

METHODS FOR SUSTAINABILITY ASSESSMENT: SUSTAINABILITY INDICATORS

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Keywords: Dematerialization, eco-efficiency, ecological footprints, environmental space, factor four, life-cycle assessment, policy wedges, societal metabolism, sustainability, sustainability indicators, triple bottom line, well-being

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Summary

Before we can effectively measure sustainability we must come to understand it in terms of a triple bottom line. Sustainability is about maximizing the production of human well-being per unit of economic output and maximizing economic output per unit of energy and materials extracted from nature. There are thus three bottom lines, not one: prosperity, environmental sustainability, and well-being. Each must be measured separately. Measures of economic prosperity are already well developed and well known. Environmental sustainability can be measured through the aggregation of indicators such as water quality, habitat preservation, ecological health, air quality, resource protection, and soil preservation. Well-being can be measured through the aggregation of indicators such as life expectancy, health, education, safety, crime reduction, and the protection of human rights.

1. Introduction

Humans have always measured what we value and what we fear, at least to the point of knowing whether we have enough to feed ourselves during times when nature's production is not immediately available. We have also carefully counted enemy warriors and weapons and taken measure of the seasons and the tides. With the rise of science we came to measure all manner of things in order better to understand them. With the invention of a money economy we began quantitative valuation of all goods and services, and all manner of things came to be economic goods through this process, including land and our own time. Indeed, it might be said that monetary valuation has become the measure of all things, including humans. Much has been gained through this

process of monetization (for example, the facilitation of exchange and an enhanced incentive to produce), but much has also been lost. One way of understanding sustainability indicators is to see them as a means of lessening what has been lost to the reification of monetary valuation.

Sustainability indicators measure and communicate fundamental qualities of human societies and the effects on the natural environment of the full range of their activities. It is crucial that sustainability indicators be rooted in a larger theory of sustainability—they must be meaningful in the sense that they measure what matters most. They should also be accurate, straightforward, powerfully communicative, and, taken together, comprehensive. Together, sustainability indicators must capture and convey a set of realities as important to society as are the vital signs (pulse, temperature, breathing rhythm) as indicators of human health. Indeed, some analysts see measures of environmental sustainability, the basic inputs and outputs of social economy, as measures of societal metabolism.

2. Sustainability: Definitions and Implications

Sustainability has been variously defined. One way to understand the meaning of sustainability is to see it as either narrow *resource* sustainability or broad *environmental and social* sustainability. Resource sustainability could be defined in either absolute terms as “the total extractions and throughputs per community, firm, or society” or relative terms as “energy and materials extractions and throughputs per unit of gross domestic product (GDP).” Resource sustainability is narrow as a concept only in relation to environmental and social (“broad”) sustainability defined as “societal well-being per unit of environmental impact” (where impacts encompass pollution, wilderness and habitat loss or damage, unintended and problematic climate or genetic alterations, and energy and materials extractions and throughputs in excess of replacement capacity).

In this usage, environmental and social sustainability is conceptually broader than resource sustainability in two ways: 1) resource extraction or throughput is broadened to incorporate comprehensive measures of environmental impact and 2) GDP is broadened to societal well-being. The second change is very much larger than the first for two reasons. First, the larger share of environmental impacts relate to the extraction, processing, and throughput of resources, and, in the case of many forms of energy, the use of the resource. That is, if resource sustainability is improved, most kinds of environmental impact will be lessened as well in the process. Second, well-being as a societal objective is significantly different from GDP growth as a societal objective in many ways. Two examples are sufficient to demonstrate both the truth of this latter assertion and its fundamental, and perhaps politically divisive, character.

Assume for the moment, before proceeding to a more detailed discussion below, that any determination of societal well-being would include, for example, measures of health and happiness. Regarding human health outcomes, Wildavsky argued that there is a systematic positive association between wealth and health—a wealthier society is almost certainly a more healthy society. Wildavsky likened the wealth-health link at the societal level to the efforts of individual joggers who may elevate by a small margin the

short-term risk of a heart attack in order to enhance, more often than not, their long-term life expectancy. That is, while some health risks are associated with economic growth, overall, in Wildavsky's view, there is a significant health gain for the population as a whole.

Wealthy nations are indeed, on average, healthier, but the relationship is far from linear. In terms of life expectancy at birth, for example, both Costa Rica (at US\$5680 GDP per capita per year and 76.4 years) and Greece (at US\$8950 GDP per capita per year and 77.7 years) finish ahead of the United States (at US\$24 680 GDP per capita per year and 76.1 years). In terms of a more comprehensive established indicator of well-being (including health, wealth, and education indicators), such as the human development index of the United Nations Development Programme (UNDP), the richest nation (Luxembourg) ranks 17th and the fifth richest nation (Kuwait) ranks 40th. Nations as diverse as Cuba, Tajikistan, and Sweden score far above what would be predicted by GDP.

In other words, while there is a rough correlation between wealth and health in nations, the relationship is complex and we might learn more by studying singular successes and failures than by fixating on the overall pattern. That is, Wildavsky did not get to the most interesting questions. What is involved in the efficient "production" of societal well-being (however measured) per unit of GDP per capita? Where, when, and why is more health, education, equity, and secure comfort obtained and where, when, and why are these things maximized at given levels of wealth, or most efficiently produced per unit of wealth? Arguably, and here political contestation comes into the discussion, Wildavsky's claims regarding wealth and health *takes advantage* of the truth that economic growth has positive potential, without noting the many systematic failures that prevent actually delivering on that potential. Wealth often delivers less health than it might and poverty is not an adequate excuse for the absence of effective actions.

Unlike health, objective measures of happiness (and many other aspects of well-being) are really not possible (see *Incommensurability of Knowledge: Theories and Values*). Analysts can, however, ask individuals how they see themselves in terms of happiness and their reports can help to generate interesting conclusions. Carley and Spapens note that for European nations, excluding the very poorest members of society there is no correlation between personal wealth and reported happiness. Moreover, these authors also report the findings of Veenhoven that, for a broad array of nations, the wealthier the nation, the less the correlation between wealth and happiness. In other words, if indeed happiness is an aspect of well-being, wealth (perhaps beyond a certain minimum) adds little to happiness as a dimension of well-being. This has led some to suggest that additional economic growth within already wealthy nations is thereby perhaps not pointless, but might not, given the attendant environmental costs, be appropriately seen as a sustainability priority.

Regardless of that particular debate, concerns regarding resource sustainability, and environmental impacts and inputs in total, suggest to most sustainability analysts that *sustainable* economic growth implies continuous reductions in material and energy extractions from nature per unit of economic output. That is, production must become less resource intensive, either more efficiently utilizing energy and materials or

dematerializing output by creating products and services that use little or no energy or materials. There are, in fact, enormous potentials for improved energy and materials efficiency as suggested by the *factor four* concept, whereby it is shown how present economic output could double at the same time as resource use is halved. As well, sustainability implies a need for absolute reductions in the use of selected materials (fiber output extracted from forests, for example), a maximization of materials re-use and recycling, and the limiting of renewable resource use to amounts well within nature's capacity to supply them continuously. Specifically and crucially, many sustainability analysts have concluded that unless and until some visible and benign substitute is found for fossil fuels, prudence—even in the absence of climate change concerns—would suggest that global fossil fuel use should continuously decline for the foreseeable future.

Obviously, such conclusions carry enormous economic, moral, political, and practical consequences. The most important implication of this perspective is that economic growth should be optimized in terms of long-term environmental and resource capacities rather than maximized only in its own terms. A second implication is that to the extent that economic activity is not an end in itself (and sustainability analysis generally presumes that it is not), we must maximize those outputs (summarized as well-being) per unit of economic output. Thus the need for sustainability analysis to be undertaken in terms of a three-dimensional model of societal functioning where well-being is taken to be the primary goal of human activity and both economy and society are understood to be dependent on the environment and resources. Sustainability theory, to which we now turn, understands the environment as *sustaining* the economy and the economy in turn as helping to create and maintain well-being.

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Biographical Sketch

Robert Paehlke is professor and chair of the Environmental and Resource Studies Program at Trent University in Peterborough, Ontario, Canada. He is the author of *Environmentalism and the Future of Progressive Politics* (Yale University Press, 1989) and editor of *Conservation and Environmentalism: An Encyclopedia* (Garland Publishers, 1995). He was a founding editor (1971) of *Alternatives Journal*, currently published at the University of Waterloo in Ontario, Canada, and has published more than 100 articles and chapters on environmental policy and politics.