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Management Objectives or Ecosystem Services Protection in Nigeria

By Njobdi A. L, Boni P. G, Marja, A. S & Mamudu, A

Modibbo Adama University

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MANAGEMENTOBJECTIVESORECOSYSTEMSERVICESPROTECTIONINNIGERIA

Management Objectives or Ecosystem Services Protection in Nigeria

Njobdi A. L [α], Boni P. G. [σ], Marja, A. S [ρ] & Mamudu, A [ω]

Abstract- People are increasingly confronted with starker choices in resource distribution to competing applications and users. At the local level, for example, land and water allocation for agricultural, industrial, municipal, recreational, and conservation operations is frequently a zero-sum game. This is evidenced by the widespread loss of water and land from natural habitats to farms and, increasingly, to urban and industrial uses. From both an ethical and a practical standpoint, these choices are getting increasingly complex and difficult to reconcile. The Ecosystem Services Framework combines the biophysical and social aspects of environmental preservation in a way that has a lot of promise for dealing with the environmental catastrophe that will most certainly peak in the twenty-first century. A quick description of this framework was presented here, along with a suggestion for immediate action.

I. Introduction

Setting goals for environmental conservation becomes increasingly necessary and urgent as human influence on the natural environment grows. In the United States, landmark policies enacted more than two decades ago address mostly local, reversible, and immediate dangers to human health. These are insufficient in controlling the consequences of human business today, impacts that are affecting the environment at an unprecedented rate, on a global scale, and with irreversible difficulties (Newman and Jennings 2012, Beatley *etal.,* 1997).

It's important to have a global perspective in mind while thinking about environmental preservation in the United States. The United States is a major contributor to and beneficiary of global impacts, both directly and indirectly, given its close biophysical, socioeconomic, and political relationships to other parts of the globe. Humans have heavily transformed v40–50 percent of the ice-free land surface; coopted v50 percent of accessible, renewable fresh water; fully exploited or overexploited v65 percent of marine fisheries; increased carbon dioxide concentration in the atmosphere by v30 percent; increased the rate of atmospheric nitrogen fixation by more than 100 percent over natural terrestrial sources; and driven v25 percent of bird species to extinction worldwide (Porrit 2012, Liu *et al.,* 2010, Costanza *et al.,* 2017, Orr 1992, and Vitousek et al., 1997). Over the next several decades, the expected worldwide rise in demand for food, fresh water, energy, and other resources suggests dramatically intensified human effect (Wuebbles and Jain 2001Schwartz and Randall 2003, Boretti and Rosa 2019).

How do these significant environmental changes affect human well-being, and how can policy respond? Which one is the most important? What are the allowed amounts and types of changes? What methods may be used to design and assess relevant standards? What institutions and policies will be most successful in providing the protection required? To answer these concerns, we must acknowledge that the nation's — and the world's — ecosystems are capital assets that, when properly managed, produce a flow of essential services. The creation of items — such as seafood, lumber, and precursors too many industrial and medicinal products — is a significant and well-known aspect of ecosystem services. Basic life-supporting activities (such as pollination, water purification, and climate management), life-fulfilling situations (such as peace, beauty, and cultural inspiration), and option preservation (such as preserving genetic and species variety for future use) are also included (Heal *et al.,* 2001; Daily 2003; Tallis and Polasky 2011). As with physical capital, proper accounting would value the flow of ecosystem services while pricing out the depreciation of the under-lying asset. Unfortunately, ecosystem capital is poorly understood, under-monitored, and – in many key circumstances — rapidly deteriorating and depleting in comparison to other types of capital. The value of ecosystem services is frequently underestimated until they are lost. As a result, ecosystem capital depreciation is frequently underestimated, if it is ever evaluated at all.

It is not difficult to comprehend this sad circumstance. Until recently, ecosystem capital was plentiful enough that the majority of ecosystem services could be considered "free." Furthermore, economic activity was restricted and had a little influence on natural systems. As a result, there was minimal cross-pollination between ecological and economics. However, as previously said, the situation has drastically changed in recent decades (Edwards-Jones 2009,Daly and Farley 2011 Raven 2012). The current scenario necessitates a much increased ability to characterize

Author α: Department of Forestry and Wildlife Management, Modibbo Adama University, Yola.
Author σ Ѡ: Department of Forestry Technology, Adamawa State college of Agriculture, Ganye. e-mail: peterboni333@gmail.com
Author ρ: Adamawa State College of Education Hong.

ecosystem services in both ecological and economic terms. This would allow the entire societal costs and benefits of various policies and courses of action to be weighed. It should, in theory, disclose what's truly at risk so that smarter decisions may be made before ecological changes become too costly and difficult (or impossible) to reverse. A rising number of municipalities in the United States are attempting to obtain natural water filtration services in their watersheds, demonstrating the benefits of acquiring and employing this capacity (Bingham *et al.,* 1995, and De Groot *et al.,* 2010). Such efforts are frequently justified solely on the basis of avoided costs of constructing and maintaining physical treatment plants; however, they may also provide many other unquantified benefits, such as flood/erosion control, carbon sequestration, recreational opportunities, scenic beauty, and so on.

a) The Framework for Ecosystem Services

A new conceptual framework for describing, monitoring, and managing environmental changes and their societal impacts is emerging. The paradigm has the potential to generate realistic and adaptable environmental protection techniques that take into account biophysical, economic, and other crucial societal elements. The Ecosystem Services Framework focuses on the many valuable services that ecosystems and biodiversity provide to civilization (Table 1). These services are provided by a complex interplay of natural cycles that are fuelled by solar energy and operate on a variety of spatial and temporal dimensions. For example, the life cycles of bacteria which take place in a space smaller than the period at the end of this sentence — as well as the planet-wide cycles of important chemical components like carbon and nitrogen, are all involved in the production of soil fertility. Ecosystem services are critical to human survival and function on such a large scale and in such complex and little-understood ways that they cannot be substituted by technology (Allenby 2000, Goble 2007 and Setten *et al.,* 2012). With examples, a categorization of ecosystem services is provided, (Edwards-Jones 2009; Farley 2011; Raven 2012). Yet, since human activities have a greater influence on natural ecosystems, their supply is jeopardized. A comprehensive biophysical and economic characterization of ecosystem services locally, regionally, and globally is urgently needed. Incorporating their worth into decision-making processes will necessitate both the development of methods for estimating their social worth and the development of institutional systems for realizing that value. The Ecosystem services Framework is made up of four main components (Farley 2011; Edwards-Jones 2009; Raven 201 and, Martinez-Alier 2003).

b) Identification of Ecosystem Services

Natural capital stocks (ecosystems, their geophysical structure, and their biodiversity) that provide ecosystem services have received less attention in comparison to physical and financial capital. The suppliers and consumers of ecosystem services must be cataloged in a systematic and quantitative manner. To enable for a nationwide evaluation of ecosystem service flows, the US would have to be classified and mapped according to ecosystem type and land use. One would like to know which services are produced and consumed locally (e.g. pollution control, pest control, soil fertility renewal, serenity), which are produced and consumed globally (e.g. genetic library preservation, climate stabilization), and which are imported or exported regionally (e.g. seafood, timber, flood control, water purification).

c) Characterization of the Services

Following the identification of the primary service kinds and flows, the ecological and economic (and maybe other) implications must be evaluated. Prior to any attempt to value ecosystem services, an ecological characterisation of ecosystem services is required to inform decision-makers about the ecological trade-offs associated with various courses of action. The forms of the production functions characterizing how ecosystems provide services would be determined by ecological categorization. In other words, it would provide light on the relationship between an ecosystem's level of services (quantity and quality) and its geographic spread, as well as the kind and degree of human alteration. For example, an ecological characterization of a forest catchment's hydrological services would characterize water flow and quality as a function of forested area and the kind and amount of human activity in and around the watershed. Because ecosystem services are so intertwined, another purpose of ecological characterisation would be to show how exploiting or damaging one might affect the operation of others. One would identify which combinations of services and human activities — and at what levels — might be sustained in the same forest catchment. Other essential functions include wood production, pollinator provision for neighboring farming, flood management, options conservation, and carbon sequestration ('Options conservation' refers to the preservation of flexibility to modify policies and actions in the future). The goal is to minimize irrevocable service losses for which there is now no apparent demand, so that they can be restored in the future). Given the current mass extinction, it would be particularly interesting to learn how dependent certain functions are on biodiversity (Bellard *et al.,* 2012 and Ceballos *et al.,* 2017). Furthermore, one would wish to discover umbrella' services, whose protection would substantially facilitate the upkeep of others.

Ecological characterisation would also assess the extent to which ecosystems providing certain services are repairable, as well as the time scale over which they may be repaired. Ecosystems generally respond nonlinearly to disturbance; their provision of services may not appear to alter with steadily increasing human (or natural) influences until they reach a point when the response might be significant, sluggish, and difficult to reverse. Such important times must be anticipated in order to build appropriate policy; nevertheless, they are poorly understood and are likely to stay elusive.

The ecological categorization would be used to determine the economic and other relevance of ecosystem services. There is no universal approach for calculating the societal value of ecosystem services. For various reasons, fostering the development of a rigorous and transparent valuation process would be extremely beneficial. First, it might shed light on the value of ecosystem assets before decisions are made that lead to their loss; even lower bound and qualitative measurements of importance can be useful in this context. Second, such a method may generate a "information market," spurring much-needed research into how these services work and how important they are (Pascual *et al.,* 2010). Third, the process may encourage the establishment of institutions, such as markets, to realize the value of ecosystem services. Around the world, new methods to conservation funding are being developed and implemented (Daily,*et al*., 2000).

Major difficulties would be addressed by an economic framework for quantifying ecosystem services, including:

1. What are the societal advantages and costs of alternate approaches to manage ecosystem assets (such as land and water)?
2. How can individual preferences for different options be appropriately aggregated?
3. What are the best ways to spread the costs and benefits of alternative plans fairly?
4. To what extent and on what scale may existing or prospective human technology replace ecological services?
5. How should future advantages be valued, in economic, cultural, or other terms, given that the value of ecosystems is largely in the future and will always be mostly in the future?
6. How can the most vulnerable parties – future generations — be represented at the negotiating table?

We're still a long way from using valuation as a scientific decision-making tool. Rather, valuation is now only one instrument in a much wider politic of decision-making – it is a means of organizing data to aid decision-making, but it is not a solution in and of itself. Nonetheless, valuation approaches have had a beneficial impact on decision-making and will most likely continue to do so in the future. The most crucial judgments to make are those in which the advantages considerably outweigh the expenses, or vice versa, and when total correctness is not required.

New York City, for example, was able to determine that it was preferable to attempt restoration of natural water purification services rather than construct a water treatment facility by developing rudimentary lower limit estimates for the value of ecosystem services in the Catskills watershed (Chichilnisky and Heal, 1998). Is this mechanism capable of protecting a larger area of the watershed? New York City is a special situation, with certain particularly favorable legal conditions, but the approach's long-term success there is far from guaranteed (Vaux and Chair, 2000). Nonetheless, assessing what is conceivable, at least in principle, would be instructive. For the United States, ecologist Walter Reid developed the following rough estimate. He gathered data from 74 municipal water supplies in the lower 48 states and calculated a typical figure of 0.3 ha as the land area required per person to maintain a safe drinking water supply. With a population of around 265 million people, the lower-48 states may rationally consider managing about 80 million ha (265 million people 0.3 ha per person) with water quality as a primary aim. This equates to 10% of total land area, which is a sizable chunk (Reid, 2000). Watershed preservation for drinking water supply will, of course, vary by geographic location, depending on ecological, economic, and political conditions. However, the potential for protecting a wide range of economically valuable services connected with watersheds appears to be significant enough to warrant further investigation.

d) *Establishing Safeguards*

The preservation of ecological services has two major components. The first is identifying the optimal mix of service output, particularly where one service (such as lumber production) may obstruct the supply of another (such as water purification). The second step is to establish institutional mechanisms for ensuring the desired variety of possibilities. Clearly, there is no one-size-fits-all approach to provide ecosystem services. Human civilizations' environmental needs and consequences are always altering, underscoring the importance of maintaining flexibility and alternatives in service delivery. An explicit accounting of ecosystem services and the effects of various actions on them is a vital first step in making informed decisions. Identifying the primary causes of ambiguity regarding the conservation of ecosystem services, as well as their relevance, is a related crucial step. The objective is to develop tools for assessing this uncertainty and incorporate it into flexible policy. Many would argue that, for the time being, the amount of uncertainty in our knowledge of ecological processes, along with the frequency of non-linearity and irreversibility's, necessitates the use of the precautionary principle. That is, it would be sensible to avoid actions with potentially severe and permanent repercussions and instead wait for further information before putting ecosystem capital at risk.

Institutional methods for maintaining ecosystem services are expected to differ significantly depending on the ecological and social setting. The gathering of regionally based knowledge is critical; ecosystems are unique, and the devil is in the details, so what works in one location may not work in another. Certain species, for example, play critical roles in some ecosystems while playing minor roles in others (Power *et al*., 1996). The 'umbrella' effect in conservation refers to when the protection of a reasonably well understood or valued service confers protection on others who lack the understanding or institutional backing to bring about their own direct protection. The interdependence of services might be used to enhance the advantages of safeguarding a particular service in this fashion. In theory, pollination services that aren't well-known may be conserved in cultivated, hilly areas if erosion control strategies utilised native flora (to serve as habitat for pollinators).

To protect important ecological services, what financial, legal, and other social structures are required? How might their growth be accelerated and customized to local conditions? Ecologists and economists' recognition that ecosystems are essential and valuable assets would be ineffective without the support of proper institutions. At a variety of scales, from local to international, and in government, NGO, and private sector contexts, promising new institutions for safeguarding ecosystem services have emerged in a wide range of cultures and economies (e.g., Australia, Costa Rica, Madagascar, the United States, and Vietnam), at a variety of scales, from local to international, and in government, NGO, and private sector contexts (Castro and Tattenbach, 1998; *Daily et al*., 2000). Pollination, pest control, water supply (for drinking, irrigation, and hydropower generation), soil fertility management, sustainable tropical wood harvesting, aesthetic attractiveness, and even decomposition are among the functions preserved by these new institutions (of orange peels produced by Del Oro, an orange juice company in Costa Rica).

e) *Monitoring the Services/Evaluating the Safeguards*

What indicators could be used to reliably and effectively track changes in the availability and quality of ecosystem services? Some areas of monitoring, such as the monitoring of specific fish stocks or the monitoring of water quality, are well-developed and frequently used. Most ecosystem services, however, are not routinely monitored; among the most important and interesting are pollination (Allen-Wardell *et al.,* 1998) and carbon sequestration (Allen-Wardell et al., 1998). (Field and Fung, 1999). This is not the place to go over all of the environmental monitoring literature. It goes without saying that, in tandem with measures to protect ecosystem services, reliable monitoring systems might be used much more extensively. Meanwhile, further study is required to establish trustworthy monitoring algorithms for lesser-known providers. Monitoring ecosystem services is essential for determining the effectiveness of institutional safeguards in place to maintain them.

f) *Implementing the Ecosystem Services Framework*

Ecosystem services get little clear legal safeguards in the United States. In general, pollution laws (Clean Air Act, Clean Water Act) are based on human health standards; conservation laws (Endangered Species Act, Marine Mammal Protection Act) are species-specific; and our resource management laws' planning mandates (National Forest Management Act, Federal Land Policy and Management Act) are multi-use planning mandates. Parts of these legislation, such as the Clean Water Act's 404 wetlands permit program and water quality criteria, the Endangered Species Act's essential habitat provisions, and the National Forest Management Act's indicator species provisions, certainly can protect ecosystem services (e.g. the spotted owl). However, these rules were not designed to create legal criteria for conserving ecosystem services, and they seldom do so in reality (J. Salzman, American University, personal communication, 6 September 1999).

There are several departments and agencies within the federal government that deal with conservation value and incentives, but only in a peripheral fashion. For example, under the Community-Based Environmental Protection program, the EPA Office of Policy Planning and Evaluation is collaborating with the World Resources Institute to create natural resource accounting and with The Nature Conservancy to build Compatible Economic Development Centers. The National Science Foundation and the Environmental Protection Agency jointly fund a grant program in Decision-Making and Valuation for Environmental Study, and the Water and Watersheds program requires researchers to integrate sociological components in their ecological research. However, none of these initiatives are focused on developing practical methodologies for valuing ecosystem products and services and developing new economic incentives for conservation (Raven, 1998).

The creation of effective institutions and legal measures to maintain ecosystem services is still a work in progress. It will necessitate an interactive process including natural scientists, economics, legal experts, and policymakers. The task is daunting, but the strong degree of interest displayed by members of these diverse organizations — as well as stakeholders in geographic locations where such measures are being tried — suggests that the prospects are bright. The first step in advancing the Ecosystem Services Framework's implementation is to identify priorities based on current data, and the second step is to strategically acquire additional data.

g) Prioritizing your Tasks

With the exception of a few isolated cases, we have little understanding of nature or the value of the services offered by the US ecosystems. With worrying signs of a lack of resource sustainability in many countries as we enter the new century, it is relevant and appropriate for the United States to establish such an understanding.

Four important measures might be performed at this point. Choose the low-hanging fruit first. Assess the ecological, economic, and societal justifications for safeguarding relatively well-known ecosystem services (such as water purification and flood control, where certain types of market institutions already exist; and for carbon sequestration, where a market may be emerging). Developing a systematic, transparent procedure for such an evaluation, as well as incorporating important stakeholders in its creation, would be a highly worthwhile exercise in and of itself. Second, live vicariously through other people's experiences. It would be extremely beneficial to keep a close eye on the results of initiatives to protect ecosystem services in the United States and abroad. Such knowledge might be used to inform debates about what works and what doesn't, as well as why.

Finally, try new things. Fostering small-scale, experimental attempts to protect undervalued but important ecological services might pay out handsomely. Promote success models in the fourth place. With institutional procedures that have shown to be highly successful in the communities where they have been implemented, a lot may be done within the current legal and economic framework.

h) Acquiring Information

While there is a wealth of knowledge regarding the functioning of ecosystems and the provision of services in broad and abstract terms, there is a scarcity of data about specific, local ecosystems and economies. Furthermore, while the services are well understood to be critical and under danger, nothing is known about marginal values (the net benefit or cost of maintaining or destroying the next unit of an ecosystem) or nonlinearities in ecological responses to human impact. This knowledge is frequently not obtained until it is too late to undo the damage that has already been done (e.g. after heavy flooding).

More case studies addressing these topics would be really beneficial. Such research would establish the range of possibilities and constraints for using the Ecosystem Services Framework, as well as reveal how universal the findings from specific locales are and serve as a guide for policy formulation. Officials in New York City, for example, are buying property and adjusting agricultural and municipal activities in the hopes of recreating the Catskills' natural water filtration services — all with very little scientific knowledge. The success of the measures is being studied carefully, but the political window for adopting this method (rather than establishing a physical filtration facility) may be closing shortly. Success in the policy arena rests on whether the scientific basis of policies are valid in this specific example, as well as in general. Many laws exist now that might be utilized to preserve the environment, but their implementation is pending more scientific data.

i) Taking Initiative

The Ecosystem Services Framework's implementation is clearly a long-term, iterative process that will change over time as experience and scientific and socioeconomic knowledge grow. Where should I start? One fruitful place to start in the United States would be to draw out ecosystem 'service area' maps for water purification on a regional or national level. Natural water purification has a substantial scientific and regulatory foundation, allowing it to I define prioritization criteria and (ii) apply them geographically to determine both the scope for using ecosystem approaches to water purification and the locations that deserve the most attention and effort. While biodiversity conservation priorities have been widely mapped based on biodiversity distributions and threats (e.g. Ricketts et al., 1999), maps of ecosystem service priority are few. Maps of ecosystem 'service areas,' like those of species or ecosystem distributions, and their associated challenges to persistence, might be employed (Balvanera *et al*., 2001). The mapping approach might reveal three important aspects: I various land management regimes necessary to deliver a particular societal benefit, (ii) the degree of geographical congruence between services and the management regimes required to maintain them (e.g. how much managing of an area for water purification would confer timber, flood control, carbon sequestration, or recreational benefits), and (iii) predicted changes in both services and society demand for them under various future demographic and land-use change scenarios.

The mapping process would also serve as a focal point for involving stakeholders, integrating social and ecological elements of ecosystem service management, experimenting with novel incentive/financing schemes, and pushing forward the policy agenda. Picking low-hanging fruit (virtually everyone understands the importance of safe drinking water), learning vicariously (ecosystem approaches to water purification are well underway in the US and internationally), developing new methodological approaches that integrate science, economics, and policy, and, last but not least, promoting models of success would be the first steps.

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Table 1: Type of Ecosystems

Categorization of Ecosystem Services with Examples
Ecosystem service
Production of goods
Food
Terrestrial animal and plant products Forage
Sea food Spice
Pharmaceuticals
Medicinal products
Precursors to synthetic pharmaceuticals
Durable materials Natural fiber Timber
Energy
Biomass fuels
Low-sediment water for hydropower

Industrial Products
Waxes, oils, fragrances, dyes, latex, rubber, etc. Precursors to many synthetic products

Genetic Resources
Intermediate goods that enhance the production of other goods
Regeneration Processes

Cycling and Filtration Processes
Detoxification and decomposition of wastes Generation and renewal of soil fertility Purification of air Purification of water

Translocation Processes
Dispersal of seeds necessary for regeneration, Pollination of crops and natural vegetation

Stabilizing Processes
Coastal and river channel stability
Compensation of one species for another under varying conditions
Control of the majority of potential pest species
Moderation of weather extremes (such as of temperature and wind)
Partial stabilization of climate
Regulation of hydrological cycle(mitigation of floods and droughts)
Life-fulfilling functions Aesthetic beauty
Cultural, intellectual, and spiritual inspiration Existence value
Scientific discovery Serenity

Preservation of Options
Maintenance of the ecological components and systems needed for future supply of these goods and services and others awaiting discovery