

Valuing Nature

GUIDE TO QUANTIFYING ECOSYSTEM SERVICES



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Reframing Protected Areas as Strategic Investments

The global economy is deeply reliant on nature. **Globally, more than half of GDP (55%)** — **or an estimated USD58 trillion** — **is moderately or highly dependent on nature and its services**. Yet, on a global scale ecosystem health indicators are declining at an alarming rate. Biodiversity loss is among the most visible signs, with monitored wildlife populations dropping by an average of 73% over the past 50 years. ²

Protected areas are one of the most effective tools for addressing biodiversity loss and advancing sustainable development goals. Although the concept of protected areas has deep historical roots and existed for generations, they were primarily associated with wildlife protection. Modern protected areas reflect a new perspective on conservation that emphasizes sustainable development and climate adaptation alongside wildlife protection.



The British ecologist **Georgina Mace** describes the transition of our understanding of protected areas as a series of shifts:

"From "nature for itself" (protecting wilderness) to "nature despite people" (reducing pollution and overexploitation), "nature for people" (maintaining ecosystem services) and "nature and people" (managing socio-ecological systems).1".

International frameworks such as the Kunming-Montreal Global Biodiversity Framework, which set a target of protecting 30% of the world's land and sea by 2030 (the 30x30 target), and the 2030 Agenda for Sustainable Development reflect growing recognition of protected areas as essential instruments for tackling broader environmental, social and economic challenges.

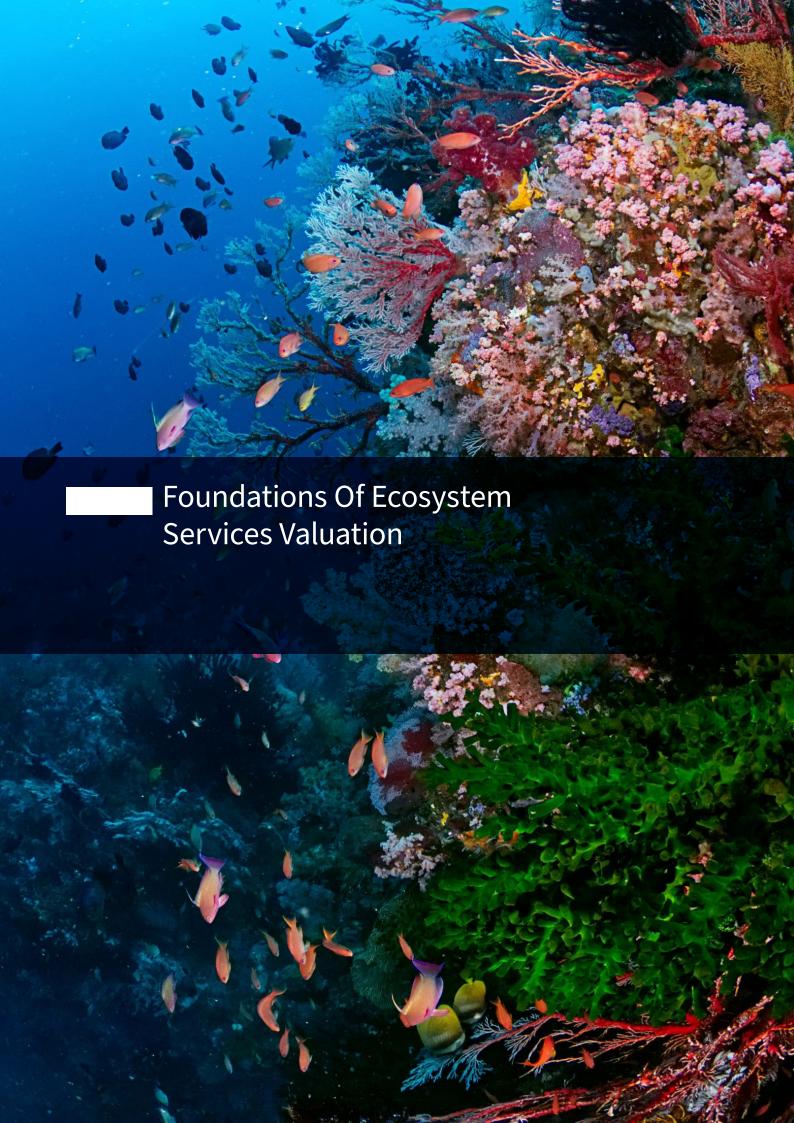
And yet, despite all the endeavors of the international community, effective funding of protected areas, in many cases, remains a significant challenge. This is mainly due to a funding model that continues to rely heavily on public budgets, which are often limited and

subject to competing national priorities. The funding gap for achieving the 30x30 target ranges between USD103 billion and USD178 billion annually.³ When considering the broader commitments under the Convention on Biological Diversity, the gap is even bigger, ranging between USD599 billion and USD824 billion annually.⁴

It becomes clear that conservation cannot rely solely on government budgets. Conservation strategies must keep pace with our evolving understanding of protected areas. This means recognizing protected areas as investments, not expenses, in order to address the funding gap.

Successful conservation investment starts with identifying the best sites for protection and valuing the ecosystem services — the benefits people derive from healthy ecosystems within protected areas. While valuation cannot capture the full value of nature, assigning a monetary value to these services helps translate ecological importance into economic terms that resonate with decision-makers and investors and supports efforts to attract diverse sources of funding.

This paper lays out a roadmap for building a strong case for protected areas through ecosystem service valuation and explores a range of valuation approaches that can guide more informed and evidence-based conservation planning.



Foundations of Ecosystem Services Valuation

"Nature is priceless. However, it is not valueless."

According to the World Bank, by a conservative estimate, a collapse in select services such as wild pollination, provision of food from marine fisheries and timber from native forests could result in a significant decline in global GDP: USD2.7 trillion in 2030,5 yet the **concept of natural capital is not adequately integrated into economic decision-making.**

Environmental protection is frequently viewed as a secondary priority, while financing continues to focus on industries traditionally perceived as "moneygenerating," supporting activities that drive the environmental crisis. Nearly USD7 trillion yearly, equivalent to 7% of global GDP, flows into private investments, tax incentives and subsidies that contribute to ecosystem degradation, biodiversity loss and climate change. In contrast, funding for nature-based solutions remains critically low, amounting to just USD200 billion annually.¹

The systematic failure to account for nature's value in decision-making has prompted international action. The second Aichi Biodiversity Target states, "By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems." Yet, this integration remains largely unmet, highlighting a persistent and critical challenge for policy and finance systems worldwide.

To bring nature's worth into decision-making, several methodologies have been developed. One of the most effective approaches, striking a balance between complexity and accuracy, is the valuation of ecosystem services (i.e., the benefits humans derive from functioning ecosystems):







Natural Capital

All energy and materials from nature, including minerals, energy, plants, animals and ecosystems (e.g., forest and watershed)

Ecosystem Function

The biological, geochemical and physical processes that occur within an ecosystem (e.g., water capture and storage)

Ecosystem Goods and Services

The benefits that humans derive from ecosystems, either directly or indirectly, that **can be translated into monetary value** (e.g., reduced flood risk)⁷

Foundations Of Ecosystem **Services Valuation**

There are four key reasons why conducting ecosystem services is beneficial for any protected area⁶:



Securing political support: demonstrating the socioeconomic value of the area helps to secure political and stakeholder support for its designation or additional funding

Diversifying funding: identifying and quantifying the benefits strengthens a case to attract alternative sources of financing, apart from government funding

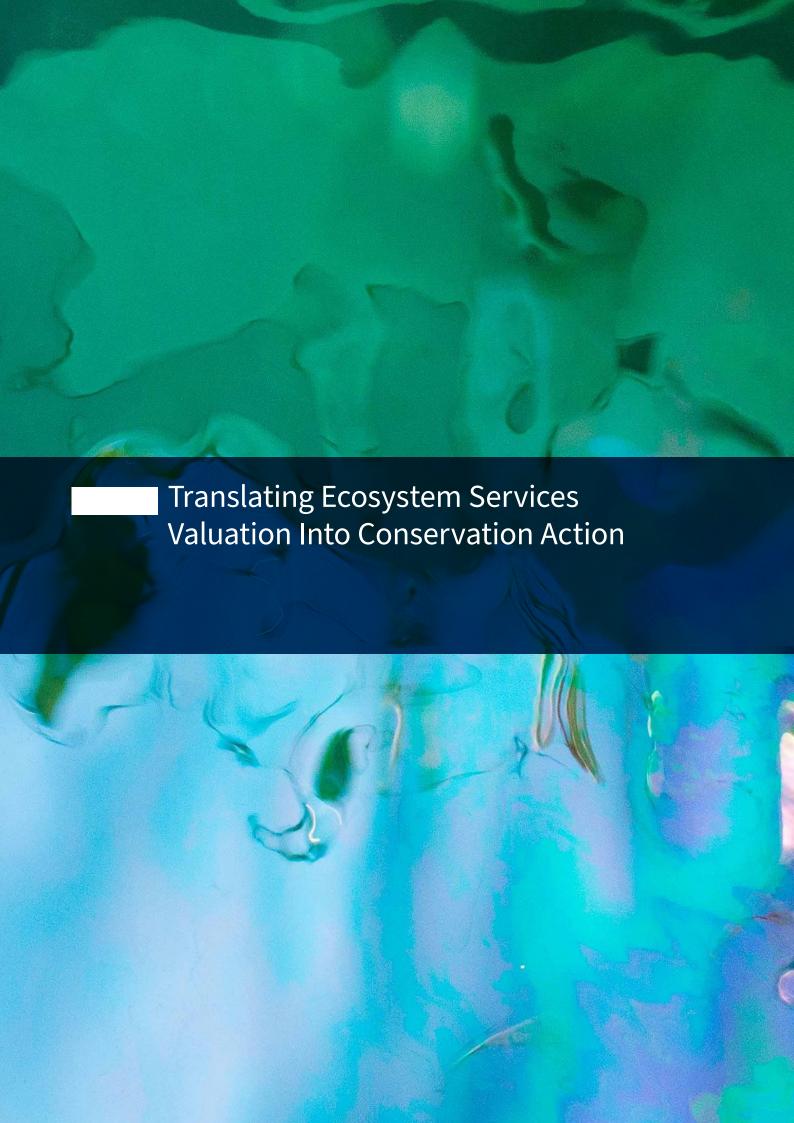


Supporting sustainable land use planning: recognizing the values provided by the area supports sustainable land use planning

Increasing public awareness: demonstrating nature's importance to the public elevates general understanding and appreciation of nature's value



There is, however, a caveat: ecosystem services valuation is limited exclusively to the benefits humans extract from nature. Such service-focused valuation is practical for decision-making, but it cannot capture nature's full worth. Biodiversity and ecosystems possess intrinsic value independent of direct and indirect benefits humans extract, reminding us that economic measures alone cannot fully represent nature's significance.



Building upon the ecosystem services framework, we have identified and applied three steps to conduct nature valuation to support decision-making:



Establish baseline value of the site



Assess impact of PA establishment against other land use



Implement projects and monitor ecosystems health

Step 1. Establish Baseline Value of the Site

The baseline value of the site represents the value of ecosystem services it provides prior to any intervention, serving as a reference point for assessing conservation impact or the impact of alternative land use. Baseline assessment encompasses two components: (1) identification of ecosystem goods and services provided and supported by the site and (2) selection of an appropriate valuation technique and valuation itself.

Identifying Ecosystem Goods and Services

According to the Millennium Ecosystem Assessment methodology, there are four categories of ecosystem goods and services:

- Provisioning Goods & Services: resources like raw materials, food and energy
- Regulating Services: natural processes, such as disease control, water purification, soil stabilization and climate regulation

- Supporting Services: fundamental ecological functions like plant growth and nutrient cycling
- Cultural Services: non-material benefits, including spiritual, recreational and educational connections to nature

Not all ecosystem services are relevant to every protected area. For instance, avalanche control is irrelevant for the Middle East. Each area provides a unique set of goods and services which should be identified in close collaboration with PA management.

ECOSYSTEM SERVICES					
1. PROVISIONING	2. REGULATING	3. CULTURAL AND SOCIAL	4. SUPPORTING		
Food (e.g., crops, fruit, livestock, wild berries, fungi, game)	Carbon sequestration		Production		
	Water regulation (e.g., flood prevention)	Ecotourism and			
Fibre/materials (e.g. wool, skins, timber)	Water purification and waste management	recreation	Nutrient cycling and decomposition		
	Air quality regulation	Water cycling			
Fuel (e.g. biomass, firewood)			water cycling		
	Erosion control	Cultural values and			
Natural medicines Ornamental resources	Avalanche control	Cultural values and inspirational services (e.g., education, art and research)	Weathering/erosion		
	Storm damage control	and researen,	Ecological interactions		
(e.g. Wood for handcrafts, seashells)					
, ,	Wildfire mitigation		Evolutionary processes		
Biochemicals and pharmaceuticals Water	Biological control				
	Pollination	Landscape and amenity values	Genetic/species		
			diversity maintenance (e.g., protection of		
	Regulation of human health		local and endemic breeds and varieties)		

While identifying relevant ecosystem goods and services, it is important to account for the interrelation between them. For instance, pollination as a service has its own value, but at the same time, it leads to an increase in the amounts and value of food provisioning. Thus, inclusion in the monetary valuation of both services might lead to double-counting. The risk of double-counting is the reason why supporting services are usually excluded from the aggregate monetary value estimates of the site.

Selecting an Appropriate Valuation Technique

There are multiple methods for establishing monetary estimates for ecosystem goods and services. They can be broadly categorized into primary and secondary valuation techniques.

Primary valuation methods involve direct data collection and are further divided into stated preference, revealed preference and cost-based approaches.

- Stated preference methods, such as choice modeling and contingent valuation, use surveys to understand how much people are willing to pay to preserve or gain environmental benefits.
- Revealed preference methods, like hedonic pricing, infer value from actual market behavior, observing how environmental features influence prices.
- Cost-based methods estimate value based on the cost of preventing or replacing ecosystem services.

In contrast, **secondary valuation** methods, such as value transfer, rely on data from existing studies to estimate values for similar services in new locations.

The value transfer method is a practical approach to valuation recommended before

the area's designation to support political decision-making. This method is cost-effective and enables the quick generation of adequate estimates on a large scale. However, once the area is designated, we suggest conducting more detailed valuation methods that yield higher accuracy and site-specific insights. In this case, refined assessment will serve as a robust baseline against which long-term management effectiveness can be assessed.

A key consideration for both conservation practitioners and decision-makers is that the valuation of ecosystem services requires acknowledging both measurable and intangible benefits. While the value of most provisioning and regulating services can be quantified, protected areas provide broader societal benefits, including strengthening community cohesion, enhancing local political participation and preserving cultural heritage, that defy economic valuation. Thus, a comprehensive valuation will likely comprise a combination of qualitative, quantitative and monetary estimates, and the actual value of PA's tangible and intangible benefits will exceed what can be captured through monetary metrics alone.

Category	Valuation Method	Approach	Application Cases	Example Ecosystem Service	Suitability Method Application
Stated Preference Method Primary Valuation Method	Choice Modeling (discrete choice experiment)	Uses surveys where people choose between different environmental options, each with a mix of features and costs, helping reveal what aspects they value most	Best for valuing cultural services and situations where multiple aspects need to be considered at once	Valuing recreational features in national parks (e.g., trail access, wildlife viewing, facility quality)	Highly robust for complex valuations but requires significant expertise and resources
	Contingent Valuation	Asks people directly how much they would be willing to pay to gain or preserve a benefit, or to avoid environmental damage	Can be used for any type of ecosystem service, especially cultural and non- use values	Measuring public willingness to pay for protecting endangered species or maintaining clean air	Versatile but faces criticism over hypothetical bias and requires careful survey design to ensure reliability
Revealed Preference Primary Valuation Method	Hedonic Pricing	Observes how environmental features (like clean air or green spaces) affect market prices, such as the price of homes or land	Works when environmental features affect property or land prices	Measuring how air quality or proximity to green spaces affects house prices	Uses real market data but is limited to environmental factors reflected in property markets

Category	Valuation Method	Approach	Application Cases	Example Ecosystem Service	Suitability Method Application
Cost-Based Primary Valuation Method	Damage Cost Avoided	Estimates how much damage (like flooding or property loss) ecosystems help prevent and uses that avoided cost as a measure of value	Best for services that protect against natural hazards like floods or storms	Valuing coastal wetlands by calculating potential flood damage to nearby properties they prevent	Provides concrete, defensible values but requires solid data on both ecosystem function and potential damage scenarios
	Replacement Cost	Calculates the cost of replacing an ecosystem service with a human-built alternative, such as building a water treatment plant to replace natural water filtration	Used when ecosystem services can be replaced by built alternatives (e.g., filtration)	Cost of water treatment plants vs. natural watershed filtration	Provides clear numbers but may overestimate value if replacement isn't necessary
Benefit Transfer Secondary Valuation Method	Value Transfer	Applies values from existing studies in other places to a new location, allowing quicker estimates without doing a full valuation study from scratch	Useful when applying values from existing studies to a new location	Using wetland values from one region to estimate values in another	Cost-effective and widely used in policymaking; however less accurate than primary studies



Step 2. Assess the Impact of PA Establishment **Against Other Land Use**

Establishing the area's baseline value is an essential step for protecting it. It can also serve as a baseline for assessing the effectiveness of the area's management in the future, with the increasing value of ecosystem services indicating the success of management endeavors.

However, a "pure" baseline value might not be enough to make an informed decision, especially when the area is considered for alternative land use.

Say governmental officials have two options for the land: establish a protected area or convert it to cropland. Protected areas often bring conservation benefits; at the same time, they can impose costs on local communities by limiting resource use. Conversely, agricultural land can generate immediate economic gains but will degrade ecosystems in the long term.

To inform decision-making and determine the best land use, comparative analysis and scenario modeling are applied.

Impacts To Consider In Scenario Modelling

While each protected area requires customized scenario modeling to reflect its unique context, specific benefits and costs consistently emerge across different management approaches:

Benefits to Consider

1. Broader socioeconomic benefits related to the establishment and overall existence of the protected area

Broader socioeconomic benefits are usually not linked to any ecosystem service and include the volume of economic activity stimulated through investments in protected area infrastructure,

management and operations, which promote local economic activity measurable through indicators like employment and GDP impact.

For instance, according to the World Bank report, for every dollar governments invest in protected areas and nature-based tourism, the economic rate of return is at least six-times the original investment.8

2. Impact on baseline value of ecosystem services resulting from management interventions

Management interventions are expected to increase or preserve the value of ecosystem services supported by the protected area. For example, mangrove restoration will improve the areas' ability to store carbon, purify water, support biodiversity and ensure coastal protection.

To accurately model how management will affect ecosystem services, it's necessary to define the specific management programs and actions that are to be carried out in the protected area and then estimate how the value of ecosystem services will change after the implementation of such management programs.



Costs to Consider

1. Direct cost of protected area establishment

The direct cost of establishing protected areas includes expenditures for designation, capital expenditures for area development and operating expenditures.

2. Indirect cost of protected area establishment

Indirect costs primarily affect local communities through restrictions imposed by protected area establishments.

- These can include limitations on resource use, changes to traditional activities or reduced access to certain areas. The impact of these costs needs to be assessed at both regional (country) and local scales to enable accurate trade-off evaluation.
- While protected areas may deliver net benefits at the regional level, local communities might disproportionately bear these indirect costs. In such cases, governments should implement mitigation strategies such as:
 - Minimizing disruption to local activities where possible
 - Offering alternative livelihood programs
 - Providing appropriate compensation for documented losses

When evaluating protected areas against alternative land uses, a decision-maker needs to carry out a comprehensive comparison of the costs and benefits of all the land use options. However, this

analysis should recognize that protected areas safeguard fundamental biodiversity value that extends far beyond quantifiable human benefits. It must also acknowledge that standard ecosystem services valuations only capture monetary impacts, while many critical benefits cannot be expressed in financial terms and put on the balance sheet. Therefore, decision-makers should ensure their final assessments incorporate both monetary and non-monetary benefits to reflect the full value of the protected area.

Step 3. Implement Projects and Monitor Ecosystems' Health

- Valuation should not end with analysis it must translate into action. The final step involves executing conservation projects, implementing sustainable land management practices and continuously monitoring ecosystem health to ensure positive outcomes.
- A comprehensive monitoring system should be established to track both ecosystem health and community dynamics, incorporating traditional metrics alongside social indicators.

Closing Remarks

Governments often face difficult trade-offs between competing land uses: investments in agriculture, infrastructure and extractive industries may offer faster or more visible economic returns, while conservation delivers long-term, often less immediate, benefits for ecosystems, communities and future generations. In this context, protected areas are frequently seen as a moral or symbolic choice, rather than a practical investment. This perception reflects a deeper flaw in our decision-making: by failing to account for the true value of nature, we continue to prioritize short-term returns at the expense of long-term resilience. Recognizing protected areas as critical investment is a necessary step forward.

This paper presents a structured framework for valuing ecosystem services as a way to inform more balanced and evidence-based land use decisions. It reviews a range of valuation methods, both primary and secondary, and explores how they can be applied to quantify the tangible and intangible benefits provided by nature. The goal is to reframe conservation not as a sunk cost, but as a strategic investment that delivers long-term social, economic and ecological returns.

This work is part of a broader effort to move from evidence to implementation. While this paper focuses on making the case for conservation through valuation, the next will look at financing, bridging the gap between understanding the value of nature and investing in its protection.

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