

“Natural Capital” as Metaphor and Concept

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The use of “natural capital” as a synonym for natural resources and services has a long history, and the term is now deeply entrenched among environmental writers. In this article I provide an overview of this history, identify the term’s useful role as a metaphor, and discuss the problems it poses as a concept. My aim is to sharpen the terminology of the environmental community in order to permit clearer thought about nature, capitalism, and the redirection of our civilization towards sustainable well-being.

The notion of “natural capital,” if not the term itself, goes back to the 19th century, when several ecological thinkers referred to plants as the original capitalists because they can accumulate the solar energy on which most life on Earth depends.¹ The earliest application of the word “capital” to nature was thus a reference to renewable resources, not to resources generally. Economist Stanley Jevons, who was concerned about the UK’s rapidly declining coal stocks, went further. He complained that, “... other countries lived on the annual regular income from the harvest, but Britain was living on capital; a capital which would not yield interest because once it was turned into heat, light, and power, it disappeared forever into space.”² Jevons therefore extended “capital” to include nonrenewable resources such as coal. This broader meaning soon became commonplace.

In the 20th century, the brilliant chemist and part-time economist Frederick Soddy tried to place humankind’s economic activities on a firm physical foundation. In words that echoed those of Jevons, he said, “Pre-nineteenth century man lived on revenue. Present-day man augments the revenue ... out of capital. ... Coal is the real capital ...”³ Half a century later, Nicholas Georgescu-Roegen deepened Soddy’s work by invoking the second law of thermodynamics (the entropy law) to characterize the economic process: “We can obtain the [advantages of mechanization] only by eating more quickly into the ‘capital’ of low entropy with which our planet is endowed.”⁴

It should be noted that Georgescu-Roegen, an economic thinker of considerable subtlety, carefully placed the word “capital” in quotation marks to indicate its metaphorical usage. Such care was not taken by another economist, E.F. Schumacher, who in 1973 referred to, “... the capital provided by nature and not by man.”⁵ On the same page Schumacher did put “natural capital” in quotation marks, but evidently to indicate that he was coining a term. To the best of my knowledge, this is indeed the first time that “natural capital” appears in the work of a well-known author.

Possibly due to Schumacher’s influence, ecological economist Herman Daly in 1988 adopted the term “natural capital” when defining sustainability.⁶ Daly based his concept on the definition of income used by British economist J.R. Hicks: the highest level of consumption that can be indefinitely maintained. Daly pointed out that this definition is synonymous with sustainability so

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long as we keep intact not only “man-made capital” but also “natural capital.” He defined the latter as “... natural stocks that yield flows of natural resources and services ...”.⁷ Daly augmented this discussion with an important footnote:

“The term ‘natural capital’ is a bit awkward because capital has traditionally been defined as produced (man-made) means of production. The term ‘land’ in earlier times meant something equivalent to natural capital, but has now lost that meaning. The term ‘natural capital’ is used to call attention to the fact that there is a *stock* of natural assets that yields a *flow* of resources and services ... and whose consumption cannot be counted as income.”⁸

When *For the Common Good* was published a year later, the awkwardness of “natural capital” was not acknowledged, and Daly (with co-author John Cobb, Jr.) converted the term from a metaphor used to raise awareness into a formal concept: “We suggest a functional definition of capital as a stock that yields a flow of goods or services. There are then two categories of capital, natural and humanly created.”⁹

The success of “natural capital” as both a metaphor and a concept apparently encouraged progressive thinkers to widen the meaning of “capital” still further. According to a 2004 textbook co-authored by Daly and Joshua Farley:

“Traditionally, economists have defined capital as produced means of production, where produced implies ‘produced by humans’. Ecological economists have broadened the definition of capital to include the means of production provided by nature. We define capital as a stock that yields a flow of goods and services into the future. Stocks of manmade capital include our bodies and minds, the artifacts we create, and our social structures.”¹⁰

In this interpretation, “capital” has shifted from being a human-made or natural stock that yields economic benefits to *any* stock that improves human well-being. This greatly expanded notion has led some commentators to formulate a “four-capital” approach to social welfare. The authors of *Natural Capitalism*, for example, identify the four types as human, financial, manufactured, and natural capital.¹¹ Richard Douthwaite, the author of *The Growth Illusion*, calls the four types human, social, fixed, and natural capital.¹² Several other variations on this scheme have been proposed.¹³

To summarize the above history, “natural capital” has its roots in the use of “capital” to refer to renewable resources. The meaning of “capital” was then broadened to include nonrenewable resources. “Natural capital” was coined as a metaphor for natural resources and services, and was subsequently converted into a formal economic concept. Finally, the meaning of “capital” was extended beyond the economic realm in order to comprehensively address human well-being. Let me now turn to a critique of these developments.

To understand the significance of “natural capital” and its evolution, we must begin with the meaning of “capital” itself. Within standard economics the word refers to either “a factor of production produced by the economic system”¹⁴ or to financial assets that underlie these factors. This definition is widely accepted, but it constitutes a fundamental distortion in standard thought. As implied by the word itself, capital is uniquely associated with capitalist economies, which means it cannot be applied to economic systems generally. Traditional economies used tools,

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and feudalism used machines, but these were simply factors of production, not capital. Economist Robert Heilbroner made this point when he criticized historian Fernand Braudel's conventional definition of the word:

"This has the ring of easy familiarity, but it leads us away from rather than toward an understanding of what capital is. If capital were only goods used in production or money needed to buy materials and labor, then capital would be as old as civilization, and there would be no purpose in singling it out as an identifying element of one kind of society..."¹⁵

This article is not the place to offer a suitable definition of "capital," but it must be emphasized that doing so is indispensable for probing the present economic order. I will return to this topic below, but until then the word "capital" will be used in its distorted sense in order to continue the discussion within the conventional framework.

E.F. Schumacher, Herman Daly, and most others who employ the term "natural capital" adhere to the spirit and principles of conventional thought, and therefore construe capital simply as an economic source of income - that is, as a revenue stream. When such thinkers became aware of severe ecological damage in the 1970s and 1980s, it made sense for them to point out the analogy between the resource streams derived from natural stocks and the benefit streams derived from human-made stocks such as machines and factories. That is, they noted that nature is *like* capital, and that, just as we must protect capital from diminution, we must protect nature from depletion and degradation. "Natural capital" was therefore used originally as a metaphor. It tied something most people were unaware of - ecological degradation - to something that was widely appreciated - the need to avoid reducing a stock of money or productive assets. In Daly's words, the term was used to "call attention" to troubling but largely unacknowledged facts.

As a metaphor, "natural capital" gets mixed grades. On the positive side, it is clearly true that the term has helped sound the alarm on our ecological predicament. It is an effective analogy that has likely drawn millions of people to the cause of environmental protection. When I questioned a knowledgeable environmentalist about his use of "natural capital," he replied, "What term would you substitute for it that would function as well? In other words, what equally concise and evocative language would you use?"¹⁶ When the term is used metaphorically, this response captures an important truth. On the negative side, the roots of "natural capital" in a skewed definition of "capital" has deepened the widespread confusion about our economic system. Certain aspects of this system now threaten our civilization. The consequences of this distortion are thus becoming increasingly serious as time marches on.

Although a reasonable case can be made for the claim that nature is *like* capital, there is no logical basis for claiming that nature *is* capital. The first claim simply indicates that similarities exist between the two categories, implying that they remain conceptually distinct. The second, however, asserts that nature and capital belong in the same category, which implies that they are conceptually alike. But nature and capital are fundamentally different: capital is produced by labor, whereas nature is not. The production of capital causes injury, disease, and death to human beings. The "production" of nature has no such consequences. If we lump nature in with capital, there is no coherent way to talk about capital's cost of production. And if we can't talk about cost coherently, we have abandoned economic rationality altogether.

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Given the sharp distinction between nature and capital, the question must be asked: Why did ecological economics convert an effective metaphor into an untenable concept? A likely reason is that it needed concepts rather than metaphors to establish itself as an academic field of study. It's fine for popular writers to use an analogy for persuasive or explanatory purposes, but this won't do for academic papers and doctoral dissertations. Another reason may be that, by using "capital" in its distorted form, ecological economists signaled its ideological alliance with those who held positions of power in universities and beyond.

But there are significant downsides to treating "natural capital" as a concept. If nature is a type of capital, then it is difficult to rebut the pernicious argument by standard economics that nature can be destroyed without limit so long as the increase in knowledge ("human capital"), buildings, machines, etc. compensates for this loss. That is, it is difficult to support the correct claim by ecological economists that we should strive for "strong sustainability" rather than "weak sustainability". Treating nature as capital also encourages analysts to "value" nature - that is, to put a price tag on it. A well-known example is the 1997 study that "valued" the earth's natural capital at an average of US\$33 trillion per year.¹⁷ The pitfall is obvious: if we can somehow create knowledge, buildings, and machines at the average rate of US\$34 trillion per year while wiping out all of nature, we should rationally proceed. This is of course impossible in the practical sense, but the conceptual hole is left wide open.

A mystery remains: why did progressive analysts extend the meaning of "capital" even beyond the natural realm to include social and other non-economic benefits? Unfortunately, the analysts themselves are vague in their justifications. For example, the editors of *Real-Life Economics* state that, "... most human situations have four dimensions - economic, social, ethical, and ecological ...". On this basis, "... a new model of wealth creation is constructed, entailing the combination of four kinds of capital ...".¹⁸ But nowhere do they explain why four *dimensions* of human life should be translated into four kinds of *capital*.

Richard Douthwaite is somewhat more forthcoming in *The Growth Delusion*. He introduces twelve factors that are important to the quality of our lives and then says that it is "enlightening" to consider these as the income from four kinds of capital. He explains this by applying the four-capital model to his definition of sustainability, which is to maintain the "total value" of the four capitals over time. However, "value" is left undefined, and Douthwaite admits that the model cannot resolve trade-offs between two kinds of capital. But if the four-capital model offers no analytical assistance relating to its central purpose, it can only be a heuristic device - a reminder that, to achieve sustainable well-being, we must pay attention to human skills, physical factors of production, social cohesion, and environmental integrity. This reminder is certainly needed, but the term "capital" should not be used to provide it.

To this point, "capital" has been used as a mystified concept - one that obscures and distorts capitalism's systemic realities. As stated, this distortion is achieved by applying the word to factors of production in any economic system, at any point in history. This usage removes the specific characteristics of capitalism from view, making it virtually impossible to critically analyze the economic formation that now dominates our world.

The true nature of capital is beyond the scope of this article, but whatever it really is, it is intimately connected to capitalism's logic and the system's inextinguishable thirst for growth.

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Capital is therefore a critical factor in the system's destructive ecological impact. Unless we acknowledge this linkage, we will be unable to formulate an appropriate strategy to transform capitalism and thus to shift our civilization onto a sustainable path.

To minimize the various confusions cited above, I offer the following suggestions with regard to our terminology:

"Natural capital" as a metaphor has provided useful service in the past, and can still be effective today. However, it should be restricted to situations where raising awareness is more important than conceptual clarity, and where its metaphorical intent is clearly indicated.

"Natural capital" as a concept is incoherent and thus indefensible. It is also unnecessary. The term does not appear in the work of E.O. Wilson, Richard Heinberg, Bill McKibben, or James Lovelock. When Lester Brown discusses the ecological footprint, he refers to "natural assets" rather than "natural capital".¹⁹ It is clear that, with some effort, the term can be avoided, much as we now avoid using "man" for "humankind" to combat sexism.

Finally, using "capital" as a broad category that includes various sources of well-being is a flagrant misuse of the concept and should be strictly avoided. Analysts can instead refer to wealth factors, components of well-being, or other alternatives that can be readily formulated. There is only one capital, and it resides at the heart of capitalism.

Notes

¹ Juan Martinez-Alier, *Ecological Economics: Energy, Environment, and Society* (Oxford: Basil Blackwell Ltd., 1987), 71 re. Eduard Sacher and 97 re. Patrick Geddes.

² *Ibid.*, 161.

³ Frederick Soddy, *Cartesian Economics: The Bearing of Physical Science upon State Stewardship* (London: Hendersons, 1922), 10, 12.

⁴ Nicholas Georgescu-Roegen, *The Entropy Law and the Economic Process* (Cambridge: Harvard University Press, 1971), 303.

⁵ E.F. Schumacher, *Small is Beautiful: Economics as if People Mattered* (New York: Harper & Row, 1973), 15.

⁶ Herman E. Daly, *Steady-State Economics* (Washington: Island Press, 1991), 249. Essay published in 1988.

⁷ *Ibid.*, 250.

⁸ *Ibid.*, 259. Italics in the original.

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- ⁹ Herman E. Daly and John B. Cobb, Jr., *For the Common Good: Redirecting the Economy Toward Community, the Environment, and a Sustainable Future* (Boston: Beacon Press, 1989), 72.
- ¹⁰ Herman E. Daly and Joshua Farley, *Ecological Economics* (Washington: Island Press), 17.
- ¹¹ Paul Hawken, Amory Lovins, and L. Hunter Lovins, *Natural Capitalism: Creating the Next Industrial Revolution* (New York: Little, Brown, 1999), 2.
- ¹² Richard Douthwaite, *The Growth Illusion* (Gabriola Island: New Society Publishers, 1992), 304.
- ¹³ Paul Ekins and Manfred Max-Neef, editors, *Real-Life Economics: Understanding Wealth Creation* (London: Routledge, 1992), 149. This is from an essay by Paul Ekins, who identifies the four types of capital as human, physically produced, social/organizational, and environmental. In their concluding chapter, the editors call this scheme one of the book's "main ideas" (425). For more on this topic, do a web search on "four-capital model".
- ¹⁴ David W. Pearce, editor, *The MIT Dictionary of Modern Economics, Third Edition* (Cambridge: The MIT Press).
- ¹⁵ Robert L. Heilbroner, *The Nature and Logic of Capitalism* (New York: W.W. Norton, 1985), 35. The following analogy might be helpful in understanding the distortion involved: All construction uses building materials. In modern office construction, steel is used. Hence (erroneously), the term "steel" can be applied to all building materials, past and present. This is parallel to: All economies use factors of production. Modern (capitalist) economies use capital. Hence (erroneously), the term "capital" can be applied to all economies, past and present.
- ¹⁶ David Delaney, member of the Canadian Association for the Club of Rome (CACOR): personal communication with the author. I would like to thank David for reviewing and criticizing a draft of this article.
- ¹⁷ Robert Costanza et al., "The value of the world's ecosystem services and natural capital," *Nature* 387, 253 - 260 (15 May 1997).
- ¹⁸ *Real-Life Economics*, xix.
- ¹⁹ Lester Brown, *Plan B 3.0: Mobilizing to Save Civilization* (New York: W.W. Norton, 2008), 11.