

# A New Dimension in Evolution: Impacts of Human Consciousness on Sustainability—and Beyond

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*“The whole future of the Earth...seems to me to depend on the awakening of our faith in the future.”*

Pierre Teilhard de Chardin (Letters to Mme Georges-Marie Haardt)  
From de Chardin's The Future of Man – 1964

**Abstract**—Starting with the concepts of the “noosphere” – the sphere of thought – and the evolution of consciousness developed by Pierre Teilhard de Chardin in the first half of the last century, we will introduce a hypothesis declaring the interdependence of the noosphere with global systems, and extrapolate to new perceptions that these concepts, and others which seem to flow from them, could contribute to transforming historic views into more hopeful visions of the future of human development and life on Earth. Just as mental outlook plays an important part in each person's life path, so also do the ideas and world-views – limiting or expanding – held by the global community affect the assumptions, boundaries, and decisions of the human family as we discover who we are in an ever-evolving existence of increasing knowledge and change. Approaching the issue of sustainability from an engineer's point of view, we quickly see, as stated in the U.S. Army Corps of Engineers' Implementation Plan for its newly promulgated Environmental Operating Principles, that it demands “...a new view of engineering that embraces the physical and biological sciences as well as those of the social and economic disciplines. ...This shift in our understanding of engineering will be huge.” The paper will discuss three additional hypotheses as part of the movement toward sustainability; “moving from passive-reactive to active-creative world views,” “the breakdown of the false dualism between nature and human activity,” and “human thought and breaking the glass barrier between historical world views and a new paradigm that opens the door to new opportunities,” and will go on to discuss policy initiatives and technology development that would align with these new perspectives.

## Introduction

The Earth, an already complex system, has evolved a new dimension of complexity – the human mind. To the extent that human creativity has resulted in actions that are changing our planet, how do we transform our understanding of reality to meet the limiting challenge of this century – assuring sustainability of our integrated sociopolitical, economic, and environmental infrastructure? Mohamed ElBaradei, the Director-General of the International Atomic Energy Agency, stated in an essay published February 12, 2004 in The New York Times, “If the world does not change course, we risk self-destruction.” Of course Dr. ElBaradei was referring to nuclear proliferation. But could his words not be taken to refer more generally to a broad range of human activity as it impacts our home in space?

Exponentially growing interaction between human thought and its products and Earth's life-sustaining

systems have brought us to a critical juncture in history where we are forced to re-examine the lens through which we view our planet and our interactive role with it. Old world views provide an old lens – one constructed over the millennia – that has shaped our beliefs and the institutions formed around them. It may not be enough to simply ‘do better,’ or ‘work harder,’ at shaping our behavior through the old lens. We may, in fact, need a kind of transformation – to re-address the fundamentals of our existence and discover a socioeconomic, legal, and technological framework that places us in a holistic relationship with the planet and on a self-sustaining path toward adding value to our home in space.

Human consciousness presents an added dimension to the womb that gave it birth. Human consciousness is the new guy on the existential block and has evolved its ideologies and institutions during the transition out of a relatively unconscious condition. But that condition is changing. Even though, in geologic time, the evolution of human consciousness is relatively recent, the cumulative

knowledge and activity created by that consciousness has produced a condition that is changing the game. And during this relatively rapid rise of reflective consciousness, some of the assumptions we imbedded in our ideologies and institutions no longer play well. We need to start thinking about what parts of our fundamental structure need to change so that we can successfully reverse the slide into unsustainable behavior.

As human thought results in activities that are now recognized as cumulatively impacting the planet, it seems logical that one approach to coming to grips with the problems resulting from thought's negative impacts is to scrutinize the institutions thought has evolved and the ideas that shape our worldviews, all of which provide a container for human thought and activity. The engineer in all of us wants things to work, and when we observe that they are not working, we need to go back to the drawing board and ask some fundamental questions. The health of the planet was not a consideration when most of our institutions were formed, and that introduces a potentially fatal flaw in those systems as they exist and are applied in today's world. How do we break out of the container formed by those flawed institutions so that we can rejuvenate them and bring them into line with a new reality while not diminishing their essential and lasting value?

Perhaps there is a connecting and supporting link between the respect humans have for one another and their respect for all life and the infrastructure that supports it. Is it possible that one could exist in its fullness without the other? I suspect not. In fact, it may be the mental separation of the two worlds that contributes to our seeming inability to view existence holistically.

## Foundation Ideas Leading to New Views of Existence

In the 1970s and 1980s, James Lovelock described an interdependence between the various parts of Earth's living matter which he formulated as a hypothesis:

*Journeys into space.... (have) provided a new insight into the interactions between the living and inorganic parts of the planet. From this has arisen the hypothesis, the model, in which the Earth's living matter, air, oceans, and land surface form a complex system which can be seen as a single organism and which has the capacity to keep our planet a fit place for life. James Lovelock, GAIA: A New Look a Life on Earth, P. ix-x (1991)*

And further,

*Our (James Lovelock and Dian Hitchcock) results convinced us that the only feasible explanation of the Earth's highly improbable atmosphere was that it was being manipulated on a day-to-day basis from the surface, and that the manipulator was life itself. James Lovelock, GAIA: A New Look at Life on Earth, P. 6 (1991)*

Another perspective, focusing on the human dimension, was voiced during the first half of the 20<sup>th</sup> Century by Pierre Teilhard de Chardin in which he added concepts describing a new dimension in the life of planet Earth – human consciousness and the sphere of thought – the noosphere:

*All around us, tangibly and materially, the thinking envelope of the Earth – the Noosphere – is adding to its internal fibres and tightening its network; Pierre Teilhard de Chardin, The Future of Man, P. 137 (1962)*

At the heart of global sustainability are two foundation concepts: the physiochemisphere-biosphere interdependence and organic wholeness suggested by Lovelock, and de Chardin's noosphere.

Combined, these two concepts form the ingredients of a physiochemisphere-biosphere-noosphere interdependence, one of four hypotheses presented here: that human consciousness has now advanced to the cutting edge of global evolution, and forms an organic whole with planet Earth. If the apex of human evolution is to be reached, we must choose to nurture the organic wholeness of inextricable interdependence between Earth systems and human consciousness. Just as Lovelock has pointed out the Earth's physical-chemical-biological interdependence, we now recognize a similar interdependence between these global systems and human consciousness, an evolving organic wholeness whose interwoven sinews become more complex and tightly woven as human choice and understanding move us beyond sustainability to new horizons.

Life's adventure has taken on a new dimension. Human consciousness is now at the cutting edge of planet Earth's evolution. Human consciousness has always depended on global systems. Starting now, a reciprocal dimension is added. The future of global systems, assuming the continued advance of value-adding human civilization, will depend on human consciousness. The evolutionary child must now assume a reciprocal role in the care of its evolutionary parent. Global interdependence has come full circle.

If we accept this hypothesis, two major developments are required:

- world views must evolve that are in harmony with our new reality, and

- institutions must evolve that are in harmony with our new world views.

Three additional concepts may help us negotiate this transition:

- moving from passive-reactive to active-creative world views
- moving beyond the false dualism separating nature and the humasphere – the sphere of human activity
- moving through a mental barrier between self-limiting historical assumptions and a new paradigm that opens the door to unlimited opportunity.

## Moving From Passive-reactive to Active-creative World Views

Life is changing. A fundamental shift is occurring. And thus the hypothesis that human culture is moving from a passive-reactive state, to an active-creative state. From a physical-mechanical point of view, the active-creative state has been in evidence since humans first started making tools and changing the world around them. But from an intellectual-consciousness point of view, a cultural point of view, we are just entering the active-creative state.

We are beginning to recognize the quality and quantity of human impact, accumulated over time by geo-unconscious development; and are now realizing that we have entered a new paradigm – the active-creative state. So it's not a matter of creating a new paradigm, it's a matter of understanding the one we're in.

What is the active-creative state? It is the application of thought to creating the future, taking the actions necessary to produce desired outcomes. It includes recognition that human actions form a growing part of evolution, and that evolution has itself evolved. No longer can evolution be viewed as the apparently unconscious advance of complexification. It now includes a powerful new element – life's own product – human thought.

The complexification of matter which we have witnessed from the beginning of the universe, as we know it, to the present, is the outer view – the manifestation – of evolution. The complexification of matter manifests itself as the gradual movement of matter from seemingly simple forms to, over the eons, greater and greater complexification, leading eventually to life, then ever greater biological complexity until most recently, the evolution of the human mind – perhaps the most complex of all. But at the heart of biological evolution are so-called errors in cell reproduction. As every cell seeks to reproduce it

goes through a series of checks, balances, and error corrections. But even with this incredible system of error avoidance, some errors get through. And thus, a cell is mutated. And from then on, the cell reproduces itself in its mutated form. This mutation then renders the owner a range of possibilities, with extremes ranging from disease and destruction to new capabilities not previously available. These mutations are then tested in the environment as to their enhanced ability to fit existing niches. And, as Darwin so intelligently theorized, those changes that rendered the owners more capable of adapting to existential niches around them, were better able to prosper and reproduce – thus extending the life of the mutation and tending to make it a permanent part of the chain of that species evolution.

Are there feedbacks from the surroundings to channel cell mutation? My understanding of science's opinion is that mutation of cells is entirely random – accidental. And if time and research continue to support that theory, it emphasizes an even greater change in evolution's course from unconscious and random-caused evolution to the consciousness-caused evolution that marks the active-creative state. For increasingly, as human activity changes the world around us, it creates new niches within which to live and explore, ever opening new doors to life and experience.

Thus we begin to see that human consciousness has introduced a new branch of evolution – one might call it Noospheric evolution – an evolution not based on cell mutation (although it may include cell mutation), but rather the mutation of ideas and reflective thought – ever opening windows of insight into, and deepening understandings of existence. And out of these mutated perceptions are created the adaptive tools needed by a changing planet.

As we conceptualize a new planet and create new niches, we are at the same time on an exponential path to learning how to engineer mutations in physics and biology that will allow us to do better in the world – and better fit the new niches – that we increasingly choose to design around us. So the full maturation of the new evolution in the active-creative state is to fully accept responsibility for our actions, understand that our destiny is to gain sufficient wisdom to increase its multi-dimensional profundity, and continually seek to add value to our integrated existential infrastructure.

The active-creative state opens the door to new responsibility, and to the vista of a holistic world that is at the same time hopeful, wonderful, exciting, boundless, liberating, choice-derived, and transforming. It is the active awareness that we are creating a new planet, and that this new planet will depend on the choices we

make and the actions we take – together. It gives new meaning to the word ‘freedom.’ We can choose to seek a world that increasingly supports life, or we can choose to ignore the signals of the planet and live for short term gains based on an outmoded socioeconomic model. The choices we make today will exist as the foundation for future life. Is there a greater freedom? Is there a greater responsibility?

The difference between active-creative and passive-reactive states is like the difference between a contributing crew member and parasite passenger on Space Station Earth (Steve Young, EPA); crew members maintain – and even enhance – the enterprise; parasite passengers are simply along for the ride while collecting critical components from the Space Station which are vital to its health simply for their own personal gain. Conscious or not, the passive-reactive state maintains the condition for dismantling the enterprise.

For most of our time on this planet, from a consciousness point of view, we have behaved as souvenir-collecting passengers. We must now choose to become crew members of our home in space. And to prepare ourselves, we must change our views of existence and our role in it. And that brings us to the heart of the matter: changing our perspective – changing the way we think.

Let’s first consider the absolutely revolutionary – and evolutionary – function of the human mind as it applies to the question of sustainability and our future. The evolution of the human mind has re-created the Earth as an open system. And that changes everything. In the past, the Earth has been viewed as a closed system. And, except for the energy and matter arriving from the sun and outer space, the physical resources of our planet are relatively fixed. But what about thought – creative intelligence – the human mind? Only one resource on the planet is relatively unlimited – creative intelligence and the human mind. And although this may be true for each individual mind, its potential can only be fully reached as many minds become connected in an open global network of shared information, dreams, ideas and creativity.

## **Overcoming a False Dualism – Achieving an Integrated View of Human-created and So-called ‘Nature-created’ Environments**

One of the great obstacles to viewing our planet holistically is the false dualism we have created

separating the world of ‘nature’ – the physio-chemisphere and biosphere – from the humasphere, the sphere of human activity and its human-constructed infrastructure. And thus the hypothesis that human activity and human-created infrastructure are part of nature and not separate from it. Viewed holistically, are the things built by humans any less ‘natural’ than the things built by ‘nature’? Isn’t human thought the product of nature’s evolution? Haven’t human activities and all the things resulting from them grown from the seed of human thought? And don’t we consider the homes that animals build part of nature? Therefore, why shouldn’t buildings, roads, ships, constructed wetlands, our scientific and engineering endeavors, our knowledge base, and all human constructions – the humasphere – be considered an intrinsic part of nature?

Perhaps we created this dualistic view because the things we produce don’t look much like nature, nor, often, do they function well with it. And iteratively, they don’t look like or function well with nature because, in the mind of the designer, they exist in separate worlds. As long as we hold the disjointed view we created, we can be assured of a continuing path away from sustainability. So until our dualistic view is abandoned, we will not be able to harmonize human activity with global systems. The mental partitioning of so called human-created and nature-created worlds produces a false dualism which limits and inhibits both our world view and the evolution of human thought and action.

One of the great proponents and leaders in the area of designing systems that recognize the interconnectedness between nature and what humans create is William McDonough, architect, artist, designer, innovator, and author. He is a strong proponent of the idea that we should do no harm, and that everything we build should be “food” for something else when its life has ended – thus the idea, and the title of his book, [Cradle to Cradle: Remaking the Way We Make Things](#) (2002).

One of the great myths of our world view is the false dualism we have created by separating ourselves and our tools from nature, thinking that all the things humans construct, the humasphere, are not part of nature, but separate from it. This outmoded view may be very understandable because we’re so low on the existential learning curve and only now starting to develop technology and construct infrastructure that respects the environment on which it depends. One of the essential mental steps to creating a better world is to accept that everything we do is a part of the total system, that it is all part of “nature,” and that all of it must be created to be integral with it. Everything must be developed to exist and function in harmony with the entire system. It is all one.



# Breaking the Glass Barrier Between Historical World Views and a New Paradigm That Opens the Door to Unlimited New Frontiers

In the Figure below, titled In Thought and Action, From an Old World to a New, the area below the Line of Global Sustainability represents the box of current thinking. It represents the idea that we are ultimately limited in what we can do, and that the best we can do for the Earth is to limit the damage we cause. And within this box of limitation are three ideas, which are really three sides of the same limiting view. The first is the idea that we should minimize degradation of the global system in an attempt to approach sustainability, but that we can only approach it, never actually attain it. Although this view moves us in the right direction, it limits its goal to approaching sustainability, thinking, perhaps, that actually reaching it or moving beyond is not possible, and that true environmental sustainability can exist only in pristine wilderness.

The second is the idea that the Earth's system is so huge it doesn't matter what we do, the system will be capable of absorbing it. This second view has probably been human kind's prevalent view until recently, and may still dominate.

And the third is a belief that the whole enterprise will eventually wind down, so why worry about it. Just take what we want for today, and so what if we degrade the system to an ultimate state of inert uniformity, it's going to happen eventually anyway.

The Line of Global Sustainability is like the Glass Ceiling of Global Evolution, to be shattered by evolution's own product – creative thought. Breaking through the Line of Global Sustainability breaks us out of the

mental box of limitation we have imposed on ourselves, and enables creation of an enhanced and unlimited system. The ability to do this forms the fourth hypothesis: that human consciousness, when it successfully integrates itself as an organic whole with global systems, is capable of evolving sufficiently to enable creation of an enhanced system with unknown limits. This hypothesis states that the noosphere, the interwoven sphere of human consciousness, recognizing itself as an organic part of global systems, will burst through the barrier of global sustainability created by our limited views, to evolve a world of unlimited potential – beyond sustainability. Movement toward this breakthrough initially manifests itself by efforts to limit the damage we do and to seek sustainability, but soon transforms to a paradigm in which we learn, not only to understand and maintain what has been created before us, but to build on the foundation of our inheritance by adding net value to the system and creating a new world of unknown limits.

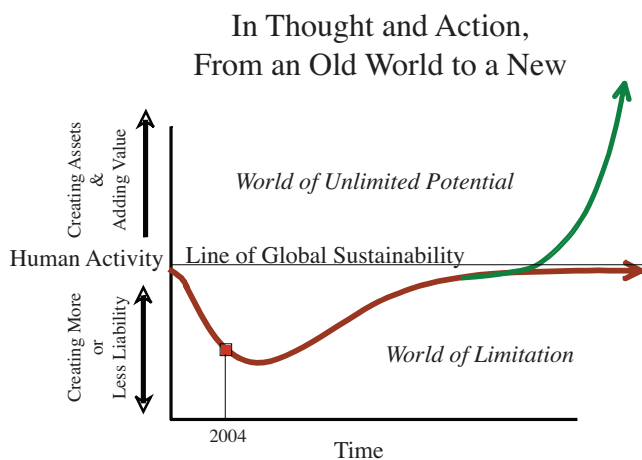
A child may take many things apart, but can't put them back together again. As far as our relationship to our planet is concerned, and even our understanding of existence itself, we are still children – perhaps even embryonic. But as we begin to see the implications of our deconstruction of the environment, and see the threat our deconstructive actions impose on our life-support system, we will soon learn enough about the fundamentals of the system and our interactive role in it to, first, gradually stop the deconstruction and, second, begin to add value.

The key to changing human action is to change human thinking. The prevalent idea that some people are good and some evil – even, as held in some circles, that all people are born with so-called original sin – is one of the flawed conceptual views held in the box of limitation. This view must be replaced by a more hopeful vision – a view that good people can have bad ideas. Moving from one world to another is, first and foremost, a matter of changing our ideas, the way we think, and the way we view the world.

Essential drivers for moving from an old world to a new are love, trust, and hope – perhaps the most powerful, yet fragile, elements of our existence. In themselves, they may not be fragile. But our connection to them is. And it is our connection to them that gives embodiment to their existence, and in essence, to ours.

## Policy Supporting a New World

Each person contributes something unique to the fabric of our planet. In a world in which human action



is changing the planet, and realizing that human action results from human thought, it should be one of the great goals of our global community to create equality of opportunity through policies that strongly support sustainable technology research and development, and enhance educational, social and economic opportunity for all.

## Economic Policy

For many, our economic system has been highly successful. However, it is an evolving system, and in its current state, severely flawed by its insensitivity to primary values in two major areas. The first, and perhaps most discussed today, is its insensitivity to some of the most valuable content on the planet – the underlying environmental infrastructure upon which our economic system – and everything else – depends. Some of our wiser policy makers have equated a healthy environment with a healthy economy. The trick is how to bring the value of services supplied by our environmental infrastructure into the economic equation. Right now, it's off the table. As Al Gore pointed out 12 years ago in his book, Earth in the Balance: Ecology and the Human Spirit (1992), our measure of economic value in the gross national product includes largely the things we trade and manufacture. It doesn't include the health of the biosphere and our "natural" resources. It doesn't bring eroded soil, stripped forests and lost species, lost wetlands, polluted atmosphere, or depleted water systems into the value equation. And as long as individual choices are based on wildly incomplete value information – both short and long term primary-value dynamics – then we are in serious jeopardy and operating unsustainably.

The second area in which our economic system is flawed is its relative disregard for the human condition. In a world with a view toward unlimited enhancement of life on the horizon, the incredible wealth imbedded in an integrated global human consciousness reaching toward its full potential is arguably the most valuable asset on the planet. Because we are concerned about the future of life on Earth and its relationship to the causative impacts of human activity, it is crucial that our utmost and most focused efforts go toward developing an ever-growing knowledge base, coupled with supportive economic and social environments, so that we can move beyond denial of the obvious and ignorance of the knowable to a condition of hope and creatively-constructive behavior. This will be necessary if we wish to create a sustainable world – and then move beyond it to the world of our potential.

Our economic system needs re-evaluation, and modifications or new systems explored. The current system is powerful in motivating activity where it increases the relatively one-dimensional bottom line and the lifestyles that money can buy. Unfortunately, it, along with all our other institutions, was evolved when the impact of human activity on the planetary system was not a consideration. The community of nations – all people – must come together to address this problem. This will only happen in democratic systems effectively enabled to overcome the narrow, short-term interests of current power structures. All systems are currently operating under disabling doctrines based on flawed assumptions, effectively denying the existence of their actions' short- and long-term impacts on the planet, and denying responsibility for the results.

There are many good things about the current system, especially as modified by progressive democratic societies with moderating policy for the common good. Therefore, attempts at changing current systems must assure that they substantially maintain current benefits and protections. However, change is needed. Recent regressive economic trends, in the U.S. and elsewhere, have led to expanding poverty, underemployment, and growing unevenness in the distribution of income and wealth, both locally and globally. Add to this the recent retreat from environmental protection, and we face an urgent need to address the question of modifying our economic system, either through fundamental change, or by policy which moderates the hard edges created by short-term, narrow, and irresponsible perspectives. Essential in this effort is the need to incorporate the value of the planet's life-support engine in our calculations of value, perhaps, as a goal, replacing gross national product with gross global value as the model for measuring progress and wealth. And since, under the hypothesis presented here, human consciousness is now a central part of the planet's life-support engine, it is critical that we now include all dimensions of human health and enhancement in the calculation of value.

To the extent possible, and certainly as a goal, we need to build an incentive system that will make enhancement of the environment, the creation of a holistic view of what we do, and adding value to our integrated social, economic and environmental infrastructure a natural response by all players. Daniel Janzen of the University of Pennsylvania, in his article, Gardenification of Wildland Nature and the Human Footprint (1998), has suggested that because the local and commercial forces are so intense, the best, and perhaps only, way to protect the biosphere is to involve the public and commercial interests by actively creating wildland nature as a global garden to be carefully used and increasingly loved by the

local people. Dr. Janzen says it best. Here are his third and seventh through tenth paragraphs.

*Why can't the wild tropical species be left "out in the wild" to fend for themselves? Because the wild is at humanity's mercy. Humanity now owns life on Earth. It plans the world, albeit with an unintended here and an uninformed there. Until the Pleistocene, not more than a few thousandths of one percent of the earth's surface was ours. Today it all is. If we place those species anywhere other than in a human safe zone, they will continue in their downward spiral as grist in the human mill, just as they have for the past ten thousand years.*

*Shelter is much of the reason why the world's biodiversity is in deep trouble. Humanity and its domesticates - those ever-present extensions of the human genome - are genetically and culturally antagonistic to most wild biodiversity. It is part of the "enemy" and always will be. "Shelter" is largely shelter from the wild - be it monkeypox and rice borers, lions and wolves, or forest that shades pasture grasses and bean plants. I cannot imagine how to hide or integrate a hundred thousand species of wild organisms, and all the things that they do to and with each other, in someone's roof or in the Integrated Pest Control of an orange orchard. My goal is co-existence with wild nature, not its exclusion unto extinction.*

*The acquisition of sustenance—feeding—appears to be the only hopeful refuge for wildland biodiversity. At first glance this seems an unlikely route. We are hunters and gatherers. We eat wild biodiversity, and we do all we can to help our chromosomal extensions eat that which we cannot eat. A bean plant is a green machine that grows directly out of our chromosomes, sitting where wild biodiversity once was, another mouth for sun and minerals.*

*However, gardens are forever. Gardens are mushrooms on horse manure and cats under the kitchen table. Gardens are beehives and cows, and sixteen varieties of rice growing in one rainforest clearing. Gardens are hydroponic tomatoes and vats of whisky-spewing yeast. Kids do it, agroindustry does it, grandparents do it. Bushmen do it, astronauts do it, and Pleistocene Rhinelanders did it. And we will all still be doing it 10,000 years from now. The garden is a somewhat unruly extension of the human genome.*

*So, how do we hide 235,000 species in the garden? By recognizing and relabeling wildland nature as a garden per se, having nearly all of the traits that we have long bestowed on a garden - care, planning, investment, zoning, insurance, fine-tuning, research, and premeditated harvest.*

*And this leads to the question of absorption of humanity's omnipresent footprints.*

In some form or other, humans need to take charge of maintaining the biosphere, and all the services it provides, because, as Dr. Janzen points out, "...the wild is at humanity's mercy. Humanity now owns life on Earth."

Although individual internal motivation based on knowledge and understanding is most efficient, external motivation from policy and law is an important tool and must also be used – at least until the dimensions of our new existence become part of our genetic consciousness – in two different ways; one, creating incentives for positive behavior; and the other, consequences for negative behavior. Of these two policy paths, positive reinforcement is more efficient, because it also stimulates a change in thinking and opens the door to creative solutions. Perhaps it's a little like creating performance specifications for a product or service, as opposed to writing out how to do something in great detail. The latter takes away the potential for creative solutions and reduces the performer's responsibility for a successful result. But sometimes the more legalistic form is necessary – witness the laws against segregation which forced a different behavior, exposing many to a different experience and leading some to changed views.

Monitoring science and technology will play a key role in developing human understanding of the essential values in the biosphere we depend on. A very interesting article by Daniel Janzen, [Now Is the Time](#) (2004), describes a potent and intimate means of both monitoring and stimulating interest in the planet's biosphere, using existing technology to place a small bio-identifier cell-data phone in the hands of the public. To give you an idea of what he is talking about, here is the second paragraph of his paper:

*Imagine a world where every child's backpack, every farmer's pocket, every doctor's office and every biologist's belt has a gadget the size of a cell phone. For free. Pop off a leg, pluck a tuft of hair, pinch a piece of leaf, swat a mosquito, and stick it in on a tuft of toilet tissue. One minute later the screen says *Periplaneta americana*, *Canis familiaris*, *Quercus virginiana*, or West Nile Virus in *Culex pipiens*. A chip the size of your thumbnail could carry 30 million species-specific gene sequences and brief collaterals. Push the collateral information button once, the screen offers basic natural history and images for that species – or species complex – for your point on the globe. Push it twice, and you are in dialogue with central for more complex queries. Or, the gadget, through your cell-phone uplink, says "this DNA sequence not previously recorded for your zone, do you wish to provide collateral information in return for 100 identification*



*credits?" Imagine what maps of biodiversity would look like if they could be generated from the sequence identification requests from millions of users.*

As Janzen's idea points out, monitoring science and technology must not simply focus on geographic views of the planet, although that will be one very valuable aspect. It is critical that in developing our monitoring science and technology, we develop it as part of a system that provides us the means to monitor and evaluate the relative health of all systems making up our life-support engine: the physiochemisphere, the biosphere, the noosphere, and the humasphere (the sphere of human activity) – along with all their connections and interactions – to create both static snapshots and dynamic models of the system.

The endeavor to reach sustainability, and eventually move beyond it, is the ultimate engineering enterprise – an Earth engineering enterprise. Human-caused planetary change is currently underway, but largely denied and un-acknowledging, especially by those who think their power and wealth would be threatened by the changes demanded by its recognition. Future life on this planet demands that these people and institutions now acknowledge human-driven climate and global change, take responsibility for it, and correct course. No greater betrayal of future life on this planet exists than the continued campaigns of denial and misinformation surrounding the subject of human-caused global change by those who see their narrow social, political, power, and profitability interests affected by a change in course.

Today, we are largely in denial of the planetary impacts of our actions. And as they relate to the enduring health of our planet, our activities are piecemeal and haphazard. Perhaps this is true, in part, because our ideologies and institutions have not given us the creative space to think in these terms. That must change. Humanity must accept responsibility for its actions, recognize the holistic nature of our system, and become planetary engineers.

Perhaps one way of doing that would be to develop the ability to construct a project assessment scheme which would give value to all the elements of a project's impacted area, and then evaluate the net value change with each project option. Conceptually, this would be similar to the National Environmental Policy Act (NEPA) process, but enhanced by including a value for the biosphere and the noosphere of the project-impacted area, as well as the interrelationship and influences over time of the immediately impacted area with its boundaries and the areas beyond. This would move us toward a global approach in value and impact assessment as our experience and understanding grows. It would also introduce the concept of evaluating the fundamental worth of the biosphere, the

noosphere, and all their supporting systems as part of any analysis of asset allocation or reallocation.

My sense of it is that there is gold in here somewhere. Sometimes, when looking at existing problems and their potential solutions, they are seen from a status quo position wherein the change seems horrific, impossible, or unrealistic. However, if visualized from the other side of the problem, the problem may appear not only to have been resolved, but surprisingly, to have opened a whole treasure chest of opportunity not originally envisioned.

In that regard, the following concept is offered to illustrate a point, and is not assumed to be applicable without a great deal more consideration and analysis. This concept involves creating an integrated planetary value system to replace the current, much more narrowly focused, property valuation system. As an example, let's consider a house on a half acre of land valued under the current system at \$100,000. Now, under a new integrated planetary value method, its value as a contributing part of the life-sustaining global system is added. Clearly, when viewed separately, the value of the planet's life-support engine dwarfs that of the humasphere, the products of human activity, i.e., everything counted in the assets of pre-existing global economic systems. Thus, using the integrated planetary value concept, a property's potential to add to the planet's life-support engine adds a value that dwarfs its previous evaluation under the current system. Let's say, for purposes of illustration, that the property is valued at 100 times its previous value, based on its condition relative to its potential contribution to the global system, and is now valued at 10 million dollars. And what does that do? Does it increase total taxes? Conceptually, no, because all property would go up in similar fashion, so the tax rate would go down to about 1/100<sup>th</sup> of its previous value, and property taxes, on average, would remain about the same. However, to create a built-in incentive to increase the property's contribution to the planet's life-support engine, taxes would be based in part on an inverse relationship to the biospheric contribution of the property. If property condition was valued at 100 percent of its potential contribution to the planet's life-support system, the tax would be lowest, increasing as its valuation decreased.

Under the integrated planetary value system, property assets would rise dramatically, giving communities much greater financial strength. It would also tend to flatten the global distribution of wealth, so that countries currently considered poor would find themselves with much higher capital assets and proportionately better situated to maintain and develop their social and economic worlds. It would also seem to provide built-in motivations to protect planetary life-essential assets, both from its inverse tax relationship, as well as from its function in



the marketplace. So the same tax and market forces that once tended to ignore and diminish our natural resources, would now be working to protect them. What would have changed in the serious consideration of such a concept are the perspective and the underlying assumptions of our value system, bringing them from an outdated and mythical belief system (that the environment is so huge it can't be significantly impacted by human activity) into alignment with the reality of today's world.

Now let's take this analysis several steps further by adding not just the value of the biosphere, but also the value of everything else, including the noosphere. How does each person on the planet relate to the total system in a constructive way? And how do we engineer a system that uses the continuing health of all systems as a motivating force in the dynamics of the one system increasingly impacting all others – the noosphere?

## Social Policy

To enhance the noosphere it will be essential to dramatically alter our view of individual worth. If we were to consider each individual on the planet an irreplaceable facet in a global jewel, and if we then treated each person with the respect due their inalienable worth, we might find ourselves living in a different world. This would be engineering at its new core.

Approaching the issue of sustainability from an engineering perspective, we quickly see that a new view of engineering is demanded, one that embraces the physical and biological sciences as well as those of the social and economic disciplines. This shift in our understanding of engineering will be huge.

Because humans are part of our planet's life-support system, respect for it is directly connected to the respect we have for one another. This leads us to certain imperatives, including new initiatives in social equity that will raise opportunities enabling every person to experience a life of dignity and self-respect. These imperatives would include modifying our laws and policy to make it the right of every person to earn a living wage for themselves and their families. This effort is not only a matter of civil rights. It would also enhance the pool of human creativity, enabling everyone to participate, as Steve Young of the Environmental Protection Agency has said, as crew members instead of simply passengers on our home in space.

Population is often considered a major problem in reaching sustainability. Yet, although certainly a factor, it is a dependent variable – dependent on ideological, cultural, social, and economic factors. This makes it a very complex and divisive issue. Lester Brown and Mark

Hertsgaard, in their excellent books *Eco-Economy* and *Earth Odyssey*, respectively, discuss the issue of population, but also point out that much of the environmental impact – perhaps most – due to human activity, comes from countries with the most controlled populations, i.e., the western developed world. And they and others point out that the United States, with about 5 percent of the world's population consumes about 25 percent of its resources. And it's that consumption – and perhaps the way it's consumed – that most powerfully relates to the levels of human impact on the global environment. So, although population is certainly a factor, the real concern is more related to human activity than simply population.

Wealthy nations, those with population control well in hand, often look at population control from their own perspective, viewing areas of the world with booming populations as somehow a threat to their share of the pie and a burden on global systems. Yet these motivations will not be sufficient to affect the changes they seek. Instead, it is the motivation within the populations at issue that will bring about meaningful change. The factors driving uncontrolled population growth, and the impact of those factors on those very populations, are at the heart of the matter and must be the focus of attention as choice-enhanced hope for the future unfolds. For if our future civilization depends on the maturation of the noosphere, not as driven by external imprimatur, but as internally motivated by the inspiration of each individual – interlaced in an increasingly radiant global jewel – then to the extent that the aspirations of these populations are thwarted by their own or other's world views, the path to maturation will be extended.

The path toward greater hope insists on respecting the lives of all populations, including our own, and assisting them in moving forward, in ways they choose, toward their full potential, all the while valuing individual identities and helping all build an increased sense of self-worth. Until the cultural and ideological barriers to action disappear, both within and outside all populations, the movement through cultural and ideological change cannot be successfully negotiated.

Underlying negatively impacting types of human activity are world views, ideologies, and institutions developed in the past when human impact on the global system was not a recognized consideration. Although local impacts were evident, the impacts were viewed as strictly local. And without the experience of a global view, these impacts seemed insignificant and the potential for their expansion under the power of human technology and development went unrecognized.

So, as mentioned previously, the solution lies in taking a multi-pronged approach – working on the long-term

issues of changing world views and ideology through deepening our understanding of global systems, along with the more direct approach of providing legal and policy incentives to do the right thing to the extent we know them at the time.

Unfortunately, the forces of our narrowly focused economic system have created incentives that make widespread development and distribution of accurate information on the state of the planet very difficult. In a recent book by Ross Gelbspan, Boiling Point: How Politicians, Big Oil and Coal, Journalists, and Activists Have Fueled the Climate Crisis – and What We Can Do to Avert Disaster (2004), the first sentence of his Preface reads, “It is an excruciating experience to watch the planet fall apart piece by piece in the face of persistent and pathological denial.” And in an August 15, 2004 New York Times Book Review article on Gelbspan’s book, Al Gore writes the following in four contiguous paragraphs:

*Gelbspan’s first book, The Heat Is On (1997), remains the best, and virtually only, study of how the coal and oil industry has provided financing to a small group of contrarian scientists who began to make themselves available for mass media interviews as so-called skeptics on the subject of global warming. In fact, these scientists played a key role in Gelbspan’s personal journey on this issue. When he got letters disputing the facts in his very first article, he was at first chastened – until he realized the letters were merely citing the industry-funded scientists. He accuses this group of “stealing our reality.”*

*In his new book, Gelbspan focuses his toughest language by far on the coal and oil industries. After documenting the largely successful efforts of companies like ExxonMobil to paralyze the policy process, confuse the American people and cynically “reposition global warming as theory rather than fact,” as one strategy paper put it, he concludes that “what began as a normal business response by the fossil fuel lobby – denial and delay – has now attained the status of a crime against humanity.”*

*I wouldn’t have said it quite that way, but I’m glad he does, and his exposition of the facts certainly seems to support his charge.*

*Gelbspan also criticizes the current administration, documenting its efforts to “demolish the diplomatic foundations” of the international agreement known as the Kyoto Protocol, and describing its approach to energy and environmental policy as “corruption disguised as conservatism.” Again, he backs up his charge with impressive research. Moreover, his critique is far from partisan. He takes on*

*environmental groups for doing way too little and for focusing on their own institutional agendas rather than the central challenges.*

If Gelbspan is correct, and the narrow interests of industry, governments, and a corporately-dependent media are intentionally, or even unconsciously, altering or withholding important information from the public, this is indeed a crime against humanity. And government’s involvement in this activity, makes it especially culpable, since its single most important mission is to serve the common good, and not the narrow interests of the powerful and the “haves and have-mores,” as our president labeled the wealthy while addressing those he calls his “base” in Michael Moore’s documentary, Fahrenheit: 9/11.

We must seek to develop policies that will lead to better understanding of our planet’s life-support engine, and develop the knowledge base that will allow us to make decisions based on their ability to add net value to the integrated global economic, social, and environmental infrastructure. No longer can truly democratic systems tolerate being effectively dominated by those who would deny or mislead, consciously or unconsciously, to serve their narrow self interests where these are in conflict with a higher purpose – the health of our planet and of civilization itself. On this we must insist. And the work required to attain the needed knowledge to satisfy this mission must be a first priority. The health of our planet’s life-support engine is our most urgent global issue. The war on terror, although related and a clear manifestation of our dangerous and unhealthy state, is dwarfed by it.

Our world is precariously balanced – socially, economically, environmentally and technologically – between a creative and unlimited future, and disaster; and mostly because we have not yet truly grasped what is taking place around us. We must move toward a world where EVERY person counts, is respected, and has the opportunity to find their own special genius, not only because it’s the right thing to do, but because it’s essential. We must create a world of hope out of a vision that recognizes human creativity as having reached the cutting edge of evolution, thus making human consciousness the most essential resource and critical asset of a sustainable civilization. And if the goal is to reach beyond mere sustainability of our economic, social, and environmental infrastructure – not only reducing the damage we do, but also adding long-term net value to all life and the life-support engine of our home in space – then the true capital of the enterprise becomes an ever-expanding, ever-deepening, and ever-enriching of each individual’s consciousness. Because we are all in this together, all people must be included. No one can be left behind.

A vision for moving toward a sustainable world includes the following, originally written by the author as part of the vision statement for the U.S. Army Corps of Engineers' Environmental Operating Principles' Implementation Plan:

- a realization that human activity is significantly changing our integrated economic, environmental and social infrastructure;
- that we can consciously choose to shape these changes so that they add net value;
- we define changes that add net value as changes that interact with the integrated system in such a way as to cause positive responses, not only at the time of the initial action, but also in a manner that catalyzes future positive actions;
- that the most fundamental value of the integrated infrastructure is its ability to sustain and enhance all life;
- that the enhancement of life, given the influence of human thought on the global system, will increasingly depend upon the evolution of human thought and understanding; and,
- that the nurturing and development of human thought requires a social and economic environment that enhances human dignity, opportunity, freedom, and equity for all people on this planet.

## Education

Education is particularly important in shaping the noosphere. My vision for future education would be a system integrated more holistically into the life of the community. Regarded as a critical investment, it would stimulate the highest regard for those involved, and garner necessary resource allocation to allow it to function as a premier sector in society.

Today, especially in the United States, the issue of guns in school, children killed by other students, and an ever increasing prison population all point to system failure. Somehow, the energy that now goes into rehabilitation and attempting to pick up the pieces of broken lives must be moved to the early days of each individual's life experience, in the form of investments in a child's sense of self worth, leading to the development and release of their creative potential. At each moment in a child's development there must be available a selection of niches within which the child can test its experience and explore its potential. To accomplish this, an environment must be created that rewards the student not only for their own success, but also for encouraging others.

Making self-worth and social acceptance a high-priority goal of our education system may be accomplished

most constructively by policy creating internal motivation within each child. Students relate socially with teachers and other professionals in the system, often quite importantly, especially for students from dysfunctional homes. However, their most intimate and important social contacts are with other students. Therefore, it is imperative that incentives be created encouraging each child to take responsibility, not only for their own development, but also for being a positive force in the development of other students within their circle of influence. In wildland, when a carnivore sees another animal injured or weak, it chooses it for its next meal. Unfortunately, our schools are often allowed to function as a wildland. Students often pick on other students seen to be weak, insecure, or a threat to another student's influence, thereby tending to create further physical and psychological damage to an already damaged child. Experienced teachers and school administrators recognize the problem of child-to-child abuse, but are not able, and in some cases not willing, to use their time to correct this situation.

A student-motivated system should be created to efficiently deal with this important issue. To do this, perhaps an investment plan could be developed in which each student would be rewarded for his or her contribution to the psychological and social wellbeing of other students, especially those demonstrating particular need for social and self-image enhancement. This investment plan could be structured in two ways, one consisting of a range of monetary and non-monetary rewards to be given the student for near-real-time recognition of their efforts, and the other being a more long-term accumulation of assets or credits toward future programs or educational opportunities. This paper is not the place to work out the details of such a program, but creative teachers, parents, administrators and legislators could quickly work out a myriad of options for both these investment forms.

Funding for the Student Motivation Program could eventually come from the money currently invested in picking up the pieces of broken lives, i.e., prison costs, drug rehabilitation costs, and others that could be directly related to disabled starts in life. In the beginning, since it would not immediately affect the cost of currently broken lives, the funds would need to be considered an investment in the future. But in a generation, the reduced costs for prison and rehabilitation would pay for the investment. And not long thereafter, the added value of creative and capable people, who might otherwise have been a drain on community resources, would be adding far more value to the community than the cost of the Student Motivation Program.

In a more traditional vein, it would be beneficial to immediately initiate an internationally organized education effort targeting all ages and aimed at impart-



ing an understanding of the interrelatedness of our global systems. This effort would present to students, as well as the general public, the most recent information on the dynamics of our global environmental infrastructure. It would be essential that, as for all education programs, it would be factually and scientifically driven, and not politically or ideologically. It would also be important that new information from the scientific community be integrated into the program quickly, relying heavily on the internet, with local teachers using subject matter from the internet in local classrooms and homes. This effort would include making broadband internet access globally available. Global broadband internet access would facilitate other communication and education efforts essential for other aspects of connecting a global community.

## **Sustainable Technology— Research and Development**

Until now, we have lived in a condition where the almost-universally held worldview is that there is not enough to go around, if fairly and justly distributed. This produces both real and mental climates of scarcity in which humans resort to violence to solve their problems. It also produces a destructive dilemma in human thought. Where most of our cultures and ideologies, at least in part, teach us to treat others justly and fairly – even with love – our condition forces us into struggles for survival, whether legitimate or otherwise, that violate our inner sense of being, thus tending to force a distortion of our doctrines and ideologies in an attempt to justify our conflicting behaviors. Our economic system reflects our current reality and state of mind by pitting one group against another to see who will win – who will survive. Violence and distrust result from the struggle over limited resources between people, communities, cultures, corporations, nations, and coalitions. Clearly, it would be desirable to move beyond this state. To do so will require critical advances, not only in the way we think, but also in science and engineering.

Technology, at this juncture, is having both beneficial and negative consequences. Scientists and engineers, coupled with the entrepreneurial genius of modern commerce, have developed technologies liberating and giving hope to many. The advance of technology is here to stay. It is one of the expressions of the noosphere. At the same time, some of these technologies, and especially the way they've been applied, have severely impacted the life-support engine of our planet, as well as being used to limit the ability of many to improve their condition, especially where that advance was viewed as producing undesirable competition or a threat to controlling

societies and their hold on power and resources. Again, it is clear that if reasonable alternatives were available, it would be desirable to behave in ways that enhance life for all on this planet.

If we yearn for a world where sharing and cooperation take precedence over hoarding and competition, then we need to begin to create that world. To reach that world, the place to begin is, first, in our minds, by tearing down the mental barriers that tell us it can't be done; and second, in our policy and investment decisions, placing high on the list research and development in technologies that could eventually lead to enhanced lives for all people and a healthy planet for future generations. Two technologies, information and energy, seem critically important for creating a significantly larger global "pie," large enough so that all humankind can share in it without leaving some people out, while at the same time adding value to the planet's integrated social, economic, and environmental infrastructure.

## **Information Technology and an Expanded Knowledge Base**

The development of information technology seems intrinsic to development of an ever-deepening knowledge base critical for the transformation we are discussing. It is through accurate information emanating from an expanding knowledge base that we grow in understanding and are enabled to change the way we think. This differs from misinformation that, in the quest for narrow personal or organizational short-term gain, is propagated for purposes of misleading minds.

Information technology includes the total construct and condition within which information is born, communicated, used, and responded to. One of the greatest examples of information technology is the Internet, created by the Department of Defense as the Arpanet, and critically supported by Al Gore in legislation that enabled its transformation to the Internet.

Broadband high speed internet connectivity for all people could evolve a higher level of participatory democracy, greatly expanding the choice of options and opening up the flood gates of human creativity and participation in an evolving global community tied together with a common thirst for freedom, democracy, and the rule of law.

The ability to create, share, and access data and information and to connect minds in a global network is key to evolving the knowledge base needed for constructive social, economic, technological, and environmental evolution, and to realize true, informed, democracy.

A hopeful future depends on the evolution of human consciousness, and information technology is a key ingredient. Healthy development will only be fully realized in a decentralized, open, and interoperable information environment. Constructive social evolution depends on good information and the means to access and use it. The essence of democracy is that people freely choose their government representatives. That choice is only truly free when it is based on accurate information. Therefore, lies, disinformation, and character assassination are deep betrayals of the democratic principle and of all humanity. They are a betrayal of democracy and the people democracies represent. Intentional disinformation is a tragic dishonor in a world that is increasingly information dependent. The health of the noosphere and all global systems is dependent on our ability to make choices and decisions based on the best and most accurate information our knowledge base can produce.

The goal for democracy, for its health and even its existence, should be the enhancement of each individual's experience and awareness of reality. The ability to develop, access, express, and use accurate information is the ultimate freedom and the heart and power of democracy, and is essential to achieving sustainability and reaching beyond to the enhancement of an integrated global sociopolitical, economic, and environmental infrastructure. A healthy future is dependent on true democracy and the power of free people armed with accurate information.

The sum total of human activity on this planet – the humasphere – is now a significant player in the Earth's evolutionary process. To productively actualize this role, we need to think of ourselves and the planet holistically, not as separate entities. Nature and the things humans create are not separate. As discussed earlier, they may look different because we're in a transitional mode. But to mentally maintain them as separate entities seems to me to be a false dualism that will keep us locked in denial and unsustainable behavior.

Once we accept responsibility for our relatively new role in the evolution of our planetary system, we will be able to move forward to a positive future built on creative action and a sense of hope for future generations. But the transition it requires and which we are confronting now demands major changes in our thought processes. And these changes can only occur if there is open access to an expanding and interoperable knowledge base that is based on science, not ideology, and is designed to facilitate its evolution as an accurate depiction of existence.

It is critical that we understand as soon as possible both the impact of human thought and action on our integrated infrastructure and the time constants of global change. Humans are now at the cutting edge of our

planet's evolution, and decisions based on good information are essential if we are to attain – and then move beyond – global social, economic, and environmental sustainability.

The process of raising people's consciousness of the long-term consequences of our actions is not an easy one. But things can happen when we least expect them, and enlightened leadership supporting good policy based on science, not ideology, can play a significant role.

Somehow we must bring the true costs of our actions as they impact the health of our planet's life-support engine into our decision-making process – whether it's purchasing a car, choosing mass transit over use of the automobile, or choosing which technologies to use and to invest in. And this will all take time – time to evolve new worldviews and supporting policy. Let us hope that we can accomplish this transition smoothly, maturely, and quickly.

We are all in this together. The biosphere has always been a shared global system. And now human consciousness is an increasingly shared and global phenomenon. Witness our connections through the internet; an increasingly open, interoperable, and inclusive information network; the global marketplace; and the ability to rapidly reach any location on the planet.

We are all tied together in an incredible enterprise. And until we liberate ourselves from the mental prisons of outmoded mythological and institutional belief systems that have grown up over the millennia, none of us will be truly free. And since none of us will ever have a complete grasp of reality, the process of liberating ourselves will be ongoing throughout human existence. However, there are crucial moments in that process, and we are in the midst of one now; a time when the impulse of rapid growth in human technology and development is beginning to make profound impacts on our environmental infrastructure; and when our current world views and belief systems, and the ideologies and institutions that have grown up around them over the millennia, are not sufficient to meet the challenge.

## Energy

Sane development of energy technology is essential to a sustainable planet. Because of their insanely continuing lobby and propaganda campaign promoting use of carbon-based fuels and deceiving the public into thinking that human-induced global warming and the carbon dioxide-induced greenhouse effect is non-existent, or at best theory, the narrowly-focused coal and oil interests, backed by a big-oil influenced Administration, are leading the planet to a catastrophic

edge. Human-induced global warming, a view supported by most of the respected scientists in the world who have studied the issue, is an extremely serious problem whose change of course will require an immediate and dedicated global response in the form of research on efficient solar energy production, efficient extraction of hydrogen from water, and the development of a distribution infrastructure for its use as fuel, most importantly in transportation. This includes research on solar cell efficiency, and development of desert-based solar-cell farms around the planet that could produce energy for direct use in electrical power grids and to extract hydrogen from water to be used as fuel for transportation systems and remotely-sited power plants. Also to be included are research on new forms of extracting solar energy through use of bio-organisms and other means, expanded use of wind power, expanded research to develop clean nuclear fusion, and continuing research on all forms of non-carbon-based renewable energy. Moving forward with any form of energy from biomass should be questioned closely because of its impact on soil, local and global agriculture needs, and the birth-to-death economics and environmental impacts of its use, including the fact that it is carbon-based and its use is likely to exacerbate the carbon-dioxide contribution to global warming.

Melting ice around the planet needs special attention. Ice is one of this planet's great climate stabilizers. It absorbs energy as it melts, and it gives off energy as it freezes. But because it undergoes a phase change from solid to liquid and liquid to solid, the energy stored or given off is large compared with the energy to change either ice or water one degree in temperature. Its loss, now on-going at an unprecedented rate, is not only a clear indication of global warming and a potential problem for those who will be affected by rising sea-levels in years ahead. Perhaps most critical regarding its loss is its potential impact on the planet's ability to maintain temperature stability within the temperature ranges needed for support of human civilization and the portions of the biosphere on which it depends. The fact that there is net melting of ice indicates that more energy is coming into and being generated within the global system than is radiating out. As long as there is significant ice mass still available to melt, thereby absorbing some of this excess energy, there will be a tendency to hold climate and temperature change to lower rates of increase than would otherwise be the case if there were no ice. This is not a reason to delay for one minute the effort to affect a solution to achieve a net energy balance for the planet, but rather, a reason to accelerate our efforts while the ice-cushion is still largely intact.

Although the ice and global warming issues are only part of the sustainability issue, they touch all of them. And for this reason they are clearly at the leading edge of concern, primarily because of their power over all life, and because reversing their direction is so intrinsically bound up with the inability of current institutions and ideologies, evolved in another world, to deal with them. The writing of Ross Gelbspan, discussed earlier, covers some of the key issues surrounding institutional resistance to meeting this challenge.

## Moving Toward Sustainability: Seven Principles—A Guide for Individuals and Organizations

As a guide for individuals and organizations who wish to participate in the quest for a sustainable world, the seven Environmental Operating Principles, promulgated recently by the U.S. Army Corps of Engineers, form an excellent starting point. They are included here accompanied with the author's interpretive text broadened to include all parties. Unlike the Principles (in bold print) which reflect the Corps' official position, the text under each principle, as well as all other portions of this paper, express the views of this author and do not represent official Corps views.

The seven Principles were approved for public release in the spring of 2002 by the Corps' 50<sup>th</sup> Chief of Engineers and Commanding General, LTG Robert Flowers, whose leadership and vision made them possible. The author was pleased to have been included as a member of the team that drafted the Environmental Operating Principles, along with its Doctrine and Implementation Plan.

**Principle 1: Strive to achieve Environmental Sustainability. An environment maintained in a healthy, diverse, and sustainable condition is necessary to support life.**

Striving for Environmental Sustainability is striving for life itself. The environment is our source for life, the font of biological evolution and the womb of evolutionary sustainability. Striving for its sustainability is simply saying that we want life, and the process of evolution, to continue – to be sustained.

Environmental Sustainability is the dynamic condition under which the Earth's systems function together in a self-regulating and self-regenerating manner, maintaining a healthy interdependence while providing the essential ingredients for sustaining all life forms and



servicing as a platform for the evolution of human thought, for all time.

In this definition of Environmental Sustainability, we must place ourselves – both as individuals and as organizations. We are part of this planet’s environment. And the strength of our participation in its evolution is growing exponentially. What we create becomes part of the environment. And thought – what we think and the thought processes that lead to human-borne change – is now becoming an ever more powerful evolutionary force for the entire system.

Therefore, to grapple with Environmental Sustainability requires moving to a new plane of understanding. It is not a matter of defining the limitations of our impact on an external environment. The environment is internal to us, and we are internal to it.

Thus, in achieving Environmental Sustainability, we must include the reflective and reflexive nature of human creativity, considering the processes of both its own evolution and its participation in the evolution of the entire system.

In doing this, we must recognize the importance of diversity of human creativity resulting from diversity in the world of thought, just as we recognize the importance of biological diversity as the necessary source of both healthy change and stability in our planetary life-support systems.

Next, we must recognize the power of vision as the flame front of human creative evolution. The future of human creativity will not be the result of a monolithic vision, but rather the multifaceted jewel of many visions. In this future, each vision will contribute a creative piece to the whole, providing and sharing a partial identity to and with the whole, while still maintaining its essential individual identity and strength. This diversity in thought and vision mirrors the biological diversity out of which thought has been born. Thus, maintaining two diversities – biological diversity and diversity of thought – is at the heart of Environmental Sustainability.

In this regard, the history of human culture has led us well. Through it, we have arrived at a place in time where both institutions and technology have evolved sufficiently to support individual freedom in thought and action while at the same time facilitating essential interconnectedness and cooperation. But we are still immature in this process: mature enough to recognize we have a problem, but not mature enough to have resolved it.

All of this applies very powerfully to us, both individually and corporately. We all design, produce, monitor, regulate, and operate systems that interact with and, to varying degrees, modify the physical, chemical, biological, cultural, and institutional world around us. Our future lies in first, understanding the importance of our

role, second, beginning to limit the damage we do to the integrated global system, and ultimately, transforming our understanding and our actions so that we move beyond sustainability – completely ending our harmful activities and then actually adding net value to our planet’s life-support engine.

**Principle 2: Recognize the interdependence of life and the physical environment, and consider environmental consequences of Corps programs and activities in all appropriate circumstances.**

Interdependence of life and the physical environment refers to the dynamic and mutually dependent relationship between all life forms, the Earth’s life-support systems upon which they depend, and the products of human thought and activity. It refers to life and to all systems that have evolved life: before us, in our time, and for all time. And it introduces the idea that we humans are part of an evolutionary and life-supportive system, albeit a relative newcomer in the evolutionary process. It is a principle which raises the question, “What part will the human newcomer play in the future process of evolution; a participating and life enhancing role, or the role of a blind stranger?” And then it challenges us to answer by accepting the affirmative, life-enhancing role.

It is also a principle that introduces, qualitatively, the idea of the health of the entire life-support system, especially in relation to the consequences of human thought and activity. Human thought and activity have become an intrinsic part of the evolutionary process, although seldom seen as such. Recognition of the evolutionary impact that human thought plays today and will play in the future is a major challenge of our time. Recognizing this fact implies accepting responsibility for our actions. And our unwillingness to recognize this fact belies our unwillingness, or our fear, of accepting responsibility for the well being of future life, our future lives included. It is a principle that challenges us to choose affirmatively, accepting responsibility for our decisions, and helping to lead a nation, and a world, to an enhanced future.

Recognizing the existence of interdependence between life and the physical environment implies a certain level of understanding. To this end, the principle makes imperative the development of our knowledge base, integrating the study of the so-called “natural” environment with the engineered and constructed environment. The principle urges us to recognize the wholeness of life. It urges us to open our eyes to a new paradigm in which human thought and activity is not divorced from the font of life that bore it. It challenges

us to give back to the planet's life-support system its due, not just for it, but for it and us, because together we are one.

**Principle 3: Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another.**

To achieve environmental sustainability, the ultimate goal should be to create a milieu within which the understanding and subsequent behavioral patterns needed to create a balance among all systems will be evolved in such a way as to make these decisions and actions not only the right thing to do, but also the thing that we would do naturally. In other words, the ultimate balance should be achieved by structuring a system in which freedom of choice and action is enhanced while making balance and synergy part of the natural order.

Often we mistakenly label the things created by humans as 'unnatural' or 'constructed infrastructure,' as compared with everything else, which we label as 'natural.' This false dualism has been with us for millennia. It is time to change the way we think about ourselves in relation to the world around us. We must stop regarding human activity, and the things that result from that activity, as separate from nature. Human thought has evolved from nature, and so are the things that human thought produces. Other animals use tools, just not as extensively, nor with the comparable physical and intellectual capacity to seek existential understanding, accumulate knowledge, develop technology, reflect on the implications of change, and contemplate future scenarios.

We must remember that our journey of conscious evolution has just begun. It began several hundred thousand years ago. But in geologic time, we have just begun. So to look through this generation's window in time and make dire predictions or judgments is like looking at a baby and thinking that it will be a failure because it is too small, uncoordinated, and makes uncontrollable messes. Culture is in the baby stage, or earlier.

This principle urges us to grow up, to view the world holistically, and to take responsibility for our new role in it. No longer are we simply passengers on an "infinitely" large planet capable of absorbing our geo-unconscious activity. Rather, we are discovering that we must take the helm and, leaving behind the role of passenger, become crew of our home in space. We are the masters of our fate, and we must be actively creative in evolving our planet.

Re-engineering our socioeconomic control mechanisms can be done alone only on paper. Their full

implementation requires system wide adoption. However, there may be opportunities for individuals, teams, and organizations to initiate change by experimenting with widely supported concept demonstrations in local or regional settings.

**Principle 4: Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.**

Corporate responsibility is critical to achieving Environmental Sustainability. And corporate responsibility cannot exist without individual empowerment.

Corporate responsibility implies mission sensibility and effectiveness extending beyond the bounds of current circumstance and institutional boundaries and reaching to the limits of our understanding of the need for enhancement of human dignity and the support of all life. Accountability under the law means that everything we do must be legal, and the law must be interpreted to assure that all activities comply with it. But accountability goes beyond bending to existing conditions. Behind the law is the public good. And the public good demands that, when deficiencies appear in current law, as made evident by changed circumstances, new information, or better understanding, accountability under the law and to the public requires good faith attempts to initiate legislative corrective action.

The sustainability enterprise is, by definition, a pioneering effort. New frontiers will abound. This is the stuff of innovation. Creative efforts to plot new courses will inevitably require the re-evaluation of existing law. And when that occurs, the principle of corporate responsibility insists that we follow through with our best efforts at providing advice and counsel to the institutional bodies responsible for making law and writing regulations.

Accepting corporate responsibility, because our situation is so dynamic, will mean continually deepening our understanding of what is needed to attain environmental sustainability, and then taking the necessary actions to make it happen, whether through legal, organizational, or engineering means. Extending our understanding of the need for enhancement of human dignity and the support of all life will present the greatest opportunity for a deepened sense of corporate responsibility.

The goal in developing corporate responsibility is to make it internally motivated and self-sustaining. Each individual within the corporate body must be regarded as an intrinsic part of the whole, must feel a necessary part of the enterprise, and be afforded the training needed to understand the sustainability issue at its depths. And

to make corporate responsibility self-sustaining, and because our knowledge base is so dynamic, training must be ongoing throughout each individual's career.

Perhaps critical to corporate responsibility is assuring that its leadership is fully in tune with the concept of Environmental Sustainability. Each senior leader must be able and willing to lead the corporate body in attaining sustainability, and be willing to stand up to the rigors of cultural, institutional, and political pressures from all sides. Environmental Sustainability must become an organizing principle around which the corporate body forms.

**Principle 5: Seek ways and means to assess and mitigate cumulative impacts to the environment; bring systems approaches to the full life cycle of our processes and work.**

To mitigate cumulative impacts implies that there exist, either in design or in fact, cumulative impacts of planned, current, or previous efforts which, due to their undesirable aspects, need to be alleviated by changing their design or by some other means. Seeking ways and means to assess and mitigate implies seeking an understanding of the dynamics of new environments that are formed by the integration of new systems into their former environments.

The task that this principle sets out is immense. Yet it does not suggest that we attain the ways and means for assessment and mitigation all at once. Seeking only starts the process. However, it sets a direction. The paths will be determined as we experience the journey, because as we go along, one insight will lead to another, one understanding to another, one discovery to another and one success to another. And on and on until we, in cooperation with others, reach our goals of understanding the nature of cumulative impacts and their assessment and mitigation, and can finally find the ways and means to attain Environmental Sustainability.

The path toward Environmental Sustainability cannot be walked alone. So part of seeking the ways and means to assess and mitigate cumulative impacts implies that we look for whatever is necessary to attain our goal. And clearly, one of the necessary elements in attaining this goal is partnership and cooperation with others. Thus, connectedness will necessarily be developed between individuals, as well as between appropriate government, university, and private sector organizations. Ultimately, because Environmental Sustainability is a global issue, global connectedness must be achieved. However, as with all the means of achieving our goal, seeking does not mean that we are there yet. It means that we begin in earnest to walk the walk. And as with technology issues,

bridging the gulf between cultures, institutions, and policies will take a long walk. But seeking is to begin, each day starting from a new position along the path.

**Principle 6: Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and the impacts of our work.**

A comprehensive knowledge base will be the font from which our decisions regarding Environmental Sustainability will derive. No investment will be more critical. Our current level of understanding is far below that required for a comprehensive approach to achieving Environmental Sustainability. An important first step is to recognize the complexity of the issue, realizing that it has scientific, economic, and social components.

Our knowledge base is the dynamic and integrated source for our understanding of the world around us, and includes information, experience, theories, created extensions of known facts, and any information related to our ability to think, understand, and create. The closer our knowledge base comes to expressing the totality of reality, the more fundamental is its reach, and the more integrating its architecture. And as it becomes more comprehensive and integrating, the rate of learning is accelerated. For it becomes more facile in its adaptation and assimilation of new discoveries and new insights, ever more efficient in stimulating the process of knowledge formation.

The understanding we have of our world comes from our knowledge base. Our minds provide us a model of the world. We divide our world into separate compartments so that we can attempt to wrap our minds around them and gain some limited understanding of how they work. This compartmentalization of our world is a way for our minds to create simplified models so that we can function. And because the current state of mind-technology mix is relatively primitive, the modeling capability of our minds is similarly limited. And so we build external models to help us. But these models, too, are dependent on our understanding and the technology of the day. As our understanding advances, and the technology to investigate and display information moves forward, our models improve. And as our models improve, our minds become better informed, change their views, and form new levels of understanding.

And out of these new levels of understanding and subsequent change in world view, new expectations are formed. And that makes all the difference. Because out of these new expectations comes the creative tension to change a world that is perceived differently and no longer meets those expectations, into a world that does.



And this fact makes it absolutely essential that we make a permanent and unbending commitment to building and sharing an ever-deepening knowledge base.

**Principle 7: Respect the views of individuals and groups interested in Corps activities; listen to them actively, and learn from their perspective in the search to find innovative win-win solutions to the Nation's problems that also protect and enhance the environment.**

Respecting the views of individuals and groups is another key ingredient in achieving Environmental Sustainability. The founders of the United States established a great nation by demanding freedom and justice for all. Even as we are still working that out on the socioeconomic level, its truth rings loud and clear around the world. Never has it been more important that we be attuned to the eternal truth, so eloquently spoken by the late Dr. Martin Luther King, Jr., that “until all are free, none are free.” These words, and the words of the U.S. Constitution and Bill of Rights, speak to all humankind. They say that each individual represents a diverse perspective, and that each individual's view reflects that person's creativity, and needs to be not only respected, but also nurtured. And they say that the lifeblood of any great endeavor is diversity of opinion and creativity, and that from a free and expressive people will come a great enterprise, whether a nation, or an organization, or a planet on the path toward transformation.

## Conclusion

The health of the planet was not a consideration when most of our institutions and ideologies were formed, and that has introduced a fatal flaw in those systems as they exist and are applied in today's world. To break out of the container formed by those flawed ideas and institutions, four hypotheses have been proposed to assist us in reshaping our world view and, eventually our institutions and ideologies, so that we can meet the challenges of a new reality. The four hypotheses are as follows:

**Human consciousness has now advanced to the cutting edge of global evolution, and forms an organic whole with planet Earth.** This hypothesis states that the evolution of human consciousness has created a new dimension in the life of planet Earth, and that the Earth and its newly derived reflective capacity form an organic whole. It is a combination and extension of two previously developed ideas: Teilhard de Chardin's concept of the “noosphere” – the sphere of thought; and James

Lovelock's GAIA – that the Earth's physical, chemical, and biological systems act as an organic whole.

**Human culture is moving from a passive-reactive state, to an active-creative state.** This hypothesis states that an over-arching world view of relative human powerlessness in the face of overwhelming global forces has formed a passive-reactive milieu, a limiting perspective of human capability, and has laid the foundation for many of our institutional and ideological beliefs. The recognition that we are, in fact, changing the planet, even though in a deconstructive way, brings us face to face with a cumulative power we previously did not think we had, and, if we are able to move beyond denial to grasp its reality, moves us inexorably to understand we can no longer remain in the passive-reactive state, but must evolve to an active-creative state in which we become actively involved in creating the future.

**Human activity and human-created infrastructure are part of nature and not separate from it.** This hypothesis states that we, and everything we do and make, are part of nature; and that separating human activity and constructions from nature creates a false dualism leading to self-fulfilling reinforcement of this dualistic view. Human constructions are intrinsically no less ‘natural’ than the things built by ‘nature.’ Human thought is the product of nature's evolution, and human activities and all the things resulting from them have grown from the seed of human thought. Often the things we produce don't look much like nature, nor, often, do they function well with it. And iteratively, they don't look like or function well with nature because, in the mind of the designer, they exist in separate worlds. As long as we hold the disjointed view we created, we can be assured of a continuing path away from sustainability. So until our dualistic view is abandoned, we will not be able to harmonize human activity with global systems. The mental partitioning of so called human-created and nature-created worlds produces a false dualism which limits and inhibits both our world view and the evolution of human thought and action.

**Human consciousness, when it successfully integrates itself as an organic whole with global systems, is capable of evolving sufficiently to enable creation of an enhanced system with unknown limits.** This hypothesis states that the noosphere, de Chardin's interwoven sphere of human consciousness, recognizing itself as an organic part of global systems, will burst through the barrier of global sustainability created by our limited views, to evolve a world of unknown limits and potential – beyond sustainability. The capacity to move through the previously self-imposed barrier of limitation will manifest itself by transforming our experience into a paradigm in which we learn, not only to understand and

sustain what has been created before us, but to build on that foundation by adding net value and creating new worlds with unknown limits.

These hypotheses led to a discussion of new ways to look at both policy and technology as they might be developed to support a sustainable world. In the policy domain, economic, social, and educational concepts were discussed with ideas for change that might engender hope and enhanced creative capacity for developing a sustainable world. In the technology domain, both information and energy were discussed as critical to social, economic, and environmental sustainability.

And finally, the seven Environmental Operating Principles of the U.S. Army Corps of Engineers, promulgated in 2002, were offered as a starting point for both individuals and organizations to assist them in working toward integrated social, economic, and environmental sustainability. These were accompanied by the author's interpretive text, broadened to include all parties.

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# Appendix 1.

## A Thought Experiment

- In a peaceful and restful state, think of a world in which you feel hope for your life and the lives of your loved ones.
- Think of a world in which you have found a niche for your genius, in which you find satisfaction in your work, in your play, and in everything you do.
- Think of a world in which you are able to listen to and communicate with anyone instantly, clearly, and accurately.
- Think of a world in which you feel confident to successfully innovate and improvise to meet both your needs and those of others in dynamic situations with unknown outcomes.
- Think of a world in which there is magic in our interactions, and music in the results.
- And now, think of a living example (such as playing with a child, reading poetry, innovating a new process, thinking of those you love, or even of Love itself) of a kind of active-creative participation in an evolving future, each new moment being created seamlessly out of the old to create an integrated whole over time.
- Now think of a world of the not-too-distant future which has become a symphony, with all people linked interactively through a multi-dimensional information and communications network to form a global jewel.
- This is the world we will create, reaching sustainability – and beyond.