THE NONMARKET BENEFITS OF NATURE

WHAT SHOULD BE COUNTED IN GREEN GDP?

By James W. Boyd

To estimate the value of goods and services in an economy and track its growth, countries use various measures of national income and output. The most visible and influential of the national accounts is gross domestic product (GDP), a measure of the total value of final goods and services produced within a country in a given period. Although GDP captures only a part of what is important about an economy, it deserves a special status because it represents a significant bottom line: how much the market economy produces and what it is worth.

For years, both environmentalists and economists have called for a "green GDP" that measures what is valuable about nature, excluding goods and services that are already captured in GDP, such as nature's contributions to commercial harvests and other products. This approach has been advanced by the director of Sweden's Beijer Institute, Karl-Göran Mäler, and others in the early 1990s and has attracted the interest of governments around the world. More recently, RFF researcher Spencer Banzhaf and I have been using economic principles to define ecological units of account. These have a wide variety of applications, including strategic planning, government performance assessment, transfer of environmental benefit estimates, and green GDP accounting.

Why measure green GDP? For environmentalists, well-being provided by nature is as important as well-being provided by market consumption. Societies should be able to see how market consumption affects the consumption of public goods like beautiful views, clean air, and clean water. Another reason to measure green GDP is to track the provision of nature's benefits over time, either to hold governments accountable or to compare their environmental conditions with those of another country. Economists want society to articulate tradeoffs, measure performance, and maximize social well-being. These tasks are impossible to achieve when nature's contribution to human welfare is not measured.

However, measuring the benefits that arise from public goods provided by nature is no small task. Indeed, just this May, China announced that it was scrapping a two-year effort to develop a green GDP index, citing problems of calculation; instead, it will focus on a method of green accounting to be presented alongside gross domestic product. And as the United Nations notes in its 2003 publication, *Handbook of National Accounting*, "there is no consensus on how 'green GDP' can be calculated and, in fact, still less consensus on whether it should be attempted at all."

Despite its difficulties, I argue that the calculation of a green GDP can and should be attempted. The benefits of nature are too important and too large to be "left off the table" of national accounting. The real difficulties should not distract from the practical steps that can begin immediately. One reason that these steps have not been clarified is that economists

have not previously integrated principles from accounting economics with those from environmental economics. I use both ecological and economic theory to describe what should—and should not—be counted by green GDP.

Making Green Accounting More Precise

GDP counts units in the market economy—cars, houses, legal services, loaves of bread, and so on. Unfortunately, nature does not come prepackaged in this way. So what should green GDP count?

GDP and its green counterpart must first count what is enjoyed or consumed. GDP measures two basic things: quantities of goods and services, and the prices of those goods and services. We need similar clues to the natural economy. When the beneficial aspects of nature are counted, nature's contributions to welfare can be much better described.

Nature offers plenty of features to count. Indeed, this abundance is part of the problem. To date, ecology, environmental economics, and the growing field of green accounting have failed to provide adequate guidance on what in nature should be counted as defensible measures of nature's services. This imprecision is a result of the failure to use ecological and economic theory to define services.

Terminology is a big part of the problem. Ecology and economics talk about ecosystem components, processes, functions, and services—and often in different ways. An important first step toward practical welfare accounting units is concrete guidance on what to count and why. To account for nature's benefits, the most important definition is that of ecosystem services. They are the appropriate units of account.

What Are Ecosystem Services?

The term "services" originates in economics but has been adopted in ecology to signify the connection between ecosystems and human well-being. Ecosystem services arise from—and depend on—the broader sets of ecological components, processes, and functions but are different: they are the aspects of the ecosystem that society uses, consumes, or enjoys to experience those benefits. Five principles guide the definition.

First, services are nature's end products, not everything in nature. When GDP is measured, it counts cars, not tires, the factory, the workers, leather, paint, or steel (although those things are counted in other kinds of national accounts). Why is this? Because the value of the car *embodies the value of all its inputs.* If we counted and valued the individual inputs, we would be double-counting their value. Similarly, we needn't count everything in nature. We only have to count what matters directly to people.

The second principle, that ecosystem services are benefit-specific, flows from the first. For example, a given natural characteristic can simultaneously be an end product and an intermediate product. Accordingly, that characteristic can simultaneously be counted and not counted by green GDP. For example, wetlands should be counted as services associated with flood protection because they directly protect against floods and are substitutes for constructed flood control. However, wetlands should not be counted as services for the water quality benefits they provide. The water quality itself should be counted because that is what people directly value. To be clear: the wetland is valuable in both cases but only needs to be counted in one.

Similarly, units of tomatoes, onions, lettuce, and ground beef are counted by GDP if sold in stores as final products; they are not counted when combined and sold together on a bun as a restaurant hamburger.

Wetlands should not be counted as services for the water quality benefits they provide—the water quality itself should be counted because that is what people directly value.

Similarly, tomatoes, onions, lettuce, and ground beef are counted as GDP if sold in stores as final products, but they are not counted when combined and sold together on a bun as a hamburger.

The third principle is a practical one. GDP's dirty little secret is that it counts what we can count, not what we should count. Consider again a car. GDP counts cars because they are things and therefore easy to count. Perhaps what we should count is "the satisfaction or utility of owning a car" or "sex appeal." But this is impractical. To place ecosystem services on an equal footing with market goods, we need to count things that can be practically measured and that have concrete meaning to people.

Fourth, ecosystem services should be ecological. This sounds obvious but reflects another terminology issue. Economists and others will often say, "Recreation is an ecosystem service." But recreation is more properly thought of as a benefit that arises when people combine inputs, including time, human resources (skill), capital (equipment such as boats, boots, and binoculars), and things in nature. Ecosystem services are the things in nature that make recreation possible or pleasurable, not the recreation itself. Once ecosystem services are combined with other inputs, such as human resources and capital, they cease to be identifiably ecological.

Finally, ecosystem services should be counted with the greatest possible spatial and temporal resolution. Individuals benefit from water quality and availability in particular places at particular times. To say that a trillion acre-feet of clean water are available nationally every year is meaningless. What matters is where and when the water is available. For example, the value of water for recreation depends largely on where that water is, in a scenic canyon or an irrigation canal. And clearly, the timing of water flows is crucial for irrigation, drinking water, and recreation.

Standardizing What We Count


LYNN SCARLETT

In late May, a workshop at RFF drew nearly three dozen experts from federal agencies, major environmental and conservation NGOs, and academia to discuss an idea vital to environmental progress: practical ways to count nature's benefits.

"All the environmental laws in the world won't matter if we can't measure what we've achieved—or failed to achieve," said RFF Senior Fellow James Boyd, who organized the workshop. "Nature presents us with an infinite number of things to count. Without principles to guide what should be counted, the result can be chaos, confusion, and paralysis. The public needs a clearer way to keep track of gains and losses in the benefits we receive from nature."

Participants debated alternatives and the desirability of standardizing environmental accounting practices. The workshop, funded by EPA's National Center for Environmental Economics, represents an outgrowth of Boyd's work on practical measurement of ecosystem services, which encompass the benefits of nature to households, communities, and economies. It was held off the record to encourage a free exchange of ideas and concerns about challenges at the participants' respective agencies and organizations.

"Our ultimate goal is to provide a standardized definition and measures of ecosystem services that facilitate performance assessment," Boyd said. Reporting anecdotes and success stories is no longer enough for donors who want to see evidence of a return on their investment, said one participant. The same holds true for government trustees of nature. Are their decisions improving our well-being or not?

Some participants felt that the demand for different kinds of information makes standardization impractical. Metrics need to emerge from where decisions are made: "who is at the negotiating table is what matters," said one participant.

Then-acting Interior Secretary Lynn Scarlett kicked off the workshop by reminding the participants to pay close attention to semantics and context as they deliberated.

Economists have been using all manner of tools, such as contingent valuation to find, check, and calculate environmental benefits, Scarlett said. "But I'm a little worried that value outside of the context of actual bidding in the marketplace is acutely subject to the assumptions used."

However, three things are certain, she said. First, the effects of environmental transformations are not always, or even perhaps often well considered in decisions. Second, the benefits from drawing upon nature's capital in investment and policy choices, and private decisions, are still frequently overlooked. And third, "the results of our environmental policy actions are too often neglected, as success is measured only by the processes we have in place rather than the actual outcomes achieved."

This perspective differs from that expressed in the *Handbook of National Accounting*, which states that "it is not generally the components of ecosystems that benefit humans, but the systems as a whole." Surely, the entire system is necessary, but so is the entire conventional market system. We only get at the value of the system, however, by counting its components. Aggregation can be meaningful only if it is "built up" from spatially and temporally distinct units.

Role of Ecology

For decades, economists and ecologists have sought a consistent point of contact between their analytical realms. As defined above, ecosystem services provide this link. Economics has dominion over what should be counted if one wants to measure the benefits of nature. But ecology has dominion over the study of changes in services over time.

If one measures nature's value at only one point in time, then a great deal of ecological sophistication is not needed. One simply counts observable features, such as air, soil, water quality, land cover types, and species populations. As envisioned here, green GDP also allows period-to-period comparison of the quantity of ecosystem services over time (for example, has a particular government presided over an increase or decrease in ecosystem services?). Degradation or enhancement of services can be directly measured and reflected in the year's green GDP numbers.

However, green GDP can—and should—aspire to more than this. In particular, it can be used to assess welfare losses arising from overconsumption—that is, borrowing from the future to consume today.

Consider two human activities: commercial fishing and energy production. Both generate consumption (seafood and energy, respectively) that is reflected in GDP as a positive contribution to welfare. One reason to calculate green GDP is to reveal the effect of current consumption on future well-being. Unfortunately, economists have little ability to make such predictions in the ecological realm. If green GDP is to incorporate adjustments for resource depletion—and it should—then only biophysical science will be capable of substantiating those adjustments.

To say that a trillion acre-feet of clean water are available nationally every year is meaningless. What matters is where and when the water is available.

Conclusion: A Note about Prices

What about prices, the other core aspect of a welfare index? By their very nature, environmental public goods lack the prices that are used to weight outputs in GDP. Indeed, the problem of missing prices spawned and continues to occupy an entire field of economics. It has also led many environmental accounting advocates to despair. To be sure, attaching weights (virtual prices) to environmental public goods is a significant challenge. But a more significant hurdle is deriving those weights without the benefit of consistently defined units of account. Defining units is a crucial step that environmental economists have largely neglected.

For several reasons, then, welfare-based accounting for environmental goods must begin with defensible definitions of the units to be counted. First, keeping track of these units (without prices) yields useful information. It is better to know how many cars and trucks are produced each year than to not know at all. The same is true for environmental public goods. Second, the missing price problem can be systematically addressed only if the units to which virtual prices are attached are consistently defined. Third, assigning prices to nature is controversial for philosophical and political reasons. Focusing on the quantities part of the problem avoids distraction by those debates and resistance to "putting price tags on nature." If green GDP is to be fully realized, then the price debates cannot be avoided forever. But they can be avoided for a while, as counting begins. ■