

Research Articles

The Practical Fit of Concepts: Ecosystem Services and the Value of Nature

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Abstract

Conceptual innovations are a central feature of global environmental governance. Confronting degradation and unsustainability, scholars and practitioners turn to new concepts to identify, make sense of, and chart new directions towards meaningful governance solutions. But why do some concepts create lasting changes to governance institutions and governance practices, while others do not? Ideational theories of international relations highlight the importance of normative fit. In this paper we analyze the concept of ecosystem services to show that normative fit is just one dimension of governance fitness, which also includes practical fitness. Ecologists and economists coined the concept of ecosystem services to make biodiversity conservation intelligible to decision-makers versed in economic thinking. It has gained rhetorical traction, but ultimately failed to change how we treat nature because it lacks practical fitness. We interviewed fifty-six individuals working in twelve international organizations that have sought to translate the concept of ecosystem services into practice. Our analysis reveals forces limiting practical fit and constraining institutional uptake at three levels of analysis: structural, organizational, and agent. We present a cautionary tale that pushes scholars to carefully consider practical fit alongside normative fit when suggesting new concepts as organizing frames for how we govern global environmental challenges.

Concepts are key to governance. They give life to features of our planet, economies, and institutions, framing our understanding of problems and presenting potential means to address those problems. Environmental concepts have proliferated in recent years. Sustainable development, resilience, circular economy, planetary limits, and green economy are just some of the innovative framings that have emerged to make sense of unsustainability and imagine alternative futures

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(Meadowcroft and Fiorino 2017). New concepts are sometimes introduced to replace apparently unsuccessful concepts or to refresh existing concepts. But what explains a concept's impact and fate? Why do some concepts stick and create lasting changes to governance institutions and governance practices, while others do not? Ideational theories in international relations highlight the importance of a concept's perceived legitimacy and fit with existing social structures and key actors' identities (Bernstein 2001, 21). We argue that this normative understanding of "fitness" is incomplete; practical fit also matters. A concept that resonates with existing ideational structures will enjoy limited success if it does not provide a clear and actionable program that practitioners can follow to solve a given problem.

We demonstrate the importance of practical fit by examining the concept of ecosystem services, which was introduced into the idiom of global environmental governance in the early 2000s. It offers an explanation for why this idea, which provided a rationale for nature protection largely grounded in economic logic, has ultimately failed to become embedded in international conservation practices. Other concepts have taken its place. The International Union for Conservation of Nature (IUCN) and other early advocates for ecosystem services now exclusively use "nature-based solutions." Even the Intergovernmental Science-Policy Panel for Biodiversity and Ecosystem Services (IPBES) recently subsumed the concept of ecosystem services within a (slightly) broader framework of nature's contributions to people.

The problem resides in the contradiction between the broad claims made for the concept (to change the balance of development decisions by accurately capturing the economic value of the services provided by nature) and the difficulty of its operationalization (e.g., systematically enumerating nature's services and valuing them economically or otherwise) to substantively alter conservation outcomes. Concepts play different roles in international environmental governance. Ambiguity and interpretive flexibility are helpful to structure discursive interaction and gain support by various actors. But for ecosystem services, the gulf between broad ambition and the impracticality of real-world application became a crippling disability.

Ecosystem services is a complex concept that reveals interactions between distinct elements in the natural world and connects humans and nature by stressing the functions that emerge from these interactions. Ecosystem services is also a technical concept that grounds environmental decisions in financial and economic modes of reasoning, often including, though not always or necessarily, monetary valuation.

The story of this concept reveals the limits of existing ideational theories. Such theories would expect—based on the concept's perceived legitimacy and fit with existing social structures and key actors' identities (Bernstein 2001, 21)—that it would succeed in making biodiversity conservation intelligible to those versed in economic thinking. For sure, these theories provide some insights into the fortunes of this concept. Ecosystem services could be considered emblematic of the compromise of environmental liberalism (Bernstein 2001). Its genesis in prestigious US academic institutions is suggestive of its legitimacy and alignment with key actors' identities. Since its emergence, a vast academic literature has appeared. In 1997 there were only forty-eight references to "ecosystem services."

Today, this number is over 24,000.¹ Rhetorically, states, nongovernmental organizations (NGOs), businesses, and intergovernmental organizations frequently cite the concept. Several political processes discussed how to perform valuations and assessments of ecosystem services and further implement the concept. The term had broad acceptance and was designed to align with dominant liberal economic ideas. According to existing theories, it should be a politically winning concept.

Yet, its use as a program of action to improve biodiversity conservation is limited. To understand this failure to launch (cf. Hadden and Seybert 2016), we amend work on ideas and institutional change. The fate of new concepts is affected by their “fit” with existing institutional contexts, where fitness is usually understood in ideational or normative terms: new ideas stick when they resonate with (or can be assimilated with) existing norms or ideologies (Acharya 2004; Bernstein 2001; Stevenson 2013). However, this understanding of fit misses whether a concept provides a clear and actionable program that practitioners can follow to solve a given problem. Borrowing from Campbell (2004), the concept is a useful frame for legitimating a way of thinking about conservation. The concept has done less well at providing actors a clear program for improving conservation. Failing to help solve problems can, in turn, undermine the output legitimacy of the concept. We show that normative fit is just one dimension of governance fitness, which also includes practical fitness. A focus on practical fit directs empirical work toward the obstacles that confront countries, IOs, and the bureaucrats working within, as they seek to use a concept as a programmatic guide. This refocus elucidates that, while normative fitness has ensured that the ecosystem services concept has succeeded as a framing device, ultimately, it has failed to change how we treat nature, because it lacks practical fitness. In short, it has proven almost impossible to implement.

The article proceeds with an explanation of the theory underpinning our analysis and our methodological approach based on interviews with individuals working in twelve IOs. We then explain how the ecosystem services concept developed before digging deeper into this story to reveal impediments to international institutional uptake. We demonstrate the concept’s lack of practical fit by pointing to structural, organizational, and agent-level constraints that have undermined its application. We conclude by summarizing our findings and reflecting on their implications for the role and limits of conceptual innovation in global environmental governance.

Theoretical Underpinnings

Our analysis is informed by, and contributes to, the theoretical insights of ideational institutionalism and conceptual innovation. Ideational institutionalism is the label we give to analyses of institutions and organizations that focus on how ideas become normalized and embedded in institutions—how they come to serve

1. These numbers reflect works included in Scopus as of January 2019.

as “cognitive filters” through which actors interpret problems and policy options. By shaping the interpretation of events and processes, ideas help uncover why an issue receives public attention and leads to incremental or radical policy change. From this perspective, ideas have a dual function: they are constraining and structuring, and they are resources that actors use to make sense of situations and pursue certain objectives (Campbell 2004; Carstensen 2011, 602–3).

Public policy scholars suggest that change comes about through a two-stage “demand and supply” process (Berman 2013). Embedded ideas (like “liberal environmentalism” or the “Washington Consensus”) remain stable until a “crisis” or exogenous change (like a financial crisis or significant shift in balance of power) creates radical uncertainty and a demand for new ideas (Hall 1993). Champions for new ideas emerge and discredit the old ideas (Blyth 2002), amounting to a new overall supply. This punctuated equilibrium model was recently supplemented with an account of incremental ideational change whereby institutionalized policy ideas are adjusted over time in response to “institutional frictions” (Moschella 2015, 443–444). For example, the World Bank began to institutionalize environmental ideas in response to sustained critique and a reputational crisis (Park 2010).

Why do some ideas become embedded in institutions while others are resigned to obscurity? Meadowcroft and Fiorino (2017, 11) suggest three elements that characterize successful ideas:

First, the conceptual reconfiguration must address a perceived need: it identifies a new problem, diagnosis, or solution, or productively reorders established understandings... Second,... it needs to be able to speak to multiple constituencies.... Third, the reconceptualization should not be too alien to existing discursive patterns and dominant understandings of the way “the world works.”

Their third characteristic reflects the notion of normative fit. Not any idea can become mainstream; there is a selection effect favoring ideas that align with dominant understandings of the world. “Successful” environmental ideas and norms are often assimilated into the liberal economic order (Bernstein 2001) or redefined to align with the approaches used by existing institutional mechanisms (Hajer 1995). To gain traction, new ideas need to resonate with existing ones.

Normative fit, we suggest, is just one part of governance fit, and practical fit is another, equally important part. A concept may align with dominant understandings, and yet still fail to generate change because it is highly impractical. The market logic underpinning ecosystem services enabled its rhetorical uptake by appealing to a broad range of stakeholders. It frequently appears in environmental discourse to highlight the importance and rationality of conservation, but practical activities related to ecosystem services focus on capacity-building (Allen et al. n.d.). Practical limitations thwart deeper institutionalization; measuring, valuing, and paying for ecological functions are complex and uncertain tasks often left to practitioners. For a concept to be institutionalized, those practicing and implementing it must be able to actually use it. To measure normative fit, one can therefore look to the uptake of an idea in discourse, but to assess practical fit,

we need to understand whether the idea has been translated into an actionable program that changes what actors do.

The best international actors to consider when assessing practical fit are those on the front lines of using a concept: bureaucrats in IOs or NGOs. How they employ the concept can affect its institutionalization. We identify three types of dynamics that shape and constrain the ability to use a concept and, in turn, its practical fit. First, structural-level dynamics consider alignment with donors' demands and countries' and others' capacities to implement the concept. Second, at the organizational level, silos created by disciplinary practice and organizational structures can impede institutionalization. Such silos mean that echo chambers may develop, creating different interpretations and uses of the concept by various groups. Such fragmented practice and understanding can undermine overall institutionalization as no overall pattern emerges. Third, at the agent level, individuals need to make the abstract rhetoric into tangible realities to implement a project. This can lead to "creative" interpretations, influenced by an individual's training and worldview. This again fragments how the term is employed at a practical level and makes scalable uptake challenging.

Methodology

We examine international actors that have sought to translate the ecosystem services concept into practice. We investigate trends *across* cases rather than in-depth studies of political uptake *within* organizations. There is variation in the extent of uptake within organizations, but our aim was to understand broader trends in the community of actors working on ecosystem services. We remained agnostic about the type of organization, treating NGOs, secretariats, and inter-governmental organizations similarly, with a shared status as "global governors" (Avant et al. 2010). This category is deliberately broad, capturing actors with distinct forms of authority "who want new structures and rules... to solve problems, change outcomes, and transform international life" (Avant et al. 2010, 1).

We selected organizations based on their extensive work innovating and using the ecosystem services concept to help uncover the political dynamics around its uptake. We used a crucial test case selection strategy. Since we are interested in over-time trends, we researched organizations involved in ecosystem services work from its conceptual refinement in the Millennium Assessment and other organizations that were later adopters, or peripheral to that process. These organizations all have experience in engaging with the concept, refining it for their use, and, at times, re-refining it based on their experiences. The organizations were the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP), the Food and Agriculture Organization (FAO), the World Bank, the Global Environment Facility (GEF), IPBES, the International Fund for Agricultural Development, IUCN, the World Resources Institute, the World Wildlife Fund (WWF), and the secretariats of the Convention on Biological Diversity (CBD) and the Ramsar Convention on Wetlands.

We conducted semistructured interviews (ranging from thirty minutes to two hours) with fifty-six individuals working in these twelve organizations.² We are confident that we reached a saturation point. Even after speaking to individuals working on different issue (such as agriculture, forests, or finance) and holding varied positions in their organizations, we reached a point where these varied individuals were relating similar themes on why ecosystem services was a difficult concept to put into action on the ground. Most were conducted in person; a few were conducted by Skype. Transcripts were coded in NVivo using a scheme focused on who uses the concept, how they used it and why, and on arising lessons and challenges. Our analysis begins with a description of key political milestones in the career of ecosystem services; we then explore factors our interviews revealed about the concept's practical-fit shortcomings.

The International Career of Ecosystem Services

The ecosystem services concept became mainstream in academic circles in the 1990s (Gómez-Baggethun et al. 2010) but took longer to move from academic debates and national experiments to international policy making. The 1992 Rio Declaration includes the idea of valuing environmental costs but not services. It instead recognizes the polluter-pays principle, which seeks to punish those causing environmental harm, whereas ecosystem services entail rewarding those engaged in conservation. Ecosystem services received only a glancing reference in Agenda 21 (155).

In the early 2000s, the Millennium Ecosystem Assessment (MA) marked a turning point by defining a framework to implement the concept. The framework divided services into four categories:

provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other nonmaterial benefits. (Millennium Ecosystem Assessment 2005, 3)

The MA's conceptual framework related each of these four types of ecosystem services to several categories of human well-being: security, basic material for a good life, health, good social relations, and freedom of choice and action. By further categorizing and anthropomorphizing the concept, the MA refined it into a more readily usable form for policymakers. Many of these policy actors, including

2. Numbers ranged from one to thirteen interviewees in each organization. Our priority was to interview staff with the most experience and/or authority on this subject, rather than large numbers of staff within each organization. Even in large organizations, such as UNDP, very few staff have an explicit mandate concerning ecosystem services, and interview requests were often redirected to one or two people within an organization. The positions of our interviewees included (present and former) program manager, head of unit, senior technical advisor, task manager, lead economist, senior and lead environmental specialist, regional coordinator, and program officer.

intergovernmental organizations and nongovernmental organizations, were subsequently involved in promoting the use of this concept, with a focus on economic valuation. Initiatives such as the network of subnational assessments, and the Economics of Ecosystems and Biodiversity (TEEB) worked with the MA's framework, seeking to analyze the economic benefits of biodiversity. Further work focused on economic valuation and took a distinctive development focus. The World Bank, through the Changing Wealth of Nations report and the Wealth Accounting and the Valuation of Ecosystem Services (WAVES) Partnership, aimed to show how economic valuation could help inform resource management and development.

These efforts helped institutionalize the concept. The CBD's Aichi Targets enshrined ecosystem services into Strategic Goal D, to "enhance the benefits to all from biodiversity and ecosystem services." The Rio+20 outcome document also referred to ecosystem services in the context of biodiversity, forests, and trade, and noted their intrinsic and economic values. New at Rio+20 was a focus on recruiting the private sector into ecosystem services initiatives, including the Natural Capital Leadership Compact and the Framework for Corporate Action on Biodiversity and Ecosystem Services. Later, the 2015 Sustainable Development Goals used the concept in targets related to Goal 15, "Life on Land."

The creation of IPBES further institutionalized the concept but also undermined it. IPBES created the rival concept of "nature's contributions to people" (NCP). Despite its place in the title of the intergovernmental body, ecosystem services has become a subservient concept to NCP. A value-pluralist epistemic community has reacted against the utilitarian framing of ecosystem services by seeking to push nonutilitarian values and methods to the center of this concept and its application (Craig et al. 2019). NCP framework includes eighteen categories grouped as regulating, material, and nonmaterial contributions, which can be "expressed through a diverse set of valuation approaches and methods" (Díaz et al. 2015). At the 2018 meeting, when the new framework was fully mainstreamed into IPBES' assessments, there was pushback against replacing ecosystem services with NCP. Some interviewees (requesting anonymity) hinted at pressure to replace ecosystem services with NCP throughout the assessments. Others characterized the conceptual evolution as an outcome of scientific debate about whether ecosystem services could incorporate social sciences and indigenous and local knowledge (IPBES2). The future of the ecosystem services concept may be uncertain, but the links that it drew between nature and human well-being remain intact.

Next we explore the practical experiences of international actors engaging with this concept and reveal the forces that constrain its implementation. The promise of ecosystem services to transform our unsustainable use of nature fades as we recognize this concept's weak practical fitness.

From Concept to Practice

Moving a concept from international framing device to program of action is a fraught process that confronts several constraints. The literature on ecosystem

services has only recently begun grappling with this process. For decades, studies on ecosystem services were dominated by methodological debates about biophysical mapping and economic valuation, although pluralist conceptualizations of value are increasingly common (Ainscough et al. 2019; Costanza et al. 1997; Daily 1997; Gómez-Baggethun et al. 2016; Spangenberg and Settele 2010). Until recently, little has been known about whether and how policy makers use the concept. Wright et al. (2017) analyzed the comparative decision-making utility of different presentation formats and found that ecosystem services information tends to facilitate conceptual discussion but not instrumental decisions involving alternative policy options. Monetary, biophysical, and qualitative measurements can be difficult for decision makers to process and often have incomplete credibility (Wright et al. 2017, 137). Van Oudenhoven et al. (2018) observe that scientific credibility is usually the main criterion used in developing ecosystem services indicators. Less attention has been paid to feasibility, which they argue is crucial in determining whether ecosystem services information is used in decision-making. Incomplete data, complexity, resource constraints, and the limited “shelf life” of indicators are all practical constraints affecting the use of this concept (van Oudenhoven et al. 2018). An Australian study found dwindling interest among decision makers, resulting from multiple impediments. The most common were governance and structural deficiencies (lack of coordination across departments; duplication of efforts; confusion over multiple, competing methodologies; staff turnover; institutional inertia), as well as inherent complexity (Keenan et al. 2019).

These studies support our argument that practical fit is crucial for successfully institutionalizing a new concept like ecosystem services. The impediments revealed by these studies are consistent with those we find in IOs and point to this concept’s lack of practical fit.

We begin our analysis with structural constraints that flow from the nature of the work carried out by IOs with countries confronting problems such as biodiversity loss. We then turn to the organizations that are involved in meaning making in global governance and the agents—or international officials—who must oversee the work of translating a new governance concept from theory to practice. This threefold focus, while not exhaustive, offers a range of perspectives on the diverse challenges the concept faces in practice. Table 1 offers summary observations about constraining factors across the levels.³ For analytic purposes, we examine the levels separately but recognize that they do interact and overlap.

Structural Level

The political-economic landscape features elements that enable and constrain the uptake of the ecosystem services concept. This is a concept that, in theory, can be applied in all countries. But the supportive work of IOs and NGOs is largely reserved for developing countries. One condition enabling the uptake of this

3. Interviewees are anonymized and identified only with an organizational code.

Table 1
Factors Constraining the Practical Fit of the Ecosystem Service Concept

<i>Level of Analysis</i>	<i>Constraining Factors</i>
Structure	Limited resource and capacity, and staff turnover, constrain implementation and enforcement, made worse given complexity and site-specific nature of ecosystem services methodologies
Organization	Inflexible silos of IOs are ill matched with systemic focus of ecosystem services concept; limited private-sector engagement with international efforts to promote ecosystem services, constraining potential of payment schemes
Agent	Inconsistent definitions and technical nature undermine and complicate implementation; valuation methods questioned or outcomes given little weight in political decision-making; methods not designed to answer questions decision makers face, and trade-offs and other alternatives are not appraised, making valuation exercises less useful; requirement for service-specific valuations to be assessed against other resource and land-use demands, creating huge technical and administrative burdens

concept is the prevalence of environmental problems and the commitments arising from multilateral agreements (mainly the CBD), both of which align with the concept of ecosystem services and direct its application toward developing countries. Ecosystem services is a solution-based lens to see the world; it highlights how nature can contribute to human well-being and how valuing nature can solve or avoid problems. As problems mount for developing countries, IOs are able to use the language of ecosystem services to propose new solutions. As UNEP and UNDP interviewees observed, developing countries may not explicitly seek out support with ecosystem services, but they do seek out support for their environmental problems and commitments (UNDP8, UNDP10). "We have passed the stage where everything, in terms of economic development, was driven by the Kuznets type curve.... Countries are aware that they will not develop through destroying their environment, so they are looking for solutions" (UNDP8). This creates an opening for IOs and NGOs to present ecosystem services valuation as one tool in the toolbox (UNDP8). While there may have once been more gung-ho optimism about the potential for this concept to change the way nature is governed, now it is mostly recognized as just one tool that might be implemented alongside others (GEF2, UNDP8, UNDP11, UNDP12).

Notwithstanding the recognition of problems and broad acceptance of sustainable development, developing country conditions constrain the implementation of solutions. Lack of resources limits regulatory capacity. While there may be capacity to design and pass environmental legislation, enforcement is often

unviable (Batista et al. 2019). High staff turnover at national and local levels is a further constraint. While this affects the implementation of any environmental policy, it is particularly relevant for ecosystem services, given the complexity of this idea. There are many potential services and distinct valuation methodologies. UNEP and UNDP reflected on the challenge of working with municipal-level staff in Latin America, where there is little consistency when the leadership changes: a new mayor comes in with a new vision and new staff, and all the investment in capacity is lost (UNDP1, UNEP2, UNEP3, UNDP2). A WWF interviewee also reflected on the challenge of limited national capacity, noting that it usually resides in “one or two champions ... who rapidly learn, then practice and implement ... then spread lessons and stories in the region or internationally” (WWF2).

Countries with commodity-based economies face particularly high opportunity costs for changing existing land uses; resolving the tension between short-term growth and long-term sustainability is arguably hardest in this context. Proponents of ecosystem services argue that seeing nature as a source of revenue can bring short-term and long-term needs into alignment. But convincing decision makers outside environmental circles remains easier said than done, especially given that policy making is often irrational. The concept of ecosystem services assumes rationality, but as one GEF interviewee said, “politics is politics,” and even in the United States, the policy process is “arguably quite irrational” (GEF1). The presence of powerful interest groups undermines rationality but also reinforces “an anti-science, anti-establishment, anti-elite movement” now evident in many countries (GEF1).

Organizational Level

At the level of the organization, we see constraints in governance structures and relations. Translating the concept of ecosystem services into practice is constrained by a set of inflexible silos characterizing international environmental governance. The complexity of the concept and its systemic basis conflict with the segregated nature of decision-making in organizations and in the countries in which they work.

One form of segregation that presents constraints is disciplinary portfolios. Putting the concept of ecosystem services into practice requires considering the interdependencies between distinct elements, such as water and energy or carbon dioxide and fisheries. Typically, individuals with certain academic backgrounds would congregate in some departments over others (WRI3). But in practice, these elements are organized into separate portfolios that “don’t talk to each other” (UNEP4). This is a problem of organizational structures and professional capacity. Typically, there is no coordination mechanism between disciplinary-based governmental agencies or organizational units (WRI3). Interdisciplinary training is very rare, and agencies are often built around academic disciplines (WRI3) or are structured to handle specific economic or environmental sectors, such as a climate change division or a water unit. Disciplinary portfolios have advantages, including bringing together substantive experts and devoting resources to priority issues. But

organizational divisions can also create obstacles. Ecosystem services is an idea intended to cross sectoral boundaries and integrate environmental objectives with other planning objectives, but most work on ecosystem services is carried out only, or largely, with environment ministries. Current and former UNDP staff explained that environment ministries “have the weakest mandate and budget, so they have limited power” (UNDP12). They “are not players, they are seen as a pain in the arse. And this is a problem if these are champions of biodiversity” (UNDP13). Outside environment ministries, there is still a pervasive perception that natural resources are nondepletable, and as a result, “it is hard to bring (planning and finance ministries) on board” (UNDP12). The interaction between environment, planning, and finance ministries is typically “the minimal... required by their mandate. It is limited to preparing reports and documents” (UNDP12).

Among the actors we interviewed, there was some recognition about how their own silos and those of client countries can hinder the uptake of ecosystem services work (IUCN1). One solution has been crosscutting thematic initiatives in strategic plans devoted to ecosystem services, as used at the FAO and planned at IUCN (IUCN2). An IUCN interviewee recognized the need to “stop being so siloed” and stressed the need to bring people together from different ministries to “run through a whole knowledge transfer, problem solving, thinking” (IUCN2). FAO implemented a “major area of work” on biodiversity and ecosystem services to bring together staff working on ecosystem services. The result was surprising—more than 150 employees signed up, stating that their work either implicitly or explicitly related to ecosystem services. Respondents were surprised at the level of interest but also expressed uncertainty about its future, given its two-year mandate. There were also diverging views about the extent to which the major area of work facilitated mutual learning, with some staff citing useful exchanges but others left unsure whether their colleagues were “really” using the term properly.

Efforts to bring different units into conversation can reveal capacity limits but also conflicting mandates that generate “turf wars,” for example, a river cannot be optimized for shipping, bird life, agriculture, *and* water supplies (WRI3). One former UNDP staffer doubted whether they or their national clients had the expertise to work with such a “complicated” concept: “It was hard to think about ecosystem services beyond, say, watersheds... [or] carbon” (UNDP13). A UNDP interview is also illustrative: “Most of the ES work at UNDP was PES projects. But these were mostly at the discussion level, I don’t recall any of these ideas taking off. We were really just paying lip service to the idea, not actually using it. Why? It was hard to figure out how you operationalize the idea” (UNDP13).

Beyond discrete organizations or government ministries, there is a broader breakdown of communication across regimes, particularly environmental and developmental regimes. For a concept aiming to intertwine these issues, this presents challenges. UNDP is at the front line of these regimes and is symptomatic of this breakdown (UNDP1, UNDP7, UNDP8, UNDP9, UNDP11). Beyond using a new rubric to organize its work, UNDP and UNEP previously implemented the Poverty–Environment Initiative. Hailed as a “paradigm of cooperation” between

UNDP and UNEP, the initiative pooled funds and staff at both the headquarters and in-country levels, raised US\$ 27.74 million, and catalyzed an additional US\$ 20.07 million in country-level support from 2008 to 2012. Its success led to its continuation through 2017. Yet, divided among twenty-eight countries over four years, the funding was insufficient to actually implement anything on the ground (UNDP n.d.).

The ability of the ecosystem services concept to break down silos seems mixed. One interviewee observed how the concept catalyzed connections and collaborations: using a “common language” was “really hard... but also really exciting” and “allowed us to work together” (WRI1). Another reflected on how the fragmentation of biodiversity and ecosystem services across regulatory bodies makes it hard for GEF to “get things done” (WRI2).

Another form of segregation that impedes uptake is between public and private governance. Proponents of ecosystem services designed the concept to speak to private actors or financial ministries and mobilize financial incentives for conservation. The private sector is key to this concept’s impact. There has been some movement toward successful engagement: IUCN with the UN Global Compact brought together a working group from the private sector, IOs, and academia to develop the Framework for Corporate Action on Biodiversity and Ecosystem Services, which aims to make the business case for valuing ecosystem services throughout a company’s supply chain (IUCN 2012). UNEP’s Financial Initiative (UNEP FI) and Global Canopy launched the National Capital Declaration to bring investors, banks, and insurance firms on board with the concept. From the TEEB Business Coalition, the Natural Capital Coalition emerged as particularly influential (WWF2). It now has more than 250 members rallied around a framework to apply natural capital and ecosystem services concepts in various types of businesses. Some interviewees pointed to successful instances of engagement where private companies were convinced to apply a valuation methodology to their operations (UNEP1, WRI1, WRI3, UNDP8).

From such successful, and more stunted, efforts, several insights emerged about why, on the whole, private-sector engagement is not meeting the aspirations of many IOs (UNDP13). Time horizons differ considerably, in both pace of decision-making and desire to stay long term. For ecosystem services projects, it can take time to build the business case for conservation and long-term productivity, which the private sector has not shown patience for (UNDP1, UNDP13). A short-term perspective is pervasive (UNEP1, UNDP13, IUCN2); without public regulation to force valuation and payment for ecosystem services, this will not occur voluntarily on a large scale (WRI2). While valuation studies are done and public policies supported to make a business case, businesses grow weary and move on (UNDP13). Such background studies are necessary to properly implement ecosystem services, as complex and disaggregated supply chains inhibit large food companies’ engagement with this concept.

The general failure to enroll the private sector limits the sustainability of ecosystem services schemes. Without private buyers, payment schemes depend

on continued public-sector support. This is financially unsustainable and defeats the purpose underpinning this concept. As a result, the payment schemes that do get off the ground tend to be short-lived projects or pilot studies (GEF2, UNDP12, FAO3). Rather than establishing payment schemes, IOs tend to employ the concept in capacity-building programs or as a general policy concept in their publications (UNDP4), which merely adds to the huge pile of reports that governments already receive (UNDP3). The best positioned IO to invest in payment schemes is the GEF, but even it focuses only on capacity-building due to the organization's short time horizons and tradition of project-based activities (GEF 2014).

Agent Level

Analysis of the structural and organizational levels highlights several problems of practical fit. Here we reflect on the capacity of individual agents to use or understand this approach to governing nature.

Conceptual innovation is driven in part by the desire to inspire and enable new ways of acting and interacting in the world. Proponents of ecosystem services were motivated by the neglect of nature in planning and policy making and believed that by speaking the language of economists, they could better communicate the value of nature. Our interviewees recognized this motive but drew different conclusions about the utility of this new language. The concept was widely believed to have higher communicative value; it highlights that nature involves providers and users and so can show connections between different economic sectors (FAO1). By speaking the language of finance ministries, there would be a greater chance of meeting the CBD target of doubling the amount of biodiversity finance (UNDP9). One WWF interviewee thought the “concept of valuing nature [though not necessarily the ecosystem services terminology]... is a bridge” to the more immediate concerns of people and decision makers (WWF3).

Yet, even this general communications value seems limited. As one interviewee complained, “we don't even have a common definition of what an ecosystem service is.” The concept is closely linked to biodiversity, which is itself a relatively new, vague, and sometimes contested term (WB23, CBD1). Many noted that they use whatever language works, which is something that “we learn as we go” (WRI2). And those lessons have shown that the concept was too technical and jargon-laden and that it can take a lot of time and resources to communicate the underlying meaning (IUCN1, FAO2, UNEP4). Local communities have not grasped the approach; they intuitively understand connections between livelihoods and nature but want to talk about their lived experience and knowledge and how to improve their lives—it would make no sense to go in and speak about “ecosystem services” (FAO4). While “talking in terms of goods and services makes sense,” the term *ecosystem services* “doesn't have the impact you would think” because people understand more general terms, such as *nature*, and more tangible ideas (UNDP9, UNEP4). For these reasons, some suggested *natural capital* or *environmental services* as useful replacement terms (UNDP9, IUCN1). Far from

speaking across silos, the concept proved to be inward-looking, mostly speaking to specialized audiences already persuaded by this approach to conservation (WRI2, WRI3, UNDP9, UNDP10, Ramsar1, WRI1, IUCN1, FAO2, IFAD1).

Even the valuation studies that put a dollar figure on the value of ecosystem services and promised to speak the language of policy makers and businesses have not bridged that gap. Doubts about the practical value of TEEB-style valuations and environmental accounts were prevalent. "It is all well and good to say that the Amazon is worth X trillions of dollars, but at the end of the day it doesn't mean much to policy makers or businessmen. This only matters to ecologists." (UNDP13; also FAO6). A WWF interviewee similarly raised the challenge of "moving to the next step" to "actually use available information... [to] make better decisions" (WWF1). Despite grabbing headlines, such valuations have little political impact, sometimes because the methods are questioned (UNDP7, UNDP9, FAO6). The valuations for ecosystems covering a large area seemed to have the least value (GEF1, FAO6). While such valuations may help ecologists and economists make sense of changes over time, they are not speaking to those wielding political power.

The problem is that the concept was meant to speak to decision makers rather than dialogue with them. Those making decisions are missing in accounting system tools and hypothetical valuations. "So the idea was you do valuation, and you give it to the decision-maker. They're like, 'Yeah, sure, it looks good... but what if I do something else with that area, what do I get out of that?' [Valuation studies] don't have the answer to that" (UNDP6). There is little space in the concept or in the valuation process for policy makers to identify the questions that the valuation should answer, leaving the reports cast aside because they do not answer relevant questions (WB2, WB27). Interaction with national policy makers in Myanmar also revealed to one WWF interviewee the limitations of the UN's environmental accounting system: after listening to precisely what they wanted and why "we had to redesign the whole system" to meet their (surprisingly ambitious) needs (WWF1). UNDP also developed its own approach, Targeted Scenario Analysis, which starts with a real policy question and presents both business-as-usual and good-practice scenarios that answer "What are the costs I need to give? How much investment do I need? What happens if I invest this much here in terms of the rate of return I get on that investment?" (UNDP6). This kind of methodology "is much easier to grasp... because if you're going to do a cost-benefit through a targeted scenario analysis, that's something that's the bread and butter of the ministry of finance, and planning." (UNDP6). Interviewees were aware that this is no silver bullet. One explained that in many cases where this methodology was used, "they didn't achieve the kind of success that they were looking for, but it helped to raise awareness... It's painstaking awareness, capacity development, and engagement" (UNDP6).

One key audience proved to be donors. Here there is patchy uptake and an increasingly flexible use of language owing to the difficulties in communicating the ecosystem services concept. There seemed to be a period when the concept was used extensively in funding proposals. One interviewee with previous responsibility for reviewing GEF funding proposals complained that the term was used

“loosely” and that PES ideas were generally “half-baked.” In response to what she saw as “sloppy practice” around the “vague” use of ecosystem services, she sent any proposal with the term back to applicants, asking them to take it out and explicitly state their meaning (UNDP11). While some donors like the idea and will demand ecosystem services be included in projects, others have no idea what the term means or trust that it means something that is valuable for their work (FAO1). Depending on the donor, there was a sense that ecosystem services could be invoked as an idea to help “sell” a project, rather than for its ability to help actors reconceptualize the connections between conservation and people (FAO3).

Perhaps deep engagement and understanding have been hampered by the lack of tangible applications of the concept. Over the last decade, there has been considerable action to try to fill the gap between science and decision-making, leading to numerous case studies, but still not necessarily making the concept truly operational in the eyes of some practitioners (WWF2, WB21). A key obstacle is the data-intensive implications of the concept. Now more than fifteen years since the MA popularized ecosystem service valuation, it is still not at the operational stage; the data requirements are too great and lacking (UNDP5, UNDP9, WRI2, IUCN1, WB13, WB17). One economist estimates that there are 3,000 ecosystem services that need to be classified, with each service assigned a number that can be used in economic modeling (WRI2). This is needed to correct for the problems of double counting in the MA and conflation of ecological functions and services. When it is used as a classification system, it causes conceptual and operational confusion (WRI2). Without spatial data and biophysical maps showing the locations and characteristics of ecosystem services, it is impossible to do the modeling necessary to inform decisions (WRI2, UNDP5).

In the face of such data limitations, the responses are largely to be “modest with methodology” because “even if it were possible to list all ecosystem services,” we don’t have “robust equations and methodologies” to value them (IUCN1) or to recognize that the methodologies are not perfect but better than nothing (WB1, WB25). Given the scale of getting all the methodologies in place, the investment required would be enormous. Given that governments already overlook data in their environmental assessments when making investment decisions (WR12), there was a sense of diminishing returns on investment in getting ecosystem services approaches fully operational.

The paucity of data means there is more information about some services than others. One UNDP interviewee explained how her team had analyzed more than 200 national biodiversity reports and action plans and found little evidence of ecosystem services data. “Nobody mapped ecosystem services... (so) policy makers have no clue what they’re losing when it comes to the ecosystems services that nature provided” (UNDP5). When ecosystem services are mapped, they are done so selectively. Analysis of national reports for the Ramsar Convention shows that countries frequently report on three particular services associated with wetlands: food for humans, recreation and tourism, and freshwater. By contrast, biological control of pests and disease, hazard reduction, nutrient cycling, and

pollination are never reported (McInnes et al. 2017, 127, 129). Even for those services that are reported, the methodological underpinnings are ambiguous. Parties would refer to broad approaches, such as “economic valuation,” but give little insight into the actual valuation techniques or approaches employed (McInnes et al. 2017, 126).

Methodological uncertainties are recognized as a broader problem for the ecosystem services concept. There are many methods for measuring the benefits of ecosystem services and calculating their value. The dominant methods are quantitative and economic. While the value pluralists have been successful in integrating qualitative and participatory methods into the IPBES framework, there is little evidence of uptake. But the quantitative methods that economists have developed over several decades are contested. There is no agreed optimal method for quantifying value. Stakeholders, powerful interest groups, and government agencies always question the methods and results (WRI1). They might challenge the proxies selected for measurement (e.g., acres of forest buffer, actual pollutant reduction, land values) or the values assigned to these proxies, or they may challenge the proxies and the values (WRI1).

Conclusions

Conceptual innovations are a central feature of global environmental governance. Scholars and practitioners, struggling with the immense challenges we face in improving our planetary stewardship, turn to new concepts to identify, make sense of, and, it is hoped, chart fruitful new directions toward meaningful governance solutions. Ecosystem services is one such concept. It offered a way to understand biodiversity that its promoters hoped would bring greater attention and action to conservation. And, while we show that the concept had strong normative fit with the ideas of sustainable development and liberal environmentalism, it fell short in practice because of limited practical fit.

Forces limiting practical fit and constraining institutional uptake of the ecosystem services concept can be observed at three levels of analysis. At the *structural* level, we observe political-economic forces. A demand for solutions to environmental problems supports the introduction of new concepts, but the economic profile of many developing countries tends to clash with the objectives entailed in valuing ecosystem services. At the *organizational* level, we see constraining forces in segregated relations within IOs and their client countries, as well as between public and private governance. At the *agent* level, we see how communicative and methodological factors constrain individual capacity to use the concept. The assumed advantage of speaking in terms of goods and services does not deliver the expected payoff; when the concept is used, it is often done so loosely or rhetorically. The ability of individual actors to implement the concept in a more robust way is hampered by data gaps, which would be difficult and costly to fill.

Ours is a cautionary tale that pushes scholars to carefully consider practical fit alongside normative fit when suggesting new concepts as organizing frames for

how we govern environmental challenges. Ecosystem services tried to offer a solution to one problem—decision makers do not value biodiversity on par with economic considerations. Yet, many constraints limit attention to conservation (e.g., capacity, data availability, methodological expertise), and the ecosystem services concept had no prescriptions for how they should be resolved. Thinking beyond our case, our analysis has clear implications for the promotion of environmental governance concepts that fit with the logic of the market. Carbon pricing, cap and trade, the social cost of carbon, and other related concepts fit Bernstein's idea of liberal environmentalism. Yet, in implementation, these ideas have struggled for reasons not unlike those facing ecosystem services. Building a market, it turns out, is not as easy as, say, regulating environmental harms. In contrast, ideas like eco-audits and environmental assessment appear to have met normative and practical fit considerations. Both have become institutionalized in the practices of states and private actors, even if in a manner that is a watered-down version of the normative goals of the original progenitors. One might argue that this is an extension of a normative fit argument. But we suggest that it is more analytically helpful to term these considerations *practical fit* given the different constraints and opportunities at play when ideas are being turned into action. Normative fit without practical fit, or vice versa, is of limited utility. But these are not static conditions. As organizational or ideational structures change, concepts might gain or lose fitness.

The topic of institutional uptake deserves further attention. Understanding the political consequences of conceptual innovation is essential to better orient us, scholars of environmental policy, in our efforts to facilitate change. Ecosystem services is just one of many environmental concepts that have proliferated in the past two decades. The purpose of such conceptual innovation is to change how we pursue development on a degrading planet. Understanding the extent to which concepts can accomplish real change thus has broad implications for scholarship on global environmental politics.

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References

- Acharya, Amitav. 2004. How Ideas Spread: Whose Norms Matter? Norm Localization and Institutional Change in Asian Regionalism. *International Organization* 58 (2): 239–275. DOI: <https://doi.org/10.1017/S0020818304582024>
- Agenda 21. United Nations Conference on Environment & Development. Available at <https://sustainabledevelopment.un.org/outcomedocuments/agenda21>, last accessed December 2, 2020.
- Ainscough, Jacob, Aster de Vries Lentsch, Marc Metzger, Mark Rounsevell, Matthias Schröter, Ben Delbaere, Rudolf de Groot, and Jan Staes. 2019. Navigating Pluralism: Understanding Perceptions of the Ecosystem Services Concept. *Ecosystem Services* 36: 100892. DOI: <https://doi.org/10.1016/j.ecoser.2019.01.004>
- Allen, Jen Iris, Timothy Cadman, Graeme Auld, and Hayley Stevenson. No date. Comparative Fortunes of Ecosystem Services as an International Governance Concept. Unpublished paper. (On file with authors, available upon request.)
- Avant, Deborah, Martha Finnemore, and Susan K. Sell. 2010. Who Governs the Globe? In *Who Governs the Globe?*, edited by Deborah D. Avant, Martha Finnemore, and Susan K. Sell, 1–25. Cambridge, UK: Cambridge University Press. DOI: <https://doi.org/10.1017/CBO9780511845369.002>

- Batista, Juliana Peixoto, Julieta Godfrid, and Hayley Stevenson. 2019. La difusión del concepto de servicios ecosistémicos en la Argentina: Alcances y resistencias. *Revista SAAP: Sociedad Argentina de Análisis Político* 13 (2): 313–340. DOI: <https://doi.org/10.46468/rsaap.13.2.A4>
- Berman, Sheri. 2013. Ideational Theorizing in the Social Sciences Since Policy Paradigms, Social Learning, and the State. *Governance* 26 (2): 217–237. DOI: <https://doi.org/10.1111/gove.12008>
- Bernstein, Steven. 2001. *The Compromise of Liberal Environmentalism*. New York, NY: Columbia University Press. DOI: <https://doi.org/10.7312/bern12036>
- Blyth, Mark. 2002. *Great Transformations: Economic Ideas and Institutional Change in the Twentieth Century*. Cambridge: Cambridge University Press. DOI: <https://doi.org/10.1017/CBO97811390087230>
- Campbell, John L. 2004. *Institutional Change and Globalization*. Princeton, NJ: Princeton University Press.
- Carstensen, Martin B. 2011. Ideas Are Not as Stable as Political Scientists Want Them to Be: A Theory of Incremental Ideational Change. *Political Studies* 59: 596–615. DOI: <https://doi.org/10.1111/j.1467-9248.2010.00868.x>
- Costanza, Robert, Ralph d'Arge, Rudolf de Groot, Stephen Farber, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V. O'Neill, Jose Paruelo, Robert G. Raskin, Paul Sutton, and Marjan van den Belt. 1997. The Value of the World's Ecosystem Services and Natural Capital. *Nature* 387: 253–260. DOI: <https://doi.org/10.1038/387253a0>
- Craig, Martin, Hayley Stevenson, and James Meadowcroft. 2019. Debating Nature's Value: Epistemic Strategy and Struggle in the Story of "Ecosystem Services." *Journal of Environmental Policy and Planning* 21 (6): 811–825. DOI: <https://doi.org/10.1080/1523908X.2019.1677221>
- Daily, Gretchen Cara, editor. 1997. *Nature's Services*. Washington, DC: Island Press.
- Díaz, Sandra, Sebsebe Demissew, Julia Carabias, Carlos Joly, Mark Lonsdale, Neville Ash, Anne Larigauderie, et al. 2015. The IPBES Conceptual Framework: Connecting Nature and People. *Current Opinion in Environmental Sustainability* 14: 1–16.
- GEF. 2014. GEF Investments on Payment for Ecosystem Services Schemes. Available at: <https://www.thegef.org/publications/gef-investments-payments-ecosystem-services-schemes>, last accessed October 23, 2020.
- Gómez-Baggethun, Erik, David N. Barton, Pam Berry, Robert Dunford, and Paula A. Harrison. 2016. Concepts and Methods in Ecosystem Services Valuation. In *Routledge Handbook of Ecosystem Services*, edited by Marion Potschin, Roy Haines-Young, Robert Fish, and R. Kerry Turner, 99–111. Abingdon, UK: Routledge. DOI: <https://doi.org/10.4324/9781315775302-9>
- Gómez-Baggethun, Erik, Rudolf de Groot, Pedro L. Lomas, and Carlos Montes. 2010. The History of Ecosystem Services in Economic Theory and Practice. *Ecological Economics* 69 (6): 1209–1218. DOI: <https://doi.org/10.1016/j.ecolecon.2009.11.007>
- Hadden, Jennifer, and Lucia A. Seybert. 2016. What's in a Norm? Mapping the Norm Definition Process in the Debate on Sustainable Development. *Global Governance: A Review of Multilateralism and International Organizations* 22 (2): 249–268. DOI: <https://doi.org/10.1163/19426720-02202005>
- Hajer, Maartin A. 1995. *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*. Oxford, UK: Oxford University Press.

- Hall, Peter A. 1993. Policy Paradigms, Social Learning, and the State: The Case of Economic Policymaking in Britain. *Comparative Politics* 25 (3): 275–296. DOI: <https://doi.org/10.2307/422246>
- IUCN. 2012. *A Framework for Corporate Action on Biodiversity and Ecosystem Services*. UN Global Compact and IUCN.
- Keenan, Rodney J., Greg Pozza, and James A. Fitzsimon. 2019. Ecosystem Services in Environmental Policy: Barriers and Opportunities for Increased Adoption. *Ecosystem Services* 38: 100943. DOI: <https://doi.org/10.1016/j.ecoser.2019.100943>
- McInnes, Robert J., Matthew Simpson, Beatriz Lopez, Robbie Hawkins, and Robert Shore. 2017. Wetland Ecosystem Services and the Ramsar Convention: An Assessment of Needs. *Wetlands* 37: 123–134. DOI: <https://doi.org/10.1007/s13157-016-0849-1>
- Meadowcroft, James, and Daniel J. Fiorino, editors. 2017. *Conceptual Innovation in Environmental Policy*. Cambridge, MA: MIT Press. DOI: <https://doi.org/10.7551/mitpress/9780262036580.001.0001>
- Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-Being: A Framework for Assessment*. Washington, DC: Island Press.
- Moschella, Manuela. 2015. The Institutional Roots of Incremental Ideational Change: The IMF and Capital Controls After the Global Financial Crisis. *British Journal of Politics and International Relations* 17: 442–460. DOI: <https://doi.org/10.1111/1467-856X.12049>
- Park, Susan. 2010. *World Bank Group Interactions with Environmentalists*. Manchester, UK: Manchester University Press. DOI: <https://doi.org/10.7228/manchester/9780719079474.001.0001>
- Spangenberg, Joachim H., and Josef Settele. 2010. Precisely Incorrect? Monetising the Value of Ecosystem Services. *Ecological Complexity* 7 (3): 327–337. DOI: <https://doi.org/10.1016/j.ecocom.2010.04.007>
- Stevenson, Hayley. 2013. *Institutionalizing Unsustainability*. Berkeley, CA: University of California Press.
- van Oudenhoven, Alexander, Matthias Schröter, Evangelia G. Drakou, Ilse R. Geijzendorffer, Sander Jacobs, Peter M. van Bodegom, Laurent Chazee, Bálint Czúcz, Karsten Grunewald, Ana I. Lillebø, Laura Mononen, António J. A. Nogueira, Manuel Pacheco-Romero, Christian Perennou, Roy P. Remme, Silvia Rova, Ralf-Uwe Syrbe, Jamie A. Tratalos, María Vallejos, and Christian Albert. 2018. Key Criteria for Developing Ecosystem Service Indicators to Inform Decision Making. *Ecological Indicators* 95 (1): 417–426. DOI: <https://doi.org/10.1016/j.ecolind.2018.06.020>
- Wright, William C. C., Florian V. Eppink, and Suzie Greenhalgh. 2017. Are Ecosystem Service Studies Presenting the Right Information for Decision Making? *Ecosystem Services* 25: 128–139. DOI: <https://doi.org/10.1016/j.ecoser.2017.03.002>