

## DIMENSIONS OF SUSTAINABLE DEVELOPMENT

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### Summary

Sustainable development has become a ubiquitous phrase and the avowed goal of many public policy initiatives, especially those concerning environmental management. But sustainable development is an extraordinarily broad and rich concept, potentially encompassing nearly every aspect of human society. No consensus has yet emerged about what a sustainable path of economic development might look like, nor about how to get there from here. In this article, we present a diversity of points of view on this complex subject. We describe the types of capital resources many economists and other writers on sustainable development expect to be necessary for working out a pattern of sustainable development in our industrial and industrializing cultures. Natural capital and human capital are widely understood as critical ingredients, alongside manufactured capital, in human economies. How these resources are managed has much to do with the sustainability or unsustainability of our economies. We discuss the patterns and styles of management that are expected to be of overriding importance in the task of moving our growth-oriented societies in the direction of sustainability. From a managerial viewpoint, sustainability takes on special complexity, since it potentially involves changes in many aspects of social organization. Individual writers emphasize more technical aspects of sustainable resource use, including dematerialization, energy policy, recycling, transport and communication networks, trade policy, accounting, and metrics procedures. In the final section we present some of the “images” or patterns of what a sustainably developing economy and society might look like. *Knowledge in depth* chapters expand on many of these aspects of sustainable development in writings by economists, other social scientists, and natural scientists.

## 1. Introduction

We begin this overview by summarizing some of the ways in which the idea of sustainable development has been discussed, both within and outside of the context of classical and neo-classical economics. Sustainable development has been discussed by economists and social scientists influenced by ecological thinking, by ecologists and conservationists, and by social and political philosophers. This summary makes no pretence at completeness, but we do attempt to give a sense of the breadth of thinking and the variety of points of view that have been brought to bear upon the still relatively new notion of sustainable development. No strong consensus has yet emerged about what a sustainable path of economic development might look like, nor about how to get there from here. Some commentators have regarded the diversity of opinions and approaches to the problem as evidence of a fundamental weakness in the sustainable development concept itself. However, another way of interpreting the increasing ferment and discussion may be that this complex subject is just now beginning to receive the attention it is due. There are compelling reasons to believe that our ability to move toward economic arrangements which can be sustained over the long term will prove decisive to coming generations. On the other hand, there is no inherent reason to expect that the discussion about the nature of sustainability can or should be concluded easily, or indeed that a clear and concise “definition” of sustainability is likely to emerge without a good deal of struggle and experimentation.

It is important to note that sustainable development cannot refer only to the development path of the less highly developed economies. On the contrary, it may be even more necessary for the already-industrialized economies, which presently consume a wildly disproportionate share of the world’s resources and are the source of disproportionately severe per capita environmental impacts, to move quickly toward greater sustainability. Particularly significant are reductions in energy and materials use and waste generation.

In the second section, we briefly describe the types of capital resources expected to be necessary for working out a pattern of sustainable development in our industrial culture. The kinds of resources categorized as “capital” have undergone a considerable expansion in the last decades of the twentieth century, partly under pressure from sustainable development ideas. Where capital (understood primarily as manufactured and financial capital) was once sharply distinguished from natural resources and the human contributions to welfare, natural capital and human capital are now being widely understood as critical ingredients, alongside the more traditional manufactured capital, in the industrial economy.

A third section briefly discusses the patterns and styles of management which are expected to be of overriding importance in the task of moving our growth-oriented societies in the direction of sustainability. It would be only a slight exaggeration to predict that sustainability may turn out to consist principally of a management style or styles. Society is engaged in the process of developing management principles such as long-term monitoring of resource use patterns, information sharing, an experimental or “adaptive” approach, operationalization of the “precautionary principle,” and the cultivation of a long-term (perhaps multi-generational) planning horizon. These

management principles are likely to be supremely important to progress toward sustainability in large-scale industrial or “post-industrial” economies. Questions of management style inevitably bring up issues of wealth distribution, of moral obligation, of intergenerational equity and of economic justice. Many writers on sustainable development see the resolution of such questions as integral to sustainability. In this view, sustainability takes on special complexity, since it potentially involves changes in nearly every aspect of human society. Other writers emphasize the technical and technological aspects of sustainable resource use, including dematerialization, energy policy, recycling, transport and communication networks, trade policy, accounting and metrics procedures.

In the final section we present some of the “images” of what a sustainably developing economy and society might look like. These are of necessity somewhat speculative: it could be argued that the world has never known a fully sustainable human economy. The advent of industrial technology broke many of the biophysical barriers to the growth and behavior of human populations, and many believe that this has led directly to unsustainable practices. However, the advent of such technologies can be seen as a logical, perhaps inevitable stage in the evolution of a tool- and technology-dependent species. If so, even the apparently sustainable pre-industrial cultures may not in fact have been sustainable in the longest term. Nevertheless, although it is speculative, this section does not consist of science fiction. What we expect a sustainably developing economy and society to look like depends in large part upon what elements we see as unsustainable in the present economy, from our particular vantage points at the beginning of the twenty-first century.

## **2. Definitions of Sustainable Development**

### **2.1. Economic definitions of sustainable development**

Sustainable development has become a ubiquitous phrase and the avowed goal of many public policy initiatives, especially those concerning environmental management. Nevertheless, not all economists today accept that the notion of sustainable development really adds anything to economic analysis. Some economists maintain that the conventional concepts of neo-classical economics, such as the maximization of welfare, already subsume the concept of sustainable development, and that further attempts to define or “operationalize” sustainability are simply redundant. Other writers warn that the idea has already been stretched to include so many points of view that it no longer means much of anything. Certainly neo-classical economics has not had much to say explicitly about sustainability. This is partly because the time-frame assumed in discussions of sustainable development is generally a good deal longer than those of neo-classical economics, which generally project no farther ahead than fifty or sixty years.

Nevertheless, some of the notable founders of neoclassical economics have written on the concept of sustainable development, without having actually used the phrase. Sir J. R. Hicks (1946), for instance, essentially defined sustainability in his classic definition of income. Income, suggested Hicks, is “the maximum value which [a person] can consume during a week, and still expect to be as well off at the end of the week as he

was at the beginning.” In other words, he interpreted income to be the flow of resources from a benefits-generating capital stock. This concept of income thus precludes the consumption of the capital stocks from which income flows. This stricture is regularly flouted in the prevailing systems of national accounts, including calculation of the GNP, where exploitation and consumption of a nation’s nonrenewable natural resources generally appear on the income side of the ledger. (Hicks continued, “Thus, when a person saves, he plans to be better off in the future; when he lives beyond his income, he plans to be worse off ... the practical purpose of income is to serve as a guide for prudent conduct.”) Of course, it would be disingenuous to suggest that attention to this simple guideline would solve the problems by itself. Which goods and services do indeed make us better off, and what are the stocks from which they flow, are complex questions without easy answers. It has been one of the tasks of “sustainable development” advocates to find substitutes to common metrics, such as the GNP, to better reflect Hicks’s definition of income at the national level.

Recently a group of economists proposed a definition of sustainability as a rate of economic growth in which the savings rate exceeds the rate of consumption. This definition relies on an understanding of the various resource types as essentially equivalent or interchangeable (“substitutable”). Thus, at least some natural resources might be used up without impinging upon sustainability, as long as they are converted into other resources, say financial or manufactured ones, and saved or invested. (See “Weak vs. strong sustainability”) The idea that resource types could be freely or generally substituted for one another serves to indicate that relatively little attention was paid to natural resources by neo-classical economists, until quite recently. (See Section 3.) The prevailing standard model of economic growth has been a two-factor model, in which production depends on labor and reproducible capital. Land and natural resources – classically considered a third factor – have often been dropped, with the tacit justification that reproducible capital was a nearly perfect substitute for natural resources.

This point of view exemplifies the strong focus in neo-classical economics on industrial production. In contrast, the classical economists of the eighteenth and nineteenth centuries were essentially agricultural economists. They were solidly grounded in the “earthy” realities of land, fertile soil, and labor as the resources upon which wealth production was based. Thus, David Ricardo (1821) developed the theory of rent from his recognition of the significance of the dwindling supplies of good land to the economics of eighteenth-century England. John Stuart Mill (1848), under the influence of philosophers including Malthus and Hobbes, explicitly discussed the need for limitations upon the growth of the human population and economy; and he did so in terms that would hardly have been out of place in the mouth of a John Muir or an Aldo Leopold. “If the earth must lose that great portion of its pleasantness which it owes to things that the unlimited increase of wealth and population would extirpate from it, for the mere purpose of enabling it to support a larger, but not a happier or better population, I sincerely hope, for the sake of posterity, that they will be content to be stationary, long before necessity compels them to it.” Thus, the vision of a sustainable, non-growth economy has a long, though interrupted, pedigree.

## 2.2. Ecological-economic definitions of sustainability

It is sometimes claimed that the US economy is changing in essential ways since the advent of personal computing, the Internet, and e-commerce, that it will soon be based on the flow of information and services rather than on material production. It is true that the United States is exporting some of its material productive capacity to other countries, along with some of the environmental challenges inherent to industrial production. Nevertheless, even an information-based economy must rely fundamentally on the transformation of resources into material goods, and of energy into productive work, and it must continue to be bounded by the laws of physics (also see the discussion of “dematerialization” below). Several economists of the latter half of the twentieth century have attempted to re-establish the concept of biophysical limits, including those of thermodynamics and biology, in the economic debate. Nicholas Georgescu-Roegen criticized neo-classical economics as being stuck in an anachronistic embrace with mechanistic science: “Among the economists only Alfred Marshall intuited that biology, not mechanics, is the true Mecca of economics” (1971). He attempted to take a new and more careful look at such everyday economic concepts as stocks and flows, the production function, and the concept of process itself. Building upon this work and upon the “Beyond the Limits” debate of the 1970s (Meadows, 1972), and referring often to the work of the classical economists, Herman Daly has elaborated a theory of a “steady-state economics” as an alternative to the theories of neo-classical economics. Where the neo-classical theorists have often appeared to rely on the idea of “perpetual economic growth” to drive changes in distribution or efficiency, the concept of an advanced but non-expanding economy has allowed Daly (1996) to redefine sustainable development simply and elegantly as “development without growth past carrying capacity,” or “development of quality, without growth in quantity.”

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### Bibliography

DALY, H. E. 1996. *Beyond Growth: the Economics of Sustainability*. Boston, Beacon. [Comprehensive look at the philosophical disjunctions within neo-classical economics from the perspective of sustainability, and foundations of a new approach including non-growth development.]

DALY, H. E.; COBB, J. B. JR. 1994. *For the Common Good*. 2nd edn. Boston, Beacon. [Particular emphasis on social, ethical and community-related aspects of sustainability.]

GEORGESCU-ROEGEN, N. 1971. *The Entropy Law and the Economic Process*. Cambridge, Mass., Harvard University Press. [Basic work applying biophysical principles to economic systems.]

HICKS, J. R. 1946. *Value and Capital*. 2nd edn. Oxford, Clarendon Press. [Contains the classic definition of income as 'sustained' flow of resources and benefits from capital stock.]

LEE, K. N. 1993. *Compass and Gyroscope*. Covelo and Washington, D.C., Island Press. [Examination of strategies for the implementation of sustainability principles, including adaptive management and the social role of science.]

MEADOWS, D. H. ET AL. 1972. *The Limits to Growth*. New York, Universe. [Seminal work, one of the first to lay out the idea that there are real-world limits to the growth of human populations and economies.]

MEADOWS, D. H. ET AL. 1992. *Beyond the Limits: Global Collapse or a Sustainable Future*. London, Earthscan. [Follow-up work to the above, in which the knowledge gained over the intervening decades is applied and evaluated.]

MILL, J. S. 1848, new edition 1909, reprinted 1976. *Principles of Political Economy*. London/ Fairfield, N.J., J. W. Parker/A. G. Kelley. [Lays out influential economic theories within the context of rapid population growth and increasing scarcity of land and other resources in England.]

RICARDO, D. 1821. *The Principles of Political Economy and Taxation*. 3rd edn. London: J. M. Dent. [Examines the dynamics of land scarcity and rent increase in England, elaborating an influential theory of resource allocation and doctrine of comparative advantage.]

SEN, A. 2001. *Development as Freedom*. Anchor. [Examination of regional, economic, and social development as the search for greater range of individual choice; discusses the role of reason and the scientific method in development.]

WILSON, E. O. 1998. *Consilience: the Unity of Knowledge*. New York, Alfred A. Knopf. [Exposition of the attempt to find common principles linking the disciplines of the mechanistic sciences with other areas of human endeavor, to underpin the search for sustainability.]

### Biographical Sketches

**Reinmar Seidler** is a graduate student in the Department of Environmental Biology of the University of Massachusetts at Boston. He has published articles on tropical forest management and sustainable development issues in *Conservation Biology* journal (1998), the *Academic Press Encyclopedia of Biodiversity* (2000), and Island Press (forthcoming). His research interests include land use change and environmental education, and he has co-led Earthwatch research groups studying Neotropical butterfly migration.

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