people around the world, and the growing demand for meat and other high-ticket items in developing countries such as China and India. Relatively prosperous nations can cope with the surge in costs, though not without some pain. Poor countries are unable to do so. Unfortunately, there's nothing to suggest the situation will improve in the short term.

Increased demand for fuel keeps the price for oil on the rise. As the price for fuel -- now at record levels -- rises, the cost of transporting raw and processed foods to market increases. The diversion of many grains from the food chain to ethanol production, especially in the United States, exacerbates the situation. The costs are passed on to consumers. The increased costs make it impossible for millions to buy food. Malnutrition, starvation and protest are the result.

The spread of hunger is well documented. Global experts say that more than 30 nations already confront food shortages great enough to promote domestic instability. More are on the verge. Protests are spreading. A recent riot in Haiti led to the ouster of the nation's prime minister. Similar protests in Egypt, Ethiopia and other countries threaten political stability.

Clearly, there is a need for both short- and long-term antidotes to rising food prices. Short-term relief requires significant financial assistance to poorer nations from wealthier ones. Long-term relief will require fundamental changes in domestic and international political and economic policy.

Neither form of relief will come easy. The United States, for example, will be hard-pressed to find money to assist poor nations buy food. The dollar is weak, and borrowing to pay for the war in Iraq has drained the treasury capacity to issue more debt. Long-term relief calls for political action that will take time to implement or that is antithetical to current policy.

Energy Not Accessible

ENERGY IS NOT EQUALLY ACCESSABLE TO ALL PEOPLE ESPECIALLY THE IMPOVERISHED RIGHT NOW.

States News Service, May 10, 2007, *New, Diverse Energy Sources Must Be Explored To Put World On Greener Path' To Economic Growth, Sustainable Development Commission Told*, In

AD MELKERT, Associate Administrator of the United Nations Development Programme (UNDP), said that despite the abundance of available energy, access for many remained as elusive as ever. Nearly two billion people currently lived without access to modern energy services, a number that had hardly changed in the past 20 years and was likely to grow. That entrenched billions of people, particularly women, in poverty. Climate, he noted, was an energy challenge, with roughly three quarters of greenhouse gas emissions due to the burning of fossil fuels. Mitigation and adaptation measures were needed. Those challenges were not insurmountable. It was possible to finance and deliver access to energy services.

Hydrogen is the equilizer

Hydrogen will create equitable and sustainable life for all people
James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 339-40)

When basic needs are met, remarkable things can happen. On the Pacific Northwest coast, for thousands of years the indigenous nations were uniquely blessed to live their lives in the midst of plenty. Between lush green forests and an ocean coastline swelled up with natural abundance, these Native Americans and First Nations bands were able to easily meet their basic needs. With substantial time on their hands, they developed rich cultural traditions that included art and dance, powerful lore, and complex ritual. Their wealth was such that self-esteem was not tied to material possession. In great intertribal festivals known as potlatch, the host chief's status was linked directly to how much wealth his band could bestow on their guests. Though this kind of beneficence and sharing is a far cry from what we know in our own culture, perhaps we are not so far away from seeing a rebirth of a similar kind of cultural goodwill. Clean, inexhaustible, renewably produced hydrogen makes it possible.

In coming decades, with good public policy, the great civilization-scale challenges the world currently faces will be overcome. Energy is the great equalizer. When you have access to unlimited quantities of cheap energy wounds can be healed, shortcomings can be corrected, life can be sustained.

We think the future belongs to the great ideas of the age, of which the best is natural capitalism. Powered by clean, renewably produced hydrogen energy, resource conservation and sustainability will become the new paradigm that governs the world economy. Public policy will reshape the marketplace so that productivity and profit are shared widely] p. 339-40

ENERGY IS THE EQUILIZER OF THE PEOPLE OF THE US

The Birmingham Times, November 22, 2007, Pg. A5, A13 Vol. 43 No. 47, (Roy Innis)

Energy is the "master resource" on which everything else depends. Abundant, reliable and affordable electricity, natural gas and transportation fuels make our jobs, health and living standards possible. They are the great equalizer-the creator of economic opportunities and true environmental justice.
Lock those resources up-cripple our energy sector with taxes, over-regulation and ill-advised laws that make heating, driving and manufacturing more costly-and the poor suffer most. Destroy jobs, or make poor families pay an ever-larger portion of their meager incomes for energy, food and clothing and the hard-wen victories for civil rights are quickly reversed.
Keep businesses out of neighborhoods blighted by slum dwellings and brownfields and you take away jobs, health insurance, a stronger tax base for schools, environmental clean-ups and a chance for the American Dream. Lock up oil, gas and coal prospects and there will be fewer job opportunities even in companies that are committed to diversity.

Natural Cap= Sustainable Econ.

Natural capitalism revolution will allow for sustained economic growth
James Provenzano, President of Clean Air Now and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 332-3)

Our challenge is to protect the vitality of the natural world while growing economically to deliver peace and prosperity for future generations. Getting it done will require energy and resource productivity levels that are fifty, perhaps a hundred times better than current levels. Nature provides the model for accomplishing the goal. Nature, over billions of years, has perfected its capacity to get the most from the least, to turn the waste from one natural process into the ideal nourishment for another, and to grow from seed to flourishing complexity.

Natural capitalism takes its lessons from nature. It assigns real value to energy and resources, accounts for all costs previously dismissed and ignored as external, and employs market tools to encourage efficiency and maximize productivity. At the same time, it embraces the best aspects of traditional capitalism.

A quote often attributed to Winston Churchill goes like this, "Capitalism is the worst form of government in the world, except for all the rest." It turns out Churchill, if he used the phrase at all, was talking about democracy, not capitalism. But there is truth in the expression, no matter its origin. The flaws in capitalism as currently practiced are not fatal. The problem lies with the assumptions that define the current economic marketplace; assumptions that give undue advantage to monetary capital and minimize the value of labor and our Earth's natural capital.

In a world driven by natural capitalism, resource productivity will be encouraged by shifting taxes away from labor and income toward taxation of negative behaviors like resource exploitation, pollution, and waste.[6]

Some like to include the word "free" when talking about the economic marketplace. Markets are never free. One of the primary purposes of government is to orchestrate public policy using taxation, regulation, and direct support to influence markets in the direction of the greatest good. Governments rarely function that benevolently, but when capitalism is transparent and unencumbered by perverse political influence, and prices are able to accurately reflect all costs and all benefits, goods and services can rise or fall to their proper level in the marketplace. In that kind of market, productivity and efficiency are appropriately rewarded. That circumstance offers the best hope for achieving economic growth while protecting the planet's natural systems over the long term.

Paul Hawken writes, "Natural Capitalism may not guarantee particular outcomes, but it will ensure that economic systems more closely mimic biological systems, which have successfully adapted to dynamic changes over millennia."[7] p.332-3

Decentralized is good: Economy

Distributed generation – decentralizing power – is key to future energy sustainability
Jeremy **Rifkin, President of the Foundation on Economic Trends and advisor to heads of state and government officials,** The Hydrogen Economy, **2002** (p. 200)

> The benefits of distributed generation, both for the power companies and the end users, are impressive. Arthur D. Little, the research and consulting firm, in its own lengthy review of the merits of distributed generation in 1999, concluded that "DG has the potential to play a major role as a complement or alternative to the electric power grid . . . the range of DG technologies and the variability in their size, performance and suitable applications suggests that DG could provide power-supply solutions in many different industrial, commercial and residential settings across the United States."[91] Even conservative industry analysts predict that distributed generation will produce up to 30 percent of all the new generating capacity in the U.S. in the future.[92]

Distributed generation will decentralize and democratize energy consumption for all
Jeremy **Rifkin, President of the Foundation on Economic Trends and advisor to heads of state and government officials,** The Hydrogen Economy, **2002** (p. 206)

> Distributed generation, and the creation of a regional energy web and, eventually, a worldwide one are the logical follow-ups to the creation of the worldwide communications web. Interactive communications and interactive energy-sharing each compliments and feeds off the other. As the two technology revolutions continue to fuse, the foundation is laid for a new type of economy and society—one in which, at least in theory, the increase in energy flow-through can be met with a new kind of complexity that is, for the first time in history, decentralized in nature and truly democratic in form.

Decentralized Good: Environment

Hydrogen decentralization makes all vehicles clean power plants significantly reducing global warming
James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 295-6)

Imagine, each and every one of us driving a fuel-cell car will become an energy entrepreneur, plugging our personal mobile power plant into the "net" wherever we park, serving society's electric power needs, and earning money in the process. One day, the entire world could be linked this way. With the ever-worsening crunch on oil supplies and the looming threat of global climate change, one can't help but ask why a concept like the Internet of Energy isn't on the minds of energy policymakers the world over.

Hydrogen production can be decentralized into homes replacing need for natural gas
James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 1[illegible])

At this early stage of market entry, the home fuel-cell systems being sold in Japan rely on small-scale, integrated natural gas reformers for their hydrogen fuel. (Natural gas reforming simply means taking the main constituent of natural gas, methane CH_4, and "cracking" off the carbon atom to be left with two hydrogen molecules, H_2). Reforming natural gas is currently the favored way of producing hydrogen on-site for residential use for two reasons. First, there is an infrastructure already in place for delivering gas cheaply and easily to most residences in Japan, as well as the United States, and the rest of the developed world. Second, because natural gas reformation is already the way the world produces most of the 50 million tons[8] of hydrogen produced every year for industry, it is currently the least expensive way to produce hydrogen. But the price of natural gas is escalating, and that trend is expected to continue as demand grows. By 2020, the supply/demand price squeeze on natural gas could be near a breaking point. However, by then, Syngas (see chapter 5) made from biomass should be widely available as a direct substitute for natural gas. It is also likely that by 2020 and perhaps even sooner, water electrolysis for home hydrogen production will be very competitive in the marketplace. A demonstration of that approach is up and running, an hour and a half from New York City.

Decentralized Good: Socio-economic

Distributive generation will empower people, democratizing power production and consumption – breaking down current hierarchies

Jeremy **Rifkin, President of the Foundation on Economic Trends and advisor to heads of state and government officials,** The Hydrogen Economy, **2002** (p. 225)

Distributed generation and the HEW are in the very early stages of development, much like the Internet was in the late 1980s. The way that distributed generation is structured during the takeoff stage in the next five years will likely determine the energy infrastructure that eventually evolves and matures ten to fifteen years from now.

The first thing to keep in mind is that with distributed generation, every family, business, neighborhood, and community in the world is potentially both a producer and a consumer and a vendor of its own hydrogen and electricity. Because fuel cells are located geographically at the sites where the hydrogen and electricity are going to be produced and partially consumed, with the surplus hydrogen sold as fuel and the surplus electricity sent back onto the energy network, the ability to aggregate large numbers of producer/users into associations is critical to energy empowerment and to the advancement of the vision of democratic energy.

The aggregation of distributed generation has much in common with the aggregation of labor in the early union movement at the beginning of the 20th century. Industrial workers, alone, were too weak to negotiate the terms of their labor contracts with management. Only by organizing collectively as a bloc within factories, offices, and whole industries could labor amass enough power to bargain with management. The ability to withhold labor collectively by using "the strike" gave workers a powerful tool in their campaign to shorten workweeks, improve the conditions of work, and increase both pay and benefits.

By organizing collectively into distributed-generation associations (DGAs), the operators of distributed generation can better dictate the terms with commercial suppliers of fuel cells for lease, purchase, or other use arrangements. The ability of DGAs to aggregate individual fuel-cell operations into vast extended power plants with large power capacity also gives them a leg up with both commercial and noncommercial bundlers of energy, who will help direct and coordinate the flow of hydrogen and electricity to potential consumers on the energy web.

Hydrogen = Decentralized Energy

Hydrogen Internet of energy will decentralize and democratize energy
James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 294)

"Power plants are now cheaper [to replace] than the grid, and more reliable than the grid," says Amory Lovins. "Ninety-eight or 99 percent of our power failures originate in the grid. Therefore if you want reliable, affordable power supplies, you have to produce power at or near the customers . . . in a decentralized fashion. That happens to be ideally suited to [the linked use of idle automotive] fuel cells."

The Internet of Energy concept is truly awesome in scale. The prospect of replacing the mostly fossil-fuel-powered, utility-based electric power generating system we rely on today is daunting to say the least. But the decentralized Energy Internet can be deployed over several decades as a patchwork that, with infill, will increasingly link together. It's worth recalling that the computer Internet hardly existed little more than twenty years ago. In that short time, it has mushroomed in size and sophistication, linking the world and human culture in ways that one can only begin to understand. The Energy Internet scenario described could play a role in the application of "distributed" power that is being implemented worldwide; that is, power being generated closer to where it is used, closer to the customer, with more local control. [p. 294

Hydrogen = Decentralized Energy

Hydrogen will allow for economic decentralization that will be sustainable and dissolve the rich/poor gap making energy accessible and affordable for developing nations

James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 294-5)

The Hydrogenics Corporation based in Toronto has staked a big part of its future on the Energy Internet. Pierre Rivard, the company's CEO, sees the time and money invested as well spent.

> This will make fuel-cell cars more affordable sooner as opposed to just displacing an incumbent [internal combustion engine auto] technology that is very difficult to compete with on a cost basis after a hundred years and multibillion dollars' worth of research going into it. So, the solution is to bundle features . . . so that you're offering more than just replacement power in the car. You're offering . . . features that would not be achievable with any other technologies but the fuel cell in the hydrogen economy. And with that, you make things more efficient because then you get the [electric power] grid financed by [consumers buying fuel-cell cars], which means the long-term [government] bonds used to finance nuclear plants and large fossil plants are no longer required. It's also an opportunity for developing countries to leapfrog the old electrical generation technologies that we are stranded with in the developed countries.[4]

Amory Lovins could hardly agree more. The general trend of decentralizing the electricity business, moving the power plant from the remote central station hundreds of miles away to your basement, backyard, rooftop, and office parking lot . . . is a perfect fit to fuel cells and the hydrogen economy."] p 294-5

Hydrogen = Decentralized Energy

Hydrogen fueling stations can be decentralized to peoples homes
James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 237-8)

As for the early adopter crowd willing to pay a premium to be among the first to have a hydrogen car in the garage, there is also an answer for them. At least two automakers well down the road to commercialization of their first hydrogen fuel-cell cars are prepared to provide their customers the means to fuel up at home. Honda and General Motors have each developed home hydrogen fuelers. The unit developed by General Motors uses electrolysis to make hydrogen, and can be powered by household current or from a renewable source like solar power.[9] Honda's "Home Energy Station," integrating fuel-cell technology from the Plug Power Corporation, produces hydrogen by reforming natural gas from the local utility's residential gas line. The small fuel cell in the Honda system is also capable of delivering five kilowatts of electricity to meet the energy needs of the home.[11] In both instances, the owner of a hydrogen-powered vehicle can connect a fuel line from the home system to the car's tank to top off the supply of hydrogen onboard. Sophisticated monitoring systems designed into the home fuelers allow refueling to take place safely without direct human supervision. For those eager to be part of the early entry of hydrogen vehicles, a home hydrogen production unit may become an indispensable accessory. | p. 237-8

Hydrogen assures energy decentralization
Jeremy **Rifkin, President of the Foundation on Economic Trends and advisor to heads of state and government officials,** The Hydrogen Economy, **2002** (p. 240)

Distributed-generation associations (DGAs) need to be established throughout the developing world. Civil society organizations (CSOs), cooperatives (where they exist), microcredit lending institutions, and local governments ought to view distributed-generation energy webs as the core strategy for building sustainable, self-sufficient communities. "Empowerment," in this context, takes on a double meaning. Without access to energy, and particularly to electricity, people will remain powerless to control their own personal destinies. Breaking the cycle of dependency and despair—becoming truly "empowered"—starts with access to and control over energy.

National governments and world lending institutions need to be lobbied or pressured to help provide both financial and logistical support for the creation of a hydrogen-energy infrastructure. Equally important, new laws will need to be enacted to make it easier to adopt distributed generation. Public and private companies will have to be required to guarantee distributed-generation operators access to the main power grid and the right to sell energy back or trade it for other services.

Hydrogen = Key

Decentralized Internet of energy only possible with Hydrogen technology
James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 293-4)

Applying the concept to the production of electricity, you get what's been coined the "Internet of Energy." Imagine for a moment what such a system would be like when fully implemented. At home, your fuel-cell-powered car is parked in the garage. It has an input receptacle mounted behind a small hatch near the front of the vehicle. In the garage, there's a standardized service unit about half the size of a refrigerator. This unit is linked to the house's electrical system and the electric grid that serves the house. It contains an electrolyzer for splitting water into hydrogen. This hydrogen is stored for use on demand. A hose from the service unit has a plug that fits the standardized receptacle on your car. The plug includes a port for delivery of a low-pressure flow of hydrogen to the vehicle, a connector to receive electricity generated by the vehicle's onboard fuel cell, and a datalink connecting the onboard computer with the service unit's computer. In these types of scenarios, you not only plug your car into your house, as you do with a battery electric vehicle, but you also plug your house into your car!

When plugged in, the service unit automatically assures a leak-proof seal of the dispensing line, and then initiates the flow of hydrogen to the car. The incoming hydrogen is converted by the vehicle's onboard fuel cell to electricity that flows out through the hose to the service unit. If needed, the electricity is used in the house; if not, it is sold directly to the public power grid. Of course, if you have a primary energy source such as solar panels on your roof, or wind turbines on your property, the electricity could be put onto the grid directly at the appropriate times when needed. This is currently done with some solar roof programs being implemented around the country. In the interconnected scenario with a fuel cell, the fuel cell can provide "peak" power when electricity is most expensive by using hydrogen that was generated with "off-peak" or less expensive electricity.

When you leave your house, perhaps you'll go to the store, the doctor's office, or to work. In a fully developed system, most places you go with your car will be integrated into the energy net. In the parking lot of the doctor's office, you link your vehicle to the system via a service post at each parking slot. Once hooked up, hydrogen flows into your car, electricity flows out. Multiply this by tens of millions of vehicles all standardized to operate on the system; one begins to sense the transformative nature of this technology.

It is hydrogen and fuel-cell technology that makes the "Internet of Energy" possible. In essence, hydrogen and electricity become two sides of the same coin. Geoff Ballard calls this interchangeable energy currency *hydricity*. "I think we'll move quickly to what we'll call the hydricity age and that's when you get the blending of hydrogen and electricity and [they can be used interchangeably and] you can't distinguish between the two."[3] p. 293-4

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Hydrogen Solves Econ Growth

Hydrogen induced natural capitalism creates a thriving and sustainable economic growth for all people creating a 'long boom'

James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 334-5)

That book was titled *The Long Boom* and its authors were all associated with the San Francisco Bay Area scenario think tank, the Global Business Network. They saw a long boom of prosperity built on four technological pillars: the Internet, biotechnology, nanotechnology, and hydrogen energy.

"Each of these technology areas is rapidly evolving," says Peter Leyden, one of *The Long Boom*'s authors. He continues:

> The Internet is taking on the role of what amounts to a planetary nervous system, linking every part of the Earth with every other. With the Net, transparency becomes the very-difficult-to-avoid norm. Even the tiniest changes in political, economic, and environmental conditions almost instantly get recorded and become part of the global knowledge base. Bio and nanotechnology have a huge upside. Biotech looks to emulate the organic processes of nature to expand industrial productivity while at the same time minimizing environmental impact. Nanotech is about taking industrial processes down to the atomic scale, literally building products atom by atom. It's true, with bio and nanotech, as with so many things, there is the possibly of misuse. We have to be on guard for that. But the upside vastly exceeds the dark side. Between now and 2020, biotech and nanotech will bring more change than humanity has seen in the past million years. The key to the long boom prosperity is a clean and inexhaustible energy replacement for oil and other fossil fuels. Hydrogen appears to be a perfect fit. It is pollution free, and with all the new hydrogen-related technologies evolving toward commercialization, it has the potential to be a very powerful economic engine right through the twenty-first century.[8]

One of the great enabling factors for the long-boom scenario is the world's burgeoning middle class. Leyden and his coauthors write, "Being middle class is a state of mind as much as an economic condition. Middle-class people, wherever they live, don't worry about food and the basic necessities. They are beyond that. Instead, they want more freedom and personal control over their lives."[9]

The world now has more than a billion people who identify themselves as middle class. India alone has a middle class of over 300 million people. That's more than the entire population of the United States, which is currently the third largest country in the world. Wherever they live, middle-class people have the luxury of being able to think about the future. There is much that they have in common. They tend to have moderate political views and are not generally drawn to radicalism, religious or otherwise. They want good schools for their children. They want to feel safe in their communities. They want a clean environment, and they want to live in peace.

The value placed on personal freedom appears to draw a thriving middle class toward a democratic political model that offers a voice in how their lives are governed, and it also seems inevitably to elevate the status of women.

The powerful "long boom" economic thrust coming from the development of the Internet, bio and nanotechnology, and hydrogen energy could produce a massive expansion of the middle class with its attendant values in countries the world over.

That's another good reason to be hopeful about the future. Still, there is another complicating factor that looms ominously. p. 334

Hydrogen solves ~~Solar~~ -economic ~~problems~~

Hydrogen will level the playing field making competitive energy economy unnecessary
Jeremy **Rifkin, President of the Foundation on Economic Trends and advisor to heads of state and government officials,** The Hydrogen Economy, **2002** (p. 217)

> Determining the "status" of hydrogen will set the ultimate course for the future of the hydrogen economy and will have deep consequences for the political and social institutions that will grow up alongside the new energy regime. The question of hydrogen's status bears many parallels with the question of the status of "information" on the Internet. Early advocates of the Internet and the World Wide Web argued passionately for the idea that "information ought to run free." The very architecture of the new communications medium, they contended, favored a free sharing of information between people. The World Wide Web, after all, belongs to no one and is open to everyone. It is merely every computer user in the world being connected to any other for the purpose of entering into a conversation. "The economy of the future," exclaimed cyberspace theorist John Perry Barlow, "will be based on relationships rather than possessions."[1] Conversations and the exchange of information between people ought not to be held at bay or be made subject to access fees, licenses, and permission of various kinds, goes the argument. The purists say why not download music, make copies, and share it over the Net with others for free? Why not make copies of articles and add your own thoughts to stories and reports and send them along to friends, and even strangers, for free? The question of what ought to be regarded as free information and what should be subject to payment to copyright holders or to gatekeepers has been the central debate as this new global interactive communications medium has come of age.

Hydrogen Solves Socio-Economic Problems

The hydrogen economy will unite the world ending conflict
Jeremy **Rifkin, President of the Foundation on Economic Trends and advisor to heads of state and government officials,** The Hydrogen Economy, **2002** (p.11-2)

The divisive geopolitics that so permeated the fossil-fuel era will give way to a new sense of biosphere politics in a hydrogen age.

We find ourselves on the cusp of a new epoch in history, where every possibility is still an option. Hydrogen, the very stuff of the stars and our own sun, is now being seized by human ingenuity and harnessed for human ends. Charting the right course at the very beginning of the journey is essential if we are to make the great promise of a hydrogen age a viable reality for our children and a worthy legacy for the generations that will come after us. p. 11-12

The worldwide hydrogen energy web, like the worldwide communications web, will allow us to connect every human being on the planet with every other in an indivisible and interdependent economic and social matrix. The human species can now become a human community fully integrated into the Earth's ecosystems. Unfortunately, our ideas about personal and collective security are still mired in a fossil-fuel state of mind. In the oil age, each human being's sense of personal security came to mirror the organizational values of the larger institutional framework that managed the flow of energy and economic activity. Autonomy and mobility became the undisputed social virtues of the era, in both personal and institutional life. In the coming hydrogen economy, the sheer density of human interaction, as well as the speed of engagement, will give rise to a new sense of security, bound up in embeddedness in multiple commercial, social, and environmental networks and in global interdependence. Our individual security and the well-being of the Earth's diverse human, biological, and geological communities will become seamless. We will come to see ourselves as part of a single Earth organism.

Hydrogen Solves Socio-Economic Problems

Hydrogen is critical to solving the rich/poor gap
Jeremy Rifkin, President of the Foundation on Economic Trends and advisor to heads of state and government officials, The Hydrogen Economy, **2002** (p. 237-8)

Making the shift to a hydrogen energy regime—using renewable resources and technologies to produce the hydrogen—and creating distributed-generation energy webs that can connect communities all over the world is the only way to lift billions of people out of poverty. Narrowing the gap between the haves and have-nots means first narrowing the gap between the connected and the unconnected.

As the price of fuel cells and accompanying appliances continues to plummet with new innovations and economies of scale, these products will become far more broadly available, as was the case with transistor radios, computers, and cellular phones. The goal ought to be to provide stationary fuel cells for every neighborhood and village in the developing world. Villages can install renewable energy technologies—photovoltaic, wind, biomass, etc.—to produce their own electricity and then use the electricity to separate hydrogen from water and store it for subsequent use in fuel cells. In rural areas, where commercial power lines have not yet been extended because it is too expensive, stand-alone fuel cells can provide energy quickly and cheaply. After enough fuel cells have been leased or purchased and installed, mini-energy grids can connect urban neighborhoods, as well as rural villages, into expanding energy networks. The HEW can be built organically and spread as the distributed generation becomes more widely used. The larger hydrogen fuel cells have the additional advantage of producing pure drinking water as a by-product, a not-insignificant consideration in village communities around the world where access to clean water is often a critical concern.

Hydrogen Solves Socio-Economic Problems

Hydrogen is key to energy interdependence universally increasing living standards around the globe
James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 330-1)

As we consider a direction for the coming century, perhaps the first thing we must come to terms with is that we are all in this together. Jeffrey Sachs, director of the Earth Institute at Columbia University, put it succinctly:

> The continued rapid population growth in many poor countries will markedly exacerbate the environmental stresses. Under current demographic trends, the United Nations forecasts a rise in the world's population to around 9 billion as of 2050, another 2.5 billion people. They will arrive in the poor regions, but aspire to income and consumption levels of the rest of the world. Those 2.5 billion people eventually living at the income standards of today's rich would have an income level more than today's entire world GNP. If the economic aspirations of the newly added population are fulfilled, the environmental pressures would be mind-boggling. If those aspirations are not fulfilled, the political pressures will be similarly mind-boggling.[1]

Little more than a century ago, there was no television, no radio, and no telephone. Communication between continents, excepting the telegraph that connected Europe and the United States, was limited to the mail that sometimes took six months just to travel one way. These days, the world is linked, live and in real time, by television and the Internet. CNN is now seen twenty-four hours a day in more than 200 countries, and the Internet is even more pervasive. There is hardly a corner of the world where e-mail cannot be accessed. And the Internet is still evolving rapidly toward its full promise. Just a few years ago, it was pretty much limited to text and still images. These days, the high-bandwidth Internet makes music and video and powerful learning tools easily accessible. People on opposite sides of the world can see and speak with each other at no cost using net services like Skype™. The Net does not discriminate. Information of all types is available on demand to just about anyone seeking access. Globalization on every level appears to be here to stay. Massive, profound change is at hand.

The prosperity that has defined the good life in North America, Europe, Japan, and other industrialized regions has been mostly unknown to the vast majority of the world's people. The wealthiest fifth of the world's population currently consumes 86 percent of the world's resources.[2] The other four-fifths have been surviving on "the scraps." That kind of disparity was largely out of sight and out of mind in the past. No longer. Increasingly, television and the Internet allow everyone to know what everyone else is doing. The prosperity gulf that separates the haves from the have-nots is no longer tenable. Fundamental fairness dictates a correction in the allocation of resources. It's not just the right thing to do; it's the only wise course. The United States alone, with 5 percent of the world's population, consumes 25 percent of the world's resources. That kind of imbalance will become increasingly unsustainable. The United States, indeed all of the developed nations, has no choice. They must learn to get along with a share of the global resource pie that proportionally has more to do with human need and less to do with economic power and military might. The alternative is to accept fear and violence as a constant and unyielding part of life. In the absence of reasonable resource equity, terrorism will remain the weapon of choice for the world's disenfranchised.

In the economic world we know, the economic world that has existed since the beginning of the Industrial Revolution, resource consumption is rewarded and labor is squeezed and taxed to the hilt. Given the increasing pressure on our planet's resources, that approach no longer works.

To achieve economic growth in an era of limits, the solution will emerge from a new kind of capitalism.] p. 330 - 1

Hydrogen key

Hydrogen fuel cell cars are key to decentralizing power
Jeremy Rifkin, President of the Foundation on Economic Trends and advisor to heads of state and government officials, The Hydrogen Economy, **2002** (p. 206-7)

The distributed-generation revolution is likely to take off in the next few years, with the introduction of automobiles, trucks, and buses operated by fuel cells. Every major automaker in the world has announced plans to introduce fuel-cell-powered automobiles. In 1997, Daimler-Benz launched a $350 million joint effort with Ballard Power Systems, a Canadian firm and leader in fuel-cell development, to create hydrogen fuel-cell engines. The automaker says it will produce 100,000 fuel-cell cars by the end of the decade—one-seventh of its total current production. Ford subsequently joined with Daimler-Chrysler and Ballard Power Systems, upping the joint investment to more than $1 billion.[106] Toyota hopes to have fuel-cell cars on the road within the decade. GM has promised to have fuel-cell cars ready by 2010. Nissan, Honda, and Mitsubishi have also announced plans to produce hydrogen-powered fuel-cell cars and have between them committed another $1 billion to the effort.[107]

Although the public has heard little or nothing of hydrogen-fueled automobiles, behind the scenes the world's automakers are gearing up for what amounts to the most important revolution in how power is harnessed since the introduction of the internal combustion engine 100 years ago. Bill Ford, the great-grandson of Henry Ford and the current chairman of the Ford Motor Company, has gone so far as to say, "I believe fuel cells will finally end the 100-year reign of the internal combustion engine."[108]

The enthusiasm of the automakers has been matched by at least a few of the world's leading energy companies. Chris Fay, the chief executive of Shell U.K., London, has said that at Shell "we believe that hydrogen-fuel-cell-powered cars are likely to make a major entrance into the vehicle market throughout Europe and the U.S. by 2005." Fay says that "this trend poses a real challenge to a company like Shell to develop new products and new technologies and to prepare and inform our customers for the changes that lie ahead."[109]

The full implications of this shift are momentous. There are 750 million passenger and other vehicles on the world's roads, and that number is expected to double over the next twenty-five years.[110] They are powered by fossil fuels.[111] In the U.S. alone, transportation accounts for 54 percent of all the oil consumed each year.[112] Transportation accounts for more than 20 percent of global primary energy.[113] Moreover, according to the International Energy Agency, 17 percent of the world's carbon dioxide emissions come from the burning of oil in road transportation.[114]

Emperical Evidence

AFRICA SERVES AS AN EXAMPLE OF THE POWER OF HYDROGEN TO RADICALLY TRANSFORM ECONOMIES.

James **Provenzano, President of Clean Air Now** and Geoffery Holland, The hydrogen age : empowering a clean-energy future, **2007** (p. 341-3)

At this time in history, life is out of balance on our planet. But we are fortunate. We have the tools to put things on a right course. The scale of change required is monumental—like nothing ever seen on Earth before—and it won't happen overnight. But it can be done.

Jeffrey Sachs, director of the Earth Institute and author of *The End of Poverty,* heads up the United Nations Millennium Villages™ Program in Africa.[16] In this program, ten villages in as many countries across Africa have become the crucible for a very powerful application of socially engineered goodwill. The people of those villages are getting a helping hand with new wells, seed and fertilizer to grow food, and basic access to education and health care, along with valuable training in civic governance. One of the most critical parts of the Millennium Village program is providing access to energy. Right now, it is low-tech, with small wind turbines and solar PV panels providing minimal amounts of energy, with only very limited storage in batteries. Sachs and his team have implemented a great model for elevating people in need that can be replicated around the world. But the model is hampered by the chronic shortage of energy. Oil, natural gas, and grid-delivered electricity are well beyond being practical. So, the model remains limited, unless hydrogen is applied as an energy storage medium. Hydrogen takes the Millennium Village model to another level. The more energy available to the people in Koraro in Ethiopia, the more they will be able to do for themselves, and the more they will be able to become part of the larger whole. Sachs and his team have provided a simple yet wonderfully effective paradigm that, over a time frame measured in decades, can elevate all those billions getting along barely in survival mode. Many things must happen in order for poverty to be vanquished by plenty. It is no easy task, but energy is the chief limiting factor. For the Millennium Village initiative to achieve its full glory, we believe the thing most needed is energy. Renewable forms of energy like wind and solar are ephemeral in nature. Yet they offer the best hope for providing power for those in remote settlements who have been worn down by poverty. The ability to store large quantities of renewable energy for use on demand makes all the difference. To do that, to accomplish that simple but noble goal, there is a simple answer; a simple answer that is better than any other. That simple answer is hydrogen.

There is a saying that is most often attributed to the Hopi people of the Southwest. That saying is: "We are the people we have been waiting for."

This empowering vision for the future is not a pipe dream, it is a possible dream. It is a possible dream, because the people, the individual stakeholders on this planet, can make it possible, and when it does come, we will know we have arrived in a good place; a good place that many will come to know as *The Hydrogen Age.* p. 341-3