

Quantifying Sustainability: A Pragmatic Approach*

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Introduction

Sustainability means different things to different people. It is so subjective that there is no consensus definition of what it means; some have described it as a process rather than as a goal. While there are two broad categories in which sustainability appears in the business world, they are just different ways of expressing the same societal values and beliefs. More importantly, many senior executives around the world expressed a need to better incorporate a meaningful measure of corporate contributions to sustainability, to learn how they can do better, and to change the approaches they have applied in the past¹. In this article I describe the magnitude of the problem and explain why a lack of rigorous approach has potential negative impacts on the corporation's ability to fulfill the vision of its CEO and Chair. The lack of quantified measures of sustainability also leaves investors, analysts, and non-governmental organizations (NGOs) unsure of a corporation's status with regard to its written commitment to corporate environmental and social responsibility. One potential approach, a mathematically robust process to quantify this subjectivity in a way that is technically sound and legally defensible, is described in the last part of this white paper.

Sustainability is a major factor for natural resource industries operating internationally, and important for businesses in all industries globally. Regulators and local residents want to know in advance how the company intends to provide for the population after the resource has been extracted to its economically feasible limit. Most companies have become adept at addressing these concerns, but admit to having room for improvement that will make the process and solutions not only more robust, but also more timely and cost effective. In the broader context of general business, corporate social responsibility (CSR) is a growing concept. It frequently is indistinguishable from similar

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¹The McKinsey Global Survey of Business Executives: Business and Society. The McKinsey Quarterly, January 2006.

concepts such as corporate sustainable development (as described above), corporate responsibility, and corporate citizenship. Some people believe CSR to be the private sector's way of integrating the environmental, economic, and social imperatives of their activities. From this viewpoint, CSR closely resembles the concept of the so-called *triple bottom line*.

The Problem

In December 2005, McKinsey & Company conducted a global survey of business and society². They interviewed 4,238 executives (more than 25% CEOs or other C-level executives) in 116 countries. Among their results were:

- More than 80% of respondents agreed that generating high returns for investors should be accompanied by broad contributions to the "greater public good."
- Most executives view engagement with environmental and social contracts as a risk, not an opportunity.
- Many respondents stressed the risks to their company's reputation, as well as potential damage to their shareholders' value, when they are expected to address environmental and social concerns.
- Executives believe that the solution is up to them.
- The majority of senior executives admitted they are ineffective at managing these social and political issues.

Of the surveyed executives, 46% said they have "substantial room for improvement" in the adequacy of their anticipation of social pressures – including criticism of their activities. An additional 24% saw "some room" for improvement.

Among explanations given for the high degree of discomfort are use of the wrong approaches and assignment of leadership below the CEO level. Almost 75% of respondents believe that the CEO or Board Chair should lead this effort.

About seven years ago, the National Academy of Engineering (NAE) issued a report called *Industrial Environmental Performance Metrics: Challenges and Opportunities*³. This extensive study focused on four specific industries (automotive, chemical, electronics, and pulp and paper) as representing the range of activities and impacts all industrial activities have on the natural environment. The report's Preface notes that a frequent assertion is "what gets measured gets managed" so the committee set out to find what was or could be measured in industrial settings. The NAE report looks at three categories of measures:

²The McKinsey Global Survey of Business Executives: Business and Society. The McKinsey Quarterly, January 2006.

³Committee on Industrial Environmental Performance Metrics, National Academy of Engineering, National Research Council. Copyright ©1999 National Academy Press. 252 pages.

Operational Those that “generally measure potential environmental burdens in terms of inputs and outputs of materials and energy.”

Management Those that “furnish information on steps being taken to influence operations.”

Environmental condition Those that “seek to provide information on the health of the environment and how it is changing.”

The problem with all of the measures is that they can be used in a comparative way, spatially, temporally, or by industry but they cannot provide insight into effects on the environment unless there is a mechanism defined. As the NAE report notes on page 25,

“Incorporating sustainability concerns into industrial management will require a much better understanding of how synergism and differences in temporal and spatial scale play out in complex environmental systems. . . . Uncertainty and the high degree of interconnectedness of natural systems will make the task of identifying basic indicators difficult and, in some instances, possibly impractical.”

Not included in this report is the fundamental problem underlying the senior executive’s difficulties in addressing requests for information on his company’s environmental and social concerns. This basic problem is expressed by the term used almost universally in describing industrial and business activities on the environment: health.

When applied to humans, the concept of health is very difficult to define inclusively. For example, the Collaborative International Dictionary of English, volume 0.48 defines health as, “[t]he state of being hale, sound, or whole, in body, mind, or soul; especially, the state of being free from physical disease or pain.” Look on Google for a definition of ecosystem health and you will find 4.7 million Web pages that use that term. One definition (from the medical school at the University of Western Ontario) is,

“A systematic approach to the preventative, diagnostic, and prognostic aspects of ecosystem management, and to the understanding of relationships between ecosystem health and human health. It seeks to understand and optimize the intrinsic capacity of an ecosystem for self-renewal while meeting reasonable human goals. It encompasses the role of societal values, attitudes and goals in shaping our conception of health at human and ecosystem scales.”

This does not get us any further than do the measures of the NAE report. This describes some nice concepts, but they cannot be implemented in the real world for the basic reason that terms such as ecosystem health, social justice,

and corporate social responsibility are based on values and beliefs. These values and beliefs vary among cultures and even within small geographic differences. A good example is the urban-rural divide that has been present in Oregon for more than a decade. It is no wonder that these issues seem intractable and so often end up in lawsuits.

Solutions

The title of this section is plural because there is no one solution that will work for all companies, in all industries, and in all locations. However, there is a process that can be universally applied to produce specific and appropriate results. The object is to quantify subjectivity as expressed by governments and stakeholders with an interest in a company's efforts toward sustainability, environmental, and social responsibilities (that is, the greater public good).

An example of some guidelines of general principles for socially responsible mining include:

- Do what you say you would do (more is always better; impress the local stakeholders).
- Be on time; make sticking with your announced schedule a priority so people can plan appropriately.
- Get input from stakeholders before you submit plans (e.g., exploration or operations).
- Conduct your project in a way that maximizes opportunities for post-mine land use (e.g., wind farm, eco-tourism park, aquaculture).
- Manage your operations in a manner that leverages the talent of your workforce and prepares them to take on similar jobs with the post-mine land use opportunities (e.g. electricians, heavy equipment operators, surveyors, mechanics).

An important component of satisfying those who want to measure sustainability or corporate environmental and social responsibility is to involve them in creating a solution based on their collective values and beliefs. The approach is that used to quantify environmental impact assessments⁴: define a range of values that represent unsustainable through highly sustainable; list the factors that contribute to environmental and social responsibility (individually), the mechanisms by which they act, and by how much each one contributes; have the group assign a dollar value to each factor as it relates to the amount of contribution.

Each contributing factor is a linguistic variable described as fuzzy sets. Measured values have degrees of membership in that set from 0.00 to 1.00.

⁴*Quantifying Environmental Impact Assessments Using Fuzzy Logic*, by Richard B. Shepard. 2005. Springer-Verlag, New York. ISBN: 0-387-24398-4.

The sets are related to sustainability by the mathematics of logical aggregation and implication in what is called an approximate reasoning model. The model represents the mechanism by which sustainability is measured as a series of IF-THEN rules. One such rule might be,

IF local workforce is taught transferable job skills,
THEN sustainability is increased.

The dollar value of each factor is assigned by each stakeholder based on a "budget" of \$100. Each individual decides how to spend his budget on sustainability factors, and a consensus average for each factor is calculated. These monetary values are used in weighting the contribution of each factor to the overall sustainability contributions of the company.

The result is a degree of membership in the set "unsustainable," "slightly sustainable," "somewhat sustainable," "sustainable," and "highly sustainable." The term *responsible* can be substituted for the term *sustainable*. Interpretation of the computed value of sustainability (or social responsibility) depends on the context. Associated with the computed value are the degree of confidence we have that this is a correct result and a measure of the strength of support that contributed to the output. These can be thought of as analogous to sample size and standard deviation associated with a mean value calculated from a population sample. That is, they are measures of how "good" the output really is.

The better use of these measures is comparative over time and space, rather than in isolation. A company can recalculate its sustainability or social responsibility score annually (or any other time period of interest) and see if the result changes, and if so in which direction. For spatial comparisons, a company can compare its calculated values for projects (or operations) in different locations. Obviously, these comparisons can be expanded based on need or desire of host country governments or other authoritative jurisdictions.

While the results certainly could be mis-used by those who have a negative agenda, it would be difficult for them to gain credibility or acceptance of their views. The factors contributing to sustainability or social responsibility were expressed by all those with a stake in the outcome. These same people contributed the mechanism by which the factors affect the results, and their relative importances. It would be quite difficult to raise a challenge to results when one was involved in creating them.

About The Author

Dr. Richard B. Shepard is a watershed and river system ecologist with more than 30 years of experience across the US and internationally. His interests in quantifying subjectivity developed more than a dozen years ago based on his involvement with permitting industrial development projects in mining,

logging, electrical power generation and transmission. He has written on the ecological aspects of the Endangered Species Act, Clean Water Act, National Environmental Policy Act, and similar statutes. Dr. Shepard started Applied Ecosystem Services, Inc. in 1993 as an environmental risk management consulting company specializing the sensitive and contentious projects.