

## 12. Value Systems and Strategies

In the wake of the Copenhagen Accord of December 2009, various comments were heard on the street. It seems like everyone has an opinion: “I’m against global warming and against altering my lifestyle.” “As a resident of Greenland, I am psyched!” “It is vital for the U.S. economy to destroy the earth.” “What have future generations ever done for me?” “We are all going to die of greenhouse warming.” “I will divorce you because you buy food shipped from other continents.” How can we begin to reconcile all of these disparate threads of human thought? To gain insight into this problem it is worthwhile to consider various aspects of the human condition.

### 12.1. Perspectives on the Human Condition

Let’s consider the statement “Humans are causing global warming and we should modify our behavior”. How and where we were brought up has a large influence on our religious views. Similarly, our upbringing has a large influence on how we think about global warming. Some of us grow up learning that the earth is mainly for our use, and some grow up learning that we should mainly take care of the earth. Both of these systems of thinking are ancient and “natural”. Perhaps we each have a mixture of both. Our learned value systems are carried throughout our lives into a wide variety of careers and situations. If we are taught that using resources to better mankind is the best value, then we tend to disagree with the above global warming statement. If we are taught that taking care of the earth is the highest purpose, then we tend to agree with this statement. However, is the family we grew up in the best way for us to decide about whether we “believe” in anthropogenic global warming? The use of logic and discriminating analysis of information can lead us to change our minds.

#### 12.1.1. Descartes and Contingency Diagrams

Perhaps we can look to Rene Descartes for an alternative approach to whether or not to believe in global warming. Descartes famously remarked that he chose to believe in God because of the risks involved in not believing in God, essentially a crisp cost-benefit analysis. His logic may be represented in the form of a *contingency diagram* (Table 12.1). Whether you believe in God is shown across the top, and whether God exists or not is shown down the side. The table shows the outcome of each possible combination. If God exists and you believe, then that is the best possible outcome. If God doesn’t exist then whether or not you believe in God carries no extreme penalty. The worst-case scenario is when you don’t believe but God exists. So, Descartes “chose” to believe in God.

	Believe In God	Do not Believe
God Exists	Good	<b>Bad</b>
Does Not	Neutral	Neutral

**Table 12.1.** A contingency diagram showing Descartes logic regarding God’s existence.

An analogous contingency diagram for our statement about anthropogenic greenhouse warming is shown in Table 12.2. Whether anthropogenic greenhouse warming is occurring or not is shown down the side. What you believe is shown along the top. If anthropogenic greenhouse warming is not real then doing nothing about it would incur no extra cost (lower right box), and we could continue with business as usual, which is what a lot of people hope is the case! If it isn’t real but we think it is and spend some effort to avoid it, there would be a moderate cost (lower left box). The worst scenario is when we do not act and anthropogenic greenhouse warming is real (upper right box), but we don’t believe it and do nothing about it until it’s too late, leading to enormous costs associated with changing ecosystems. If it is real and we attempt to ameliorate it then we can avoid this largest cost and perhaps restrain it to more moderate costs (upper left box). To be conservative logicians like Descartes, we should choose to believe in anthropogenic global warming, because it avoids the worst-case scenario. If businesses acted in favor of the collective, then a conservative business approach would be to minimize losses by acting prudently to avoid further greenhouse warming.

	Believe in Anthropogenic GW and Act	Do not Believe and Do Not Act
Anthropogenic GW is Real	Moderate Cost	<b>Large Cost</b>
Is Not Real	Moderate Cost	No Extra Cost

**Table 12.2.** A contingency diagram for anthropogenic greenhouse warming.

### 12.1.2. *Our Primordial Nature and Thomas Hobbes*

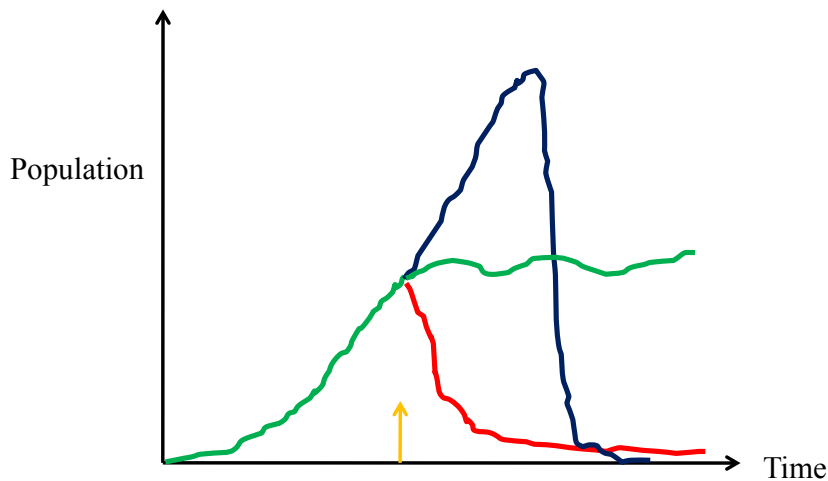
Yet the global population is increasing, the rich get richer, and most people in the United States probably think about recycling and probably find the oil spill in the Gulf of Mexico disturbing for a week or two, but in most of our personal choices we are primarily trying to increase our personal wealth and security rather than help the earth. How can this be? To really get to the roots of this we may briefly examine how *Homo sapiens* succeeded in the long period of time prior to civilization. We can then consider the implications of Thomas Hobbes' social contract view of human nature, which allows us to understand the concept of the tragedy of the commons and to extrapolate to the effects of modern global capitalism.

We succeeded and evolved as a species by being competitive as a group and by planning for the future. Those of us that survived and passed on genes to our offspring shared the tendency for acquisition in order to achieve security. In a formidable environment, if a group of people can accumulate enough food for the winter, then they can survive. No wonder we have an innate desire for exponential growth in success and accumulation! This trait allowed us to survive in, and was selected by, challenging environments. Perhaps in the absence of having to struggle hard in the jungles and savannas for water, food, clothing, and shelter, our minds worry about our surroundings and create replacement struggles, such as worrying about how we don't have enough of something to feel secure. Maybe we need heavier cars to feel safer on the road.

This value system of growth being synonymous with security manifests itself today in concepts such as the Gross National Product (GNP). We almost universally regard the situation as being "good" if the GNP is increasing and "bad" if it is not. Since our economy uses natural resources and influences the environment, the higher-paced the economy, the faster the earth's resources are used up and the more the earth system is influenced by our activities. However, we generally regard the GNP as rather independent of our effects on the earth system that sustains us in the long run. Phrases such as "sustainable growth" comfortably reassure us that we can expand our consumption indefinitely, but one glance at the finite earth as seen from space reveals that this is physically impossible. Surely our ultimate goal is not to have the planet crammed only with people, such as in the movie *Soylent Green*, where our ultimate destiny is a pleasant death to become food for others. Since the earth is finite, we are being challenged for the first time as a species to come up with a different operating model for personal motivations and societal goals.

The common ideal of exponential growth, that we cherish individually and as nations, is arguably an anachronistic point of view, since it is physically impossible to sustain after a certain point. It is the hallmark of an immature civilization. Figure 12.1 shows three possible trajectories for our global civilization. Exponential growth would lead to catastrophic failure when crucial resources are consumed (upper curve). Limiting ourselves to low-tech hunting and gathering would imply a serious decline in global population (lower curve), for it is our technological inventiveness that has allowed us to achieve a population of some 7 billion individuals today. Equilibration to moderation and true sustainable resource usage is the only possible path to avoid serious calamity (middle curve). To behave consistently with this is to be

a *mature civilization*. Yet this is highly unlikely because of human nature. What is the root of our modern compulsion to consume?



**Figure 12.1.** Global human population until the present (yellow arrow). If we continue to attempt to grow exponentially on our finite planet, the mark of a “young” civilization, there will likely be a crash (upper, purple curve). If we aim to live as hunters and gatherers then we will die off to low numbers (lower, red curve). If we use our technology wisely and aim for moderation we can achieve a stable population, the mark of a “mature” civilization (middle, green curve).

Thomas Hobbes (1588—1679), in his work *Leviathan* (1651), described the pervasive condition of human misery as essentially originating from wanting to feel superior to our neighbors. Since every individual works hard to feel better than his fellow human beings, every person feels miserable as a result. If I am engaged in trying to be superior to you and you are also so engaged, there will always be encroachments and friction and a kind of psychic pain. Those that are millionaires or billionaires seem to have an even harder time refraining from having to make even more money. In our pursuit to feel better we need to keep in mind that all of our “false idols”, whether they be shopping at the mall, alcohol, career success, fame, money, or whatever, do not really provide long-term happiness.

Hobbes postulated a society without government and drew on direct observational insights of behavior in English society to deduce that this society in a “state of nature” would constitute a “war against all” in which lives are “solitary, poor, nasty, brutish, and short.” He argued that the only escape is a social contract and the establishment of a civil society. One positive example of this process is the decline in homicides per year per 100,000 people over the centuries under the mollifying influence of lasting civil societies. This relative safety allows us to focus on things like acquisition!

### 12.1.3. *Alan Durning and Consumerism*

Alan Durning (1996) in *How Much is Enough?* wrote that since 1950 per capita consumption of energy and car travel in the U.S. has doubled, plastics use and air travel have multiplied 20-fold. “The lifestyle of this top echelon—the car drivers, beef eaters, soda drinkers, and throwaway consumers—constitutes an ecological threat unmatched in severity by anything but perhaps population growth. The wealthiest fifth of humankind pumps out more than half of the greenhouse gases that threaten the earth’s climate.” Yet “In the United States, repeated opinion polls of people’s sense of well-being show that no more Americans are satisfied with their lot now than they were in 1957. Despite the phenomenal growth in consumption, the list of wants has grown faster still.”

This condition is perhaps the expected outcome of our collective urge to acquire exponentially more for security and our urge to be better than our neighbors. Durning quotes a U.S. retailing analyst in the 1920s named Victor Lebow: “Our enormously productive economy . . . demands that we make consumption our way of life, that we convert the buying and use of goods into rituals, that we seek our spiritual satisfaction, our ego satisfaction, in consumption . . . We need things consumed, burned up, worn out, replaced, and discarded at an ever-increasing rate.”

However, Durning writes, the “car drivers, soda drinkers, and beef eaters” should be aware that “producing a pound of steak requires five pounds of grain and the energy equivalent of a gallon of gasoline, not to mention the associated soil erosion, water consumption, pesticide and fertilizer runoff, groundwater depletion, and emissions of methane.” “The resource requirements of making the new generation of microwave-ready instant meals are about ten times larger than preparing the same dishes at home from scratch.” In fact, the average person in the United States consumes most of his or her own weight in basic materials such as paper, steel, and fuel every single day.

For an antidote, Alan Durning argues for an ethics of sustainability: “In a fragile biosphere, the ultimate fate of humanity may depend on whether we can cultivate a deeper sense of self-restraint, founded on a widespread ethic of limiting consumption and finding non-material enrichment.” But he soberly recognizes some of the challenges: “It would be hopelessly naïve to believe that entire populations will suddenly experience a moral awakening, renouncing greed, envy, and avarice. The best thing that can be hoped for is a gradual widening of the circle of those practicing voluntary simplicity. The goal of creating a sustainable culture—that is, a culture of permanence—is best thought of as a challenge that will last several generations.”

### 12.1.4. *Wendell Berry on the Environmental Movement*

In “Word and Flesh” Wendell Berry (1996) makes an interesting conjecture about environmentalists in wealthy nations:

In his essay on Kipling, George Orwell wrote: “All left-wing parties in the highly industrialized countries are at bottom a sham, because they make it their business to fight against something which they do not really wish to destroy. They have internationalist aims, and at the same time

they struggle to keep up a standard of life with which those aims are incompatible. We all live by robbing Asiatic coolies, and those of us who are ‘enlightened’ all maintain that those coolies ought to be set free; but our standard of living, and hence our ‘enlightenment,’ demands that the robbery shall continue.

This statement of Orwell’s is clearly applicable to our situation now; all we need to do is change a few nouns. The religion and the environmentalism of the highly-industrialized countries are at bottom a sham, because they make it their business to fight against something that they do not really wish to destroy. We all live by robbing nature, but our standard of living demands that the robbery shall continue.

Berry further criticizes the “planetary” mentality of abstract, large-scale solutions which serve “to distract people from the small, private problems that they may, in fact, have the power to solve.” He argues that “The problems, if we describe them accurately, are all private and small. The problems are our lives. In the “developed” countries, at least, the large problems occur because all of us are living either partly wrong or almost entirely wrong. It was not just the greed of corporate shareholders and the hubris of corporate executives that put the fate of Prince William Sound into one ship; it was also our demand that energy should be cheap and plentiful. The economies of our communities and households are wrong. The answers to the human problems of ecology are to be found in economy. The answers to the problems of economy are to be found in culture and in character. To fail to see this is to go on dividing the world falsely between guilty producers and innocent consumers. The question that must be addressed, therefore, is not how to care for the planet, but how to care for each of the planet’s millions of human and natural neighborhoods, each of its millions of small pieces and parcels of land, each one of which is in some precious way different from all the others. Our understandable wish to preserve the planet must somehow be reduced to the scale of our competence—that is, to the wish to preserve all of its humble households and neighborhoods.

#### 12.1.5. *Chellis Glendinning and Addiction to Technology*

In *Technology, Trauma, and the Wild*, Chellis Glendinning argues that our enthusiasm for ever-new kinds of technology may be regarded as a kind of addiction. She believes that it stems from a fundamental split between our wild side and our tame side, “the trauma that we inherited”. Instead of connecting with our feelings and being in tune with the earth, we are disconnected from our feelings through the distractions of technology, and use the earth at an ever-increasing rate in order to feed our need for new kinds of technology. She advocates returning to simpler ways of life which embrace sensitivity to the earth.

Glendinning draws a psychologist’s analogy between commonly agreed-upon addictions and techno-addiction, with hallmarks of denial, dishonesty, control, thinking disorders, and disconnection from feelings. Reactions to this approach range from “she is way over-reacting; technology is not addictive but essential”, to “she presents a good wake-up call; we need to re-assess our relationship with technology”. We may be in denial about many aspects of

technology. Do you think your computer uses your time or saves you time? Does your computer use more energy or save more energy?

*Taking it personally: Cells phones*

*In my experience there is some reason to think that most people should think more carefully about their relationship with technology. Let's take cell phones as an example. Until one year ago I purposefully avoided having a cell phone, believing that the sudden rise in personal electronic devices and computer information storage is causing a concomitant rise in the use of electricity and raw materials and contributing to greenhouse warming. I further believed that I would lose my way of life, including some measure of privacy and an ability to make plans and stick to them. My wife gave me a cell phone and it changed my life forever, including a pleasant concise voice message of daily tasks. At first I was shocked when some of my friends got mad at me when I left my ring off. Some people began to call me 5, 10, 15 times a day. Plans that would've been easy became time consuming and complicated because people had the ability to change their plans on a moment's notice. But I got hooked because the most fundamental dynamic is that you need to compete for social inclusion via cell phone. I got so good at texting! But then my wife got a qwerty board and could send 10 texts when I was just replying to my one text, which made it impossible to have a coherent conversation. I must say, though, that my simple, sturdy Nokia survived being launched off of a third floor balcony into the street. Scary!*

*Have I gotten rid of my cell phone? No. I carry it wherever I go in the hopes of receiving texts or phone messages from people that I'm thinking about. I have it on its own electronic drip. I don't seem to be able to go back to the former, carefree self that I was. This extra object sometimes puts me over the edge as far as complexity of too many objects to have to remember. Am I now a cell phone addict in only one short year? I don't know. Perhaps I'm in denial. All I know is that I love my computer more than my pet. I know it's wrong but what should I do? (You'd pay more to fix your computer than to fix your pet too!) Computers are the new pets. Or maybe it is that they are visceral extensions of our very selves. How do you feel if you don't know where your cell phone is!? Could you function in your life if I took away your personal computer!?*

What about even scarier aspects of technology, such as genetic engineering, or the "grey goo problem"? Bill Joy, who helped invent the vi editor, unix, and java, predicted that replicating *nanobots*, molecular-scale robots that can consume its environment and reproduce, would get free in the environment and gradually expand everywhere, turning all existing matter into its product, a gray goo. This is just one variant on the challenge of animating circuits with every-increasing complexity, with "the singularity" occurring when machines take over. We can see the beginnings of our psychic animation of computers when we are gratified with a nice blue glowing ring at the tip of the electronic drip to our computer. (Don't keep me unplugged – I'll die!) Maybe we will all start integrating computers into our bodies and become something new, like a woodpecker gradually getting a longer pecker, getting farther out on the limb, unable to return to how we were.

When it comes to technologies of war it does seem that we are in denial. The United States bred and owns most of the world's anthrax and the anthrax scare in the wake of the World Trade Center destruction in 2001 was entirely internal to the United States. Yet most citizens were afraid and convinced that some "other" was attacking us. It was our own technology! To add a bit of irony, a primary component of the University of Wisconsin - Madison's endowment comes from profits from a patent for making military-grade dispersable aerosols with anthrax over 50 years ago. (<http://www.news.wisc.edu/anthrax/>)

During 2010, the United States has deployed over 500 drone aircraft with bombs over Afghanistan, controllable by technicians sitting in an armchair stateside, where they go home to a family. Is it okay that we feel less when we kill? What are the implications for our collective "soul"? Robots are an increasing component of warfare. Will it not outrage the "enemy" further if they fight mechanical representatives of our wealthy nation rather than "man-to-man"?

A notable example of denial among the U.S. public is the widespread use of nuclear-tipped weapons in recent conflicts by the United States military (Weitzel, 2007). By the mid-1950s the U.S. had 600,000 tons of *depleted uranium* waste, byproducts of the enrichment process for building atomic bombs. Depleted uranium makes weapon tips that are 1.7 times denser than lead, making them much more effective at penetrating enemy armor. Most of the munitions that have been deployed over the past 20 years are radioactive and will remain so long after the United States is no longer a country. Impact "creates a radioactive cloud of submicroscopic insoluble uranium oxide particles, which settle to the ground to be inhaled and ingested by combatants and civilians alike." In 1991, one month after the end of the first Gulf War, the United Kingdom Atomic Energy Authority warned that 40 tons of depleted uranium debris could cause 500,000 civilian deaths by cancer. The U.S. left behind 375 tons of depleted uranium debris in the Gulf War, 800 tons in Afghanistan, and 2,200 tons during the current occupation of Iraq. From 1990 to 1999 there was a 12-fold increase in leukemia and lymphomas in Iraqi children and a 6-fold increase for Iraqi adults. A U.S. federal study showed that 67% of children born of Gulf War veterans in Mississippi had birth defects or severe illnesses. In addition, 90,000 Gulf War veterans suffer from the Gulf War syndrome, which many researchers believe is related to exposure to depleted uranium.

How can we achieve more understanding and control over our choices to use or not use various technologies? It seems pretty hard to avoid cars, phones, and computers in this modern techno-tribe. When and how should we limit our own use of technology? Should limitations be based on effects on the environment primarily, or on the differences they make for human behavior and quality of life? It may be useful to establish a dialogue which includes the following feedback processes. A new technology is introduced, which has some benefits and detriments. Negative aspects could be examined more thoroughly and awareness could be raised so that individuals could choose to use or not. It may or may not be helpful, however, to include labels such as "Caution: overuse of this phone could cause dissociation from Mother Earth". But it does seem that it would be good to 1) not value technology merely because it is new, 2) raise awareness of your personal duty to choose, and 3) question love of technology because it is a



barrier to recognizing its negative effects. In the end, it will likely be a change in social values that exerts changes in how we regard technology.

Whenever we take time out of our hectic modern life to listen to messages from the deep past it can be life-changing. The film *Quoyaanisquatsi*, named after the Hopi concept of “world out of balance”, eloquently conveys some of the psychic disconnect that we have with modern technology. It is all time-lapse photography set to music by Philip Glass. Near the end of the film a U.S. spacecraft launch goes terribly wrong, with amazingly detailed footage of this icon of technological prowess seeming to tumble and tumble forever, out of control and pointless. One of the most affecting scenes in the film is the simple statement that “when the final days approach, cobwebs will be seen covering the sky.” The similarity with modern satellite photographs of weblike networks of jet condensation trails is eerie (see book cover).

In attempting to get close to the heart of the matter, it seems to me that because we are of the earth, to harm the earth is to harm ourselves. As one example, half of the world’s forests are gone. Our love of technology distracts us from this deep problem.

## 12.2 Geo-engineering

A closely related scientific and moral question that arises directly from global warming is whether we should we use geo-engineering techniques to avoid the consequences. Again, people tend to break down into two camps, those that favor using more resources and more technology to fix problems, and those that favor promoting a healthy earth and allowing the natural system to function as only it can. A more fundamental schism may be that some of us regard nature as separate from humans while some of us regard humans as part of nature. Two prominent geo-engineering proposals to avoid global warming include dispersing sulfate aerosol in the stratosphere to reflect sunlight, and fertilizing the oceans with iron to stimulate phytoplankton growth, hence increase the biological carbon pump.

Climate engineering proposals have been around for over 50 years. In 1960 Rusin and Flit published a pamphlet “Man Versus Climate”, including proposals to put a ring of reflective particles around the earth and diverting rivers into the Arctic Ocean (Baum, 1994). In the early 1990s scientists suggested that annual injections of 50,000 tons of ethane or propane into the Antarctic polar stratosphere could suppress the CFC-induced ozone hole through photochemical smog production (Cicerone et al., 1991). Subsequently, these authors cautioned that the complexity of the chemistry implied great uncertainty for the outcome. They felt, however, that the peer-review process is important in determining the validity of geo-engineering concepts.

One of the more striking geo-engineering proposals came from John H. Martin, who proclaimed “give me a tanker-full of iron and I will give you an ice age”. He was referring to the idea that phytoplankton are starved for iron and can be stimulated to bloom, take up CO<sub>2</sub>, and when they die, settle to the sea floor, “pumping” CO<sub>2</sub> into sediments, thereby reducing the atmospheric greenhouse effect and cooling the planet. Oceanographic experiments have shown that iron can indeed induce phytoplankton blooms, but the ensuing zooplankton blooms

compensated by giving off CO<sub>2</sub>. Further, the other nutrients consumed during the bloom meant that less phytoplankton growth could occur in the same water mass at later points in time.

Two strategies for reducing solar radiation to compensate for greenhouse gas increases include stratospheric aerosol injection and sun-shades placed in orbit between the sun and the earth. Nobel prize-winning atmospheric scientist Paul Crutzen (2006) revisited the idea of injecting sulfate into the stratosphere by flying a fleet of aircraft continuously. Tuck et al. (2008) and Robock et al. (2008) provided extensive arguments which show that the pattern of cooling would be very uneven around the globe, and therefore unfair to some countries, and would cause unpredictable changes in weather patterns. Tuck et al. (2008) provided further arguments against the feasibility of such an approach based on uncertainties in aerosol chemistry and in the photodissociation of stratospheric sulfuric acid. Tilmes et al. (2008) showed that the ozone hole would worsen with added stratospheric aerosol.

Robock et al. (2009) analyzed the benefits, risks and costs of stratospheric geo-engineering. They concluded that “Using existing U.S. military fighter and tanker planes, the annual costs of injecting aerosol precursors into the lower stratosphere would be several billion dollars. Anthropogenic stratospheric aerosol injection would cool the planet, stop the melting of sea ice and land-based glaciers, slow sea level rise, and increase the terrestrial carbon sink, but produce regional drought, ozone depletion, less sunlight for solar power, and make skies less blue. Furthermore, it would hamper Earth-based optical astronomy, do nothing to stop ocean acidification, and present many ethical and moral decisions.”

Robock (2008) described 20 reasons why stratospheric sulfate geo-engineering may be a bad idea, including effects on regional climate, continued ocean acidification, ozone depletion, more acid deposition, seeding of upper tropospheric cirrus clouds, moral issues, and unexpected consequences. Salient points include the fact that if we halted stratospheric aerosol abruptly then greenhouse gas warming would kick in with a vengeance, and once we start geo-engineering we can't readily go back, requiring further and further epicycles of fixes upon fixes with unforeseen consequences. Ray Pierrehumbert says that “It's like taking aspirin for cancer” and likens this situation to the “Sword of Damocles”, where we risk calamity if we stopped pumping sulfate aerosols into the stratosphere, when years' worth of accumulated carbon would make temperatures surge. Everything might be okay until the hair snapped and the world would experience the full force of postponed warming in just a few years (Wood, 2009).

The American Meteorological Society, in a 2009 policy statement on geoengineering, concluded that all geoengineering suggestions must be viewed with extreme caution, primarily because manipulating the earth system is almost certain to trigger adverse and unpredictable consequences. Further, “the possibility of quick and seemingly inexpensive geoengineering fixes could distract the public and policy makers from critically needed efforts to reduce greenhouse gas emissions and build society's capacity to deal with unavoidable climate impacts. Geoengineering technologies, once developed, may enable short-sighted and unwise deployment, with potentially unforeseen consequences.”

A contingency diagram for whether we should engage in geo-engineering projects aimed at curbing global warming is shown in Table 12.3. If there is no global warming then doing nothing is okay (lower right) but doing something may harm the climate (lower left), so that would be worse than doing nothing at all. If there is global warming and we do nothing then that could be bad (upper right). If there is global warming and we attempt to geo-engineer, results could be very bad (upper left). We do not understand the earth system well enough to try any geo-engineering without risking harm to the earth.

	Attempt to Geo-engineer	Don't attempt to Geo-engineer
Global Warming Is real	<b>Very Bad?</b>	Bad
Global Warming Is not real	<b>Very Bad?</b>	Okay

**Table 12.3.** Contingency diagram for whether we should geo-engineer the earth.

I have another geo-engineering proposal to offset global warming. Since low latitude trees cool the tropics by evapotranspiration, creating clouds which reflect sunlight, and since high latitude trees trap heat, we should cut down the boreal forest and re-forest all of the tropics. What do you think of my plan?

## 12.3 What Can We Do?

### 12.3.1. Global Village

The task before us in coming to grips with global warming as a global community may be better-understood by examining the composition of the earth's population. If we could shrink the earth's population to a village of precisely 100 people, with existing human ratios remaining the same, it would look like this (ICRAF, 1996):

- 57 Asians, 21 Europeans, 14 North and South Americans together, and 8 Africans
- 70 Non-white and 30 Caucasians
- 70 Non-Christians and 30 Christians
- 6 people control 50% of total wealth, all from the United States
- 70 cannot read
- 50 have malnutrition
- 80 live in substandard housing
- Only 1 has a college education

In persuading people to act in concert we must achieve mutual respect and appreciation and be fully aware of differences. If you are reading this text chances are you are in college. With knowledge comes a global conscience and responsibility! Further, the role of wealth acquisition in environmental degradation puts the onus on wealthier nations.

### 12.3.2. *Population and Wealth*

One way to describe our role in global climate change is with the equation  $E = P W^2$ , put in this somewhat arbitrary form to evoke Einstein's famous relationship between light, mass, and energy, except here E is environmental degradation, which equals population times wealth squared. I made up this approximate equation to show that one of my daughter's ecological footprint is comparable to that of about 10 children in India! I think that we should have considerable motivation to change our lifestyle. Our activities are changing the composition of the atmosphere and the properties of the land to the point that we are changing our climate. Species reduction is changing the resiliency of our climate system.

### 12.3.3. *Tragedy of the Commons*

At present, the dominant mood seems to be to maximize short-term gains for yourself. Biologist Garret Hardin called this the "Tragedy of the Commons". Commons such as the atmosphere, the seas, fisheries, forests are vulnerable to being overspent. The reason is that incremental benefits to each user accrue exclusively to that user, for short-term gain. Environmental degradation is spread out to everyone and can only be seen in the long term, when the resource shows signs of severe stress or collapse.

This concept has been appreciated for a long time, as indicated in the following Medieval English Quatrain:

The law locks up both man and woman  
 Who steal the goose from off the common,  
 But lets the greater felon loose  
 Who steals the commons from the goose.

Some people believe that we try to pave over and control wilderness, which we fear subconsciously. Yet Senator Clinton Anderson, NM, said of our wilderness in 1963: "Wilderness is an anchor to windward. Knowing it is there, we can also know that we are still a rich nation, tending our resources as we should - not a people in despair searching every last nook and cranny of our land for a board of lumber, a barrel of oil, a blade of grass or a tank of water."

### 12.3.4. *Dysfunctional Civilization*

How did we get into this mess? Al Gore (1992) describes this in terms of a "Dysfunctional Civilization", analogous to a dysfunctional family. In extended families of society, we propagate learned rules, world views that are inappropriate and damaging. It may be

that we regard humans as distinct from the earth, with a disembodied intellect, where we suppress our feelings and subdue nature. The Cartesian notion of man as a spirit in nature, or Ghost in the Machine, and a false cleavage between mind and body, may give rise to psychic pain. We can distract ourselves from this pain by habitual consumption of natural resources. The worse we feel, the greater the need to consume.

#### *12.3.5. Spiritualism and Expanding the Rights of Nature*

My personal feelings are that we need to do much more than merely study the complexity of these problems. Learning as much as possible is good, yes. But to address the underlying causal aspects we should try to foster a profound change in cultural values. We need to value maturity as well as youth, time-tested as well as anything new, shift our valuing of objects more toward valuing time spent with friends and family, and enjoyment of ideas and natural beauty. Karl Marx said that a fundamental aspect of capitalism is that it undermines security via accelerating change. We need to de-emphasize newness and growth and "tribal competitiveness", and have more quiet time.

One useful and ancient concept is that of the moderate path, being in balance, "the Greek ideal", or "Goldilock's choice". In the case of exposure to sunlight, if we get no exposure then we do not make enough vitamin D to stay healthy, but if we have too much we get a sunburn, so getting out in the sun for a while is the best. Similarly, if we live on this planet with a "zero ecological footprint", then we die because we are not eating any food. On the other hand, if we consume too much, global ecological disasters will follow. Hence it is best to enjoy life but be careful about our choices. This ties in with our collective choice between exponential growth, an outgrowth of survival of the fittest, but unsustainable on a finite planet, and our choice for a mature trajectory of moderation and sustainability.

In the end, each person does make a difference. One way to see this is through extensions of chaos theory, applied first to the atmosphere, then to biodiversity, and then to human civilization. Whether a butterfly in Brazil flaps its wings or not eventually affects the timing of a cold frontal passage in Wisconsin. Removal of a species affects the future trajectory of the biosphere. How you think and act will alter the detailed future course of civilization.

We should recognize the intrinsic worth outside of human existence and legal descriptions of what has rights. The concept of legal rights in developed countries has gradually expanded from land-owning males to all people and corporations, yet does not include the earth system. The struggle to quantify the value of nature in economic theories and to articulate the rights of nature in the legal system is just beginning. This evolution is closely related to the concept of ethics and its expansion resulting from consideration of the earth system. One may consider that in our primal animal state our ethical considerations were primarily for ourselves. As civilization unfolded, ethical considerations became relevant at the family, tribe, and regional levels. In more modern times we consider the ethics of nations, race, and humans in general. We even now have ethical considerations with regard to how we treat animals. Perhaps in the future this expansion of awareness of our ethical purview will include plants, life in general,

rocks, ecosystems, and ultimately planets and the universe. It would be an immature civilization indeed that simply used up the earth and then consumed each planet in the solar system and “threw them away like so many cans of coca-cola.

Finally, we should consider the question of dominion versus domination. Each religion and spiritual path has ways of celebrating conservation. For Christianity, for example, one may quote Psalm 104 regarding the marvels of creation and Deuteronomy 20:19 and 22:1-7 regarding the wisdom of stewardship. It may be of interest to visit the Medicine Wheel in the Big Horn Mountains of Wyoming and consider Native American perspectives on living in concert with the earth. These choices are very individualistic and there are many paths to enlightenment regarding global ethics. We should be good stewards of the earth and try to integrate spiritualism with environmentalism in the way that is most meaningful to us.

### Key Terms

*contingency diagram* – A problem with two possible realities and two possible beliefs yields four outcomes which can be evaluated for benefit and risk

*depleted uranium* – Dense for penetrating armor, this radioactive outer layer on U.S. weapons in Kosovo, Afghanistan, and Iraq is pulverized on target impact, with particles being inhaled later, causing mutations

*dysfunctional civilization* – Values that are held and passed on from one generation to the next, even though the values lead to the damage of civilization itself.

*mature civilization* – One which can maintain a steady state on a finite planet rather than exponential growth followed by a crash

*nanobots* - molecular-scale, self-replicating robots

*quoyaanisquatsi* – Hopi word for “world out of balance”; also an interesting movie

*tragedy of the commons* – A few individuals can use up a given resource if unchecked, leaving very little left for everyone else.

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