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Ecosystems, Infrastructure, and the Use of Economics to Influence Decisionmaking

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Does Nature Risk Being Lost Due to Large-Scale Infrastructure and Other Development Projects?

A keynote address made recently by the vice president of operations of the Asian Development Bank summarizes well the priority accorded to infrastructure investment by most development decisionmakers: "…to say that infrastructure development has impact is to state the obvious. No industrial country has advanced to such status without developing solid infrastructure facilities. And no low-income country has managed to escape poverty in the absence of infrastructure. There is no question that, for a developing country, infrastructure investment will pave the way for growth and thus poverty reduction."[1]

Few people would deny that the provision of adequate and accessible infrastructure lies at the heart of economic growth and poverty reduction across the globe. It would, however, be extremely naïve to overlook the fact that there also exists an inherent tension between development and nature conservation. This tension has fundamentally to do with making choices about how, where, and why to produce, consume, and invest. In the context of this essay, one of the most critical trade-offs involves balancing the benefits of large-scale development projects with the costs that are incurred when they give rise to ecosystem degradation.

Habitat loss, widely cited as one of the greatest threats to biodiversity, results directly from the conversion and modification of lands to accommodate the expansion of agriculture, housing, industry, roads, ports, dams, mining, and other infrastructure and developments. Ecosystem impacts are also felt as previously inaccessible areas are opened up to human settlement and influence and connected to transport and trading networks. Such changes are well-documented: take, for example, the progressive loss of mangroves caused by the boom in shrimp farming in Southeast Asia and Central America, the long history of cattle ranches

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[1] Liqun, Jin, "Improving the Welfare of the People through Infrastructure Development," keynote addressat the "Asia-Pacific Business Forum 2006 on Transport and Logistics," Seoul, Korea, November 8, 2006.

encroaching into the Brazilian Amazon, the new road corridors cutting swathes through the forests of the Mekong region, and the development of large dams across the world's major river systems which have progressively altered downstream water flow.

Many known examples thus confirm the observation that there is indeed a risk, and ample evidence to suggest, that nature has, is, and will continue to be lost due to large-scale infrastructure and other development projects.

The Costs of Ecosystem Loss (and Benefits of Ecosystem Conservation) Are Well-Documented

There are undoubtedly economic costs associated with the ecosystem impacts of large-scale infrastructure and other development projects. Over recent years, a growing body of economics literature has been accumulating on the value of biodiversity and ecosystem services and (albeit to a somewhat lesser extent) the costs of ecosystem degradation and biodiversity loss.

Some of the figures that are presented are quite staggering—and, in certain cases, are so large as to be not entirely credible. Several authors have pointed out the danger of overestimating (and the propensity of some economists to overstate) environmental values, often motivated by the very laudable wish to preserve biodiversity by protecting habitats from exploitation or degradation. In many cases, there are, however, clear grounds to conclude that the total economic value of ecosystem services frequently exceeds the economic gains from activities which are based on ecosystem conversion or degradation. A recent review of more than 300 case studies, that matched estimates of the marginal values of goods and services delivered by a biome when relatively intact and when converted to typical forms of human use, found that in every case examined the loss of non-marketed services outweighed the marketed marginal benefits of conversion, often by a considerable amount.[2]

In summary, economists have provided abundant evidence, drawn from many different countries and biomes, to show that "developments" as conceived and implemented in practice are not always unambiguously beneficial in economic terms once their ecosystem impacts are taken into account.

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[2] A. Balmford et al., "Economic Reasons for Conserving Wild Nature," *Science* 297, no. 5583 (August 9, 2002): 950–53.

In Very Few Cases Has the Economic Analysis of Conservation Impacts Led to Significant Changes in Policy or Development Project Outcomes

Although economic measures are not the sole factor or influence when development decisions are made (and here it should be noted that other criteria such as politics, public opinion, personal tastes, culture, laws, and regulations all have a role to play), they typically hold considerable sway as indicators of what is deemed the "best" way to invest funds, use land, and allocate resources. Until recently, environmental values were simply not factored into these measures—and it is therefore not altogether surprising that conventional investment appraisals and cost-benefit analyses of development projects in many cases led to outcomes which impacted negatively on natural ecosystems.

As the tools and methods to represent environmental costs and benefits in monetary terms have developed and their use has become more widespread, so ecosystem valuation has, however, become a burgeoning trade over the last two decades or so. Although a better understanding of the value of ecosystems does not necessarily favor their conservation and sustainable use, it at least permits them to be considered as economically productive systems alongside other possible uses of land, resources, and funds, and to be incorporated in the economic measures that are used to weigh up development trade-offs.

Today, most conservationists have access to the expertise, tools, and information base to use economic analysis to make their case. A growing number of conservation organizations are starting to incorporate economic approaches into their projects and programs, and using them to address issues associated with large-scale infrastructure and development projects. A recent publication by IUCN documents several experiences where economic techniques and information have influenced river basin development planning.[3] Three of the more "successful" cases include: 1) where the incorporation of downstream ecosystem damages into measures of the profitability of a hydropower scheme in Kenya radically altered what emerged as the preferred dam design option; 2) where recalculating the returns to water use in Sri Lanka showed that the value of local wetland systems warranted their inclusion alongside "modern" irrigation schemes when annual water flow allocations were determined; and 3) where articulating the benefits to urban dwellers from the water purification functions provided by wetlands in Uganda

[3] L. Emerton, ed., *Values and Rewards: Counting and Capturing Ecosystem Water Services for Sustainable Development*, Water, Nature, and Economics Technical Paper, no. 1 (Columbo, Sri Lanka: World Conservation Union [IUCN], Ecosystems and Livelihoods Group Asia, 2005).

highlighted the wisdom in economic and development terms of zoning them as part of Kampala city's greenbelt.

These examples of conservationists using economic analysis to influence policies and projects are, however, few and far between. Despite the fact that economics data and arguments can in theory provide a powerful and convincing tool for placing ecosystems on the agenda of development planners, there remain few documented cases where they have been used successfully to change real-world project outcomes in favor of conservation.

Overcoming the Challenges

There now exists a suite of methods and raw data which can be used to articulate both the ecosystem costs arising from large-scale infrastructure and development projects, as well as the economic benefits associated with ecosystem conservation. Yet, there is scant evidence that these findings are actually incorporated into the decisions which are made by investors and developers, when nature is threatened.

It may be concluded that economic analysis provides a valuable—but currently under-utilized—tool by which to influence development decisionmaking, but is unlikely to reach its full potential until a number of important (but by no means insurmountable) obstacles are overcome. These challenges are less to do with any failings in the methods available to express ecosystem impacts in economic terms or the credibility of the resulting figures. (On both counts, the quality of analysis carried out is generally good.) Rather, they relate to the persistent failure of conservation agencies to communicate the economic importance of ecosystem damage effectively to developers or to root their analyses firmly in real-world development decisionmaking and practice.

Improving Communication

It would be a mistake to think that development planners and policy makers deliberately and maliciously degrade the environment (although this possibility cannot be discounted in a minority of cases). Rather, their myopia is understandable, given that information about ecosystem costs and benefits are rarely communicated by either economists or conservationists effectively, in practical and policy-relevant forms, or in a timely manner. One problem is that, all too often, economic analysis remains a largely academic exercise. Valuation, in particular, is frequently seen as an end in itself (coming up with large figures which represent the monetary

worth of particular ecosystem goods and services), rather than as a means to an end (supporting better and more informed decisionmaking).

Within the ever-growing mountain of doctoral theses, erudite journal articles, and highly technical papers dealing with the economics of conservation, there remain relatively few documents which are digestible, relevant, or even appealing to non-economists. While laudable efforts have been made by some conservation organizations to present economic information in a more accessible format (although, again, this shows a marked bias towards reiterating large monetary values), there continues to be a heavy emphasis on "preaching to the converted," rather than on actively reaching out to (and speaking the language of) the sectors, companies, and individuals who actually invest in, plan, and implement large-scale infrastructure and development projects.

Integrating with Development Planning

Decisionmaking is not influenced by words alone: poor communication is only one reason for the general failure of conservationists to exert significant influence via economic facts and figures. A second challenge is that the economic analysis of conservation impacts is most often carried out in isolation from broader development planning processes, or used only once a development has been implemented in order to show retrospectively what its environmental costs were. In very few instances, indeed, is the economic analysis of ecosystem impacts routinely carried out as part of development appraisal and planning processes, or are the resulting figures factored into the measures of economic and financial profitability that determine how land, resource, and investment choices are actually made.

It is worth noting that one of the common factors of success in the IUCN case studies mentioned above was the application of environmental valuation techniques as an integrated part of —rather than separately from—the economic appraisal of dam options in Kenya, annual water allocation planning in Sri Lanka, and urban zoning exercise in Uganda. An additional aspect was the time and effort invested in communicating the findings of these analyses to energy sector planners and donors, the river basin management and irrigation authorities, and the municipal council.

Effecting Changes in Behavior

In addition to better communication and integration, a third need is for conservation agencies to use economic analysis not only to influence specific development decisions but also

to address the underlying structural factors that influence development decisionmaking. However high the costs of ecosystem damage (or the benefits of ecosystem conservation) are demonstrated to be in theory, this has little meaning unless it actually translates into changes in the prices, profits, and returns that people face as they carry out economic activities.

While the use of economic, fiscal, and market-based instruments to correct for the failures and distortions that cause environmental costs and benefits to be omitted from development decisionmaking[4] is becoming more widespread, they remain the exception rather than the norm in most cases. For the most part, public policy makers, private landholders, developers, and investors still perceive, and receive, few immediate losses from degrading ecosystems in the course of their business and few tangible gains from conserving them.

Shifting Paradigms

Underpinning the requirement for improved communication, better integration with development planning, and efforts to change the structural conditions that influence development decisions is the need to effect a shift in the paradigms which drive both conservation and development investments. Here, a major obstacle is the tendency by economists, conservationists, and developers alike to treat natural ecosystems as being separate from the large-scale infrastructure and development projects that impact on them, and only conceiving their linkages in negative terms—in terms of environmental costs caused and needs to invest in mitigation or remediation measures.

Rather, economic analysis suggests that ecosystems themselves should be treated as part of the stock of facilities, services, and equipment that is needed for the economy and society to function properly: in other words, as productive components of development infrastructure, and as part and parcel of investments that are made in it.[5] The continuing failure to do so, by both conservationists and development investors, is not only short sighted in economic terms, but may

[4] For example, deposits and bonds against environmental damage or restoration are now regularly required for large-scale infrastructure projects and for extractive industries, such as logging and mining. In many sectors, a variety of polluter- or user-paid taxes and fees are levied on activities which run the risk of causing ecosystem damage or environmental harm. In addition, various forms of offsets are becoming increasingly commonplace as mechanisms to compensate for the impacts on biodiversity caused by infrastructure projects.

[5] L. Emerton, "Counting Coastal Ecosystems as an Economic Part of Development Infrastructure," (Colombo, Sri Lanka: World Conservation Union (IUCN), Ecosystems and Livelihoods Group Asia, 2006).

ultimately undermine many of the goals that so much time, effort and funds are being channeled into to provide cost-effective, equitable and sustainable development for all.

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