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# On accounting for sustainable development and accounting for the environment

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**Abstract**

Economic sustainability or intergenerational equity entails maintaining social well-being by decisions about investments in different types of assets. Under certain conditions, consumption can be sustained by depleting resources, or various kinds of natural capital, while building up other kinds of capital. Theoretically, the choices involve the use of a set of accounting prices. The question becomes one of finding and implementing accounting prices that express the roles of the various capital goods in achieving the objective of the economy.

Hartwick's rule holds that an economy can be sustained if the value of the total, net investment in the economy, evaluated at those accounting prices, is zero. The rule applies to a special, abstract economic model which expresses a social objective different from the discounted-utilitarian objective on which national accounting is based. Different objectives give rise to different accounting prices. Because the prices may not be right, the zero net-investment rule using available national-accounting prices cannot generate a condition for sustaining an economy.

Still, environmental accounting is a tool which, used prudently, can make an important contribution to social decision-making. This paper expands upon these ideas by discussing the incorporation of natural resource and intangible environmental costs and benefits into green accounting at the firm as well as the economy level. Common techniques of mine valuation and standard corporate accounting are the bases for this extension to the valuation of and accounting for decisions concerning the environment.


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## Economic statistics and decisions

What does it mean for a society to be sustainable or sustained? What should the society attempt to sustain? Can the "degree" of sustainment be measured? In reading about such questions one is impressed, not by progress toward the goal of sustaining society, but by the vagueness of the concept. In a frequently cited statement, the Brundtland (1987) report argues for a balance between the needs of the present and of the future. But those needs are not specified and, more importantly, the balance to be implemented is not defined. In the intervening years, the notion of sustainment has come to encompass all that the proponent thinks would be ideal in a society, including environmental protection, climatic stability, elimination of poverty, concern for the well-being of future generations, good corporate and social governance, social inclusiveness, maintenance of small communities and ways of life, and others. Given present and foreseeable technologies, some of these disparate goals are inconsistent. Moreover, noble statements about what is ideal are too often camouflage for the special interests of their proponents.

An economist (e.g. Solow, 1993) approaching the question of sustainability asks whether the concept can be defined precisely, and in particular, whether there are

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statistics that can indicate how well society is doing in sustaining itself. Economic statistics are gathered by governmental statistical agencies that record consumers' expenditures, firms' transformations of inputs into outputs, and the activities of non-profit organizations. Each component is observed as a market transaction involving a quantity of some good, a price of the good, and the product of the two, a revenue. The revenues for different goods can be added together to form statistical aggregates. The best known such aggregate is the gross national product, which is used by government for making policy to influence the levels of employment and inflation. There are also a large number of sub-aggregates.

Much that is important to modern society can be expressed using such statistics, but much cannot. For many environmental "goods", there is a measurable quantity but no price. These goods cannot be incorporated into the market statistics, and so the statistics are incomplete in recording what "matters" for policy.

Some environmentalists feel that the incompleteness is inescapable, that the economy is only a part of the environment. In a *physical* sense, all market activity occurs within the natural universe. The economy, however, is not limited to marketed goods. Economics is the study of how people make decisions and how they can make better decisions according to specified criteria. Society continually makes decisions about the environment: how much land to set aside as wildlife reserves, how much to invest in pollution control, and so on. In an *analytic* sense, the environment is a part of the economy.

Any decision balances different, often conflicting, underlying values. To an economist, this balance entails an implicit price. de Haan (2004) argues that several issues militate against the use of prices to evaluate non-priced goods and services, including environmental ones. Some individuals morally refuse to put a value on environmental attributes. Although some people may make such refusals, decisions still must be and are made with respect to environmental services and stocks. It is also unlikely that the refusals express an infinite value; more likely, these same individuals unconsciously reveal an implicit, finite trade-off, or price, through their choices.

Without an *explicit* price there is no objective way to compare the environment with the part of the economy that is mediated in markets and has prices. There is no consistent way to make or to evaluate decisions. How can a statistician make the implicit prices explicit? This question raises a deeper question about the ultimate meaning of the statistics. The meaning needs to be clear if society is to use the statistics for making and evaluating policy. Much effort has been exerted in economics to understand the statistics and to estimate prices for non-priced goods. Economics has a criterion called *welfare* that gives meaning to a particular aggregate statistic, the *net* national product (NNP). All that contributes to welfare, however, must be aggregated into NNP. That means finding prices for non-priced goods such as the environment.

Some economists have also attempted to use the same statistics to try to measure sustaining of the society. This paper argues that the focus of economic accounts should be welfare and that sustaining is not readily measured. Still, using the precepts of accounting, extensions can be made to incorporate the environment in a way that expresses social values.

## Green accounting

In a real economy there are many types of *capital*. Capital is any good, even an abstract one such as knowledge or environmental quality, which is used to produce goods and services that contribute to society's underlying purpose or objective over an interval of time. A change (positive or negative) in any capital good is a net investment. The value of a net investment is obtained by multiplying the change in the good by a price that summarizes its contribution to the objective.

Economists usually represent the underlying purpose as (discounted-)*utilitarian welfare*. It is the present value of all future consumption (more precisely, of future utility, a general, mathematical aggregate of consumption). The method of compound interest is used to discount the level of consumption at any future time back to the present by multiplying it by a discount factor that is lower for times further in the future. The discounted values for all future times are summed over the indefinite future to yield the level of welfare.

A utilitarian welfare function can be manipulated mathematically to show that current "interest on social welfare" (the interest rate multiplied by the level of welfare) is equal to the sum of the value of consumption and of net investment, or NNP (Weitzman, 1976). The most general form of income is interest: even one's wage can be considered "interest on" (plus "depreciation of") an abstract capital good, one's lifetime capacity for work. In theory, NNP is equal to the income from the total value of social capital.

In practice, however, NNP excludes many non-priced goods that contribute to welfare, either as consumption goods (e.g. beautiful scenery and pollution, the latter considered a "bad" with a negative price) or capital goods (e.g. the capacity of the environment to absorb pollution). The aim of green accounting is to make NNP more comprehensive by including as many non-priced goods as possible.

NNP can be made closer to comprehensive income by estimating prices for non-priced goods through techniques of "non-market valuation" (e.g. Freeman, 2003), which is a major part of the theory of cost–benefit analysis. The estimation is difficult and subject to error and interpretation. More fundamentally, if an analyst's view of social welfare does not coincide with what is implicitly being pursued by the economy, then the observed market prices used in comprehensive NNP are not the desired or "right" accounting prices.