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## COMMUNITY ESSAY

# Sustainability science – and what’s needed beyond science

Paul H. Reitan

Department of Geology, University at Buffalo, P.O. Box 603050, Buffalo, NY 14260-3050 USA (email: preitan@msn.com)

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### Author’s Personal Statement:

Why would anyone write outside of their field of certified expertise? Why would an author venture beyond known and “safe” disciplinary boundaries? I do, of course, think beyond “safe” boundaries and I have ideas that I want to discuss with others. For many years I “stretched” my environmental science students to consider the necessarily uncertain long-term implications of the science and some of the associated moral issues. I have also begun to try to stretch – just a little – the traditional boundaries of the sessions at meetings of the Geological Society of America (GSA), and for several years have shared my concerns about the potential of successfully sustainable future with a stimulating group of colleagues in the Critical Issues Caucus of GSA. Today, I write this essay for *Sustainability: Science, Practice, & Policy* to stretch my thinking yet further to new readers in hopes of pushing them to think hard about the value of looking for solutions to environmental problems in links among seemingly disparate fields. And also, in truth, as a grandfather, I worry about the world my grandson will have to live in, and that motivates me to take the risk in the hope that what I write might constructively contribute – just a little – to a future I’ll not see.

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“Sustainability Science” is becoming a commonly used term, but what does it mean? Clearly it refers at least to science that is used to sustain, but sustain what?

If we begin with an anthropocentric focus, that is, on human concerns, we could answer, “To sustain human societies.” But surely no one would want simply to sustain the maximum number of humans organized into societies, knowing that that would mean existence at the barest, meanest survival level of all individuals and societies far into the distant future.

Our anthropocentric focus must then be modified: “To sustain *successful* human societies,” and that would surely include comfortable and healthy levels of nutrition, shelter, intellectual stimulation, self-realization, equity, peace – and probably more. For this to be the case worldwide and over a long time, societies could not systematically undermine the geoeological systems that support them. Natural geoeosystems 1) provide food, fiber, fodder, shelter, medicines, and energy; 2) process and store carbon and nutrients; 3) assimilate wastes; 4) purify water, regulate runoff, and moderate flooding; 5) build soils (necessary for food) and reduce soil degradation; and 6) house Earth’s reservoir of genetic material and species diversity (Watson et. al., 1998). Thus, even an anthropocentric focus leads us to require

ecocentric sensitivity at all levels, local to global – a human commitment to real global stewardship.

Successfully sustainable human societies must, therefore, be as attuned as possible to their local and regional environments, their geoeological support systems; lifestyles must be adapted to the ecosystems in which societies live and which support them with cultures, practices, economic systems, and governing policies each adjusted to fit their area, not a single dominant culture or way of living spread across the globe. This would be a world of multiple, diverse societies with their numbers also adjusted to what regional geoeological support systems can sustain.

This is a view of the future that is quite different from our present situation.

However, if something like this indicates the kind of successful societies that we desire, then the term we started with – “Sustainability Science” – refers to the cultivation, integration, and application of knowledge about Earth systems gained especially from the holistic and historical sciences (such as geology, ecology, climatology, oceanography) coordinated with knowledge about human interrelationships gained from the social sciences and humanities, in order to evaluate, mitigate, and minimize the consequences, regionally and worldwide, of human impacts on planetary systems and on societies across the

globe and into the future – that is, in order that humans can be knowledgeable Earth stewards (Kieffer et. al., 2003).

Understanding Earth systems and applying the best possible technologies, based on local and global policies attuned to geocological limitations, will require unprecedented success in educating students at all levels, continuous effective communication with the public aided by informed media, and uncommon wisdom among policymakers. This, at best, will be a formidable task, but will be impossible without a change in the dominant worldview that has led to our addiction to growing consumption (i.e., “In Growth We Trust”). This suggests a heretical path, a path that leads to questioning the dominant paradigm, our controlling myth (Rees, 2004), to asking whether “In Growth We Trust” really should be our motto. We all know that growth cannot continue forever. But who asks, “Have we *already* grown too much”? Too much in terms of numbers, too much in rates of consumption of essential and luxury resources, too much in excluding and confining other species, too much in degradation of ecosystems, too much in desensitizing ourselves and alienating ourselves from the non-human part of our world?

Can we learn from the past? Ossification of the governing approach societies used in dealing with their world, that is, fixation of the controlling myth, has led repeatedly to collapse of societies throughout human history (Wright, 2004; Diamond, 2004). A rigid commitment to our present dominant worldview, unwilling to see how it fails to respect the limitations of supporting natural systems, will likely bring about the collapse of our present globalized society.

Most people, including policymakers, don’t realize the breadth and magnitude of the threats: for example, the growing scarcities of water, especially underground water, on all continents (Postel, 1999; Gleick, 2000); that the soils necessary for food are being lost much faster than they are able to renew (Pimentel et. al., 1995); the ecosystem disruptions that global climate change will trigger (IPCC, 2001; Kling et. al., 2003); the decline of grain production (Brown, 2004). Or, as put by Ayres (1999), most people are not actively conscious of the significance of “four spikes”: the carbon dioxide spike, the species extinction spike, the consumption spike, and the population spike. Education to remove that ignorance – a kind of blindness – must assume a high priority.

It is wonderfully eye-opening and worldview-broadening to see the planet through geological eyes. Through this perspective we can better understand the implications of the human presence in the context of deep time, and the significance of a fossil record that demonstrates the changing communities of organisms and our recent emergence as a part of the latest community. We can see the archeological record that, across the planet, the earliest hunter-gatherer humans (with the exception of some wanton hunting) were integrated components of the ecological system living in dynamic balance with the rest of the system (Palmer, 2004). We can begin to see how we set the stage for our current problems when we began the agricultural revolution (Quinn, 1992; Chesworth, 1996, 2004; Diamond, 1997) and even more when we gained the

power of controlled fossil fuel use (Reitan & Reitan, 2001). We sense with foreboding the impact of our present exponential growth and our addiction to it.

We have two big problems: blindness and addiction!

There are, however, those who see, but who cover or turn away their eyes, and deny what the sciences of Earth systems are telling us, deny the risks of their addiction. Denial is not the best way to treat an addiction. Can we accept or acquiesce in denial of our “In Growth We Trust” addiction (Cairnes, 2004), an addiction that is delusional in its unwillingness to admit to limits in a finite world?

Blindness and denial make impotent the body of scientific knowledge and block the use of helpful technologies. What alternatives, then, should we seek?

Effective education is the best treatment for blindness resulting from ignorance of the breadth and depth of the threats to sustainability. Self-interest must be enlisted to get past denial, whether of reality or of the dangers inherent in addiction. An addict must realize that his or her own self-interest is not served by experiencing a few more highs. The addict knows that getting off the “stuff” and going through de-tox will be very difficult. So the addict must *want* to change, must see that change is better not only for himself/herself, but for all concerned, and therefore *want* to quit the addicting “stuff.”

Taking that analogy, however imperfect, and returning to the question of long-term human success, what can individuals and societies do to *want* to support collective efforts to bring global human policies and practices into accord with what Earth can sustain? What can help us to *want* to learn about and pay attention to what the sciences can teach us about how and where we threaten our necessary support systems, to select and use those technologies that minimize our impact, and to use the science and technologies that can reverse the harms we have done? What can help us to *want* to recognize that our own self-interest requires us to think about the non-human world with respect and concern for its own intrinsic values?

When asking these questions, I realize that the sciences and technologies in themselves are not enough, and that we need to think about what can motivate us to get off our addiction, to open our eyes, and to actually make use of science and technology to help us. Those tools are necessary, but willingness to accept policies that really address our needs is indispensable.

There are those--- and Mary Evelyn Tucker and John Grim are exemplary here (Tucker, 2003; Tucker & Grim, 1994, 2001; Tucker & Clugston, 1998) – who point out that all of the world’s religions have a deep-seated respect for both the human and the non-human worlds, recognizing that humans have an obligation to care for the integrated whole. Anyone who is religious should be able to find in the essence of their religion ample reason and ethical guidance to want to know the long-term consequences of present policies and practices and how they will effect future human generations and the world in which they will live. And knowing the consequences, feel the moral mandate to act (Rockefeller & Elder, 1992; Tucker & Grim, 2001).

For both the religious and those who feel no special connection to any religion, there is environmental ethics, and for me, in particular, the philosophy called Deep Ecology (Naess, 1973, 1988; Fox, 1990, 1994). Some will read this and groan and regard me as hopelessly – even naively – idealistic. I would remind them that the way humans are now living on Earth is not working; essential Earth systems are breaking down and can't be sustained. In other words, the present dominant worldview, or overall philosophy, which directs how lives are lived and choices are made, is bound to fail. So let's heed the philosopher, William James (1991), who believes that the measure of a worldview's value or worth is its *practical* consequences. If the behaviors that follow from a worldview cannot work well in the long run, then that worldview really is not practical (Reitan & Reitan, 2001). So, rather than live in the truly naïve dream world of "business as usual," let's try to be practical and stick to what at least has a chance of working. That would be to adopt a worldview that makes us want to change course, one of respectful participation in the world's community of ecosystems in which "enough is sufficient." Do we, *Homo sapiens*, have the wisdom to do that?

This is what Arne Naess (1973), the Norwegian philosopher who introduced Deep Ecology, asks us to strive for, to go beyond concern for pollution, resource depletion, and geologic and biologic hazards. Though necessary, these are not deep enough.

Deep Ecology uses a total-field image, one of organisms as knots in the geobiospherical field of intrinsic relations. In this image the relation between entities is, in fact, an essential part of those entities. In Naess's view, without the relationships, the entities are no longer the same, no longer whole or complete. This expanded sense of identification is central to the Deep Ecology worldview and results from internalizing this total-field model.

It is exactly in this respect that Deep Ecology, with its enlarged sense of self – the recognition that "I am an integral part of the whole field and the whole field is an integral part of me" – changes my response to what is happening around me. I cannot look around and say, "First I have to take care of myself." That sort of lifeboat ethic is not conceivable, because by myself I mean the whole thing! We realize that the only lifeboat is the one that holds all of us – Lifeboat Earth (Hardin, 1974; Zen & Palmer, 2004; Reitan, 2004).

As individuals we must recognize that "by myself I *have* to mean the whole thing!" The psychological impact of that recognition, but – not necessarily the intellectualization of a coherent philosophical position, is the great benefit and power of Deep Ecology. The way we *want* to live is changed. To paraphrase the environmental philosopher, J. Baird Callicott (2000), what we do collectively depends upon what we collectively think and want.

We can only accomplish our goal, to change the behavior that undermines a sustainable future, if we change what we collectively think and want. That is, we will have to change the dominant worldview. The Deep Ecology worldview leads us to want to moderate our impact, to

want to share equitably, and to want to adopt sustainable behavior.

The idea of "mutual coercion mutually agreed upon" (Hardin, 1968; Zen & Palmer, 2004) – the idea of cooperation according to mutually accepted rules – becomes a self-evident and *automatic* response when each of us sees ourself as inextricably embedded in the web of life and relationships, all of which are parts of myself and of yourself. We end up working together for our mutual best because we *want* to.

Educating broadly about the science and technologies of sustainability is essential, because it leads us to realize that a sustainable future is being undermined. The need to seek a worldview compatible with sustainability becomes evident. Education helps to remove the scales from our eyes; it can cure our blindness. But then we have to take the other step – deal with our addiction and denial. We have to find and communicate worldviews, such as Deep Ecology, that can lead us to want to cooperate with all other humans and with all of the non-human world, to respect Earth and its limits, so that all of us and our progeny can continue to enjoy this marvelous planet – our one and only lifeboat.

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