**Chapter 21.
The Growing Abundance of Natural Resources**

**By Jerry Taylor**

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| One of the most serious problems now facing the planet is that associated with historical patterns of unsustainable consumption and production, leading to environmental degradation, aggravation of poverty, and imbalances in the development of countries. -*Agenda 21*, presented at 1992 UN Conference on Environment and Development  |

The most fundamental axiom of economics is the objective reality of scarcity. Productive resources are limited, yet human desires are virtually unbounded. Resources have thus been scarce since time immemorial and will continue to be so for all eternity.

From that simple, self-evident fact a corollary hypothesis has arisen: as population and economies grow, resource depletion accelerates until physical limits are reached and resource exhaustion occurs. Such a corollary would hardly strike one as radical. After all, if resources are fundamentally scarce, it stands to reason that increased demand for them hastens the day when they will disappear from the planet.

Warnings of impending catastrophe, which have been around for almost 200 years, have arisen with increasing frequency in the 20th century. The population explosion in the Third World, coupled with the dramatic postwar growth of the global economy since 1950, has increased the volume, pitch, and urgency of warnings that civilization is living on borrowed time. The gasoline lines and inflation of the 1970s brought warning voices from the intellectual wilderness squarely into the center of public debate. International best sellers such as Paul Ehrlich's *The Population Bomb,* the Club of Rome's *Limits to Growth,* and the Carter administration's *Global 2000 Report* all helped convince millions of people that civilization as they knew it was on the verge of collapse.

Although the boom years of the 1980s temporarily quieted voices of doom, the "conservation ethic" has become an institutionalized element of American politics. Both political parties agree government must intervene in the economy to protect us from potentially catastrophic overexploitation of natural resources. The debate tends to be over "how much" intervention is necessary, not whether intervention is justified in the first place.

Today, government planners, having been judged incompetent when it comes to overseeing economic production, are firmly entrenched in the United States with a new mandate: to eliminate resource waste in virtually every industry while strictly regulating the use of our supposedly dwindling stock of natural resources.

Many people still believe that conservation is simply not enough, that it will only temporarily stall our slide into crisis. Indeed, the authors of *Limits to Growth,* in their recently published sequel Beyond the Limits, argue that "even with much more efficient institutions and technologies, the limits of the earth's ability to support population and capital are close at hand."[1](http://www.cato.org/pubs/chapters/marlib21.html#1) The only way out of "civilizational collapse," they contend, is to radically reform all elements of society. "We are talking about a revolution here, not in the political sense, like the French revolution, but in the much more profound sense of the Agricultural or Industrial Revolution."[2](http://www.cato.org/pubs/chapters/marlib21.html#2) And just what kind of reconstituted American civilization do the "revolutionaries" envision? Theirs is the same tired vision that has hypnotized communitarians for decades: socialism, but this time with a happy green face.[3](http://www.cato.org/pubs/chapters/marlib21.html#3)

**Taking Inventory**

So is it true, then, that civilization is teetering on the precipice of collapse due to resource exhaustion? Just how far down have we drawn earth's material abundance?

There are three means by which to judge the extent of our resource base: proven reserves, price data, and ultimately recoverable stock.

Proven reserves measure the amount of a given resource that has been discovered and can be extracted profitably given current prices and technologies. Thus, proven reserves are a function of economics, not geological abundance. When resource prices are low, there is little incentive to invest in exploration or development. Dropping resource prices also make uneconomical exploitation of certain resources that were economically viable under higher prices. Although those reserves are moved off the books, so to speak, they will still be available when prices increase at some point in the future. Likewise, low resource prices provide little incentive to invest in research and development efforts for new extraction technologies that often allow previously uneconomical resource fields to be mined profitably. Only when inventories begin to dwindle and resource prices begin to rise do commercial enterprises find it necessary to invest in resource exploration and development.

Thus, proven reserves, although providing useful information to industry, tell us little about ultimately available resources. As economists Ronald Ridker and Elizabeth Cecelski noted, "Since exploration and development are costly, little effort is made to find proof of new resources if what is already known is considered adequate to meet demands for the next ten to twenty years."[4](http://www.cato.org/pubs/chapters/marlib21.html#4)

Price data are a far more accurate means by which to evaluate relative resource scarcity. Basic economics tells us that, in a free market, prices rise when demand for a resource is greater than current supply. Likewise, prices fall when the supply of a given resource is greater than consumer demand. Because prices reflect the accumulated knowledge of millions of economic actors who daily put their own money at risk, the market is far more likely to accurately judge resource scarcity than are noneconomic actors.

Moreover, the needs of future generations are fully considered in the pricing mechanism. An asset's value is determined by the projected value of its future returns. Resource owners are thus fully encouraged to consider the long-term implications of management decisions. Resource degradation and depletion are costly; as soon as the market anticipates future problems with a commodity, the value of that commodity falls and the owner's wealth depreciates immediately. Likewise, the maintenance of a strong resource base increases both the value of a holding and wealth of the owner.

Producers of resource materials have an incentive to maintain adequate stocks for the future simply because potential shortages in the years ahead will lead to higher prices and thus greater returns on the sale of commercial resources. The rapid emergence of future markets for most resources allows speculators to purchase the rights to various resources and hold them off the market for resale at higher prices in the future. If future supply of and demand for a resource are poorly reflected by its market price, enterprises that know better have every incentive to act on their superior knowledge to garner large future profits.

The third means of examining resource abundance is by reference to ultimately recoverable stock, defined as a mere 1 percent of a given resource estimated to be in the top kilometer of the earth's crust. Although advances in extraction technologies and adjustments in resource prices will perhaps allow us to economically mine a greater proportion of the earth's abundance, it is historically reasonable (and perhaps even a bit conservative) to assume that man can use about 1 percent of the earth's mineral and fossil fuel deposits.[5](http://www.cato.org/pubs/chapters/marlib21.html#5)

If we examine the earth's resource base using those three yardsticks, we do indeed come to a jarring conclusion: at the very time that the conservation lobby was convincing millions of Americans and legislatures everywhere that resource shortages were lurking just around the corner, the global economy witnessed the greatest explosion of resource abundance in the history of mankind.

If there are indeed "physical limits to the sources of materials and energy that sustain the human population and the economy, as is contended in *Beyond the Limits,* it appears that those limits are so far beyond the human horizon that they are for all intents and purposes nonexistent.

**Energy**

Contrary to popular belief, energy stocks of all kinds, both fossil and nonfossil, have been increasing steadily and dropping in price. We face unprecedented abundance, not scarcity.

As noted by MIT professor Morris Adelman, one of America's foremost energy experts, "The great oil shortage is like the horizon, always receding as one moves toward it."[6](http://www.cato.org/pubs/chapters/marlib21.html#6) The world has nearly 10 times the amount of proven oil reserves that it had in 1950 and almost twice the known reserves of 1970. In fact, proven oil reserves are greater today than at any other time in recorded history.

Oil prices have dropped 35 percent in constant dollars since 1980. When indexed to U.S. wages, oil prices have dropped 43 percent since 1980 and show steady and continuing declines in price from as far back as 1870.[7](http://www.cato.org/pubs/chapters/marlib21.html#7) The decline in oil prices has been reflected in the price of gasoline at the pump. Fuel prices in constant dollars are 6 percent lower today than they were in 1972 (just before the OPEC oil embargo), 25 percent lower than in 1963, and 30 percent lower than in 1947.[8](http://www.cato.org/pubs/chapters/marlib21.html#8) Whereas 3.2 percent of total household expenditures were devoted to gasoline in 1972 (the lowest such rate since 1952), American households today devote but 2.6 percent of total expenditures to gasoline purchases.[9](http://www.cato.org/pubs/chapters/marlib21.html#9)

Proven natural gas reserves have also shown dramatic increases in the past 20 years; they have increased by 84 percent since 1974. At current rates of consumption, proven gas reserves alone will be sufficient for approximately 58 years.[10](http://www.cato.org/pubs/chapters/marlib21.html#10) The fact that natural gas prices, after adjusting for inflation, have dropped only 3 percent since 1980 is largely a function of price and production controls that lingered into the 1980s and discouraged optimum product levels.

Likewise, between 1979 and 1989 proven coal reserves grew by 84 percent, an amount sufficient for 238 years given current levels of consumption.[11](http://www.cato.org/pubs/chapters/marlib21.html#11) On an energy equivalent basis, proven reserves of coal are 43 percent greater than the world's combined total proven oil and natural gas reserves.[12](http://www.cato.org/pubs/chapters/marlib21.html#12) Since 1980 the price of coal has dropped 91 percent when adjusted for inflation and 243 percent when indexed to U.S. wages.[13](http://www.cato.org/pubs/chapters/marlib21.html#13)

Economist William Nordhaus concludes from U.S. Geological Survey data that the world has enough ultimately recoverable fossil fuel reserves to last approximately 520 years given projected rates of demand, although others have pegged that figure as high as 650 years.[14](http://www.cato.org/pubs/chapters/marlib21.html#14) If historic rates of productivity increase and technological advances are considered, then we have every reason to believe that the 1,000-year trend of falling energy prices will continue for generations to come.

Remember, the figures cited above are for fossil fuel reserves only. Current nuclear technology ensures that the world has 8,400 years of energy for the future at current rates of consumption.[15](http://www.cato.org/pubs/chapters/marlib21.html#15) Advances in nuclear breeder and fusion technologies would ensure vast supplies of energy for tens of thousands of years, and geothermal resources and the potential of solar energy also promise virtually limitless supplies of energy as technology improves and those sources become more economically competitive.

**Mineral Deposits**

Back in 1980, during the height of the Carter-era resource depletion scare, economist Julian Simon bet conservationist Paul Ehrlich $1,000 that the real price of any group of natural resources of Ehrlich's choice would be less at any given date in the future than in 1980. Ehrlich chose five minerals-copper, chrome, nickel, tin, and tungsten-and set the payoff date for 10 years hence. As Simon expected, the real price of those five resources dropped by 24 percent, 40 percent, 8 percent, 68 percent, and 78 percent, respectively. Ehrlich sent Simon a check-but no admission of error-in 1990. No matter which minerals Ehrlich chose, it was a sucker's bet. All but two strategic minerals (manganese and zinc) declined in price during the 1980s, reflecting the dramatic increase in mineral abundance that has occurred globally since the beginning of time. Simon renewed his offer to any and all corners in 1992, but to date there have been no takers. As the data in [Table 1](http://www.cato.org/pubs/chapters/marlib21.html#table1) indicate, proven reserves of virtually all important minerals have skyrocketed since 1950.

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| ***Table 21.1*Proven Reserves of Various Resources, 1950-90(Million Metric Tons)** |
| **Resource** | **1950** | **1990** | **Change (%)** |
| Bauxite | 1,400 | 21,500 | 1,436 |
| Chromium | 70 | 420 | 500 |
| Copper | 100 | 350 | 250 |
| Iron Ore | 19,000 | 145,000 | 663 |
| Lead | 40 | 70 | 75 |
| Manganese | 500 | 980 | 96 |
| Nickel | 17 | 59 | 247 |
| Oila | 104 | 1,002 | 863 |
| Tin | 6.0 | 4.2 | -30 |
| Zinc | 70 | 145 | 107 |
| SOURCE: Kahn, Brown, and Martel, p. 92; U.S. Bureau of Mines, *Mineral Commodities Summary,* January 1990; *Resources for Freedom,* Report of the President's Materials Policy Commission, 1952, vol. 2, p. 27; and *Energy Statistics Resource Book* (New York: PennWell, 1991), pp. 143, 151.NOTE: Information on proven reserves of coal, magnesium, natural gas, and titanium in 1950 is unavailable.aBillion barrels. |

An examination of the price of 13 metals and minerals (aluminum, antimony, copper, lead, magnesium, manganese, mercury, nickel, platinum, silver, tin, tungsten, and zinc) shows a net 31 percent decline in real prices from 1980 to 1990. When indexed to wages, those price declines are even more dramatic. "Most of the minerals and metals at the turn of the century were five to ten times more expensive than they are today in terms of numbers of hours of work needed to purchase them."[16](http://www.cato.org/pubs/chapters/marlib21.html#16)

Declines in metal and mineral prices are reflected in the equally dramatic declines in raw material costs. From 1980 to 1990 the real price of glass fell 33 percent, cement prices fell 40 percent, metal price dropped 18 percent, and rubber prices declined by 40 percent.[17](http://www.cato.org/pubs/chapters/marlib21.html#17)

Examination of ultimately recoverable mineral resources indicates that we have only begun to tap the rich veins of the earth's abundance. U.S. Geological Survey data reveal that, if current consumption trends continue, recoverable mineral resources will last for hundreds and in many cases thousands and even tens of thousands of years.[18](http://www.cato.org/pubs/chapters/marlib21.html#18) Physicist Herman Kahn and several colleagues concluded in 1976 that "over 95 percent of the world demand [for minerals] is for five metals (iron, aluminum/bauxite, silicon, magnesium, and titanium), which are not considered exhaustible." Another 4.85 percent of world mineral demand is for seven metals (copper, zinc, manganese, chromium, lead, nickel, and tin) that are "probably inexhaustible." Thus, 99.9 percent of all mineral demand is for metals virtually inexhaustible over any conceivable time horizon.[19](http://www.cato.org/pubs/chapters/marlib21.html#19)

**Agricultural Resources**

The disturbing, ongoing pattern of famine and drought in Africa and Asia has added credibility to the argument that the earth is approaching a point at which it will not be able to continue to feed the "teeming masses" of the planet. Yet by any analysis, this is a time of agricultural abundance unprecedented in the history of the world. Economist Thomas De Gregori observes that "if there is hunger in the world-and so there is, in abundance, even in wealthy countries-it is because of maldistribution of food, not insufficient global production.[20](http://www.cato.org/pubs/chapters/marlib21.html#20) "Ten times as many people died of famine in the last quarter of the 19th century as have died of famine in the third quarter of the 20th century, despite our much larger present population and the massive engineered famines in Cambodia during the 1970s.[21](http://www.cato.org/pubs/chapters/marlib21.html#21)

An examination of 15 representative agricultural commodities (barley, broilers, carrots, cattle, corn, cotton, eggs, milk, oats, oranges, rice, sorghum, soybeans, wheat, and wool) reveals that real prices in the United States dropped by an average of 38 percent from 1980 to 1990. When indexed to wages, the price of those foodstuffs has declined 83 percent since 1950.[22](http://www.cato.org/pubs/chapters/marlib21.html#22) Clearly, if the earth's agricultural productivity were being outpaced by voracious demand for food as a result of the population explosion, agricultural prices would be rising sharply rather than falling dramatically as the data indicate.

Likewise, it is clear that the agricultural output of the planet has increased exponentially over the past several centuries. Since 1960 technological advances in farm equipment, pesticides, fertilizers, irrigation techniques, bioengineering, and soil management have led to a doubling of world food production and 30 percent increases in farmland productivity.[23](http://www.cato.org/pubs/chapters/marlib21.html#23) Technological advances have more than kept pace with the explosion in global population. Since 1948 world food production has surpassed population increases by about 1 percent a year.[24](http://www.cato.org/pubs/chapters/marlib21.html#24) Although global population has doubled since World War II, world grain production has tripled.

The dramatic increase in the availability of foodstuffs occurred without any appreciable global increase in land committed to agricultural uses over the last 30 years. Since 1950, in fact, 200 million acres of U.S. farmland have been retired as a result of the unprecedented glut of agricultural commodities on the world market.

Agricultural abundance has translated into improved health for even the poorest in the Third World. Whereas only 42 percent of all countries reported that average daily caloric consumption reached 100 percent of recommended levels in the mid-1960s, 66 percent of all nations reported caloric intake at those levels by the mid-1980s, a 56 percent increase in less than 20 years. Fully 81 percent of the world's countries, including China and India, now report average caloric intake of at least 90 percent of recommended levels.[25](http://www.cato.org/pubs/chapters/marlib21.html#25)

Moreover, there is good reason to believe that the planet can feed tens of billions of people for many generations to come. Suitable agricultural land makes up 24 percent of the total ice-free landmass of the globe, well over twice the amount cultivated in recent decades and more than triple the acreage cultivated in any given year.[26](http://www.cato.org/pubs/chapters/marlib21.html#26) Moreover, a great deal of the world's cropland is underused or cultivated using low-yield technologies and practices similar to those used in this country in 1910. Obviously, agricultural productivity will skyrocket as high-yield technologies continue to advance throughout the developing world.

Yet even those expansive limits are not fixed. Agricultural history is largely defined as the transformation of land unsuited for cultivation into productive cropland. Nobel laureate Theodore Schultz observes that "the original soils of western Europe, except for the Po Valley and some parts of England and France, were in general very poor in quality. As farmland, these soils are now highly productive. A substantial part of the productivity of farmland is manmade by investments in land improvements."[27](http://www.cato.org/pubs/chapters/marlib21.html#27) Political economist David Osterfeld points out that "much of the American Midwest was forest and swampland. No account of arable land in, say, 1800 would have included it. Now, after it has been cleared and drained, it is among the most fertile lands in the world. And the elimination of the tsetse fly would open up to cultivation about 200 million hectares of African land, an area larger than the total cropland in the United States."[28](http://www.cato.org/pubs/chapters/marlib21.html#28) Productive farmland is not some sort of finite given; it is, instead, a function of agricultural skill and technology, two "resources" that have been expanding rapidly over the centuries and exponentially over the past 80 years.

Simply increasing the efficiency of water use in developing nations could provide enough advances in productivity to support a global population of 35 billion to 40 billion people, between seven and eight times the current population of the world.[29](http://www.cato.org/pubs/chapters/marlib21.html#29) And then there is the coming revolution in biotechnology, a science well on its way to producing crops that are able to resist drought, insects, disease, and salinity and thrive in the harshest soils and previously inhospitable environments. Because of the projected low costs of those new products, biotechnology will probably have its greatest impact in the developing world, enabling poor farmers to take full advantage of the agricultural revolution and to afford the relatively costly inputs required to make high-yield farming economical.

Although conservationists argue that accelerating soil erosion will make those productivity gains short-lived and illusory, the facts speak otherwise. Most of the world's worst soil erosion problems are the result, not of modern high-yield farming, but of attempts to use low-yield, traditional agricultural techniques on fragile soils.[30](http://www.cato.org/pubs/chapters/marlib21.html#30)

Studies by the U.S Department of Agriculture, the University of Minnesota's Soil Sciences Department, and economist Pierre Crosson of Resources for the Future all conclude that, at current erosion rates, heavily farmed soils in the United States might lose 3 to 10 percent of their inherent fertility over the next 100 years. Such small losses are sure to be more than offset by continued improvements in agricultural productivity even if no new conservation techniques are adopted. As Crosson noted:

The success of the new [high-yield] technologies strongly suggests that erosion damage to soils in the main crop- producing regions of the country was not and is not as severe as is sometimes claimed. Soil scientists have acknowledged that even severely eroded soil can be restored to high productivity with investments of human skill and other resources, even though they may seem to forget this when they make pronouncements about the erosion threat. Continuation of present rates of erosion throughout most of the next century would pose no serious threat to the productivity of the nation's soils.[31](http://www.cato.org/pubs/chapters/marlib21.html#31)

**Timber Products**

The fear that mankind is rapidly deforesting the globe has arisen on and off ever since the 18th century. Yet precious little evidence, other than anecdotes, has ever been advanced to support that lamentably widespread belief.

According to the most recent UN data, the most authoritive figures at our disposal, world forestland today covers 4 billion hectares, more than 30 percent of the total global land area. That figure has not changed appreciably since 1950, even in the midst of the population explosion, massive economic growth, and urbanization of the globe. Today forestland occupies about one-third of the United States, and that proportion has been expanding steadily for over 70 years. According to the U.S. Forest Service, 22 million new cubic feet of wood are grown annually in the United States, while only 16.5 million cubic feet are harvested. Net annual growth exceeds annual harvests in commercial forests by 27 percent.

Since 1920 U.S. forests have expanded by 57 percent, a remarkable fact given that during the same period the U.S. population doubled, the economy grew by a factor of 6, and per capita output increased by a factor of 3. Forestland has increased by 27 percent since 1952.[32](http://www.cato.org/pubs/chapters/marlib21.html#32) Although demand for wood products today is at an all-time high, the United States is still able not only to meet demand with currently available timber stock but to continue adding to forest reserves. In fact, there is only one-third less forestland in the United States today than there was in the 1600s when European settlers first encountered it.

An example of the striking increase in U.S. forest reserves is found in New England, where logging thrived in the 19th century. From the mid-1800s to 1980 the amount of land covered by forests increased from 74 to 90 percent in Maine; from 50 to 86 percent in New Hampshire; from 35 to 76 percent in Vermont; and from 35 to 59 percent in Connecticut, Massachusetts, and Rhode Island.[33](http://www.cato.org/pubs/chapters/marlib21.html#33)

That growth in forest reserves is reflected in the price of various wood commodities. The real prices of lumber and paper have fallen by 10 and 25 percent, respectively, since 1980. When indexed to wages, lumber prices today are one-third those of 1950, one-sixth those of 1900, and one-tenth those of 1800. Likewise, the cost of paper when indexed to wages is less than half that of 1930.[34](http://www.cato.org/pubs/chapters/marlib21.html#34)

The increased supply of wood has not come at the expense of rugged, pristine nature preserves. From 1980 to 1989 land classified as wilderness increased by 29 percent. Although environmentalists argue that the second-growth forests of today are ecologically inferior to the old-growth forests that the colonists encountered three centuries ago, Roger Sedjo of Resources for the Future points out:

In the United States, the forest estate consists of a wide array of forest types and ages. In this regard it is not too different from the mosaic of forest types present during the time of early settlement. The species found in these stands are usually similar to those that would have existed there at settlement. Even in most forest plantations in the United States the species composition mimics the forest that would have naturally regenerated there. By most criteria, U.S. forests are in excellent condition. U.S. forests have shown the potential to deliver large volumes of wood on a sustainable level into the indefinite future.[35](http://www.cato.org/pubs/chapters/marlib21.html#35)

**Market Liberalism and Resource Creation**

So how does one explain the unprecedented abundance of natural resources today, an explosion of plenty in the very midst of record demands for resources?

One school of thought holds that the world's economic growth since World War II is historically atypical and that our half century of prosperity since then is the result of "a fortuitous confluence of favorable events" that cannot be counted on again. The revolution of high-yield agriculture, favorable weather, massive petroleum finds in the Middle East, the exploitation of the last hectares of virgin land, and countless other events are one-time gains that have shielded man from the true reality of his condition. As those events run their course in the 1990s, we are due for a jarring return to global reality.

Yet declining resource scarcity is a long-term trend, evident from the beginning of human society. Without exception, every material resource imaginable has become more abundant during the course of civilization. Whether measured in terms of proven reserves or prices relative to income, a graph of the relative abundance of virtually every resource looks like the population graphs we have seen so many times before: long-term, steady growth in resources with an exploding, exponential increase in resource availability over the last 200 years. The record of the last 50 years, then, is not atypical but perfectly consistent with the observable data on increasing resource availability since the beginning of time.

Another view holds that we are a world in "overshoot," living off our resource capital and not our income, irresponsibly and rapidly drawing down precious stocks of resources that have taken eons for the earth to accumulate. The authors of *Beyond the Limits* argue that "overshoot comes from delays in feedback-from the fact that decisionmakers in the system do not get, or believe, or act upon information that limits have been exceeded until long after they have been exceeded. Overshoot is only possible because there are accumulated resource stocks that can be drawn down.[36](http://www.cato.org/pubs/chapters/marlib21.html#36)

That argument, however, is in direct contradiction to every possible measurement of resource scarcity and the march of recorded history. If overshoot occurs when we use resources faster than they are created by nature, then the world has been in accelerating "overshoot" for the last 10,000 years, or ever since the development of agriculture. Moreover, our best "feedback" on scarcity-market prices-tells us that resources are expanding, not contracting ([Table 2](http://www.cato.org/pubs/chapters/marlib21.html#table2)).

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| ***Table 21.2*Resource Prices Indexed to Wages, 1950-90(Relative to 1990 Baseline)** |
| Resource | 1950 | 1960 | 1970 | 180 | 1990 | Change (%)1950-90 |
| Fooda | 386 | 210 | 145 | 161 | 100 | -74 |
| Lumber | 170 | 114 | 95 | 126 | 100 | -41 |
| Paper | 139 | 121 | 97 | 104 | 100 | -28 |
| Mineralsb | 194 | 147 | 179 | 217 | 100 | -48 |
| Energyc | 184 | 126 | 74 | 138 | 100 | -46 |
| SOURCE: Moore, pp. 18-19, 23, 30-31, 40.aIncludes barley, broilers, carrots, cattle, corn, cotton, eggs, milk, oats, oranges, rice, sorghum, soybeans, wheat and wool.bIncludes aluminum, antimony, copper, lead, magnesium, manganese, mercury, nickel, platinum, silver, tin, tungsten and zinc.cIncludes coal, electricity, natural gas and oil. |

Virtually every year since 1800 a book, study, report, or commission has pronounced the imminent depletion of this or that resource on the basis of indices that examine current trends and known reserves. Yet every one of those pronouncements has been not only wrong but spectacularly and embarrassingly wrong.[37](http://www.cato.org/pubs/chapters/marlib21.html#37) More efficient technologies that require fewer resource inputs, advanced extraction and harvesting technologies that allow far greater access to resource deposits, and material substitutions that replace scarce resources with far more abundant resources are just a few of the routine advances that mark the entire march of human civilization.

The fundamental flaw in the conservationist paradigm is the premise that global resources are created by nature and thus fixed and finite. Not a single material resource has ever been created by "nature." Human knowledge and technology are the resources that turn "stuff" into useful commodities. What we think of as resources are actually certain sets of capabilities. As De Gregori points "Humans are the active agent, having ideas that they use to form the environment for human purposes….Resources are not fixed and finite because they are not natural. They are a product of human ingenuity resulting from the creation of technology and science."[38](http://www.cato.org/pubs/chapters/marlib21.html#38)

Two hundred years ago petroleum was just a useless ooze that actually drove down property values. Human creative endeavor, knowledge, and technology, however, turned the ooze into a valuable resource. Likewise, sand has never been considered a resource, but the revolution in telecommunications and man's expanding technological capacity have turned sand into a valuable commodity-the basic resource from which computer chips and fiber-optic telecommunication devices are made.

"Since resources are a function of human knowledge, and since our stock of knowledge has increased over time, it should come as no surprise that the stock of physical resources has also been expanding," observes Osterfeld.[39](http://www.cato.org/pubs/chapters/marlib21.html#39)

The free, competitive marketplace is the most efficient engine of resource creation and conservation because it is the most explosive engine for intellectual and technological advance. Technological advance, the heart of resource creation, depends heavily on the competitive free exchange of ideas, entrepreneurial activity, investments in capital and labor, and a profit mechanism.

The size of our resource pie is determined not by nature but by the social and economic institutions that set the boundaries of technological advance. Closed societies and economies under the heavy hand of central economic planners are doomed to live within the confines of dwindling resource bases and eventually experience the very collapse feared by the conservationists. Liberal societies, built on free markets and open inquiry, create resources and expand the possibilities of mankind.

**Notes:**

1. Donella Meadows, Dennis Meadows, and Jorgen Randers, *Beyond the Limits* (Post Mills, Vt.: Chelsea Green, 1992), P. 47.

2. lbid., p. 219.

3. See ibid., pp. 209-36, for a rather vague but militantly communalistic view of how a sustainable society might look.

4. Ronald Ridker and Elizabeth Cecelski, "Resources and Population," in *International Encyclopedia of Population,* ed. John Ross (New York: Free Press, 1980), p. 595. Cited in David Osterfeld, *Prosperity versus Planning* (New York: Oxford University Press, 1992), p. 93.

5. William Nordhaus, "Resources as Constraint on Growth?" I>American Economic Review. May 1974, pp. 22-26.

6. Morris Adelman, "Oil Fallacies," *Foreign Policy* 82 (Spring 1991): 10.

7. Stephen Moore, "Doomsday Delayed: America's Surprisingly Bright Natural Resource Future," Institute for Policy Innovation Policy Report no. 118. July 1992, pp. 35-40.

8. Daniel Yergin, "Gasoline and the American People," Cambridge Energy Research Associates, June 1991, p. 15.

9. lbid., p. 17.

10. Energy and the Environment: A Power for Good, a Power for Ill," *The Economist,* August 31, 1991, survey, p. 4.

11. Ibid.

12. National Coal Council, "The Long-Range Role of Coal in the Future Energy Strategy of the United States," June 1990, p. 3.

13. Moore, pp. 35-40.

14. See Nordhaus and "Energy and the Environment."

15. Nordhaus, p. 25.

16. Moore, pp. 25-31.

17. Moore, p. 32.

18. Nordhaus, p. 23.

19. Herman Kahn, William Brown, and Leon Martel, *The Next 200 Years* (New York: William Morrow, 1976) p. 102.

20. Thomas De Gregori, "Resources Are Not; They Become: An Institutional Theory," *Journal of Economic Issues* 21, no. 3 (September 1987): 1252.

21. Julian Simon, *Population Matters* (New Brunswick, N].: Transaction Books, 1990), pp. 43-45.

22. Moore, pp. 12, 16-19.

23. Dennis Avery, "Sustainable and Beneficial Agriculture," Paper presented at Cato Institute conference on "Global Environmental Crises: Science or Politics?" June 1991, p. 1.

24. Osterfeld, p. 61.

25. World Resources Institute, *World Resources 1987* (New York: Basic Books), pp. 252-53.

26. Roger Revelle, "The World Supply of Agricultural Land" *The Resourceful Earth,* ed. Julian Simon and Herman Kahn (New York: Basil Blackwell, 1984), Pp. 184-201.

27. Theodore Schultz, in *Lectures in Agricultural Economics* (Washington: Economic Services Bicentennial Lecture Series Committee, 1977), pp. 16-17. Cited in De Gregori, p. 1254.

28. Osterfeld, p. 66.

29. Ibid., pp. 67, 83.

30. Dennis Avery, *Global Food Progress 1991* (Indianapolis: Hudson Institute, 1991), pp. 78-79, 81, 224.

31. Pierre Crosson, "Cropland and Soils: Past Performance and Policy Challenges," in *America's Renewable Resources,* ed. Kenneth Frederick and Roger Sedjo (Washington: Resources for the Future, 1991), pp. 190, 191, 196.

32. Roger Sedjo, "Forest Resources: Resilient and Serviceable," in *America's Renewable Resources,* pp. 81-115.

33. John Barrett, "The Northeast Region," in Regional Silviculture of the United States, ed. John Barrett (New York: John Wiley & Sons, 1980), pp. 25, 37. Cited in Sedjo, p. 109.

34. Moore, pp. 21-24.

35. Sedjo, pp. 111-14.

36. Meadows, Meadows, and Randers, p. 137.

37. As noted by Nobel laureate Friedrich Hayek, "Industrial development would have been greatly retarded if sixty or eighty years ago the warning of the conservationists about the threatened exhaustion of the supply of coal had been heeded; and the internal combustion engine would never have revolutionized transport if its use had been limited to the known supplies of oil ... though it is important that on all these matters the opinion of the experts about the physical facts should be heard, the result in most instances would have been very detrimental if they had had the power to enforce their views on policy." Friedrich Hayek, *The Constitution of Liberty* (Chicago: University of Chicago Press, 1960), pp. 369-70.
See further James Bennett and Thomas DiLorenzo. *Official Lies* (Alexandria, Va.: Groom Books, 1992), pp. 132-56; Ronald Bailey, *ECO-SCAM: The False Prophets of Ecological Apocalypse* (New York: St. Martin's, 1993), pp. 40-78; and Osterfeld, pp. 85, 103.

38. De Gregori, pp. 1243, 1247.

39. Osterfeld, p. 99.

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