

The Preanalytic Visions of Environmental Economics and Ecological Economics in Investigating Biodiversity Preservation

Dr. David Martin
Professor of Economics
Davidson College
DaMartin@ davidson.edu
www.davidson.edu/academic/economics/martin/

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Abstract

The purpose of this paper is to investigate the differences between the perspectives (preanalytic visions) of neoclassical environmental and natural resource economics and ecological economics when investigating the issue of preserving biodiversity. Since (in some senses) neoclassical economics is a subset of ecological economics, one would expect the two social sciences to have similar perspectives leading to similar conclusions. But, if the two versions of economic analysis ask different questions and lead to different conclusions, then the consumers of economic advice, both policy makers and the everyday citizen, need to carefully consider the source of that advice.

As will be argued here, the broader perspective of ecological economics leads it to define the value of biodiversity very differently than the neoclassical economics does and it must include cultural elements that a neoclassical economist would consider less relevant. In Section 2, I briefly review the current status of biodiversity preservation and introduce the concept of preanalytic vision. In Section 3, I discuss the preanalytic vision used by neoclassical economics to investigate biodiversity preservation. In Section 4, I compare and contrast that preanalytic vision to the preanalytic vision of ecological economics. I conclude the paper in Section 5 by developing the appropriate implications for policy makers and the everyday citizen.

The Preanalytic Visions of Environmental Economics and Ecological Economics in Investigating Biodiversity Preservation

1. Introduction

The “big picture” question that this paper takes only a small step towards answering is: how important is income as a factor in promoting the preservation of biodiversity? As a caricature of reality, one might argue that economists promote the notion that as a society’s income rises it will naturally demand more goods and services, including biodiversity. Continuing with that caricature, policy makers should focus on economic development because biodiversity preservation will naturally accompany that income growth. The other straw man in this caricature would be the humanist who argues that a preservation ethic can only develop independently of income. If that were the case, then policy makers should concentrate on educational programs that instruct people, especially the children, in ethics that would help them as individuals make decisions that preserve biodiversity.

The narrow purpose of this paper is to investigate the difference between the perspectives (preanalytic visions) of neoclassical environmental and natural resource economics and ecological economics when investigating the issue of preserving biodiversity. Since (in some senses) neoclassical economics is a subset of ecological economics, one would expect the two social sciences to have similar perspectives leading to similar conclusions. But, if the two versions of economic analysis ask different questions and lead to different conclusions, then the consumers of economic advice, both policy makers and the everyday citizen, need to carefully consider the source of that advice.

To presume that there is unity of conclusions among neoclassical economics¹ or ecological economists is as silly as it is to assume that there is a unity of opinions within any academic discipline. But, policy makers and citizens do use economists to rank choices they must make between good and valuable projects competing for scarce resources. For example, not only do different biodiversity preservation projects compete with each other but biodiversity protection competes with health care, education, and welfare programs for the limited governmental resources. The importance of this paper lies in understanding how an ecological economist gives very different advice than the economist with the very similar title of environmental and natural resource economist. As will be argued here, the broader perspective of ecological economics leads it to define the value of biodiversity very differently than the neoclassical economics does and it must include cultural elements that a neoclassical economist would consider less relevant. So, the root cause of the different advice is the different starting points of the analyses, the different preanalytic visions, and to sort the good advice from the chaff the consumer of the advice must understand those different perspectives.

In Section 2, I briefly review the current status of biodiversity preservation and introduce the concept of preanalytic vision. In Section 3, I discuss the preanalytic vision used by neoclassical economics to investigate biodiversity preservation. In Section 4, I compare and

¹ Is there anyone who hasn’t heard the joke about the king requesting a one-armed economist so that he wouldn’t have to hear, “But, on the other hand ...”?

contrast that preanalytic vision to the preanalytic vision of ecological economics. I conclude the paper in Section 5 by developing the appropriate implications for policy makers and the everyday citizen.

2. The current status of biodiversity and introducing preanalytic vision

It is important to begin by noting that this analysis focuses upon terrestrial biodiversity preservation. Although aquatic biodiversity issues are important, the open access nature of many of the world's aquatic ecosystems creates important policy difficulties and, frankly, less is known about aquatic biodiversity than the little is known about terrestrial biodiversity (Grafton, *et al.* 2005; Gudmundsson and Sutinen 1998). For simplicity, I ignore aquatic biodiversity here.

For concreteness and to minimize bias, I use The Biodiversity Project's definition of biodiversity (undated):

Biodiversity can be expressed or measured in four different ways:

- Genetic variability within a species.
- Diversity of populations of a species. This is measured in both the number of individuals within a local group and the distribution of a species' geographic range.
- Diversity of species within a natural community. This means the variety of different species in a particular habitat area.
- A wide array of natural communities and ecosystems throughout the world.

From an anthropocentric perspective, biodiversity is a public good; it is non-excludable (no one person can exclude someone else from using biodiversity to produce something) and non-rival (no one person's use of biodiversity diminishes its value for someone else as long as that use does not deplete the stock of biodiversity). Assuming that we can differentiate the *use* of biodiversity from its *depletion*, society does not need to worry about the use of biodiversity as it is quite literally freely provided to us and, as a public good, we all can use it freely.

Yet, it is reasonable to conclude that biodiversity is being depleted. Using just one current example to make that point, Ricketts, *et al.* identified "794 species distributed among 595 sites that are likely to become extinct unless *immediate and direct action is taken*," (2005, pp. 18498-18499, emphasis added) three times the number of extinctions since 1500 (245 species). Naturally, prioritizing these different geographic regions is a difficult task. For example, Brooks *et al.* recently synthesized nine different prioritization templates by dividing them into two categories: reactive approaches that prioritize high vulnerability combined with high irreplaceability, such as the Western Ghats of India, and proactive approaches that prioritize low vulnerability with high irreplaceability, such as the rainforests of Amazonia, the Congo, and New Guinea (2006).

Once the priorities have been identified on a scientific basis, difficult choices between policy options remain. Two key constraints to policy choices are the sources and amounts of financial support available for biodiversity preservation. Brooks *et al.* note that approximately \$5.4 billion of annual conservation funding originates in and is spent within the developed

countries, leaving only \$.6 billion of annual conservation funding available for the developing world (2006, p. 58). While it does make sense for the developed countries to pay for biodiversity preservation projects in developing countries (Ferraro and Kiss, 2002; Swart, 2003; Ferraro and Kiss 2003) even given concerns about potential confounding effects of local land markets (Armsworth, *et al.*, 2006) and the impacts of such spending upon poverty reduction (Adams, *et al.*, 2004), such concerns would be mitigated if developing countries themselves were in a position to finance more biodiversity protection.

If the caricature view of economics is correct and economic development would naturally lead to more spending on biodiversity preservation, then the question of the role of income in determining biodiversity preservation would be a simple empirical exercise. That is, the issue would be reduced to the question, will the developing countries gain wealth fast enough to preserve the relevant biodiversity from depletion? It is still an important question, but a very different question than, say, does a society need to develop a conservation ethic or a preservation ethic before it will preserve biodiversity?

As with all caricatures, elements of truth combine with elements of distortion to create a certain view of reality; but to appreciate that reality the viewer needs to understand the artist's perspective. In the same way, to understand the economic prescription – wait for income to grow – one needs to understand the fundamental perspectives underlying the social science of economics. Such fundamental perspectives combine to create the preanalytic vision; from it flow the analyses and the policy conclusions. Two analyses using the same tools but starting with different preanalytic visions will arrive at different conclusions.

In the following quote from *Desert Solitaire*, when Edward Abbey is walking down the road with the flashlight on he is using one preanalytic vision while walking down the same road with the natural light he is using a second preanalytic vision.

Letting [the fire] die, I take my walking stick and go for a stroll down the road into the thickening darkness. I have a flashlight with me but will not use it unless I hear some sign of animal life worthy of investigation. The flashlight, or electrical torch as the English call it, is a useful instrument in certain situations but I can see the road well enough without it. Better, in fact.

There's another disadvantage to the use of the flashlight: like many other mechanical gadgets it tends to separate a man from the world around him. If I switch it on my eyes adapt to it and I can see only the small pool of light which it makes in front of me; I am isolated. Leaving the flashlight in my pocket where it belongs, I remain a part of the environment I walk through and my vision though limited has no sharp or definite boundary. (1968, p. 14)

Abbey will see the same world down that road very differently. For us to understand his report of what he sees and what he doesn't see, we need to understand both whether he has the flashlight switched on and why he prefers to leave it off. Both elements combine to make his preanalytic vision; they determine what he will tell us about the world down that road.

Herman Daly has often compared the preanalytic vision of modern neoclassical

economics, which includes the sub-discipline of environmental and natural resource economics, to the preanalytic vision of ecological economics (see Chapter 2 in Daly and Farley, 2004). In this paper I follow Daly's lead in comparing the two preanalytic visions but dig more deeply into the competing visions for the specific case of biodiversity preservation. By focusing on the roots of the two paradigms, I will be able to compare and contrast the competing policy recommendations more effectively.

3. The preanalytic vision of neoclassical economics

The preanalytic vision of neoclassical economics is not nearly as impractical as Gowdy and Erickson imply by saying that it makes every human "irrational" and every firm and market "imperfect" (2005, p.18). Still, it is a very limited perspective of human behavior. I will discuss three pillars of that preanalytic vision – (1) decision making, (2) circular flow, and (3) substitution – as well as some aspects of each pillar.

As the first pillar of the preanalytic vision, neoclassical economics does assume that *Homo economicus* makes a decision to maximize her own individual welfare subject to both her income constraint and the limited information that she has consumed. Of many important aspects related to such decision making, I would like to stress four. First, because no one else can tell her what she ought to value, individual liberty is maximized. Second and related to this point, individuals may choose the extent to which they are ethical; a person may indeed maximize her own individual welfare by making decisions that improve society as a whole. The same perspective on individual liberty that allows an economist to think of a person to be purely selfish allows us to think about a person as being purely selfless. That means that even if she completely understands the value of biodiversity *Homo economicus* has the right to choose how much she values it; no authority should tell her that she must sacrifice some of her own income to protect biodiversity if she doesn't want to do so.

The third aspect of decision making for a neoclassical economist is that "things" can enter or leave her decision calculus as income, tastes, and information change. This aspect of decision making is the source of the debate about the role of income in biodiversity preservation. As her income increases, *Homo economicus* can choose to buy more of the goods and services that she has been consuming already and she will be able to buy goods and service that she couldn't afford before. Neoclassical economists typically add another assumption at this point, which lead to the much discussed *Environmental Kuznets Curve* (see, for example, Hanley, Shogren, and White, 2001, 129-133). At the very beginning of a society's development, it is a poor agrarian society so its people are forced by the needs of survival to live close to the land and to maintain environmental quality. As the society develops economically, the people can afford to purchase goods and services that do degrade the environment so they choose to consider them and choose not to consider some environmentally responsible behaviors associated with their previous poorer lifestyle. The assumption is that only after some substantial income growth can people afford to consider "environmentally clean" goods and services. So, as income grows, people buy these "clean" goods and services and environmental degradation decreases. Applying these assumptions to the case of biodiversity, we see that early in a society's economic development the people naturally choose consumption patterns that

deplete biodiversity and that only after income reaches a certain threshold do people feel rich enough to afford to preserve biodiversity. This aspect directly leads to the economic policy prescription mentioned in the introduction: the best policy to protect biodiversity is to ensure that peoples' incomes are high enough that they choose to pay for it.

The fourth aspect of decision making is that neoclassical economists assume that goods and service consumed in the future are worth less than those same goods and service consumed today. In simple examples, this assumption leads to basic and noncontroversial conclusions about saving and investment. In the cases of both renewable and nonrenewable natural resources however, this assumption (in combination with the other two pillars of the preanalytic vision discussed below) leads neoclassical economists to conclude that there is an optimal depletion rate (see, for example, Hartwick and Olewiler, 1998). That is, society should use natural resources today as investments that improve society; in principle the payoffs from those investments will lead to an economic status that does not require those natural resources in the future. In the case biodiversity preservation, an environmental and natural resource economist could be very comfortable with the conclusion that it is appropriate for the current generation to deplete some aspect of biodiversity completely if the resulting investments are productive, not wasteful (Solow, 1991).

The second pillar of the preanalytic vision of neoclassical economics is the circular flow that links economic entities: consumers demand goods and services from businesses who, in turn, demand the labor and savings of households in order to supply the goods and services. Two aspects of this pillar are especially important. First, given that it assumes that the value of savings must equal the value of investments, neoclassical economists can develop rules that guide governments towards savings and investments patterns to achieve optimal economic growth (see, for example, Chapter 10 in Hess and Ross, 1997). Since natural resource use is treated as an investment, the rules that define optimal natural resource depletion including biodiversity depletion are very similar conceptually to these rules. Second, that circular flow occurs within a very limited scope – from households to businesses and back to households, with government acting in the background. As this aspect is crucial to the distinction between neoclassical economics and ecological economics, I will defer discussing it until later.

The third pillar of the preanalytic vision concerns the role of substitutes (Solow, 1991). Neoclassical economics assumes many different goods and services can satisfy a single desire of *Homo economicus* and that she will choose the best one. Similarly, neoclassical economics assume that many different inputs can be used to produce any single good or service and the business will choose the best one.

The basic neoclassical economic policies with respect biodiversity depletion follow from those three pillars of the preanalytic vision. Let me summarize those policy conclusions with four statements. First, biodiversity should not be treated differently than any other good or service since people have the right to value it as they wish and because there are substitutes for it. Second, as society crosses a certain income threshold, it will begin to preserve biodiversity as part of its demand for environmentally clean goods and services. Third, society can deplete biodiversity today because the investments it undertakes with its savings and with the depleted biodiversity will lead to the creation of substitutes for the depleted biodiversity. Finally, because

people do value consumption today more than consumption in the future, a society should deplete the natural biodiversity today and require the future to use the existing and to-be-developed substitutes.

It is no surprise that many policy makers and citizens wonder how some neoclassical economists can call themselves “environmental and natural resource economics” when they prescribe the depletion rather than the preservation of the ecosystem. My point is simply that these conclusions flow from the preanalytic vision of the discipline, not from any illogical twist or turn. As I will discuss below, ecological economics takes these VERY SAME assumptions but adjusts its preanalytic vision in a way that allows it to earn its name.

4. The preanalytic vision of ecological economics

To understand the preanalytic vision of ecological economics simply, think of a three-legged stool. The first leg is the very same neoclassical economics described earlier, but the stool is incomplete without the other two legs.

The second leg is scale. Daly (Daley and Farley, 2004) often refers to the Plimsoll line of a boat to describe this leg. The Plimsoll line is the line on any boat or ship that measures when it is fully loaded. If the boat is loaded so heavily that the Plimsoll line is not visible, then the boat will sink. Neoclassical economics is concerned with whether the weight on the boat is distributed evenly: too much to the left, too much to the right, too much to the front, or too much to the back and the boat will capsize. Neoclassical economics will allow the boat to take on more and more weight as long as the weight is distributed evenly, so the boat can sink optimally!

The third leg is distribution. Neoclassical economists are professionally agnostic about the appropriate distribution of income across a society or many societies at one point in time or across different points in time. Ecological economists are not agnostic, but at that same time they are not authoritarian. Further, their focus is qualitative not quantitative; they want to improve peoples’ welfare not their income so having better goods and services can be as valuable as having more goods and services (Daly, 1991).

The point of describing ecological economics as a three-legged stool is that it should be clear that even with the basic assumptions of neoclassical economics as part of its foundation, ecological economics is much broader than environmental and natural resource economics. It cannot lead to the same policy prescriptions with respect to biodiversity. Depleting biodiversity today affects the sizes of both the natural ecosystem and the man-made economy; the growing economy might become too heavy to be supported by the shrinking natural ecosystem. Depleting biodiversity today, especially in the developing countries where it is so rich, affects the distribution of peoples’ welfare across time and place; these patterns might lead to the collapse of societies in certain locales and/or in certain times.

As mentioned in the previous section of the paper, the circular flow perceived by neoclassical economics is essentially limited to the flows from households to businesses and back. Instead and crucially, the preanalytic vision of ecological economics conceives of the

man-made economy being one part of a larger whole. Humans interact with other humans both within and as part of the larger ecosystem whole.

In part, the ecosystem supports and sustains human economic activity, so ecological economists must assume that humans do value it (Costanza, *et al.*, 1997). Even if a human can't put an economic price on the ecosystem for her own anthropogenic purposes, because she can put an economic price on goods and services she can indirectly value the ecosystem. Further, even though some activities within the ecosystem are beyond the understanding or direct experience of humans, ecological economists will assume that people should value those activities somehow because the ecosystem is so fundamental to human existence.

Remember that the neoclassical environmental and natural resource economist assumes that *Homo economicus* has the choice of whether to value the ecosystem or not. Starting from the preanalytic vision of the ecological economist, humans must value the ecosystem and so value biodiversity. Therefore, policy designed from an ecological economics perspective will necessarily treat biodiversity as a more valuable asset than will the neoclassical economist. One might even argue that while the limit to value for a neoclassical economist is economic income – so the use of biodiversity in one time period can never be worth more than society's income in that period – the ecological economist is not constrained by this limit. The value of biodiversity is not determined by the small box that is the human economy; rather, it is determined in part by the workings of that small box and in part by its intrinsic value within the larger ecosystem.

Further, because ecological economists are interested in economic welfare, not financial income, all aspects of welfare become relevant for the analysis. In particular, the qualitative aspects of human welfare include cultural components. Places that are sacred, knowledge that is passed down from generation to generation, and community practices are all examples of human interaction with biodiversity that people do value. These anthropogenic relationships with nature are part of biodiversity's value that must be incorporated into policy.

5. Biodiversity policy from an ecological economics preanalytic vision

Whereas a neoclassical economist must treat biodiversity like any good or service, the different preanalytic vision forces the ecological economist to treat biodiversity differently than other goods or services. Therefore, biodiversity policy is also different from the ecological economics perspective than from the perspective of environmental and natural resource economics. Four main differences distinguish the two disciplines.

First, consider an otherwise socially appropriate benefit-cost analysis underlying the decision about whether or not to deplete some aspect of biodiversity. That depletion takes something – perhaps something that we don't know how to describe or directly relate to human activity – from the ecosystem. That loss will be evaluated as greater by the ecological economist than by the neoclassical economist; therefore, the offsetting benefits must be correspondingly greater for the ecological economist to agree to the depletion than for the neoclassical economist.

Second, the issue of the lack of substitutability for natural biodiversity must be accounted

for instead of assuming that other goods can or will substitute for it. Ecologists speak of weak sustainability in which some substitution across human capital and natural capital exists, such as the way that a tree plantation might substitute for a natural forest. Ecologists also speak of strong sustainability in which human capital can't substitute for natural capital, in the same way that a tree plantation does not replace the natural forest. It is not clear where biodiversity falls on that weak-strong sustainability scale, but any movement from the weak towards the strong side of that scale speaks to less substitutability than the traditional neoclassical economist assumes. That characteristic of biodiversity will force the ecological economist to value it more highly than the environmental and natural resource economist, perhaps as high as irreplaceable.

Third, the environmental ethic is as important to develop as is a society's income so that the "difficult to quantify" and the "difficult to see the linkage to human activity" won't be summarily valued as zero. Once people begin to recognize the value of the ecosystem (even if not in monetary terms) even the poorest people will choose to preserve some biodiversity of their own accord and support costly protection policies. Governments should begin to preserve cultural practices that promote biodiversity preservation and educate its citizens about the value of biodiversity. Society does not need to wait for its income to cross a threshold.

Fourth, society should not require that the future use to-be-developed substitutes instead of the natural biodiversity used today. Yes, whenever biodiversity is depleted it should be used in a manner that is consistent with investment to build a better future. But, given the likely limited capability of human-made capital to substitute for natural biodiversity, requiring the future to use human-made capital is not equitable.

The purpose of this paper was to investigate the differences between the perspectives (preanalytic visions) of neoclassical environmental and natural resource economics and ecological economics when investigating the issue of preserving biodiversity. Even though neoclassical economics is a subset of ecological economics, the two versions of economic analysis start from different preanalytic visions. So both policy makers and the everyday citizen need to carefully consider the limited perspective of the neoclassical economist before choosing it over the broader perspective of the ecological economist.

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