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ABSTRACT: While acknowledging the need for "sustainability," this paper summarizes the problems that have been encountered in our understanding and use of this concept. It explores the efforts of others to define the concept within the context of specific disciplinary areas and sets forth a proposal for a basic understanding of the term "environmental sustainability" as an expansion of our common perception of the nature of human activity so as to more clearly connect it with the ecological concept of interdependence and to serve as a goal for environmental managers.

KEYWORDS
Defining Sustainability, Ecological Services, Environmental Sustainability, Goals of the Environmental Professional, Principles of Environmental Sustainability

I. INTRODUCTION

In the middle of the 20th century, we saw our planet from space for the first time… From space, we see a small and fragile ball dominated not by human activity and edifice but by a pattern of clouds, oceans, greenery, and soils. Humanity's inability to fit its activities into that pattern is changing planetary systems, fundamentally. Many such changes are accompanied by life-threatening hazards. This new reality, from which there is no escape, must be recognized - and managed (From One Earth).

The need for sustainability

There is no question regarding the need for sustainability. In "The Concept of Environmental Sustainability," Robert Goodland substantiates a history documenting this need, presenting proponents ranging from Mill and Malthus to Meadows and Brundtland et al., and puts forth a definition of "environmental sustainability as the maintenance of natural capital" and as a concept apart from, but connected to, both social sustainability and economic sustainability. These arguments are not repeated here but rather accepted as valid, supported, and used as a basis from which to proceed to further develop this concept.

The problems with "sustainability"

On October 6, 2010, the US Federal Trade Commission (FTC) proposed significant revisions to its Guides for the Use of Environmental Marketing Claims also known as its "Green Guides," which exists to help marketers avoid making deceptive claims under Section 5 of the FTC Act. The proposal lists five terms that will not be addressed

by the Guides. Number one on that list is the term "sustainable." The reasons provided for this interesting decision include claims that there is no clear understanding of the term among experts, the term cannot be defined, and there are no accepted criteria with supporting test methods to measure it (Morelli et al., "Sustainable Consumption").

There has been more than a decade of struggle with the definition and relevance of the term among individuals in various professions (see Toman, Costanza, Mebratu, Vos). A debate exists between those who support a three-legged approach (i.e., simultaneously benefitting economy-society-environment), and those who view it as a relationship between human society and nature (Robinson). The result is that the concept is now more open to individual political and philosophical interpretations than to scientific definition (Robinson).

Even less progress in defining this concept appears to have been made by the organizations that employ "sustainability" professionals. "Sustainability" was recently identified in an annual guide to corporate newspeak as one of the most abused terms in the corporate vernacular ("Urban Intelligence Network"). The term has become a corporate buzzword, applied so commonly and ubiquitously that it has become simply "a synonym for everything that is positive," (Kiss). This is strongly evidenced in recent employment advertisements for sustainability managers and directors. In their analysis of posted job descriptions associated with employment opportunities for sustainability managers in US corporations, Greenwood and Bliss reported great diversity in expectations regarding the associated scope of duties (Greenwood and Bliss). The descriptions varied in emphasis from not much more than straightforward accounting to an almost evangelistic extreme of sustainability championing, (Morelli et al., "Sustainable Consumption").

II. DEFINING SUSTAINABILITY IN THE CONTEXT OF A PROFESSION

While the concept of sustainability is increasingly discredited as a useful concept by itself, it appears to be serving some purpose when preceded by a delineating modifier like "ecological" or "agricultural" or "economic." Efforts have been made by members of various professions to give meaning to the term within the context of those respective professions. Callicott and Mumford, for example, develop the meaning of the term "ecological sustainability" as a useful concept for conservation biologists; In "Ecological Sustainability as a Conservation Concept," these authors advance an ecological definition of sustainability that connects human needs and ecosystem services: "meeting human needs without compromising the health of ecosystems." They propose this concept as a guiding principle for areas where human activities take place.

In "Economic Sustainability and the Preservation of Environmental Assets," Foy explains that from an economic standpoint, sustainability requires that current economic activity not disproportionately burden future generations. Economists will allocate environmental assets as only part of the value of natural and manmade capital, and their preservation becomes a function of an overall financial analysis. In contrast, the ecologist will seek to preserve minimum levels of environmental assets in physical terms. He suggests that since an ecological approach will better characterize the present situation, it should serve to limit conventional economic reasoning to ensure sustainability. Economic sustainability should involve analysis to minimize the social costs of meeting standards for protecting environmental assets but not for determining what those standards should be.

In "Social Sustainability: towards some definitions," McKenzie identifies several attempts to define social sustainability and concludes it generally to be, "a positive condition within communities, and a process within communities that can achieve that condition." This definition is supplemented with a list of corresponding principles, including:

- equity of access to key services
- equity between generations
- a system of relations valuing disparate cultures
- political participation of citizens, particularly at a local level
- a sense of community ownership
- a system for transmitting awareness of social sustainability from one

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- mechanisms for a community to fulfill its own needs where possible
- political advocacy to meet needs that cannot be met by community action

Others attempt to capture its use for those working in agriculture (Harwood) or in the various functional units of business organizations (Morelli et al., "Sustainable Consumption") Not surprisingly, environmental managers have identified "environmental sustainability" as a concept that has a professional meaning for them," (Morelli and Lockwood).

There is ample evidence in the literature by Chan, Ionescu-Somers, Rothenberg, and others indicating that above and beyond all other pursuits, achieving regulatory compliance is the primary and principal role of the environmental manager in industry. Markusson enriches the related body of knowledge by exploring the characteristic of "environmental championing," defined as "any effort made by an (individual or collective) actor in a firm to promote environmental issues." However, until fairly recently, there had been little that discussed the professional goal of the environmental manager as an independent and commonly held meaning of the profession itself.

In 2009 Butler concluded that a common professional goal for environmental managers does exist separate from, though related to, that of the industries that employ them, and he tentatively identified that goal as "ecological balance." His efforts were unique in that they were supported by a collaborative international research program, established at Rochester Institute of Technology, called the Environmental Management Leadership Initiative (EMLI), which was created specifically "to define and develop the evolving role of the professional environmental manager in moving our social economic systems toward a more sustainable future," ("Statement of Purpose").

The author supported and has continued this work during the past four years toward further refining this goal and vetting the evolving results through presentations and corresponding workshops at a series of EMLI symposia hosted by Corvinus University in Budapest, Hungary; American College of Management and Technology in Dubrovnik, Croatia; Bocconi University in Milan, Italy; Leuphana University in Luneburg, Germany; and Rochester Institute of Technology in Rochester, New York in the US. The outcome of this process was a determination of strong support by members of the profession for establishing "environmental sustainability" as the professional goal of the environmental manager.

III. A CASE FOR ENVIRONMENTAL SUSTAINABILITY

Whether one considers sustainability to exist as a three-legged table consisting of the environment, the economy, and society, or as a dualistic relationship between human beings and the ecosystem they

inhabit, there should at least be agreement that ensuring the provision of clean air, clean water, and clean and productive land is foundational to a responsible socioeconomic system. Examining, for a moment, the three-legged model, the question might be raised, Do these legs provide equal support or is there some associated hierarchy of values among them? It is apparent that, without a sustainably productive environment to provide a resource foundation, it would be difficult or impossible to imagine having a sustainable society. Similarly, a sustainable economy depends upon a sustainable flow of material, energy, and environmental resources. Without it, economic systems will fail. However, a sustainable environment need not be dependent on the existence of either society or economy and, as evidenced in the wild, can stand alone as a sustainable system. As the only piece of the puzzle that can actually stand by itself, it should be the model to emulate, and indeed there have been attempts to do so.

"The human species, while buffered against environmental changes by culture and technology, is fundamentally dependent on the flow of ecosystem services." Such services include:

- Provisioning services, the products obtained from ecosystems, including food, fiber, genetic resources, biochemicals, natural medicines, pharmaceuticals, ornamental resources, fresh water, and all forms of energy resources;
- Regulating services, the benefits obtained from the regulation of ecosystem processes, including air quality regulation, water purification and waste treatment, pest regulation, disease regulation, climate regulation, water regulation, erosion regulation, pollination, and natural hazard regulation;
- Supporting services, including soil formation, photosynthesis, primary production, nutrient cycling and dispersal, seed dispersal, and water cycling; and
- Cultural services, the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences ("Ecosystems and Human Well-Being").

If it can be agreed that a sustainable environment is a necessary prerequisite to a sustainable socio-economic system, then it also should make sense that the actions we take to remove threats to and foster environmental sustainability should contribute to such a system. While ecosystems range "from those that are relatively undisturbed, such as natural forests, to landscapes with mixed patterns of human use, to ecosystems intensively managed and modified by humans, such as agricultural land and urban areas," the "environmental" focus proposed here delineates the portion of that range where there exists significant patterns of human use ("Ecosystems and Human Well-Being"). A general definition of "environmental sustainability" can now be crafted in recognition of these linkages between human well-being and ecosystems and, in particular, "ecosystem services."

IV. A DEFINITION OF ENVIRONMENTAL SUSTAINABILITY

Understanding and use of the word "environmental" quite often tends to be associated with some kind of human impact on natural systems. This context distinguishes it from the word "ecological," which can be characterized as a concept of interdependence of elements within a system. As discussed above in the essay, "Ecological Sustainability as a Conservation Concept," the authors suggest that an ecological definition of sustainability be advanced

that is in better accord with biological conservation. Their suggestion was that ecological sustainability is "meeting human needs without compromising the health of ecosystems." This seems inappropriate in that the general perception of the word "ecological" is that it implies a broader context than just the human experience. The word "environmental," however, is almost always used in reference to human interaction with the ecosystem. To increase precision, it thus seems reasonable to view "environmental" as a subset of the broader concept of "ecological," i.e., the intersection of human activities and ecological systems.

Understanding and use of the word "sustainable" or "sustainability" endured a period of accelerated evolution commencing in 1987 with the publication of Our Common Future, which was then followed by a more recent decline in coherency to become an often-abused term simply meaning "good" and sometimes used even without a connection to the natural environment or ecological health (Kiss). As discussed above, meanings for this concept of sustainability have been evolving as individual professions have attempted to develop definitions that make sense in the context of their respective areas of expertise and contribution.

The basic understanding of the term "environmental sustainability" set forth in this paper essentially expands our common perception of human activity so as to more clearly connect it with the ecological concept of interdependence, thus delineating the boundaries of this use of "sustainability" to correspond to the overlay of human activity upon the functioning of the supporting ecosystem. Environmental sustainability, then, is limited to and, in fact, becomes a subset of ecological sustainability. Broadly speaking, this concept of "environmental sustainability" might be seen as adding depth to a portion of the meaning of the most common definition of sustainable development, i.e., "meeting the needs of the current generation without compromising the ability of future generations to meet their needs," by taking on the general definition "meeting the resource and services needs of current and future generations without compromising the health of the ecosystems that provide them," ("Our Common Future").

More specifically, environmental sustainability could be defined as a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity.

V. SUPPORTING PRINCIPLES OF ENVIRONMENTAL SUSTAINABILITY

The primary purpose for this effort to develop a definition of environmental sustainability was to help environmental professionals and others operationalize a portion of the concept sustainable development as set forth in Our Common Future. The general understanding and conditions proposed in the preceding section do provide more clarity of purpose and direction but do not include instructions for serving that purpose or following that direction. The list below contains 15 guiding principles, collected from a variety sources by the author and his students and colleagues. They are sorted into five imperfect but helpful categories. They are included to stimulate thought as well as provide advice. Readers are encouraged to visit the original sources for greater depth and perspective.

Societal Needs

- Produce nothing that will require future generations to maintain vigilance ("Sustainability Report").
- Design and deliver products and services that contribute to a more sustainable

economy ("Moffat).
- Support local employment (Southampton City Concil)
- Support fair trade (Williams).
- Review the environmental attributes of raw materials and make environmental sustainability a key requirement in the selection of ingredients for new products and services ("Global Sustainability Principles").

Preservation of Biodiversity
- Select raw materials that maintain biodiversity of natural resources ("Global Sustainability Principles").
- Use environmentally responsible and sustainable energy sources and invest in improving energy efficiency ("Global Sustainability Principles").

Regenerative Capacity
- Keep harvest rates of renewable resource inputs within regenerative capacities of the natural system that generates them (Goodland).
- Keep depletion rates of nonrenewable resource inputs below the rate at which renewable substitutes are developed (Goodland).

Reuse and Recycle
- Design for re-usability and recyclability ("Sustainable Living 101").
- Design (or redesign, as appropriate) manufacturing and business processes as closed-loop systems, reducing emissions and waste to zero (Robinson).

Constraints of Nonrenewable Resources and Waste Generation
- The scale (population x consumption per capita x technology) of the human economic subsystem should be limited to a level that, if not optimal, is at least within the carrying capacity and therefore sustainable (Goodland).
- Keep waste emissions within the assimilative capacity of receiving ecosystems without unacceptable degradation of its future waste absorptive capacity or other important ecological services (Goodland).
- Develop transportation criteria that prioritize low-impact transportation modes (Moffat).
- Approach all product development and product management decisions with full consideration of the environmental impacts of the product throughout its life cycle (Moffat).

VI. CONCLUSION

This paper defines **environmental sustainability:** *as meeting the resource and services needs of current and future generations without compromising the health of the ecosystems that provide them,*

…and more specifically,

as a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity.

It is intended to help operationalize the concept of sustainability by providing more clarity of purpose and direction, particularly regarding the importance of valuing ecological services and recognizing our

interconnectedness.

It is intended as an articulation of the professional goal of the environmental manager and other environmental professionals.

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