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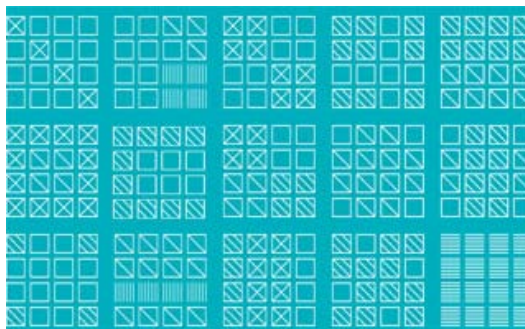
SHARED NATURAL RESOURCES UNDERPIN THE GLOBAL ECONOMY, BUT OUR CURRENT ECONOMIC SYSTEM DOES NOT ACKNOWLEDGE THEIR WORTH. CAN A MAJOR NEW EFFORT TO ASSESS THE COSTS OF BIODIVERSITY LOSS FORCE A PARADIGM SHIFT IN WHAT WE VALUE?

Wealth of Nations

GLOBAL RESET SERIES / BY SEED / NOVEMBER 29, 2010



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Amid the dark clouds of the 2008 financial crisis, as the media documented a litany of bank failures, collapsed credit markets, and growing panic well beyond Wall Street, there was a brighter headline: For the first time since scientists began tracking them, carbon emissions in the United States decreased. The drop was marginal, but this environmental success, when juxtaposed with the crippled economy, raised a troubling point: Two important objectives—mitigating climate change and reviving the economy—were at cross-purposes. And it now appears likely that this contradictory relationship extends far beyond atmospheric carbon and climate change. In area after area, issue after issue, economic growth appears to be whittling away at the very foundations of the global economy: the ecosystems that supply our food, fuel, clean water, and stable climate. Our principle measure of success, the gross domestic product, or GDP, excludes the worth and loss of ecosystems and the services they provide, because as valuable as they are, they have no price.



Ecosystem services have passed beneath the financial radar in part because they are accessible to almost anyone—in economic parlance, they are “non-excludable.” No one can be prevented from breathing the air, for example. Also, demand does not affect supply, since one person’s enjoyment of the services doesn’t diminish that of the next user, a characteristic economists dub “non-rival.” These two basic properties place things like clean water and carbon sequestration in the economic category of “public goods.” And the problem with these goods is that since everyone can enjoy them free of cost, no one has an individual incentive to provide them. Their value goes officially unrecognized, and their supply is not maintained.

Public goods are not a new idea; many of them, like the atmosphere, the geostationary orbit, and the electromagnetic spectrum, existed long before humans, notes public-goods



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scholar Inge Kaul, former director of the United Nations Development Program. The paradox of provisioning such goods is not a new idea either, even to non-economists. The concept of a common property falling into disrepair entered the societal lexicon in 1968 when Garrett Hardin wrote his landmark paper *The Tragedy of the Commons*.

Today, however, acknowledging the worth of such goods is more pressing than ever. The increasing connectedness of the world's ecosystems—largely through human mobility, international commerce, and accumulated environmental degradation—means that the fallout from the abuse of public goods shakes communities from the Maldives to the Andes. National governments have traditionally managed the provisioning of goods like public health and clean air, but in this connected world, the goods that each nation desires, or doesn't, in the case of pollution, are unattainable without incorporating the interests of other states. As Kaul puts it, "A growing number of national public goods have gone global."

The global public good that both epitomizes and encompasses the challenges that the world faces today is biological diversity, the variety of life on Earth. "Biodiversity loss is, in a sense, the big problem of which all others are relatively small applications," says Charles Perrings, an environmental economist at Arizona State University and a fellow of the Beijer Institute in Stockholm. Biodiversity is the foundation of ecosystems that capture carbon and energy, and that cycle water and nutrients through the biosphere. These processes, in turn, enable all of the activities—from plant photosynthesis to potato farming—that make human life on Earth possible. Another way of looking at it, says Perrings, is that most human activity boils down to changing the mix of organisms with which we interact. Public health, for instance, is the control of which pathogens come into contact with humans. Farming is simply the tweaking of wild species to suit human tastes and energy needs. Science, medicine, and global agriculture rely heavily on the barely explored cornucopia of the world's genetic resources. The loss of biodiversity, then, is the loss of everything.

To begin putting a price on such global public goods, says Perrings, we must understand that biodiversity has a dual nature. A healthy forest, for example, provides an array of public services, such as carbon sequestration and water filtration. The components of forestland, however—the trees, animals, and soil—are often privately owned. According to Perrings, this creates large externalities: Private actions, such as cutting down trees, have an effect on public well-being that isn't reflected in the price of that timber. Clean water that benefits the region, medicinal plants that could benefit the nation, and carbon sequestration that is valuable to the entire world are all at risk of destruction because they are invisible to the market.

Assigning Value to Nature

In order to make preserving ecosystems worthwhile to their owners, we must place some value on the services they provide. This challenge is a familiar one for ecological economists, who study the coevolution of economies and ecosystems. Robert Costanza, a professor at the Gund Institute for Ecological Economics at the University of Vermont, one of the founding fathers of the discipline, points out that the standard view is inverted. "In effect, the world's financial economy is just a subset of the larger economy of the natural resources and ecosystem services," he says. In 1997 Costanza conducted one of the first global assessments of what that larger natural economy is worth: In a landmark paper, Costanza and colleagues estimated the value of ecosystem services worldwide at \$33 trillion. Global GDP that year, by contrast, was only \$18 trillion.

In the years since, hundreds of case studies and “environmental impact assessments” have begun to incorporate economic measures when evaluating proposed development projects. Some of their findings have been persuasive: In 1992, for example, plans to pave a swath of the Mayan Biosphere Reserve were halted because the cost of the ecological damage was shown to outweigh the potential economic gain. An estimated 311,000 hectares of jaguar habitat were found to be at risk if the roads, which would have connected Mexico to Guatemala through the middle of pristine forestland, were built.

A more holistic evaluation of ecosystem values in the Mayan forest (carbon dioxide emissions, for instance, were left out of the calculus) would have tilted the conclusions even more decisively in the direction of conservation. But the larger process of assigning monetary values to public goods is confounded by a lack of information at many levels.

Despite high-profile efforts like the Millennium Ecosystem Assessment—a four-year scientific survey of the planet’s natural resources launched in 2001 by the United Nations—we’ve managed to identify only a small slice of extant biodiversity, not to mention the benefits that humans derive from them. Even smaller is the share that we’ve been able to assess quantitatively, in terms such as cubic meters of clean water, tons of carbon stored, or number of people affected by lack of food. And still smaller are those for which we’ve developed the economic tools to describe in monetary terms: How much would society be willing to pay for water purification, carbon storage, and food provision?

The many holes in our knowledge notwithstanding, ecological economists have derived several different ways to begin making such estimations. Measuring values for things like fuel, fiber, medicinal plants, and food turns out to be relatively straightforward, since commodity markets for timber, agricultural crops, and fish provide a basis for evaluation. For so-called “regulating services,” which include regulation of the water cycle, the nitrogen cycle, and climate stabilization, the calculations are much trickier. Preliminary assessments are under way, however, and the results are striking.

In a recent effort led by Alterra, an institute at Wageningen University in the Netherlands, researchers analyzed the costs of not halting biodiversity loss. Using a model called GLOBIO, the team estimated that changes in land use, water use, pollution, and climate would strip the world of about 10 to 15 percent of its species by 2050. This biodiversity loss, coupled with physical changes to the landscape, they found, would put a dent in ecosystem services equivalent to roughly \$75 billion per year.

This figure is undoubtedly a low-end estimate, given that GLOBIO excludes marine life, deserts, the Antarctic and the Arctic, services such as disease regulation and pollination, losses from invasive alien species, and the fact that resource degradation tends to deepen poverty, which can beget more resource degradation in a vicious feedback loop. Another factor left out of the analysis: Natural systems are hardly the predictable, slow-changing things we once thought they were. “Ecosystems are complex, dynamic, adaptive systems, with nonlinear feedbacks, thresholds, and hysteresis effects,” says Costanza. We can’t assume, for example, that our incremental pumping of carbon dioxide into the atmosphere will cause equally incremental shifts in the global climate. Or that the buildup of nitrogen in our rivers and oceans will have steady, predictable effects on marine life. When nitrogen levels hit a certain threshold, algal blooms can suddenly transform the water from oxygenated to oxygen-starved, just as beyond a certain tipping point, positive feedbacks—like the melting of the Arctic ice—are set in motion, causing dramatic shifts in multiple ecosystems across the planet.

Ecologies, we’re now beginning to understand, are best described as complex adaptive

systems, with biodiversity as the key to their ability to absorb shocks and stresses. And the economic value of such resilience is likely to be extremely high. Experts have surmised, for example, that mass erosion of Louisiana's coastal wetlands was largely to blame for the billions of dollars in damage from Hurricane Katrina. Some scientists now say that the worldwide push toward monoculture and away from crop diversity could create huge vulnerabilities in the global food supply.

Solving these mounting concerns will require an understanding of why people destroy ecosystems in the first place—a concept most valuation studies have not taken into account. Ecological economists may be able to cite studies showing that mangroves and wetlands provide coastal protection in Hawaii worth \$1,022 per hectare; bee pollination brings in roughly \$361 per hectare per year; and coral reefs worldwide are worth a whopping \$172 billion. But to communities that draw their livelihoods from clearing, farming, or developing these ecosystems, conserving them comes at the cost of lost income.

So today's more sophisticated assessments don't just attempt to quantify the benefits that ecosystems provide to humans; they also figure in the costs of foregone economic development and the expenses of conservation. A major 2002 review of 300 case studies published in the *Proceedings of the National Academy of Sciences* found that by investing \$45 billion per year in a global reserve program, we could protect natural services worth some \$5 trillion—a benefit-cost ratio of 100:1. In other words, even when the steep costs of non-development are figured into the equation, nature's services emerge as the ultimate bargain.

It is increasingly evident that safeguarding ecosystems makes solid financial sense, yet biodiversity and the services that ecosystems provide have long been overlooked by classical economists. That is all about to change.

A Stern Review for Ecosystems

Pavan Sukhdev is founder and chair of Deutsche Bank's Global Markets Center in Mumbai, head of its Global Markets Finance for Asia-Pacific, and chief operating officer of the Global Emerging Markets Division, representing more than 30 countries across Latin America, Eastern Europe, Asia, the Middle East, and Africa. He was instrumental in the evolution of India's currency, interest rate, and derivatives markets, served on several Reserve Bank of India committees, and in the late 1990s co-founded FIMMDA, India's association for fixed-income markets, money markets, and derivatives. Sukhdev is, in other words, a banker head to toe, and perhaps the last person one might expect to be expending much brainpower on long-tailed lemurs, forest carbon, or coastal mangrove swamps. However, the New Delhi native has been a champion of green growth, in 2004 launching an ambitious attempt to provide a "sustainability yardstick" for India's booming economy. The Green Accounting for Indian States Project, according to Sukhdev, adjusts classical GDP measures to reflect unaccounted externalities such as those involving ecosystems and biodiversity.

Sukhdev's innovative approach to finance spurred the UN to ask him in the summer of 2007 to take a temporary leave from Deutsche Bank to lead a first-of-its-kind study: a comprehensive analysis of the "global economic benefit of biological diversity, the costs of the loss of biodiversity, and the failure to take protective measures versus the costs of effective conservation." Called the [Economics of Ecosystems and Biodiversity](#), or TEEB, the study was endorsed later that year by the leaders of the G8 and the five emerging economies: Brazil, China, India, Mexico, and South Africa.

Just as the Stern Review had a huge impact in bringing worldwide attention to the devastating economic effects of inaction on climate change, TEEB researchers are aiming to give policymakers, business leaders, and the wider public a strong economic argument for conservation of the ecosystem at large.

At first blush, this may not seem like such a radical proposition, but what it implies is nothing short of revolutionary: We won't just be valuing biodiversity, but beginning to change the very shape of the global economic system by recalibrating what it values. "At a time when traditional market mechanisms have failed," explains the initiative's website, "TEEB is offering critical insights into how we may not just rebuild market mechanisms, but also improve them."

In Phase I of the TEEB study, Sukhdev's team made a sweeping call for scientists and economists around the world to contribute data on biodiversity loss as well as economic valuation studies. As the reports and spreadsheets came pouring in, they reaffirmed much of what was already suspected: The economic loss is enormous, as is its impact on human welfare—in terms of health, wealth, and culture. They also brought into focus the strong links between biodiversity loss and poverty, as well as the ethical questions that arise when applying discount rates to future generations.

It also became apparent, however, that at this point the studies are too piecemeal, location specific, and dependent on widely differing metrics to have much utility on a global scale. So in Phase II, which concluded in October, TEEB did a meta-analysis of existing valuation studies in order to prepare a globally comprehensive, spatially specific estimation grid—a calculator of sorts—for deriving the value of ecosystems and biodiversity.

Providing these tools to international, regional, and local policymakers, according to Sukhdev, will allow for unprecedented scenario analysis: People will be able to examine the financial costs of ecosystem decline in a business-as-usual development scenario, as well as the costs and benefits in various alternate scenarios.

But what does the president of Indonesia, for example, do with the new knowledge that his coral reefs are worth several billion dollars per year to the global economy? It is one thing to determine the value of a public good and another to restructure incentives so that the global community makes it profitable for Indonesia to keep its reefs intact.

Who Pays for Biodiversity—and How?

Correcting the underprovisioning of ecosystem services entails not only establishing values for them, but also synching those economics with workable policies. Two primary approaches have emerged to this end: implementing regulations that reward conservation of ecosystem services or penalizing their destruction, and encouraging markets, which give economic value to the decision to conserve.

As far as regulation is concerned, reforming subsidies that make environmental destruction profitable would go a long way. To keep the fishing industry alive as fish populations dwindle, governments worldwide pay fishermen an estimated 20 to 25 percent of the value of all fish caught in a year. These fishing fleets, propped up by aid, are as a result drastically overharvesting the world's oceans. With the subsidies removed, fish catches would likely adjust to more sustainable levels. Another way of encouraging behavior that respects the global public good is regulation that forces polluters to pay for environmental cleanup, just as Exxon was forced to shell out \$3.4 billion for the Valdez spill.

Market-based incentives get more to the root of the problem by creating demand for ecosystem services. Perrings cites a system of payments as one way to encourage farmers to consider the benefits their actions can lend to people elsewhere. Under normal circumstances, property owners may acknowledge the private value of their resources—the timber on their land, say, or the fish in their lake—but are blind to the ecosystem services that flow primarily to others. With “payments for ecosystem services,” or PES, owners are compensated for the global good their property provides.

In the past decade, hundreds of new PES schemes have emerged around the globe, with Costa Rica, Mexico, and China boasting some of the largest-scale programs, providing payments for erosion prevention, biodiversity, conservation, carbon sequestration, and even scenic beauty. The Costa Rican PES system was one of the earliest national systems and has served as a model for many that have followed.

In the 1990s, Costa Rica was facing the effects of decades of deforestation. Although the government had initially encouraged turning forestland into pasture in order to raise cattle, the investment had not paid off, and citizens were dealing with erosion, water pollution, and other side effects of deforestation. At the same time, awareness of rainforests as important global carbon sinks was growing. The government began a series of conservation and reforestation efforts, and by 1996, Costa Rica was ready for an even more serious commitment to conservation.

That year the government passed a law that presented a framework for preserving four classes of ecosystem services provided by forestland: carbon sequestration, hydrological services, biodiversity, and scenic beauty. Under this law, participating landowners sign the rights to their land’s services over to the government for five years in return for annual compensation from the National Forestry Fund.

Payments vary with what services the land provides and how it is being managed—whether it is being reforested, protected, or used as a harvestable plantation—but they are set to compete with prices fetched by pastureland. As of 2007, land that was being reforested garners landowners \$1,326 per acre, paid out over five years; for conserved forest, it was \$519 an acre, and for sustainable logging it was \$808.

Costa Rica’s national experiment, which included more than 300,000 hectares (740,000 acres) of land in its first phase, is now widely regarded as the archetypal model for PES schemes, helping to fill the gap between the value of ecosystem services and the prices currently assigned to them. A nationwide fuel tax has generated most of the financing, though a small amount has also come from selling carbon credits to Norway and a US-based company. The Costa Rican government has long been hoping to generate much more revenue from the forest’s carbon-sequestration services, however, and soon should be able to do so under REDD, an arrangement that amounts to a worldwide PES scheme.

Short for Reducing Emissions from Deforestation and Degradation, the REDD program will compensate developing nations for keeping their forests intact—acknowledging that, according to the IPCC, 18 to 20 percent of global emissions come from the destruction of trees. Agreement on REDD seemed a near certainty at the Copenhagen climate conference in December 2009, but two key provisions—what sort of emission cuts nations would aim to achieve through avoided deforestation and what level of financing rich nations would offer—could not be resolved. So REDD was temporarily tabled, though the UN’s top climate official, Yvo de Boer, told Reuters that forestry provisions should be completed in 2010 within the framework of a climate pact.

While the exact details of REDD are pending, industrialized nations that exceed their emissions targets will likely be able to purchase carbon credits from poorer countries that reduce greenhouse gases by preserving forests. These credits could then be traded on a market, a practice that fundamentally alters the nature of the public good by making it partly exclusive. If the atmosphere is normally available to all, a carbon market charges some parties, in this case, polluters, a hefty fee for access. Indeed, a number of public-goods solutions, REDD being just one example, hinge on making them more exclusive—not fully private, but also not freely accessible to those who would exploit them.

Other nascent market-based schemes present intriguing possibilities for recognizing externalities. In the US, for example, the Department of the Interior's Fish and Wildlife Service bureau has set up a little-known conservation banking system, allowing for the creation of "endangered species credits" that companies can purchase to offset negative impacts their growth may have on threatened species and their habitats. Wetland mitigation banks in the US work in a similar fashion, enabling individuals or corporations to pay for wetlands degraded by agriculture and development. As of 2005, more than 400 banks had been approved, and in 2006 wetland bank credits reached a total of \$350 million. Australia is also pushing the envelope with innovative schemes: In 2006, New South Wales began a pilot project through the BioBanking Bill to protect private lands with high ecological value.

It is important to remember, however, that trade in ecosystem services, even global ones, fundamentally involves individuals making decisions on a local level. A potential problem with REDD is that payments will not go directly to forest communities, but will instead wind up in the hands of government officials or private intermediaries. Successful PES programs have recognized that compensation must trickle down: In Brazil and Portugal, for instance, a system of tax transfers between central, regional, and local governments provides a stream of local revenue. Since 1995 the Ugandan Wildlife Authority has distributed 20 percent of all tourism revenue from its protected areas to local communities.

The key to these programs' success is partly economic, in that the programs reimburse local communities for any lost revenue that results from limiting their land use. But it's also political: By allowing local groups to manage their own resources, they have effectively boosted the quality of conservation. Local peoples nearly always have a more intimate knowledge of the landscape and its dynamics than any remote regulating authority; they are therefore able to create a more locally adapted system of governance.

Indigenous groups, of course, have long been making this argument. Many, such as the Achuar Indians in Peru, are locked in bitter fights with their own governments and with multinational corporations for property rights and the right to self-governance. But their cause received a powerful boost with the 2009 Nobel Prize in Economics, awarded to Elinor Ostrom. A political scientist, Ostrom has spent a lifetime researching the community management of public commons, documenting dozens of cases around the world in which fisheries, forests, lakes, and groundwater basins—to name but a few—have been surprisingly well maintained even when not privatized or regulated by government authorities. Ostrom's work, and that of many others now following her lead, has begun to elucidate the powers of decentralized control and of self-organization by local stakeholders.

Nowhere will these ideas be more critical than in the developing world, where most future biodiversity loss and ecosystem degradation is expected to occur. Yet in order for

governments of developing nations to be willing to cede authority to local communities and to invest in the right trickle-down incentive schemes, they can't perceive these actions as inimical to economic growth. And here is where sticky ethical questions arise: Industrialized nations that have grown wealthy in part through the depletion of their biodiversity now find themselves saying to the developing world: The planet can't afford to let you follow in our footsteps; you must preserve the atmosphere and Earth's remaining forests rather than boost your GDP. It's an argument that will go nowhere unless we are able to find a yardstick of national well-being that is more holistic than gross domestic product. What we need is a new benchmark of progress.

Beyond GDP

In 2007 the European Commission, the EU parliament, the Club of Rome, the World Wildlife Fund, and the Organization for Economic Cooperation and Development (OECD) gathered for "Beyond GDP," a major conference in Brussels. Attended by more than 650 policymakers and thought leaders from around the world, the meeting focused on the need for a more inclusive measure of what society values. The conference consensus? The world should add environmental and social measures such as inequality, health, and higher education to the existing GDP metric.

Currently, nations derive their GDPs using something known as the System of National Accounts—a system that doesn't include externalities in health, education, and environmental protection. Herman Daly, a recognized pioneer of steady-state economics, was a senior economist in the World Bank's environment department in the early 90s but ultimately resigned from that position after many frustrated attempts to get the bank to include the environment in its economic calculus. As Daly points out, GDP does not separate the costs and benefits of growth: Though pollution is a cost of growth, a negative externality, it actually boosts GDP, because people earn money from cleaning it up. "When you chop down a forest, the timber is a plus on your accounting sheet, but so is the cost of cleaning up the water pollution," he says. "This is a strange, asymmetric entry into the accounts, because if you're not going to count the cost of pollution, then you shouldn't count as a benefit the cleanup of pollution. You've got to do both or neither."

Once on the fringe, Daly's views are now catching on. Months after the Beyond GDP conference, President Nicolas Sarkozy told the French national statistics agency to begin considering factors like quality of life and the environment when measuring France's economic health. Sarkozy's comments came on the heels of a report he had commissioned from a panel of top economists, including Nobel laureates Amartya Sen and Joseph Stiglitz. The report found that an "excessive focus on GDP metrics" contributed to the onset of the global financial crisis because it caused nations to ignore a bevy of crucial data. "The main message is to get away from GDP fetishism," Stiglitz told the press. "There are many aspects of our society that are not covered by GDP."

Many policy think tanks and international organizations are hard at work developing alternatives to GDP, including the Index of Sustainable Economic Welfare, the Genuine Progress Indicator, the Happy Planet Index, and the UN's Human Development Index. Sukhdev's group suggests that the UN's System of Integrated Environmental and Economic Accounting could be a starting point for the global community to prepare a new metric that reflects public goods, including natural resources, health, and education.

Using more holistic metrics, we may unearth some telling truths. The US is an unrivaled powerhouse when it comes to per capita GDP: \$47,500 per person as of 2008. Take into account life expectancy, "life satisfaction," and ecological footprint, however, and suddenly the top ranking goes to Costa Rica, a nation with a per capita GDP of just

\$11,600. The global public value of Costa Rica's forests, coupled with its robust PES program to keep those forestlands healthy, is a major contributor to its top-notch ranking. In short, biodiversity and ecosystems can become a large slice of a poor nation's development pie.

Economic growth versus environmental health. Development versus conservation. Can we learn to think more systemically about these often counteracting forces? Recognizing that biodiversity loss and poverty are inextricably linked, can we define new markets and new policies to make biodiversity count as wealth? Which financial tools will foster equity among nations—and account for the value of future generations? This conversation, in essence a question of providing global public goods, is now beginning to command attention at the highest levels. The TEEB study, which will publish its final synthesis in October 2010, will provide unprecedented access to scientific data and the means to translate ecosystem services into monetary terms—the lingua franca of decision makers worldwide.

Valuing ecosystems will strike some as a heartless utilitarian approach, tantamount to slapping dollar signs on species, soils, oceans, and air. What it presages, however, will be a change in the very shape of the global economic system: by valuing our landscapes and the services they impart, by recalibrating incentives toward their preservation, and by respecting the needs of communities most closely dependent on them. We will not just value what nature provides, but also reorganize around a new definition of what is valuable.

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