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Review

Untrammelled growth as an environmental “March of Folly”

E.A. Keller^{a,*}, John W. Day Jr.^b

^a Environmental Studies and Earth Science, University of California, Santa Barbara, CA 93106, United States

^b Department of Oceanography and Coastal Sciences, Louisiana State University, Baton Rouge, LA 70803, United States

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ABSTRACT

The theme we explore in this paper is that uncontrolled growth and resulting environmental damage can be considered as an Environmental March of Folly. A folly has been defined as the pursuit of policies that are contrary to the pursuers own long-term interests. For an event or series of events to be considered a folly, three criteria must be met. The policy must be perceived as counter-productive in its “own time.” A feasible alternative course of action must have been available. The policy should come from a group, not an individual leader, and should persist beyond one political lifetime. Environmental folly is uncontrolled and environmentally damaging growth that has been recognized as counter-productive; that this has been fueled by cheap fossil energies which are non-renewable; alternatives have been suggested; and the present policy based on growth of use of resources and human population has been continuous over several generations of humanity in the face of repeated warnings. We suggest ways that environmental folly can be ended.

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1. Introduction

A main characteristic of folly according to historian Barbara Tuchman is rejection of reason that involves near addictive, compulsive pursuit of the counter-productive after it has been determined to be counter-productive. In this essay we argue that our relationship with the environment, as a result of compulsive addiction to growth (including numbers of humans, resource use, and transformations of the biosphere), largely fueled by cheap fossil energy, constitutes a “March of Folly”. We discuss why it is a folly, why it persists and suggest solutions.

Barbara Tuchman, in her 1984 book, *The March of Folly* defines a folly as the pursuit by governments and/or industry (including agriculture), of policies that are contrary to their own long-term interest. For an event or series of events to be considered a folly, three criteria must be met:

- The policy must be perceived as counter-productive in its “own time.” That is, during the time period when events were occurring, the policy must have been perceived by a relatively large number of thoughtful people as being counter-productive and damaging.
- Feasible alternative courses of action must have been available.
- The policy should come from a group, not an individual leader, and should persist beyond one political lifetime. This excludes the policy of a tyrant with dictatorial powers.

Two of several examples of follies cited by Tuchman span a period of about 3000 years. The first was the Trojan War when, following nine years of warfare, the Greeks departed leaving behind at the gate of the city the famous wooden horse containing hidden soldiers. Many people within the city argued vehemently to burn the horse, or throw it into the sea, or cut

* Corresponding author. Tel.: +1 805 893 4207; fax: +1 805 893 2314.

E-mail addresses: keller@geol.ucsb.edu (E.A. Keller), johnday@lsu.edu (J.W. Day Jr.).
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it open. Nevertheless, the Trojans brought the wooden horse into the city, and that decision led to their doom. The defeat of Troy was not ordained by fate. The people in the city made a conscious decision to reject the alternative of destroying the horse outside the city. Today, a metaphorical horse full of our population and pollution and gobbling up the earth's natural resources (especially fossil fuels) is upon us awaiting our decision. In all follies, the choice of destroying the horse is always there.

A 20th century March of Folly was the Vietnam War. Tuchman writes that ignorance was not a major factor in Vietnam that was continued through five successive presidencies. She concluded that the folly lay not in America's pursuit of a goal in ignorance of the obstacles, but rather long-term persistence in pursuing a policy in spite of the accumulation of evidence that the goals were not attainable. The policy, long before the end of the war and in spite of the courageous and brave sacrifices of Americans and others on both sides serving in Vietnam, was recognized by many to be contrary to American interest, and damaging to American society and reputation. In the final analysis, the folly in Vietnam (and perhaps now in Iraq) is consistent with classic symptoms of folly, which are to deny evidence, to refuse to draw valid conclusions, and to become addicted to the counter-productive. Our leaders chose too late to destroy the mythical Greek horse and end the war, and that policy led to tragedy and humiliation.

2. Environmental "March of Folly"

That environmental policy in much of the world may be leading us on a March of Folly was hinted at when Tuchman asked why many insist upon "growth" when such a practice is spoiling and using up basic resources of life including land, water, energy and air, and is demonstratively not sustainable?

This essay expands upon and presents an argument that many individuals, governments as well as national and international companies that control industry, mining, energy extraction, forestry, fishing and agriculture are wedded to profit-motivated, largely unregulated principles. These growth policies are counter-productive, unsustainable and damaging to people and the ecosystems with which we share our planet. This growth is fueled by rapid utilization of limited fossil energy and nurtured by people that consistently attempt to reduce, or eliminate regulations and laws that protect the environment. Many recognize this problem and alternative solutions have been proposed, especially by individuals in the fields of ecological economics, restoration ecology, and ecological engineering. Continuation of the growth policy is the Environmental March of Folly.

At the onset of the argument that an environmental folly is happening and that an alternative exists, it is important to recognize that capitalism and democracy are not the same. In fact, democracy is necessary to insure that global, unregulated capitalism and the growth it demands does not result in further ecological damage and perhaps even the elimination of our species. The democratic system has the flexibility and power to provide control of unregulated capitalism necessary to sustain our environment now and in the future. Such control will be unpopular to many who view growth as the only

viable path to prosperity. Measures to control present unrestricted growth will be challenged and fought at every step. This results because there will be economic costs to those who exploit resources and abuse the environmental commons (air, water, soil, minerals, fossil fuels, and living things). We do not suggest that energy, minerals, land, water, air and biologic resources not be extracted or used. Humans, as with all living things, need and have the right to use Earth's resources and to enjoy our beautiful planet. However, we have the moral obligation to use resources responsibly and minimize harm to the environment. Basically, we have created a growth-oriented world economic system, which is the only game in town. In essence, we have to change the rules of the game. But the growth-based neoclassical economic system will be self-limiting because it is based on finite resources, especially fossil fuels. An important issue is how growth will slow and stop. We basically have two alternatives. We can use the Earth's resources to make the changes to a more sustainable society. Or we can use up fossil fuels and other resources in a last ditch effort to sustain current patterns of growth. The latter seems to be the path of the energy policy of much of the world. The focus, not withstanding the rapid growth of solar and wind energy, is primarily on fossil fuels with relaxation of environmental protection to allow maximum exploitation and use of those fuels at the expense of clean air and human health and foreclosing future options for sustainability.

It is also important to acknowledge that unregulated capitalism is not the sole problem. The former Soviet Union promoted growth policies that, on a per capita basis, damaged the environment to a greater extent than previous political systems. The factors responsible for environmental degradation in both systems include rapid growth in human population, industrialization, and use of natural resources all fueled by cheap energies. The Soviet government, as sole owner of the resources and committed to centralized control of industry, promoted policies resulting in environmental problems. It was very difficult to challenge government proposals for projects and resource utilization and thus even well intended programs could lead to unanticipated environmental degradation. Such programs are more likely to be terminated in a society that allows public criticism than in one that does not. Such policies continue today in the People's Republic of China, where projects with potential for serious environmental disruption continue, such as the world's largest dam and reservoir on the Yangtze River. The decision (policy), from a totalitarian system, to build the dam was from the top down. Internal criticism of the project was not appreciated and was punished or ignored.

An additional important point is that human societies have altered the environment in the past, sometimes to their own destruction, as clearly demonstrated in the book *Collapse* by Jared Diamond. The culture of Easter Island is an example of this. But early societies were limited to relatively local impacts because they were running on solar energy. The globalized super consumption, which characterizes the industrialized world today, has the additional energy source of fossil fuels. And this has allowed the human population to affect the biosphere at a global scale.

People's religious beliefs have sometimes been blamed as the cause of environmental degradation. For example, Lynn

White, Jr. argued that the Judeo-Christian heritage is responsible for Western human's attitudes and behavior towards the environment. First, Christianity is the most anthropocentric religion the world has ever seen, establishing a dualism between man and nature. This dualism insists that it is God's will that humans exploit nature. Second, by destroying pagan animism, which tended to unite people with nature, Christianity made it possible for people to degrade the environment by being indifferent to the rights of ecosystems. Third, Western science, technology, and industrialization are a natural result of Judeo-Christian dogma of creation. This dogma teaches that humans were created to have dominion over the earth.

White's argument can be refuted on several grounds. First, prehistoric humans, using fire and water, also caused considerable environmental damage, a point recognized by White. Long before the birth of Christianity, early Greeks and Romans both caused considerable damage to the environment in pursuit of resources. Second, when Christianity triumphed over paganism, there were some changes, but no revolutionary change in the relationship between people, society and the environment. Third, although the ideals of some cultures may suggest that land is sacred, there is often a considerable hiatus between ethical ideals and actual use of the land. Finally, while Judeo-Christian tradition was important in the development of science by helping providing order and understanding of the natural world, science did not enforce human domination of the environment. In fact, science has supported the concept that humans, through evolution, are part of the natural world. Also, other cultures have contributed greatly to intellectual and technological development. The Arab world was the leader of intellectual growth for nearly a millennium while the western world was mired in the dark ages.

We conclude that religious attitudes and beliefs are not a primary cause of environmental degradation and the implication that one religion or one culture or one political system is responsible for the way we treat the land cannot be rigorously defended. It is true, however, that sustainability, resource use and protection of the environment are not central elements in any of the world's major religions. One can be a member in good standing of any of these religions and still be a contributor to the unsustainable path we are on.

A simpler explanation assumes that our environmental problems are due to a pattern of human development that began when earliest people attempted to use tools to better their chances for survival. Early humans were a product of harsh times and like other animals we are extending our niche as far as restraints allow, in our case to the detriment of the biosphere. What has happened is a change in the scale of the problem. Humans have always altered the environment, but the problems of high resource use and environmental impact are now global and to the point where the continuation of present trends will lead, in a relatively short time, to profound changes in human society. Humans, in one form or another, have lived more or less sustainability on the earth for hundreds of thousands of years. Our current patterns of life cannot be sustained for more than a few more decades. This is amply demonstrated in the recently published Millennium Assessment.

The roots of what drives the folly of environmental degradation go deeper than our political, economic, and religious

systems. To find answers to stop the folly we will need to examine our drive for growth in human population, resource utilization, urbanization, as well as the lack of a land ethic. We need to understand that while humans were limited in the past by the amount of solar energy, we now have huge amounts of additional energy, which allows our impacts to be much greater. We also need to understand that there are viable alternatives.

Today a major problem and source of social unrest results because 20% of the people in the world, most of whom live in the richest countries, account for: over three-fourths of private consumption expenditures; consume over half of total energy; use over three-fourths of all paper; about half of all meat and fish; and own over three-fourths of the world's automobiles. The rich are able to do this because they control and use most of the energy in the world. Partially as a result of our present economic and environmental policies that are addicted to growth, the gap between rich and poor appears to be growing. To some the only solution is more growth—this keeps us on the March of Folly.

As a result of our dominant environmental policies around the globe that encourages growth in humans and resource use, human processes are increasingly dominating Earth's ecosystems, according to ecologists Vitousek and colleagues and the Millennium Assessment. For examples, about half of the land surface and freshwaters of Earth have been transformed and/or used for human processes, and about 50% terrestrial net primary productivity has been directly or indirectly appropriated by humans.

The environmental folly is far different in both scope and potential significance than those discussed by Tuchman. For example, the Trojan War involved two nations and a city. In last century for Vietnam War involved a few countries. The environmental folly is global and involves not only the well-being and perhaps survival of our species but also that of ecosystems with which we share our planet.

We now explore the theme of uncontrolled growth and resulting environmental damage as a March of Folly in greater depth. The argument is based upon the assertions that: uncontrolled and environmentally damaging growth has been recognized as counter-productive; that this has been fueled by cheap fossil energies which are non-renewable; alternatives have been suggested to destroy the horse at the gate of our Troy; that the present policy based on growth of use of resources and human population has been continuous over several generations of humanity in the face of repeated warnings (these several generations are the period of greatest fossil fuel use); and that reasonable alternatives have been proposed, especially by ecological economists, restoration ecologists, and ecological engineers.

2.1. Recognition of counter-productivity

The birth of modern environmentalism in the late 1960s and 70s was, in large part, a result of the recognition that what we are doing to the environment is counter-productive to both people and ecosystems and the patterns of resource use are unsustainable. Pollution of the land, water, and air had reached a point where many people perceived it as a real problem. Actually, this recognition dated back 200 years or more.

Thomas Malthus recognized in 1803 that it is impossible to support an infinitely growing human population on a finite resource base. Nearly 200 years later, Rachel Carson, in 1962, published her book *Silent Spring*, which carefully documented the folly of attempting to control nature with chemical poisons (mostly pesticides). The book was on the bestseller list for nearly a year and was very important in raising public consciousness that eventually resulted in the environmental movement of the 1970's. When *Silent Spring* was first published, some people with influence, power, and financial interests in the chemical and agricultural industries, believing she was threatening their existence, tried to silence her message by defaming her research. She reported what the chemical industry feared most and did not want people to know about:

- The indiscriminate widespread application of pesticides that are poisonous to many living things other than the target insects.
- The irresponsibility of industry and its apparent conscious, damaging treatment of the environment.
- The assumption of some in the agricultural industry that damage to the environment was a necessary price for increased production facilitated by using chemicals to protect crops from insects.

The implications of silent spring continue today with new studies, such as those by Hayes and colleagues of the widely used herbicide, atrazine. Their work documented how, through hormonal processes that fool the body, atrazine can cause unexpected changes such as the feminization of wild male leopard frogs. Frogs (like the canary in a cage in a mine with a poison gas hazard) are early warning organisms because they live in water, have porous skin and are sensitive to pollution. Humans are becoming canaries themselves as diseases related to environmental contamination increase.

Six years after Carson's book, Garrett Hardin published his essay "Tragedy of the Commons". Hardin argued that resources held in common (air, water and space for examples) would eventually be overused and degraded. Thus, industry that is given unrestricted and uncontrolled access to resources also exploits the commons. Therefore, exploitation of resources by individuals or groups without appropriate environmental oversight often results in environmental degradation. He further argued that our pattern of resource use and growth of human population is counter-productive and will lead to ruin. By the 1980's it was becoming apparent to many interested in the future that population growth, environmental degradation, poverty, and shortages of resources were all increasing at rates that were perceived to be impossible to continue in the long-term. An influential publication that preceded a more general recognition in the 1980's that we are on a collision course with our environment was *Limits to Growth* published in 1972 by Meadows and colleagues. A major conclusion and message of the book was that present rates of growth of human population, pollution, industrialization, resource depletion and production of food, if continued, would result in limits of resources being reached sometime within the 21st century. As a corollary, the results of reaching these limits might be the sudden and uncontrollable reduction in both the number of people on the planet and the industrial

capacity to produce useful goods. This conclusion was very unpopular and led to angry rebuttals. The recently published 30-year assessment of the *Limits to Growth* shows that the original predictions were fairly accurate. Other environmental scientists and economists recognized that current trends are unsustainable. Kenneth Boulding used the analogy of space-ship earth to illustrate the finite nature of the earth. Some economists, such as Herman Daly, have talked of the necessity of using steady state economics rather than growth-based economics to describe human well-being. Robert Costanza, James Gosselink, Howard Odum and others have shown that the work services of natural systems have high economic value and contribute greatly to the well-being of society.

The protest by moderate environmental groups such as the Sierra Club and thousands of trade unionists of the December 1999 World Trade Organization (WTO) meetings in Seattle, Washington, and at subsequent meetings, was a "wake up call" of the environmental folly we are experiencing. Max Sawicky, an economist with the Economic Policy Institute in Washington, D.C., asks an important question, "Why should we sanction a contest among nations for foreign investment, where the criterion is who can best exploit its workers and destroy its natural environment?" The people are protesting because they believe that the WTO is adversely influencing democratic rights of nations by protecting investment from democratic decisions, at the expense of workers (including children and prisoners), who are exploited, kept in poverty and denied basic human rights. One reason that the environmental situation we are in is not more widely understood and appreciated (and why many were surprised at the Seattle and subsequent demonstrations) is that the same multinational groups that control the WTO also control most of the mass media. There is a lot of activity and information related to environmental matters, but relatively little reporting of it in the mass media. The main message of the mass media is to encourage more consumption and unsustainable behavior. Certainly most people know more about Britney Spears, Survivor and football scores than they do about environment and sustainability.

2.2. The alternative

The alternative to environmental folly is to first control and then stabilize the growth of human population and resource use that is recognized as counter-productive. *Limits to Growth* concluded that it is possible to alter or stop the trends in growth and establish conditions of economic and ecological stability conducive to human survival. Thus the term "sustainable" was introduced. Today, "sustainability" is a widely used and misused term that needs to be carefully evaluated. For example, we sometimes see the term "sustainable growth", which according to physicist Albert Bartlett, is an oxymoron. When we use the concept of sustainability, we are considering a relatively long period of time where simple mathematics shows that steady growth yields impossibly large numbers. In spite of the fact that there is a wide spectrum of uses for the term "sustainability", and that some people don't accept the concept, it is considered by many as a significant concept that encourages thinking critically about the future of our planet, ecosystem, and human beings.

Along with the development and refinement of the idea of sustainability, specialists in a number of fields have given us the intellectual and practical tools to attain sustainability. Ecological economics and the practice of ecological restoration based on restoration ecology and ecological engineering teach us how to live in a more harmonious manner with the natural world. Ecological footprint analyses show that the human population is already living beyond the carrying capacity of the earth. It has also been demonstrated that when basic needs of food, housing, and security are met, human happiness is decoupled from consumption.

3. Why does the Folly continue?

The sustainable alternative is believed by some to be the alternative that ensures the existence of local to regional democratic market economies within an ethical culture that is not centrally planned by global corporations who work to maximize growth and money over rights of people and environment, confusing our needs and values with our wants. The alternative of sustainability further requires that international capitalism and its offshoot of globalization, that has resulted in the concentration of power and money in the hands of a few to the detriment of most people and the environment, be managed rather than exist as a global, unregulated system. Part of the resistance to the concept of sustainability is human habit and natural reluctance to change. Part is that “profit” as a major driving factor dictates the creation of goods that are often not necessary and are not generally planned to last, but are expected to be soon replaced. We must realize that human society was basically sustainable for tens of thousands of years, but it was rarely democratic. We will have to work hard to ensure that democracy is kept in the sustainable societies that surely must come in the relatively near future.

Assuming that our policy and resulting treatment of the environment in the world today is leading to an Environmental March of Folly, why might this be so? According to Bartlett, there are at least three reasons. First, consistent with Garrett Hardin’s “Tragedy of the Commons,” the benefits of growth of human population and growth in rates of consumption of resources accrue mostly to a few (this has always been the case). On the other hand, the costs of population growth, and growth in resource consumption, are borne by all in terms of environmental degradation and resource depletion. But they are borne disproportionately by the poor. Second, those individuals and groups who benefit from the growth have most of the power and will continue to exert strong pressures to support and encourage both the growth of human population and rates of resource consumption. Third, those same individuals and groups who promote growth are strongly motivated through recognition that growth is good for them, now. In order to gain support for their views and goals of continual growth, they seek to convince other people that growth is good for society. They point to the fact that people are better off today than they ever have been. We live longer and better (materially if not spiritually) than we ever have before, and people have been extremely successful in finding new resources when shortages present themselves. But these

trends cannot continue for much longer because of resource and environmental constraints.

If all this is true, why are we worried about future growth and the necessity of stopping growth? Looming over all of this is the idea that there must be some limits to growth. We cannot support a continually growing consumption on a finite resource base. We must realize that what is primarily driving the cycle of non-sustainability is energy (mainly fossil fuels). Without this realization, we will have difficulty understanding, much less solving the folly.

The inter workings of the environmental folly are both intriguing and mysterious. What is it in human conditions and thought patterns that drives people and groups of people to pursue goals and objectives that are, in the long term, counter-productive to their very existence? Is it greed, fear, desire for power? Perhaps it is buried even deeper in the human psyche and our Pleistocene genetic heritage. Whatever it is, it is present at the human level from the individual who exploits the local environment to the mega-international industry that exploits the global environment. We believe that the problem is not something unique or different about the “human drive”. We are like all other organisms strive to capture as much resources from the environment as possible. The difference is that the limiting factors which worked in the past such as high mortality rates, resource limitation, and lack of energy have been overcome in the short-term. We are not the first species to experience rapid and exponential growth. This happens all the time when additional energy is added to a system. An apple or sandwich half eaten and tossed on the ground results in a rapid growth of a profusion of organisms from bacteria to ants. But when the energy is used up, the populations fall back to beginning levels or lower.

The apparently deep human need and desire to provide a legacy drives many of us to obtain land and use resources far beyond our per capita share of the resources of the planet. In a time of material excess, an important question with increasingly looming moral and environmental implications is asked by Stites, How much consumerism (use of resources) is enough? We fear the drive to accumulate as much as possible may be very basic, more like an instinct that drives the squirrel to collect nuts. This is true for many species. Remember that the richest 20% of people on Earth use over 75% of the resources. Similar human needs may drive others to have additional children, too many of whom may suffer from poverty. But studies worldwide show that above a rather modest level of consumption, happiness is not related to consumption.

Reaching a state of absolute equality of income among diverse groups of peoples, according to Garrett Hardin, is neither probable nor practical. However, the great and growing discrepancies between resource utilization and incomes between groups of peoples suggests that “natural” differentiation of peoples may have gone dangerously far, and social corrective measures are called for. Today, both those who have and those who do not are practicing counter-productive behavior. What is necessary to derail the runaway freight train that is the March of Folly is to somehow bring the have and have-nots of the world to positions where the latter are raised to a new position where basic needs are satisfied and the former learn to live without the hyper-consumption we have

now. Furthermore, it is most appropriate that this transformation take place within the context of sustainability. And, as stated above, we need to come to the realization that satisfaction and happiness are not related to continuously increasing consumption.

Another view is that we are barreling down the tracks without considering the curves ahead (resource depletion—especially oil, environmental impact, global change, population growth, etc). We have to slow down before we derail in a major catastrophe. It will be difficult but not impossible to bring a greater prosperity to the have-nots. The only real solution is for the rich to find ways of not consuming so much, while maintaining an acceptable standard of living and a high degree of satisfaction. As oil peaks and starts down, it is likely this will happen naturally. The real folly is not realizing this and trying to continue our high-energy lifestyle. We have to learn, in spite of what the mass media constantly tells us, that basic human needs and happiness are not tied to excess consumerism. It is important to remember that what is needed is a redefinition of human values away from rampant consumerism. Howard and Elisabeth Odum did this in “A Prosperous Way Down”. Their thesis is that we need not suffer decline or crash to reduce consumption, but plan for orderly change that reduces consumption followed by renewed succession and opportunity that is sustainable.

4. To end the folly

Reduction of environmental degradation and rapid resource depletion and stabilization of population are the challenges of the 21st century, if we are to survive, and if we are to enjoy a quality environment shared with other living creatures in the future. Continuing business as usual will most certainly make the existence for more and more people less and less pleasant. Resource constraints and environmental deterioration will make business as usual less and less possible. In fact, over the past 2 to 3 decades, there have been numerous resource wars. Make no mistake—Earth will survive and move on in “deep time” regardless of what we do. As Stephen Gould has stated so clearly concerning our dependent relationship with Earth, “If we treat her nicely, she will keep us going for a while. If we scratch her, she will bleed, kick us out, bandage up, and go about her business at her own scale”. To allow the narrow, self-interest of policies of growth to guide our destiny is the largest of follies.

To end the folly, we must move away from growth and hyper consumerism to a more sustainable path. To do this that three things are necessary: a good information base, a framework or value system within which to make decisions, and good, honest leadership.

4.1. Information base

We believe that the facts cited and discussed in this article clearly indicate that the information is available to show that the folly we are talking about is real. We know that the rates of resource use, especially fossil fuels, are not sustainable. We know that humans are affecting the earth at a global level. We know that human population is still growing. In short, we

know that the way humans are living, especially in the industrialized world, is clearly unsustainable, and can continue for no more than a few decades at best.

It's good news that the growth rate of global human population has recently decreased. In the late 1980's to early 1990's, the number people added to the world per year peaked at 86 million, and since then has generally declined. This was a milestone in human population growth and is encouraging. It is possible that our global population of 6.6 billion persons may not (if you are an optimistic person) double again. It is estimated that by the year 2050 human population will be between 7.3 and 10.7 billion, with 8.9 billion being most likely. Population reduction is related to education of women and the decision to marry later in life as well as medicine, which have given us birth control. However, until the growth rate is zero, population will continue to grow and this growing population is demanding more and more resources – many would like to begin to live the way we do in the United States. If the rate of growth is reduced to 0.7% per year, one-half the rate today, human population will still double in 100 years. Thus, even the most optimistic projections of human population suggest we will have at least a billion or so more people to feed, clothe, and house by the end of the first half of the 21st century. Continuation of the environmental folly will make it more difficult for those billions as well as the remaining ecosystems of the world. If, as we believe, available information clearly shows our environmental folly, why are most of us continuing on with business as usual?

One important reason is that information about sustainability is being drowned out by the mass media. The global mass media information system is generally not geared to providing in a clear, broad-based manner the kind of solid information that is needed for wise decision-making. On the contrary, much of the global information system is geared to stimulating further the kinds of consumption patterns that are unsustainable. The great majority of information provided is superficial. This system is not generally geared to providing clear, unbiased information. There is ignorance in a sea of information. The economic system controls information, generates desire for more material goods, displaces community values (sports, material things equal happiness, violence), and deflects attention away from community and sustainability. The ability to learn about sustainability and make wise decisions will be based in a value system that embraces sustainability. Over the past decade, there have been a spate of books and articles that discuss the situation we are in and suggest ways to a more sustainable future. However, these ideas have still not penetrated the mainstream. A notable exception is the recent media coverage of global warming. News stories, television documentaries and movies are getting the concepts and potential solutions out to the public at large.

4.2. Value system

We need to move towards a value system that will help us move away from the present non-sustainable patterns of living. Aldo Leopold stated part of the solution to our counterproductive environmental actions 50 years ago in terms of an environmental ethic as “a limitation on freedom of action in the struggle for existence”. In order for all components of our

environment to co-exist, we need to embrace a land ethic that includes the entire community including people, other animals, plants, air, water, and soil; collectively, the environment.

Religions have long provided value systems that give moral, ethical, and spiritual direction and meaning to humans. Today, however, environment and sustainability are not generally reflected in mainstream religions. The great religious discussions of today are mostly about issues other than sustainability and environment (fidelity, abortion, prayer in schools, homosexuality, capital punishment, the “10 commandments”, etc.). This is not to say that these are not important issues for a just society, only that they are not generally related to sustainability. Some issues, such as the distribution of wealth and poverty, are issues related to considerations of sustainability and are reflected to varying degrees in religions. We believe that religions must help by beginning to incorporate teachings related to sustainability.

We need a new, more universal set of moral, ethical and spiritual values which specifically address the issues of environment and sustainability and which can compliment traditional religious values. The institutions that should create this broader set of values need to do a better job. These institutions include the family, church, schools, government, and the “economic” sector.

4.3. Leadership

Part of the solution to ending the folly involves having leaders with the moral courage, ethics, integrity and character necessary to avoid the controlling and consuming power of money, ambition, and corruption, to come forth and lead democratic systems. Another part is for moral people with high ethical standards to make decisions and follow through with actions that are socially and environmentally just. There are many people who are private citizens and/or leaders with the qualities to end the folly. What is needed is for all of us to come together and act in unison.

It is important to recognize that the environmental folly in which we are involved is complex and composed of many different components, including growth of human population, resource utilization, waste, and human transformation of the Earth's ecosystems. In order to stop the folly, each of these must be identified and acted upon. This requires a value clarification, and sound environmental and economic science coupled with wise environmental policy that values long-term environmental quality over short-term economic profit that discounts the future. There are encouraging signs. For examples, people in the United States, when queried concerning their values concerning the environment, consistently state that protection of the environment is a very important goal. Nevertheless, there does remain a gap for many of us between our values concerning the environment and our personal and collective actions that continue to harm the environment.

At the government level, there are many good examples of positive environmental policy (and these need to be continued and expanded). During the past thirty years, governments around the world have enacted legislation to improve environmental quality. At the international level, the Montreal Protocol in 1987 laid out a plan for reduction of global emissions of chlorofluorocarbons (CFCs) that were

shown to cause stratospheric ozone depletion. More recently the United Nations International Environmental Conference in 1992, known as the “Earth Summit”, brought to the surface conflicts between environmental concern, economic issues, and emissions of carbon dioxide, known to be contributing to global warming. This was followed by an additional conference in 1997 in Kyoto, Japan, with the purpose of negotiating to reduce emissions of carbon dioxide to levels below those of 1990 by the year 2010. The United States with 5% of the world's population emits about 20% of the atmospheric carbon dioxide, and the United States national government is reluctant for financial and other reasons to support reductions of emission of carbon dioxide. The science of global warming is solved according to many scientists, including NASA scientist James Hansen—global warming is happening and human activity (burning vast amounts of fossil fuels) is a significant contributor. The compulsive pursuit of the counter productive consequences of global warming is now a fully developed March of Folly. The reluctance of the United States, at the national level, is particularly damaging to international cooperation, as we are considered a leader in the world. California, with the 12th largest economy in the world, enacted legislation in late 2006, to sidestep national policy and reduce emissions of CO₂

The United States from 1970 to about 2000 was a leader in developing environmental policy with the objective of reducing environmental impacts resulting from human activity. This position of leadership has weakened and eroded in the past few years as environmental concerns are too often placed second to economic growth. As the United States and its industrial lobbyists push to delay environmental regulations and demand for additional scientific before taking action to reduce potential environmental problems, the torch of environmental protection is being passed to the European Union and other countries. It is these countries not the United States that are recommending the application of the precautionary principle (implementing cost-effective environmental protection when evidence exists, but absolute proof is lacking that a particular activity is damaging the environment). Other countries are aggressively developing new environmental protection policies. Fear of economic isolation (for example the EU may not buy our products if they contain toxic material they ban) will likely push the United States have to follow the lead of other countries. In this case world trade and globalization may lead to improved environmental regulations. This would be a positive change with potential far-reaching consequences. In the past globalization has too often resulted environmental neglect.

With respect to waste, we need to stop talking about disposal methods and do more with materials management to eliminate the concept of waste. This includes designing coupled systems of humans and nature to function where the waste of one part of the system is a resource for another, thus eliminating the concept of waste. This is called ecological engineering. To end the folly, we need to go beyond recognizing counter-productive, harmful policies and environmental practices of the past and present and move to manage and stop growth policies that damage the environmental at global, regional, and local levels.

Finally, to end the folly we need to reverse the trend of human abuse of the land. We have learned much about how

ecosystems work and are applying this information in many locations in the practice of ecological restoration and ecological engineering. Previously channelized rivers are being un-channelized, wetlands are being constructed or reconstructed to provide habitat and help remove pollutants from water, and agricultural practices are being developed that are more environmentally friendly with reduced domination of Earth's ecosystem. For example, at the University of California, Santa Barbara, storm runoff from a large dormitory complex is routed to a system of bioswales. The bioswales retard the water, and water plants remove nutrients that would otherwise be discharged into the campus lagoon (that has experienced cultural eutrophication in the past) and then into the ocean. As another example, one of us (Day) has worked with William Mitsch and others to develop an ecological engineering approach using wetlands to solve problems of water quality deterioration and habitat loss in the Mississippi Basin and delta. Such approaches are cost-effective and sustainable examples of restoration ecology and ecological engineering.

There are encouraging signs. However, as Steven Gould warned us, a true environmental ethic and improvement of the environment at local, regional, and global levels may not be forthcoming until we are able to convince people (not just environmentalists in rich countries) that clean water, clean air, clean energy, materials management, and reforestation are the best solutions for the needs of humans at a human time scale. There is a growing realization that services provided by ecosystems are worth as much to the human economy as money flows. Thus, we need to convince people that stopping growth of human population and runaway growth of use of resources will result in the protection and improvement of the environment desired by people today. Furthermore, people need to be convinced that this path will help people today and in the near future. To assist in this the religions of the world have a role.

At first glance, science, environmentalism, and religion might seem to have little common ground. Science is concerned with expanding knowledge through testing of hypotheses, and as such, has helped remove superstitions sometimes associated with religion. Environmentalism is concerned at a variety of levels with an eco-centered world that in the fringe areas may conflict with both science and religion. Religion, although very difficult to define, presents a framework of the universe and our role in it that in some areas conflicts with science and environmentalism. On the other hand, there is growing common ground between science, environmentalism, and religion. All three tend to view the world through a moral framework and view nature as having value. In particular, both religion and environmentalism oppose excessive consumption. The role of science in achieving sustainability is clear, because solutions to environmental problems are possible when results of scientific inquiry are used in technological advances, as for example to reduce air pollutants. Environmentalists are important in achieving sustainability as they have been at the core of the movement towards a paradigm change from growth to sustainability. The role of religion is emerging in the move to sustainability in areas where religion and environmentalism can work cooperatively.

The religions of the world, according to Gardner, writing in 2002, have significant influence over the environment by:

shaping people's attitudes towards the natural environment; and using blessings, offerings, rituals and ceremony that help to control our use of natural resources. Furthermore, religion has tremendous power in the world today due to its ability to shape people's view; provide a moral authority; offer people a sense of meaning with the possibility for personal transformations; involve large numbers of people on all continents and countries on Earth; have large material resources; and finally, utilize community building at the local level to achieve desired results

In summary, today there is a move towards more ecologically centered religious views. As a result, areas of cooperation with environmentalists and scientists are opening up. This makes it easier for people to understand advantages of protecting the environment, conservation, and land management as well as saving endangered species. Using Christianity as an example, some Christian teachings now mention saving endangered species with an analogy of plugging holes in Noah's Ark. Native American spirituality also involved conservation of living and water resources. For example, in the arid West, Native Americans incorporated beavers and their role in the environment in their religious beliefs. This reinforced a ban against hunting the animal, which in turn helped preserve freshwater wetlands constructed by the beavers and utilized by Native Americans for hunting and fishing activities.

4.4. Energy use and ecotechnology

Over the past decade, increasing information has appeared that suggests that world oil production will peak within a decade or two implying that demand will consistently be greater than supply and that the cost of energy will increase significantly in the coming decades. This information has come primarily from petroleum geologists with long experience in petroleum production. This suggests that for the first time since the beginning of the industrial revolution, energy demand will consistently be greater than supply. Society can react in two basic ways to this energy shortage. One is to attempt to maintain our consuming and growth way of life. This will likely lead to even worse environmental problems than exist now. And this path cannot work for more than a decade or two. The second way is to realize that the current path is unsustainable and that we must move towards a steady state. This can be done in a way that is equitable and that makes more use of alternative and renewable energy resources. But this second path must realize that we cannot continue present patterns of consumption and growth.

In the coming world of increased scarcity of oil, we must learn to do things much more efficiently. This includes more efficient homes and transportation systems. In the area of maintaining a healthy environment, ecotechnology offers such an efficient approach. The approach of using the energies of nature to the greatest extent possible is called ecological engineering. This is the ecological principle where small amounts of fossil fuel energies are used to channel much larger flows of natural energies. Ecological engineering offers both a conceptual and practicable approach for long-term environmental management in an era when the cost of fossil energies will become much more expensive. Ecological economics offers a sustainable ecological framework that values

all types of capital including natural, social, human, and built. Restoration ecology brings all of this together to develop sustainable approaches to restoration of the biosphere.

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