An Chomhairle Náisiúnta Eacnamaíoch agus Shóisialta
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Valuing Nature–Perspectives and Issues

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Dr Patrick Bresnihan

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Table of Contents

Introduction

1.1. Valuing biodiversity?

In May 2016, the international environmental charity, Earthwatch, held a debate in London on the motion: 'Does nature come with a price tag?' The topic for discussion was the increasingly popular concept of Natural Capital – in short, the idea that, to protect the planet's stocks of natural assets, which include soil, air, water and all living things, we need to place a monetary value on them. In her presentation, anthropologist Sian Sullivan described the example of Yasuni National Park in Ecuador, arguably the most biologically diverse place on earth (the park is also home to many indigenous peoples, including at least two uncontacted tribes). As well as providing for the flourishing of diverse life forms, Yasuni contains hundreds of thousands of gallons of crude oil just beneath its surface, some of which has already been exploited. Yasuni represents a dramatic example of a familiar conflict: the many different social, cultural and ecological values associated with a unique place coming into conflict with the monetary value of a single resource (crude oil).

In 2007, under pressure to make good on the progressive ecological and indigenous platform he had campaigned on, Ecuadorian President Rafael Correa offered the international community an unprecedented offer. In exchange for half the projected revenue to be gained from exploiting the oil reserves, the Ecuadorian government would give over the right to drill. The international community could, in other words, purchase certificates that would ensure the conservation of the Yasuni National Park (and reduced emissions from deforestation and the burning of the oil). The Yasuni Fund was launched at COP15 in Copenhagen in 2009. By 2013, however, sufficient funds had not been forthcoming. Rafael Correa claimed that the Ecuadorian Government had no choice but to go ahead with the drilling (raising much-needed revenue for public investment projects). The fund has closed, oil is being extracted, and oil spills have already been reported within the park.

Sullivan used this example to demonstrate the failure of monetary valuation to protect one of the most precious ecosystems in the world. She argued that what was needed was not (more) monetary valuation of nature, but a concerted challenge against the sacred cows of continued economic growth and development and the fostering of new social values and diverse ways of living with nonhuman nature. In the subsequent question and answer session, an individual in the audience disputed Sian Sullivan's analysis. Rather than proving the limits of monetary valuation, the Yasuni example, it was argued, represented a poor application of the valuation approach. The problem was that the Ecuadorian government had sought to raise money as a form of ethical investment or charitable payment, appealing to the same kind of normative values associated with nature conservation in the past. If, on the other hand, the range of ecosystem services provided by the Yasuni biosphere (carbon sequestration, nutrient cycling, climate regulation, clean water, timber, bioprospecting, and so on) had been adequately valued and monetised, and then paid for by those who benefit from those services,

then not only would a greater price tag be placed on Yasuni (more than half the oil revenues) but there would be a meaningful economic rationale for conservation (rather than just an ethical one).[1] In other words, the failure of the Yasuni Fund initiative was taken as justification for greater investment in Natural Capital accounting approaches, methods and instruments, to more fully materialise the economic value derived from nature. It is the logic behind this line of argumentation and the momentum that it generates that will be emphasised in this discussion paper.

1.2. What is Natural Capital?

In its simplest form, Natural Capital points to the underlying and vast range of goods and services provided by nature for society (from food provisioning to climate regulation). The failure to adequately value these goods and services, the argument goes, has resulted in biodiversity loss, pollution, and large-scale environmental depletion. Today, the emphasis in Natural Capital approaches is on attributing *economic* value to natural assets (forests, rivers, agricultural land) and the range of ecosystem goods and services that flow from them (carbon sequestration, clean water, pollination). The argument is that, placing an economic value on these assets and the services they provide will encourage a more ecologically sensitive and sustainable model of development.

For many conservation scientists, NGOs and environmental economists, the Natural Capital approach offers a compelling response to the failure of previous environmental policies, the limited success of international agreements (particularly in the context of climate change), the fragmented character of much environmental regulation, and the limitations of voluntary environmental action on the part of 'well-meaning' individuals. Criticisms of previous and existing attempts to address environmental problems, particularly biodiversity loss, point to a lack of political will, the tendency towards economic trade-offs, and the limited (un-ecological) economic models and metrics used by governments to make decisions about long-term sustainable development. These are valid arguments that have, at least within certain fields, begun to crystallise around the idea of Natural Capital and its promise to be the 'game-changer' that environmental conservation so desperately needs (Daily *et al.,* 2009). The multi-trillion-dollar question is why this economic information about nature will change the decision-making of governments, businesses and investors in such a way that conservation goals are prioritised.

A recurring statement in the Natural Capital literature is that meaningful conservation relies on 'making nature count' for governments, businesses and investors. The great promise of the Natural Capital approach is that it will reverse the well-established trade-off between economic development and the environment. Emerging alongside more established concepts such as sustainable development and green growth, the Natural Capital approach aims to decouple economic growth from increasing levels of resource extraction and environmental

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[1] This argument was supported by one of the leading conservation scientists in the Natural Capital field who was also on the Earthwatch debate panel.

degradation. The argument is compelling in its apparent simplicity: by placing an economic value on the range of goods and services provided by nature, individuals and businesses can be incentivised to invest in and conserve them (as the argument for monetising the range of ecosystem services provided by Yasuni National Park suggests). The potential for aligning conservation goals to economic growth is attractive for international environmental NGOs, fiscally restrained governments keen to kick-start new sectors of the economy, and investors looking for new financial opportunities. The prospect of attracting much-needed financial investment into conservation is particularly attractive to conservationists and governments in countries (largely in the Global South) with 'High Value Nature'. The apparent resolution of long-standing contradictions between economic growth and environmental conservation also extends to more traditional areas of the economy where environmental pollution or degradation in one area can be offset through conservation in another. As the understanding and application of Natural Capital accounting has developed over the past twenty-five years, the drive to align conservation objectives with continued economic growth has been central to how nature is being transformed into Natural Capital.

1.3. What is there to debate?

There are differing and contested arguments supporting the uptake of the Natural Capital approach; while much work has taken place in terms of designing and developing Natural Capital valuation techniques, methodologies and databases, as well as payments for ecosystem services programmes, these are not widespread, uniform or even commonly agreed upon. There continue to be different and nuanced perspectives on how nature should be valued and how these values should be translated into conservation strategies. Many environmental scientists, accountants, economists, conservationists, NGOs, and the media and civil society more generally, are wary of the outright economic valuation of nature and its potentially negative implications.

Although there is widespread acknowledgement in the scientific and policy literature that economic valuation of nature poses challenges, there is a tendency to approach these challenges as largely technical problems that can be addressed through more accurate or inclusive valuation methods. The example of Yasuni National Park is instructive: rather than understanding Ecuador's attempt to place an economic value on Yasuni as fundamentally flawed, the failure is taken as a catalyst for devising more accurate, refined and effective valuation methods and instruments – i.e. a scenario where payments for conservation of ecosystem services are materialised. This pragmatic commitment to 'making nature count' can limit the terms of the debate, focusing attention on the increasingly technical process of measuring and valuing ecosystem services, thereby distracting attention from more fundamental debates about the causes of biodiversity loss and the uneven political and economic contexts in which Natural Capital accounting is being developed. This tendency is reflected by the predominance of environmental scientists, conservationists, economists, businesses and investors within the Natural Capital field (rather than social scientists, philosophers, grassroots NGOs, indigenous groups). In other words, while the need to value nature is beyond question, the motivation to 'make nature count' within dominant economic and

development discourses limits the potential for a wider debate on diverse ways of viewing, valuing and organising nature that have historically been ignored.

A second, related point regarding current debates on Natural Capital is the tendency to under-estimate the power of metaphors and metrics to transform how nature is viewed, valued and organised (Raymond *et al.,* 2013*)*. There is an implicit understanding that the 'first' task of mapping and valuing the range of goods and services provided by nature is a value-free, scientific exercise, which provides neutral information for the 'second' task of deciding which parts of nature should be conserved. But the transformation of nature into Natural Capital is not neutral or value-free. To begin with, it requires reducing nature to a series of ecosystem services (serving humans), which in turn can be compared (and possibly exchanged) with one another (the carbon storage capacity of one forest compared to that of another). This is a process of simplification and abstraction that fundamentally changes the way nature will be viewed, valued and managed. What is more, the design and development of Natural Capital accounting over the past twenty-five years has not been happening in a vacuum. The explicit intention of 'making nature count' begs the question of 'count for whom?': for local communities, national policy-makers, international financial institutions? This is not just a technical question. What is missing in many accounts of Natural Capital is the fact that nature, and the diverse cultures, economies and histories it is embedded in, must be radically transformed in order to fit the economic and financial logics of 'decision-makers', namely governments, businesses and investors. These transformations can often be at odds with other logics, needs and values, as well as obscuring the need to question prevailing models of economic development and the social and environmental losses they engender.

1.4. Outline of discussion paper

Since the 1990s, the Natural Capital approach to environmental conservation has not only gained momentum but also put into practice new methods for valuing and monetising nature. This discussion paper describes the evolution of the Natural Capital approach over the past twenty-five years; it demonstrates that the direction of this evolution has been driven by a pragmatic desire to 'make nature count' within particular and uneven political and economic contexts; and it shows why an understanding of Natural Capital as a continuum (rather than a single policy or approach) can help identify likely future applications of Natural Capital and the need to challenge its underlying assumptions.

This report aims to open the debate on Natural Capital by engaging with a growing body of critical scholarly work, as well as grassroots environmental movements,[2] particularly those in the Global South. This work pulls the debate away from procedural concerns (how to 'improve' Natural Capital approaches) by drawing our attention towards the diverse, uneven and conflicting value practices that exist within specific contexts, and the dangers of seeking to account for this through a

[2] Global Forest Coalition; The People's Agreement produced by the World People's Conference on Climate Change and the Rights of Mother Earth held in Cochabamba, Bolivia (April 2010).

common metric. These perspectives not only provide valuable empirical accounts that challenge more idealised versions of the Natural Capital approach, they also offer theoretical insights into the problematic assumptions that underlie the seemingly neutral scientific and economic knowledge claims on which the Natural Capital approach relies.

The Natural Capital approach to conservation is not a pre-formed project that now just needs to be put into practice. For the past twenty-five years, it has been unfolding with growing momentum, largely driven by conservation scientists and economists committed to their disciplinary practices, and the need to place environmental decision-making on a 'rational' (economic) basis. The second section of this paper outlines the background to this, from the origins of the concept in the 1970s to its popularity amongst business leaders, investors and international environmental organisations.

Sections three and four focus in more detail on, first, the contested issue of ecosystem valuation and, second, the application of different payments for ecosystem services schemes. A key argument made across these three sections is that Natural Capital should be understood within an historical context as each phase of its development has sought to further establish the terms, methods and techniques required to align biodiversity conservation with the economic needs and financial interests of governments, businesses and investors. Thus, while conservation scientists, ecological economists and environmentalists may not support the commodification of ecosystem services or ecosystem offsetting, the pragmatism of many Natural Capital proponents ensures that this is the direction it is moving in.

Section 2: A History of Natural Capital

The concept of Natural Capital is neither new nor commonly agreed upon. For some, the term is used very loosely to communicate the idea that nature provides services for human welfare. But this generic idea that goes back to the myth of Eden can be used to obscure the more complex, contested and historic development of the term over the past forty years (Fisher *et al.,* 2009).[3] The intention of this section is to show that Natural Capital (and the allied concept of ecosystem services) has moved from being a critique of economic growth to a global policy platform firmly wedded to the vision of 'green' economic growth. This illustrates how the meaning and application of the term has changed over time, but also how it has been shaped by wider developments in environmental governance; namely, the ongoing effort to align environmental and economic development goals. Stemming in large part from scepticism towards existing political institutions, the dominant approach to Natural Capital today rests on a faith in economic valuation as first step towards 'making conservation pay'.

2.1 Environmental critique and the limits to growth

The term Natural Capital was first coined in 1973 by Ernst Schumacher in his popular book *Small is Beautiful. A Study of Economics as if People Mattered*. The immediate context was the oil crisis and anxieties about the future costs of and access to energy. More generally, this was a period of growing concern and doubt around dominant models of economic development, articulated through an active environmental movement and pessimistic scientific prognosis (Rome, 2010).[4] In 1972 the newly formed Club of Rome published its well-known report *The Limits of Growth*, and five years later a research group based in MIT released the *Global 2000 Report to the President* (Pirages & Cousins, 2005). These reports claimed that demands on soil, forests, fisheries and water supplies would reach critical levels by the turn of the century.

While the 'limits to growth' perspective was easily incorporated into more conservative, neo-Malthusian positions, Schumacher's own thinking was more aligned with a new, progressive and ecologically minded generation of thinkers who took the evidence about environmental limits as a point from which to launch a systemic critique of the prevailing economic model, the basic tenet of which was the unquestioned assumption that 'growth is good'. Challenging this economic imperative, Schumacher put forward the notion of 'enoughness'. Keeping in mind the over-exploitation of natural resources, his economic philosophy foregrounded both human and non-human needs as the basis for small-scale, social economies (Schumacher, 2011). Schumacher was one of the first economists to question the

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[3] At the other end of the spectrum, highly specialised debates over the meaning of Natural Capital, ecosystems services and allied concepts can become too technical for non-specialists – such that there is a distinction made between ecosystem function, which has been argued to imply anthropocentrism (because function implies a goal), and ecosystem functioning, which does not (quoted in Fisher *et al.,* 2009).

[4] The advent of the 'limits to growth' arguments should be seen, as Sarah Nelson argues, within more general debates over the crisis of the post-World War II economic boom, the mass consumption and mass production that had fuelled the economic redevelopment of North America and Western Europe (Nelson, 2015).

appropriateness of gross national product as a means of measuring human welfare, emphasising that 'the aim ought to be to obtain the maximum amount of well-being with the minimum amount of consumption'. In this understanding, the valuing of 'natural capital' was a way to hasten the *downsizing* of economic production such that the (re)productive life of the 'irreplaceable capital' of nature would remain abundant (Sullivan, 2014). Schumacher was not alone in his critique of conventional economics and the capitalist (and socialist) orientation towards ever-expanding growth.[5]

Schumacher's understanding of Natural Capital and his critique of growth-orientated development overlaps with a generation of heterodox economists that emerged in the 1970s. Unlike neoclassical economics, or neo-Malthusian theories of population and scarcity, these diverse and heterodox economic thinkers did not share the idea that economics was a neutral, descriptive science. Rather, for them economics was normative (implicitly or explicitly), involving different value systems that were not evenly positioned within society. Ecological economics was one branch of this new school of economic thought, distinguishing itself from neoclassical economics by its assertion that the economy is embedded within a larger finite global ecosystem. A key argument made by these early ecological economists was that natural capital was not substitutable for other kinds of capital (namely fixed capital). The belief in substitutability was an important cornerstone of neoclassical economics, which had maintained for decades that technical innovation decouples economic growth from (limited) natural resources, through substituting industrially produced resources for the resources formerly harvested from the environment. With mounting evidence suggesting the irreplaceability of environmental goods and services, ecological economists attacked this notion of substitutability 'by arguing on ecological grounds (and more importantly, non-utilitarian grounds) that it violated the conservation of matter and the first law of thermodynamics; in other words, that there are meaningful "limits to growth"' (Dempsey & Robertson, 2012: 761).

2.2. Sustainable development & the green economy

Ecological economics developed as a sub-field of economics during the 1980s,[6] paralleling the emergence of sustainable development as a new global framework

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5 Andre Gorz, for example, published *Ecology and Politics* in 1975. In this wide-ranging critique of capitalism, Gorz proposes a vision of the economy that values creativity, care and autonomy, not by expanding monetary valuation but by reducing it. He writes: '"Better" may now mean "less": creating as few needs as possible, satisfying them with the smallest possible expenditure of materials, energy, and work, and imposing the least possible burden on the environment' (1980:27).

6 In 1981, Ehrlich and Ehrlich coined the term 'ecosystem services' to indicate the benefits derived from nature that were not conventional commodities, such as food, water or minerals. Ecosystem services included benefits from ecological regulation processes such as clean air, climate regulation, flood buffering and other non-material benefits such as recreation, cultural heritage and cognitive development (Daily, 1997). Gomez-Baggethun *et al* argue that the rationale behind the use of the ecosystem service concept was mainly pedagogic: 'it aimed to demonstrate how the disappearance of biodiversity directly affects ecosystem functions that underpin critical services for human well-being' (2009: 1214). Interestingly, the growing prevalence of ecosystem services and their value also reflects a fundamental transformation in core, Western economies. Rather than nature being viewed and valued as limited stocks of material resources (land, timber, water), it is the range of services that nature provides that are increasingly valued. These services are less tangible and

for balancing environmental conservation, economic growth and societal well-being.[7] This gave rise to debate within ecological economics regarding the compatibility between continued economic development and the limits of the ecosystem. Herman Daly (one of best-known ecological economists) proposed that development should mean changes in economic and social structures, and that 'growth', understood as increasing the scale of the economy, was not ecologically sustainable. Joan Martinez-Alier (and others) rejected the term 'development' altogether, believing it was too closely tied to economic growth and linear ideas of modernisation (2002).

Regardless of these debates, the optimism and ambition of the new vision of sustainable development set the scene for the first UN Earth Summit, in Rio de Janeiro in 1992. This unprecedented meeting of international leaders, NGOs, businesses and civil society marked a new era in global environmental governance. Key outcomes were the Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity. These international treaties involved commitments from nation-states on greenhouse-gas emissions and biodiversity conservation. Significantly, the UNFCCC also paved the way for the use of carbon markets as a key instrument for regulating greenhouse-gas emissions (instituted through the Kyoto Protocol three years later), and the Convention on Biological Diversity gave partial endorsement to the ecosystem services approach, a significant moment in the translation of the concept from theory to policy (Sullivan, 2014).

An important shift was under way as global environmental problems (biodiversity loss, deforestation, climate change) were no longer being considered as 'externalities' that could just continue to be ignored or be overcome through opening up new resource frontiers. Rather than marking a limit to growth-based development, problems such as climate change and biodiversity loss were beginning to be discussed as problems that could be accounted for through more accurate economic valuation and institutional arrangements capable of internalising and offsetting those costs. The pessimism of the 1970s began to be re-orientated around a new faith in environmental science and economic pricing as the means for sustainably managing 'spaceship earth'.[8] This opened a new role for ecological economics.

Ecological economics challenged neoclassical economics for failing to properly account for the primary role of nature in creating wealth. The question was: how to

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quantifiable, and thus developing valuation methods and techniques to identify them is relatively difficult (Dempsey & Robertson).

7 The International Society for Ecological Economics launched in 1987, the same year that the Brundtland Commission published its report with the well-known definition of sustainable development: 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (Brundtland *et al.,* 1987). In 1990, a well-known book that came out of the first world conference of ecological economics in Washington DC defined the field of ecological economics as 'the science and management of sustainability' (Costanza, 1991).

8 At the 10th Conference of the Parties to the Convention on Biological Diversity, the project leader of The Economics of Ecosytems and Biodiversity (TEEB) project, Pavan Sukhdev, a former senior banker with Deutsche Bank and head of the United Nations Environment Programme's (UNEP) Green Economy Initiative, said: 'This is one world; it's ours to create. Let us create it and make it what we want, rather than wait for it to be dictated to us through further crisis and further problems'.

account for the value provided by nature. One response involves assigning monetary values to ecosystem services and losses – for example, imposing taxes on water abstraction for agricultural activity – 'but its main thrust is rather in developing physical indicators and indexes of (un)sustainability, *looking at the economy in terms of 'social metabolism'*" (Martinez-Alier, 2002: 19; my emphasis). Returning to the critical spirit of the 1970s, the focus on 'social metabolism' foregrounds the historically and geographically specific ways in which human labour and systems of production work on and organise non-human nature, transforming it in ways that are (un)sustainable. Understood from this perspective, accounting for the value of nature requires both better attention to locally specific forms of 'social metabolism' of nature, as well as analysing the role of broader political and economic forces for driving (un)sustainable modes of production and consumption. Overlapping with the field of political ecology (which emerged in the 1980s), this critical approach sought to value and support the diverse cultural, economic and epistemological understandings of nature that sustained communities and ecosystems around the world (Berkes *et al.,* 2000; Escobar 2009). However, this attention to more complex, uneven and contested patterns of social metabolism within ecological economics has tended to be obscured by the foregrounding of economic valuation as the *principal* tool for accounting for ecosystem goods and services.

The 1992 Rio Summit saw the establishment of the World Business Council for Sustainable Development (WBCSD). This network was initiated by millionaire Maurice Strong, formerly an entrepreneur in the Alberta oil patch and president of the Power Corporation of Canada, in his capacity as secretary general for the 1992 Earth Summit. Strong was instrumental in developing the language of 'natural capital' during the early to mid-1990s.[9] The metaphor of 'natural capital' was specifically tied to financial capital, which meant running 'Earth Incorporated' with a depreciation, amortisation and maintenance account. This sentiment is echoed by former UNEP official Don de Silva, who states that:

> … much of what we regard as wealth creation has in fact represented a running down of our common capital. Like any other business, Earth Incorporated simply cannot function for long on that basis. In fact, if we were to present its accounts on a business basis, Earth Incorporated would be, in a very real sense, like the current banking crisis, heading steeply in the process of liquidation: bankruptcy' (de Silva, 2008).

After Rio, the concept of Natural Capital began to be mainstreamed in the policy literature, with increased interest in methods to estimate the economic value of ecosystem services (Gomez-Baggethun *et al.,* 2010). In the following decade, the first comprehensive frameworks for the analysis of ecosystem services were

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[9] Sian Sullivan shows how, in the relatively short period of twenty years since the 1992 Rio Earth summit, the concept of Natural Capital has been fastened to that of financial capital – that is, as natural assets providing dividends – therefore eliding other ways of describing and valuing nature. She quotes former Friends of the Earth director Tony Juniper, who writes in his book, *What Has Nature Ever Done for Us? How Money Really Does Grow on Trees*, that '[t]he ecosystems that naturally renew themselves, and which supply us with the huge range of commercially valuable services and benefits, are sometimes seen as analogous to financial capital, and are increasingly referred to as "natural capital"' (2013: 268).

published. In 1997, ecological economist Robert Costanza and his team released their oft-cited estimate of $33 trillion as the US dollar value of the world's ecosystem services (Costanza *et al.,* 1997), and ecologist Gretchen Daily (1997) published the edited collection titled *Nature's Services: Societal Dependence on Natural Ecosystems*. Costanza's total value estimate received considerable criticism at the time but this only served to further the burgeoning debate and interest in designing better methods of identifying and valuing nature capital and ecosystems services.[10] An article published the year after Costanza's estimate sought to develop the idea that the monetisation of environmental services could and should be used to leverage conservation finance. In 'Economic returns from the biosphere' (1998), the authors describe various economic instruments that would allow investors to obtain economic returns from environmental assets, such as forests and landscapes, while ensuring their conservation.

The next big landmark in the development of the ecosystem service approach was the Millennium Ecosystem Assessment Project (MEA, 2005), involving over 1,300 experts worldwide and funded by the United Nations Environment Programme (UNEP), the Global Environmental Facility, and several private foundations and governments. Between 2001 and 2005, the MEA assessed the conditions and trends of the world's ecosystems through an ecosystem service framework. The report provided a definition of ecosystems services: 'the benefits humans receive from ecosystems' (MEA 2005: v) that has been widely used and applied within policy circles. One of the key findings of the MEA was that, globally, 15 of the 24 ecosystem services investigated were in a state of decline; this is likely to have a large and negative impact on future human welfare. As with the Stern Report published a year later (2006), the trend was towards linking the need for action on environmental conservation with an economic valuation of the costs and benefits derived from biodiversity.

The MEA succeeded in moving the ecosystem services concept from 'an academic backwater to the mainstream of conservation and environmental policy' (Adams & Redford, 2009: 785). Since its release, the literature on ecosystem services has grown exponentially (Fisher *et al.,* 2009); several further initiatives launched around the world have framed environmental problems in economic terms, demanding cost-benefit analysis.

In Europe, a broad, multi-phase research effort called *The Economics of Ecosystems and Biodiversity* (TEEB),[11] was launched by Germany and the European Commission in response to a proposal by the G8+5 environment ministers in 2007. As with the MEA, the TEEB report drew attention to the global economic benefits of biodiversity, the costs of biodiversity loss, and the overwhelming need to include these economic values within decision-making (TEEB, 2009). The report made explicit that at the heart of the complex problem of biodiversity loss was a 'market

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[10] As Costanza admitted subsequently: 'We freely admitted the study's many shortcomings, including (a) it assumed too much homogeneity in natural capital forms and economic contexts; (b) it was partial and static rather than general equilibrium and dynamic; and (c) the studies from which the shadow values were taken differed widely in their theoretical and practical relevance. Far from invalidating the results, however, these shortcomings merely beg for further attention to the question.' (Costanza *et al.,* 1998: 58).

[11] TEEB is both a study and an initiative, see http://www.teebweb.org/about/

failure'; the lack of market prices for ecosystem services and biodiversity means that the benefits derived from these goods were neglected or undervalued in decision-making: '[v]alues that are not overtly part of a financial equation are too often ignored' (TEEB, 2009: 10).

In 2011, following on from TEEB, the European Commission adopted the Biodiversity Strategy to 2020. Target 2 of the strategy aims that 'by 2020, ecosystems and their services [will be] maintained and enhanced'. To achieve this, Action 5 of this target foresees that EU member states will 'map and assess the state of ecosystems and their services in their national territory by 2014, *assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020*' (Maes *et al.,* 2014; my emphasis). To this end, the 'Mapping and Assessment of Ecosystems and their Services' (MAES) initiative was set up, and produced a framework for ecosystem assessment to ensure a harmonised approach across the EU (MAES *et al.,* 2013a).

This work also contributes to progress on assessing ecosystem services on a global level, coordinated by the 'Intergovernmental Platform on Biodiversity and Ecosystem Services' (IPBES), established by the UN in 2012. A press release for IPBES explained how it would aim to bridge the gap between science and policy: 'the IPCC-like platform will bridge the gulf between the wealth of scientific knowledge on the accelerating declines and degradation of the natural world, with knowledge on effective solutions and decisive government action required to reverse these damaging trends' (UNEP, 2010a). IPBES explicitly references the MEA, the usefulness of the concept of ecosystem services, and the need to develop new indicators that identify the value of ecosystems services for human welfare: 'tracking conventional biodiversity indicators alone is insufficient; indicators will also need to be developed that can demonstrate… the benefits of biodiversity and naturally functioning ecosystems so that the relevance of biodiversity to policy can be more clearly understood' (UNEP, 2010c). Elsewhere, various countries and bodies are developing approaches to natural capital accounting, including the UK government-sponsored National Ecosystem Assessment (UKNEA 2011), while accounting frameworks are being developed by the UN Statistical Division System for Experimental Ecosystem Accounting (SEEA) (United Nations Statistical Division 2013), WAVES (Defra 2005),[12] and in the UNU-UNEP Inclusive Wealth Report (UNUIHDP& UNEP 2012).

Twenty years after the Rio Earth Summit, the UN Rio+20 Earth Summit took place. A 'Natural Capital Declaration' (NCD) was presented as a private-sector finance response signed by the CEOs of financial institutions and committing the financial

[12] The WAVES (Wealth Accounting and Valuation of Ecosystem Services) initiative of the World Bank Group (WBG), for example, is a key element of its recently published 'Environment Strategy', and is a methodology for incorporating 'natural capital' and ecosystem measurements into national 'wealth accounts', in part 'to establish the true value of biodiversity' (World Bank Group, 2012a: 48, 51; WAVES, 2012). WAVES is set within the context of a substantially energised System of Environmental-Economic Accounting (SEEA), agreed in 2012 by the UN Statistical Commission as an international standard for combining economic and environmental data, including 'ecosystem services' and 'natural capital', into a single global accounting system (EC *et al.,* 2012; UN, 2012; WAVES, 2012: 10).

sector to mainstream 'natural capital' considerations in all financial products and services (Sullivan, 2014). A year later, the inaugural World Forum on Natural Capital took place in Scotland. Established with the support of the United Nations Environment Programme (UNEP), the International Union for the Conservation of Nature (IUCN), and the CEO-led network of corporations that is the World Business Council for Sustainable Development (WBCSD), the World Forum website claimed that 'a revolution is taking place in how businesses and governments account for natural capital', and that 'there has never been a better time for senior decision makers to exercise leadership for the benefit of business and the planet' (quoted in Sullivan, 2014).

The context of these two international events was not just continued concern about global environmental degradation, but the wake of the global financial crisis, the fiscal restraints on national governments (particularly in the EU), and the search for new financial investment opportunities. In the space of forty years, Schumacher's call to downsize economic activity because of the (limited) value of nature was replaced with the possibility of rebooting the flailing economies of Western countries through the monetisation of natural capital (to be discussed in further detail in Section 4). There is clearly a tension between the potential (and need) for cultivating diverse economies and ecologies, and the drive to translate this diversity into the monetary logics of prevailing financial and economic demands.[13] At the heart of this trajectory is the (continuing) belief that environmental conservation and economic growth can be aligned.

2.3. Natural Capital as 'win-win'?

Implicit in the Natural Capital approach to valuing nature is a critique of previous attempts to address environmental degradation and biodiversity conservation. This is encapsulated in the benign-sounding formulation: the failure to protect and value nature in the past arose because of a failure (and inability) to incorporate ecosystem services into cost-benefit calculations. As the European Commission states: '[a]s a result of the failure of the markets to account for the value of many supporting and regulating services, they have historically been neglected in decision making and thus consistently degraded, leading to progressive declines in overall system integrity, functioning and resilience' (DG Environment, 2015: 18).[14] This extends neoclassical economic arguments around utility maximisation: the need for economic valuation to weigh up the most efficient allocation of scarce resources. One of the problems with this argument is that it ignores the past forty years of environmental policy-making and the countless struggles that have sought to halt

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[13] The mainstreaming of ecosystem services has resulted in the application of the concept in directions that diverge significantly from the original purpose with which the concept was introduced. For example, Peterson *et al* (2010) notice a move from the original emphasis on ecosystem services as a pedagogical concept designed to raise public interest in biodiversity conservation, towards increased emphasis on how to cash ecosystem services as commodities on potential markets.

[14] This rehearses liberal economic arguments from the 18th century calling for the enclosure of common lands in order to enhance productivity. 'For example, if a forest reduces air pollution, this service cannot be parcelled up and sold to those who choose to invest in it. This results in "market failures" meaning that landowners receive no financial rewards for providing these benefits to society and therefore have no economic justification for investing in them' (Schägner *et al.,* 2013; TEEB, 2010).

environmental degradation in the name of development. Since the birth of the environmental movement in the 1960s, alliances of activist movements, scientists, political leaders and NGOs have succeeded in preventing considerably worse environmental damage through campaigns, actions and political pressure that resulted in greater environmental regulation (Martinez-Alier, 2002). The oft-quoted example of the New York City Watershed scheme is instructive.

In 1989, the US Environmental Protection Agency (EPA) found that the New York City water supply did not meet quality standards. The municipal authorities faced the prospect of having to invest an estimated $6-8 billion to build a water filtration plant. The alternative to investing in this costly engineering solution was to invest in the conservation of a 2,000 square mile water catchment area, largely located in the Catskill Mountains. Restoring the watershed and limiting development in the area would ensure that ecological processes could maintain the quality of the water 'naturally'. What is more, the total cost of restoring the watershed was estimated to be between $1 billion and $1.5 billion. These calculations were conservative at the time as they only considered one watershed service, whereas the conservation of the area would also provide habitats for birds and animals, carbon sequestration and recreation.

The New York City authorities decided to invest in the watershed conservation scheme, making it one of the biggest public investments in natural capital to date. Not only does it demonstrate how a large city can directly benefit from (and invest in) ecosystem services, but it is also used as an example of how economic valuation of natural capital can result in conservation goals (Daily & Ellison, 2012; TEEB, 2009). However, a closer look at the decision-making process behind the scheme and subsequent developments suggests that the New York watershed scheme has more in common with the 'old' policies, economics and trade-offs of the past than with the supposed power of ecosystem valuation to deliver more 'rational' decision-making and 'win-win' solutions.

In Daily and Ellison's extended account of the New York City watershed scheme, they provide details about the struggles involved in bringing about the decision; even with a potential saving of $6 billion, the decision to invest in a major conservation scheme was not straightforward. First, the New York City authorities did not own a lot of the land within the watershed area (and thus had to buy it from private landowners). Second, many people lived in the Catskill/Delaware area and were not all supportive of a scheme that would limit development in the area. For example, the conservation scheme would limit the expansion of the tourism sector, the building of second homes, and agricultural pollution. A strong lobby against the scheme brought together real-estate developers, the tourist industry and farmers. Besides the lobbying from these sectors, the City authorities were reluctant to interfere with individual property rights or to introduce new laws, regulations and enforcement required as part of any conservation programme. Finally, NYC faced action from the EPA throughout the 1990s for not providing safe water. The pressure from this federal agency encouraged a 'quick fix', rather than the prolonged political and legal process involved in establishing the watershed conservation area.

In the end, it was only through the concerted, well-organised (and financed) lobbying of an environmental and social justice alliance, led by Robert F. Kennedy Jr,

keen to protect the watershed (for its environmental and social value) that the decision was ultimately brought over the line. This included bringing multiple court cases against the New York Department of the Environment, and novel alliance-building between unions, HIV activists and African-American and Latino communities, united around concerns of environmental justice (access to clean water).

Problems remained even after the decision had been taken to invest in the conservation scheme. The anti-watershed lobby was strong enough to ensure that the regulations and restrictions on what could happen within the watershed were watered down. The resulting projects was criticised by some environmental groups as not going far enough. Over the past two decades, developments have continued as urban sprawl persists. A new highway has been built, for example, generating greater quantities of sulphur dioxide that the forests may not be able to absorb, meaning it will enter the water supply. Thus, while the scheme remains in place today, the EPA has kept a watchful eye to ensure that the quality of the water supply does not suffer. At the same time, the cost of the filtration plant has come down since the 1990s, contributing to the argument that an engineering solution may make more economic sense in the future as the City continues to expand.

What does the example of the New York watershed tell us about conservation policy and the role of economic valuation? Rather than providing a clear example of a straightforward trade-off between an investment in natural capital and an investment in physical capital, the case demonstrates the extent to which *economic valuation always takes place within uneven and contested political, economic and cultural contexts*. The economic assessment was just one contributing factor to a contested decision-making process that ultimately involved the public authorities acting against certain private economic interests in order to advance the public good through a large-scale conservation project. While the savings generated by the watershed option were significant, it was the political will generated through alliance-building and campaigning that ensured the scheme went ahead. This alliance managed to mobilise scientific evidence and economic arguments to push a public institution to buy out private landowners, to legislate, and to invest in conservation. This political pressure was necessary because conservation goals were *not* aligned with short-term economic goals. Indeed, it is this continuing tension that raises doubts about the future of the watershed scheme.

In 1998, two economists, Graciela Chichilnisky and Geoffrey Heal, wrote a paper called ‘Economic returns from the biosphere’ (Chichilnisky & Heal, 1998), in which they outlined the that role economic valuation had played in the New York water-supply decision, but sought to go one step further, making their case for the monetisation of ecosystem services. In effect, they sought to respond to the continued contradictions between publicly financed and managed conservation and economic development. Similar to the argument made against the Yasuni Fund Initiative (that the Ecuadorian government didn’t adequately price the ecosystem services provided by the Park), Chichilnisky and Heal argued that full monetisation of the water services provided by the Catskill watershed was necessary to enable the scheme to pay for itself. They wrote:

> Imagine a corporation managing the restoration of New York’s watershed with the right to sell the services of the ecosystem. In this

> case, the service is the provision of water meeting EPA standards. Ownership of this right would enable the corporation to raise money from capital markets to meet the costs of conserving New York's watershed. If the issue was biodiversity, rather than a watershed, the corporation would own and sell (or license) the rights to intellectual property derived from the biodiversity. Such a framework would harness private capital and market forces in the service of environmental conservation. (Chichilnisky & Heal, 1998)

As many proponents of natural capital will be the first to point out: there is a big difference between the relatively simple economic valuation performed by the NYC authorities in the 1990s, and the way this is subsequently projected into a future market-place for fully monetised and financialised ecosystem services. Indeed, there is a complete reversal in so far as, rather than purchasing private land for the public interest, the vision of Chichilnisky and Heal demands that the NYC authorities institute private property rights over ecosystem services before selling them to a corporation.

The direction and scale of natural capital accounting has moved far beyond the rather simple calculation involved in the case of New York's water supply. The programmes currently under way across many parts of the world, including Europe, aim to establish complete databases of natural capital and the economic value of the ecosystem services they provide, regardless of what specific developments are being planned. What is more, the motivation behind these programmes is not simply to aid policy-makers make better decisions, but to advance a means of making conservation profitable, of making conservation pay for itself in a context where governments and conservation organisations are fiscally limited. Chichilnisky and Heal thus articulate more explicitly what many in the field of natural capital implicitly aspire towards: the possibility of resolving the contradiction between publicly mandated conservation goals and the costly economic trade-offs that have historically undermined these goals. Although there are debates and tensions within the field of Natural Capital, the enthusiasm for supposedly 'win-win' solutions not only continues to drive efforts to 'fix' market failures ('getting the prices right'), but also detracts from the need for more immediate action against the ongoing destruction of nature through unsustainable economic activity and development.

Section 3: Valuation: Making Nature Commensurable

3.1. From nature to ecosystems services

> A single mature English oak (*Quercus robur*) can host up to 25,000 individual animals, from tiny invertebrates to birds such as tawny owls and small mammals like dormice. As many as 280 species of insect live on English oak. The green oak moth caterpillar (*Tortrix viridana*) feeds on the oak leaves, and in pupa stage can be parasitised by species of ichneumon wasp. When the ichneumon wasp egg hatches, the larvae eat the still live but parasitised moth pupa. The life cycle of the oak is long and fascinating; loosely divided into three phases, juvenility, maturity and decrepitude, with each phase lasting anything from about 100 years to 300 years. Dead and rotting wood are a feature of oaks from early middle age, and the distinctive "stag's head" – formed from dead wood at the ends of branches – are important habitats. The older the oak, the more significant it is to biodiversity, not least because in the final stage, when the tree becomes a "veteran" (a period that can last as long as three human lifespans) the slow disintegration provides even more food and habitat opportunities. Oaks are so slow out of the blocks they do not even become sexually mature until they are 50 years old, at which point they begin to produce acorns. (Wilson 2014).

There is little disagreement about the need to value nature. The question put by most proponents and 'practitioners' of natural capital today is *how* we should value the goods and services provided by nature. At a basic level we can understand that bees pollinate flowers or that soil breaks down organic matter, but this is very different from mapping, measuring and valuing these 'services', using instruments, models and valuation techniques. Any suggestion that ecosystem services are just waiting to be 'counted' by scientists, economists and accountants equipped with standardised methods, techniques and protocols, fails to understand the unavoidable simplifications and abstractions involved in transforming complex, situated and diverse ecosystems and values into discrete, quantifiable services. As the lengthy quote above makes clear, nature is messy, full of imbricated temporalities, flows of matter and energy that operate at multiple scales. Perhaps surprisingly, this description of an oak tree ecosystem comes from an article in the *Financial Times*. The author, Matthew Wilson, was drawing attention to the problems and difficulties associated with a UK government offset scheme in which 10,000 mature trees felled for a new M6 toll road were to be offset by 1 million new saplings. While this example has been quoted almost as much as the New York water-supply case (by critics of the natural capital approach), the point that Wilson raises through his eloquent description of the oak tree raises important questions about the ambitious scientific project of transforming nature into natural capital – questions that are not lost on many of the ecologists and conservation scientists involved in that project.

The literature and reports on ecosystem service mapping and accounting are full of debates on how ecosystem services should be defined, measured and valued. These debates arise because there is no consensus on what exactly is being measured and

how ecosystem services should be valued – evinced by the uneven and geographically distinct accounting and valuation methods that have been used to date. As Fisher *et al* make clear, the main tension lies between the need to provide a common definition and valuation of ecosystem services, and the recognition that ecosystems, and the functions and services they provide, vary over time, geography and social context: "the complexity of ecological systems and the services they generate inhibits both our social understanding of the benefits as well as our ability to place a monetary value on them" (Fisher *et al.,* 2009).

The dominant approach to ecosystem service valuation is economic valuation, although most valuation exercises recognise and even seek to incorporate social, spiritual and cultural valuation of biodiversity and ecosystems (TEEB, 2009); most approaches recognise the multiple dimensions and concepts of value embedded in ecosystems and biodiversity, and that any exercise of valuation is relative to a given individual or group of people (Turner *et al.,* 2003). Despite acknowledgement of these tensions and challenges, the inclusion of social and cultural criteria, while desirable, is difficult to attain. This is because values are messy, ecosystems are messy, and different (non-quantifiable) means of articulating, deliberating and organising them are thus required.

As the project of natural capital accounting advances, driven by the goal of aligning conservation with economic development, these differences and disagreements can be forgotten as more standardised methods and valuation techniques are established and normalised. This is obscured behind the supposedly neutral goal of devising *better* valuation methods and models. But what is 'better'? As I argue, 'better' translates into the pragmatic goal of rendering ecosystems services more legible and 'useful' for decision-makers. This reflects a continuum in the unfolding of ecosystem accounting as the pragmatic drive to 'make nature count' for decision-makers, including businesses, requires increasing simplification, standardisation and monetisation of ecosystem services.

3.2. Defining ecosystem services

The Millennium Ecosystem Assessment (MEA) provided one of the most general definitions of ecosystem services:

> Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling" (MEA, 2005: v).

In this definition, there appears to be no actual limit on the features of the environment that are called 'services' so long as they are connected in some way to an increase in human welfare. Thus, despite being one of the most open definitions of ecosystem services available, the MEA still assumes (which has been generally accepted) that ecosystems services are only classified as services if they are of benefit to humans.

The EU has further refined the MEA definition to include only those ecosystem services that provide a 'realised benefit to people'. This definition thus excludes ecosystem functions that might not directly result in benefit to people, i.e. the 'supporting' functions included in the MEA definition. For example, although nutrient cycling helps to clean water, this is only an indirect service that benefits humans; clean-water provision counts as a provisioning service, but the nutrient cycling that enables this is not. While this simplification makes mapping and valuation easier, the challenge of accounting for provisioning, regulating and cultural services does not resolve the uncertainty, inter-relatedness and complexity of different ecosystem functions. Although individual services are often modelled separately from other services, ecologists claim that they are clearly related, 'either positively or negatively, to other services' (Tallis *et al.,* 2008: 9462). For instance, Isbell *et al* (2011) conducted a meta-analysis across grassland biodiversity experiments and concluded that different species were important for different functions at different times, places and under different environmental change scenarios (EU report 10). Similarly, Tallis and Kareiva ask the question: 'A single wetland grass plant does not cycle enough nutrients to be of value to an upland cattle farmer. But how many plants are considered valuable? 100 plants? One hectare of wetland? And how does this answer change with the seasons, climate fluctuations and land use change in the watershed?' (Tallis & Kareiva, 2005: 748). Such model complexity is daunting, but it is what ecologists and economists are trying to achieve through the refinement and extension of data collection and modelling.

A second challenge concerning the valuing of ecosystem services is that some services are easier to identify and value than others; there are established methods, techniques and expertise for measuring and valuing certain services, but not others. The most recent 'consensus' text on ecosystems valuation, *The Economics of Ecosystems and Biodiversity* (TEEB, 2010c), begins its chapter on valuation by dividing valuation techniques into two different 'valuation paradigms': biophysical approaches and preference-based approaches. In TEEB, preference-based approaches include those that assume that values 'arise from the subjective preferences of individuals' (TEEB, 2010c: 191). Biophysical approaches assume that values flow from non-human sources, with assessment based on 'measuring underlying physical parameters'. Dominated as TEEB is by ecosystem scientists, the biophysical functions and values of ecosystems are more easily identified, measured and valued within ecosystem service accounting – e.g. carbon storage capacity. Conversely, 'subjective' human values are not so well-defined or understood – e.g. cultural memory. The reduction of 'non-biophysical' ecosystem services to generic categories of 'cultural' or 'aesthetic' value only serves to demonstrate this, flattening the range of (especially indigenous) epistemological and ontological experience and meaning that do not easily admit a distinction between (biophysical) 'nature' and (subjective) 'culture' (Escobar, 2008; Rose, 2004). Before the question of economic valuation arises, therefore, values and judgements inherent to the

scientific enterprise are involved in mapping and categorising nature as ecosystem services.[15]

The difficulty of mapping ecosystem services, and the skewed results this provides for decision-makers, has not been missed by those involved in the process itself. Despite acknowledging the importance of mapping multiple services, many studies map only a single or few ecosystem services (MAES *et al.,* 2014). For instance, a review by Crossman *et al* (2013) showed that, out of 113 mapping studies, 32 per cent mapped only one ecosystem service. Emphasising one ecosystem service without considering the whole system can have, and has had, damaging consequences for both other services and biodiversity (MEA, 2005; Everard & McInnes, 2013). An EU report on the obstacles facing effective mapping and assessment of ecosystem services stated:

> The importance of systemic thinking and multi-functionality *is not a side issue* when it comes to considering the links between biodiversity and ecosystem services. In fact, the true significance of biodiversity may only be revealed when the whole system, across the full spectrum of ecosystem services, including different locations and across many years, is considered. (EU, 2015; my emphasis)

The report concludes: '[t]here is concern that if suitable data cannot be found for these [less well-represented] ecosystem services they will be neglected in policy decisions as a result' (*Ibid*: 16). The problem is that, while reports such as this are keen to acknowledge the limitations of ecosystem service valuation, they are less clear on how such limitations (which ultimately relate to the complexity and dynamism of ecosystems) can or should be overcome within an approach that is fundamentally about simplification. The answer tends to echo the response to the failed Yasuni National Park scheme: there is recognition that existing data and valuation techniques are insufficient to account for the complexity and economic costs and benefits of ecosystem services. This provokes a call to address these limitations through greater investment in data collection ('filling the knowledge gaps'), the design of more refined valuation methods ('accounting for economic values'), and more refined models ('capturing the dynamic nature of ecosystems') (Daily *et al.,* 2009; Mace *et al.,* 2015). While the need for more refined information about the functions and values of ecosystems is hard to dispute, there is an assumption that the production of this data is neutral and transparent. But at the same time the intention of Natural Capital accounting is to make nature legible (and ultimately profitable) to governments, businesses and investors, an intention that is by definition not neutral.

Over the past twenty years and more, the life and earth sciences have generated unprecedented quantities of data and models to inform the public and decision-makers about the declining state of the planet's basic ecological functions – from the carbon cycle to the soil cycle. Added to this have been countless popular

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[15] A point that was made in relation to Ireland's ecosystem assessment by an EU-commissioned report. The report found that provisioning, regulating and supporting services were considered, with less attention to cultural services (with the exception of recreation).

documentaries, books, articles, speeches, events and actions that have called attention to any number of ecological crises. Yet, despite the overwhelming evidence, little has been done to curb greenhouse-gas emissions, soil degradation, pollution and so on. At the same time, a basic claim made by the Natural Capital approach is that, if 'better' information (and modelling) about the value of ecosystem services is generated, more rational, long-term decisions will come about. But what makes the information generated through ecosystem accounting 'better' than other kinds of information? Why will it have an effect where the IPCC hasn't, for example? It is in asking these questions that the close (and getting-closer) relationship between 'neutral' ecosystem valuation and the prevailing policy and economic contexts can be better understood; in other words, how the motivation to make 'nature count' for high-level decision-makers, including businesses and investors, shapes the nature that is counted.

3.3. Economic valuation

Although ecosystem assessments do not require economic valuation, the justification for such extensive assessment programmes is premised on the idea that a better understanding of the value of such services to society will shape decision-making positively. The EU has adopted economic valuation as a necessary element of the EU Biodiversity Strategy, for example, thus requiring member states to carry out economic valuation of ecosystem services. The application of economic value to ecosystem services is understood as a logical extension of the anthropocentric definition of ecosystem services. As Brouwer *et al* state: 'It is this human focus that necessitates the integration of economic analysis within such assessments so that we can quantify and value ecosystem services, ensuring that their importance and worth can be incorporated within decision making.' By placing an economic value on diverse ecosystem services, the argument goes, decision-makers will also be able to make more informed, rational decisions. Implicit in this approach is the assumption that greater amounts of data about ecosystems services translated into a common (and thus comparable) economic metric will result in better allocation of resources, including the conservation of beneficial environments. In other words, the simplification of complex ecosystems and the value of the services they provide is proposed as one of the primary advantages of the Natural Capital accounting approach: '[a] further benefit of economic valuation is that it can provide a single common unit which can be used to condense a complex system and to compare the impacts of alternative policy measures' (EU 2015: 18).

What begins to become clear is that ecosystem scientists, intent on mapping and making visible complex ecosystems functions, are also working to provide information that can be of benefit to decision-makers. In this context, ecologists must work in tandem with economists so that the value of the ecosystem services they identify can be translated into data required for economic analysis. This suggests that a cost of entering ecosystem services policy debates, for ecosystem scientists, is that they must accede to describing ecosystems as discrete units of service that retain a stable identity over space and time. Although conservation scientists, ecologists, and economists may want to include a range of values about ecosystems and their services, one of the fundamental justifications for ecosystem accounting is to provide 'useful' information for governments, developers and

businesses; namely, the actors who can make things happen. Indeed, one of the explanations for why previous efforts to articulate the value of nature (in all its messy, cultural, historic and intrinsic meaning) have failed to make a difference is precisely because the forms of representation and kinds of values expressed were not *legible* to decision-makers. 'Too often, qualitative values of nature—indigenous ways of understanding nature, the love of nature felt (but rarely acknowledged) by even professional conservationists, the way ideas of wildness or cultural resonance overlay calculations of diversity or rarity (e.g. Berkes, 1999; Milton, 2002)—are left out of conservation calculations because they cannot be expressed in a currency that decision makers can deal with' (Adams & Redford, 2010: 328). This amounts to what Gomez-Baggethun and Ruiz-Perez (2011) describe as 'a strategic endorsement of valuation as a pragmatic and transitory short-term tool to communicate the value of biodiversity *using a language that reflects dominant political and economic views*' (615; my emphasis).

Challenging the view that ecosystem accounting is simply a 'transparent' evaluation of natural capital and the goods and services it provides, Turnhout *et al* (2014) examine the monitoring, reporting and verification procedures, indicators auditing, and performance measurement work of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). These measures are intended to ensure the generation of transparent, reliable and standardised information that can be used to objectively assess the effectiveness and efficiency of conservation. Turnhout *et al* (2014) identify the tension between aspiration and pragmatism that characterises the work of IPBES. Claiming to be both policy-relevant and policy-neutral is a contradiction as the knowledge produced by IPBES is not equally relevant for all actors. 'Different policymakers want and need different things, so any one framing of a problem—be it scientific, economic or ethical—signals who will act and how' (Turnhout *et al.,* 2014).[16]

A good example of this contradictory claim to be both 'neutral' and 'policy-driven' is found in the work of Gretchen Daily and others at the Natural Capital Project, a partnership between Stanford University, The Nature Conservancy, and the World Wildlife Fund (www.naturalcapitalproject.org). The goal of the project is to help integrate ecosystem services into everyday decision-making around the world:

> In theory, if we can help individuals and institutions to recognize the value of nature, then this should greatly increase investments in conservation, while at the same time fostering human well-being. In practice, however, we have not yet developed the scientific basis, nor the policy and finance mechanisms, for incorporating natural capital into resource and land-use decisions on a large scale (Daily *et al.,* 2009).

The above quote from Gretchen Daily and others is taken from a paper that seeks to set out a conceptual framework for 'delivering on the promise of ecosystem

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[16] The authors use the example of 'global temperature' as the standardised unit to express the problem of global warming. Such standardisation is good for modellers and funders, but it has failed to inform effective, diverse and local adaptation and mitigation policies and practices.

services in decision-making'. The authors identify two fundamental challenges to achieving this goal:

> First, the science of ecosystem services needs to advance rapidly. In promising a return (of services) on investments in nature, the scientific community needs to deliver the knowledge and tools necessary to forecast and quantify this return… Second, ecosystem services must be explicitly and systematically integrated into decision making by individuals, corporations, and governments. Without these advances, the value of nature will remain little more than an interesting idea, represented in scattered, local, and idiosyncratic efforts. (Daily *et al.,* 2009; my emphasis).

Gretchen Daily, a professor of environmental science, thus makes clear the need for scientists to design tools and models capable of showing the returns to be gained from investing in natural capital. Referring to the existence of fragmented and diverse values attached to nature, she and her co-authors again make clear the need to advance common metrics capable of mobilising the potential of the Natural Capital approach.

To help address the twin challenges outlined above, the Natural Capital Project has developed InVEST (a system for Integrated Valuation of Ecosystem Services and Tradeoffs). InVEST is an open-access tool based on land cover maps for use with GIS (Geographic Information System) software. It can be used to map ecosystem services and trends over time as well as economic values of ecosystem services (Kareiva *et al.,* 2011). InVEST is intended to enable decision-makers to assess quantified tradeoffs associated with alternative management choices, and to identify areas where investment in natural capital can enhance human development and conservation. The idea is that, while such tools are costly and difficult to develop, they are designed to be 'user-friendly for non-specialists with outputs that are understandable to all stakeholders' (Daily *et al.,* 2009).

The Natural Capital Project, and the tools it is developing, proposes that the 'success' of the ecosystem services approach hinges not just on better understanding of ecosystem production functions, but on integrating this information into the economic (and financial) terms understood by governments, businesses and investors. There is thus explicit recognition (as there is in much of the literature) of the overlap between ecosystems science and research and the regulatory, policy and economic contexts in which this is taking place and in which it hopes to make a mark. This undermines the belief articulated by many ecosystem scientists that 'science, writ large, can tell us what ecosystem services are; how to monitor; measure; and value such things. Social processes tell us what issues and perspectives are important in the short term, and what information is actually utilized by decision makers' (Fisher *et al.,* 2009: 652). But, as outlined above, the main justification for many of those involved in ecosystem assessment and accounting is to 'make nature count' in certain ways, to certain decision-makers. In other words, the transformation of nature into natural capital is not value-neutral.

3.4. Value commensurability

Many people engaged in the Natural Capital debate are not convinced that economic valuation is the only, or even the best, way of valuing the range of services provided by nature (McCauley, 2006). However, the pragmatic position is that economic valuation can provide a simple way of 'getting everyone's moral imperatives on the same page' (Marvier *et al.,* 2006: 749). Money, in this formulation, is not important because it is the best representation of value or because it allows the generation of a price signal, but because it allows diverse values to be expressed in comparable terms. In seeking to distance this argument from markets and price tags, Mace *et al* even argue that the common measure need not be money at all, but 'any indicator that society chooses' (2015). What appears to be accepted from this perspective is that there needs to be a common measure or value (regardless of what it is) that will enable the comparison of different values, a means of making the incommensurable commensurable.

Echoing Daily *et al* (2009), one of the justifications for a common metric is the 'idiosyncrasy' of different value practices. Indeed, the limited success of environmental campaigns and movements in the past is seen to rest, at least in part, on the overly specific, localised ('intrinsic') values imparted to particular places, animals and environments. If only, the argument goes, indigenous communities, like those in the Yasuni National Park, could express the value of the rainforest in terms of the monetary value of the many services it provides (hydrological, climatic, food provisioning). If this was achieved, then sound economic arguments could be made for conservation instead of drilling for oil. Extending the argument of neoclassical economists, the problem with existing environmental governance and decision-making is that there is insufficient economic data for making rational choices. This approach assumes that value commensurability is attainable. As Costanza *et al* write:

> We agree with Herendeen (1998) that: ''the argument that we lose our souls by economically pricing the environment is silly'' and ultimately counterproductive. As we (authors) said in the paper, we (humans—both as a society and as individuals) are forced to make choices and trade-offs about ecosystems every day. These imply valuations. To say that we should not do valuation of ecosystems is to simply deny the reality that we already do, always have and cannot avoid doing so in the future. (Costanza *et al.,* 1998:68)

Costanza *et al.* argue that the only way to decide between having 'more houses, or more viable forests' is to 'directly compare the value of ecosystem services lost with the value of other economic services gained', something that no other method of ecosystem service accounting can do (Costanza *et al.,* 1998: 58). There is a clear assumption that decisions or judgements over alternative developments require value commensurability. But this is not the case.

The environmental philosopher John O'Neill makes the obvious but often forgotten point that decisions are made every day by environmental managers (at different scales) without exhaustive economic data for a cost-benefit analysis: 'on a day to day basis, decisions are normally made without appeal to monetary values and *for the most part without appeal to any single common measure*' (O'Neill, 1997: 546; my emphasis). He gives the example of forestry management in the UK, where

conflicts arise between different biodiversity objectives; increasing the diversity of native tree species in forests conflicts with the aim of protecting the native species of red squirrel, which only fares better than the immigrant grey in conifers; the protection of the goshawk, which flourishes in spruce plantations; landscape objectives; the use value of forests as a timber resource; the historical and cultural meanings of a woodland, and so on. 'These conflicts,' he writes, 'are at present normally settled without a price ever being assigned to red squirrels, goshawks, or broadleaf woodland. They are resolved through fairly messy looking methods of argument between botanists, ornithologists, zoologists, landscape managers, members of a local community, farmers and so on' (O'Neill, 1997: 546). Challenging the assumptions of neoclassical economics, O'Neill writes:

> Money as the universal equivalent is taken to provide the most appropriate measure to render commensurate different values. That picture of rational choice is mistaken. Different values are incommensurable; there is no unit through which the different values to which appeal is made in managing a particular site can be placed upon a common scale. Given conflicts between landscape values, biodiversity, timber, cultural values, there is no substitute for good practical management of a habitat. (548)[17]

John O'Neill writes in defence of the *incommensurability* of values; in other words, the impossibility of choosing between certain alternatives through recourse to a common measure of value. This argument is developed by thinkers in the fields of ecological economics and political ecology. The perspective here is to challenge the notion that economic value should be assigned to non-economic phenomena, including ecosystem services, as a means of arriving at a more 'neutral' and transparent allocation of limited resources. Thus, in this version of environmental governance, 'instead of focusing on "missing markets" as causes of allocative problems, the focus is on the creative power that missing markets have, because they push us away from economic commensurability, towards multi-criteria evaluation of evolving realities' (Martinez-Alier *et al.,* 1998: 283).

> Environmental policy deals with 'reflexive' phenomena since an effective assessment, in order to be realistic, should consider not merely the measurable and contrastable dimensions of the simple part of the system, that even if complicated may be technically simulated (Funtowicz et al., 1997). It should deal as well with the higher dimensions of the system, those in which power relations, hidden interests, social participation, cultural constraints, and other 'soft' values, become relevant and unavoidable variables that heavily, but not deterministically, affect the possible outcomes of the strategies to be adopted. (*Ibid*)

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[17] Indeed, the argument has been made that the quantity of data currently being produced for ecosystem services may actually hamper decision-making (Albert *et al.,* 2014b). One interviewee in the Albert *et al* study raised concerns over '[...] numbers that appear to be accurate but indeed are not (pseudo- accuracy)' and the way maps have 'an air of authority' (p. 17).

The danger of designing decision-making around the promise of commensurability is that both 'soft' values and power relations may be obscured beneath the supposed neutrality and transparency of quantitative data; to summarise Martinez-Alier, as a rule we should not believe in *algorithmic* solutions to multi-criteria problems. An algorithm is any set of rules to be followed in problem-solving. Martinez-Alier uses this term to indicate a tendency within environmental governance whereby problems are reduced to cost-benefit analysis of a limited set of options – even when this is carried out through complex modelling software. This is because problems can, and usually do, have *different responses under different descriptions*. What this means is that problems (deforestation, biodiversity loss) are not just waiting to be solved according to the best available information, but rather problems themselves can be reframed and re-narrated from different perspectives (or dimensions), thereby changing the possible range of options and requiring different models.

> In the framework of ecological economics, the use of a multidimensional approach seems desirable. This implies that the strong comparability assumptions of neo- classical economics have to be abandoned. Since multi-criteria evaluation techniques allow one to take into account conflictual, multidimensional, incommensurable and uncertain effects of decisions, they form a promising assessment framework for ecological economics both at micro and macro levels of analysis. (*Ibid*: 284)

Accepting incommensurability, particularly when it comes to valuing nature, involves rejecting any kind of reductionism (not just monetary). This does not, however, imply incomparability (Martinez, 1999). The emphasis here is on designing, fostering and supporting more open and inclusive deliberative procedures through which a range of experiences, values and visions can be proposed and discussed. More important than the appropriate form for such 'multi-criteria evaluation techniques' is the recognition that the complex, messy and highly contested arena of decision-making, particularly as regards environmental conservation, should not be sidelined through the intensification and extension of 'better' ecosystem accounting and valuation techniques.

As already mentioned, there is no shortage of acknowledgement of the difficulties and controversies inherent to the valuation of ecosystem services. There is less evidence, or reason to be confident, that this will be translated into adequate investment of time, energy and resources in supporting more open, inclusive, and deliberative decision-making. One reason for scepticism is the extent to which the Natural Capital field is dominated by trained scientists, economists and accountants. There is no expectation that more rigorous accounts of different cultural and power-laden contexts are going to play a significant part in the accelerating project to account for nature's values. At a policy level, there are repeated calls for ecosystem assessments and valuation to become more standardised to establish reliable, scientific links between the biophysical provision of ecosystem services and their economic values, and to create and maintain a consistent and coherent System of National Accounts (SNA). The EU report on ecosystem assessment is a good example, stating that more integrated, diverse value systems are desirable but economic valuation is the most commonly used method. It is thus far more probable that tools such as InVEST, developed by the Natural Capital Project, will be

put forward as more refined, 'user-friendly' responses to questions of complexity and uncertainty.

The dominant tendency towards economic valuation of ecosystem services must also be put into context. The inability or unwillingness to incorporate diverse values in decision-making and planning has been a persistent feature of environmental governance. As Adams and Redford point out, '[e]conomic calculations have always trumped others, particularly qualitative valuations of nature, and that is why the idea of payments for ecosystem services has such significance. There is no theoretical reason for the primacy of economic calculations, but it is a fact of life in policy' (Adams & Redford, 2010: 328). Turnhout *et al* (2013) also make this point in relation to the Platform on Biodiversity and Ecosystem Services (IPBES):

> We acknowledge here that the IPBES does recognize the need for pluralistic inputs to its processes. For example, it has recognized the importance of indigenous knowledge in a recent press release (UNEP 2012). So far however, this appears to be a nod to social inclusion that has taken place largely in the margins. Thus, we are concerned that the diversity of understandings that the inclusion of local and indigenous knowledges could potentially introduce, will be co-opted and "integrated" into mainstream knowledge production systems in problematic, instrumental and impoverished ways. (2013)

Without considerable and concerted efforts to challenge or reverse this pattern there is little reason to believe that the development of ecosystem valuation will significantly account for diverse values or develop the institutional spaces and mechanisms through which substantial deliberation and debate can happen. Conserving a diversity of life requires acknowledging a diversity of values, knowledge and framings of biodiversity, and fostering a diversity of social–natural relations (Sullivan, 2014; Turnhout *et al.,* 2013).

3.5. 'Valuing nature does not mean putting a price tag on nature'

A familiar argument made by proponents of Natural Capital (particularly ecologists and conservation scientists) is that what they are doing (mapping and valuing ecosystem services) is not the same as putting a price tag on nature. The European Commission claims that '[u]ltimately, economic valuation should not be used to set a price at which to trade nature, but rather as an indication of the substantial benefits that ecosystems provide to humans, which should be considered in economic, political and ecological discourse' (EU, 2015: 19). Similarly, Daily *et al* argue that '[p]rice is by no means the only thing that affects peoples' decisions. However, if we can get the price closer to being "right", everyday behavior and decisions will be channeled toward a future in which nature is no longer seen as a luxury we cannot afford, but as something essential for sustaining and improving human well-being everywhere' (Daily *et al.,* 2009).

As the New York City watershed example demonstrates, there is an important distinction to be made between economic valuation and pricing of ecosystem services. However, the drive to 'make nature count' (as typified by the above quote from Daily *et al*) means there is more of a continuum than a clear demarcation between the different phases of mapping, assessing, monetising and marketing

involved in Natural Capital approaches today.[18] While advocates of the economic valuation of ecosystem services acknowledge that other values, norms, cultural practices and institutions for governing nature exist, they also argue that accurate price signals (i.e. markets) is the most effective means of changing 'everyday behavior', whether at the level of the individual farmer or the multinational company deciding where to invest. In strategically pursuing this line of argument there is an implicit assumption that 'other ways of valuing' nature must also be recognised and protected. The problem with this assumption is that it imagines a neat separation between the different ways nature is viewed, valued and worked with – as though we can maintain a rainbow of different ways of valuing nature that can be kept apart but included equally. This understanding ignores how metaphors and metrics are not just not transparent ways of describing the world. When a complex oak forest is valued in terms of two or three ecosystem services, for example, this will change how this oak forest is viewed, valued and potentially managed. To introduce information about the value of certain ecosystem services is not to provide neutral information to realise the best course of action, it is to alter preferences by pointing out features of an object that make them valuable (O'Neill, 1997). New ways of mapping, measuring and valuing nature do not just 'represent' an underlying reality, but in fact produce a new reality that allows, and possibly even drives, the development of further tools and technologies such as payments and markets for ecosystem services.[19] Metaphors and metrics thus have effects beyond the intentions of well-meaning environmental scientists or policy-makers (Kill, 2014).

As outlined above, the process through which nature is transformed into (not simply 'made visible as') natural capital determines what ecosystem services are mapped and represented (not all, and not all equally) and how these are translated into comparable, quantified values (some values not being included). First, 'nature' in all its diversity and complexity must be cut up into discrete, individualised units (services) that can be represented and scored numerically. These numbers are then vested with the power to act as surrogate or proxy measures that represent the productive 'nature' aspect under consideration. This involves:

> the mapping and reduction of complex ecological and non-linear parameters into socially-determined numerical scores considered to adequately capture (i.e. to represent and 'value') particular dimensions of nature. As such, *calculative expertise is privileged as the most appropriate way of knowing and managing nature*, even though this technical knowledge relates predominantly to the layers of numbers

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[18] A good example of the ambivalence surrounding Natural Capital, particularly the controversies associated with pricing and markets for ecosystem services, is encapsulated by the inconsistent positions of the TEEB report and comments made by its lead author, Pavan Sukhdev, now Head of UNEP's Green Economy Initiative. Despite TEEB claiming that economic valuation was only one way of valuing nature, Sukhdev has made stronger comments himself, publicly stating that '[w]e use nature because she is valuable, but we lose nature because she has no price. Currently, no one pays for the services that ecosystems provide to us. That is why people who are expected to maintain these systems are not receiving payment to do so. Thus, an economic incentive to do the right thing is missing. That is why we first have to create a market' (2008; quoted in Kill 2014:42).

[19] Nor are those who are involved in this process immune from these developments: one only has to attend a conference on Natural Capital to witness the new, increasingly normalised ways in which ecologists discuss nature in terms that would have historically been more associated with the worlds of economics and finance.

> that come to represent those selected nature aspects that can be thus symbolized. (Sullivan, 2014; my emphasis)

What Sullivan identifies is that the process of abstraction involved in ecosystem service accounting does not just produce a simplified 'image' of a more complex and diverse underlying reality; this 'image' *becomes* nature, at least the nature that is valued and circulates within the field of calculative expertise that has become dominant. Science thus produces an account of nature (natural capital) that is not only partial, but is increasingly taken as nature itself. Over time, the numerical representation of nature acts to create and normalise the appearance of equivalence and commensurability between different aspects of nature, across different locations and times (Pawliczek & Sullivan, 2011; Sullivan, 2014).

Not only does this mean that other ways of viewing, describing and valuing nature are undermined and excluded. It also leads to the transformation of these other relationships, as the dominant forms of valuation and expertise require people and natures to 'appear' in certain ways if they are going to count in decision-making, and indeed the future of 'green' development. Thus, to suggest, as some supporters of Natural Capital do, that economic valuation of ecosystem services can co-exist or be combined equally with non-economic valuations is either naïve or disingenuous, particularly as one of the central justifications for economic valuation is precisely a recognition that economic figures (and monetised value) matter more than 'idiosyncratic' alternatives. Adams and Redford (2010) thus warn that ecosystem services practitioners need to be 'cautious about the power and applicability of economic metaphors' (p. 328), because of the ecologies that might be created: 'diverse ecosystems that produce economic returns will be well preserved, and those that do not will be converted or transformed to increase returns' (p. 329). This will become clearer in the next section as I describe some applications of the ecosystem services approach.

Section 4: Monetisation: Making Nature Pay

The last section examined the scientific and accounting work involved in valuing ecosystem services. This section focuses on the application of these valuations through payments for ecosystem services (PES) schemes. Such payments can take various forms, including but not limited to: charges, taxes, donor funds, and market-based trading in environmental credits. As with debates over economic valuation itself, there are ongoing debates about how to translate ecosystem accounting into meaningful conservation strategies. Pursuing the core approach of this discussion paper, the intention here is not to rehearse more abstract debates weighing up the advantages and disadvantages of different payment schemes and applications, but rather to identify the dominant tendencies, directions and momentum behind PES instruments and schemes. In line with the pragmatic strategy of 'making nature count' for decision-makers, specifically making conservation profitable (or at least not a financial burden on the state), the momentum is towards monetising ecosystem services, not simply as an indicator of societal value but as a means of directly mobilising flows of finance capital. As with the tensions surrounding the valuation of ecosystem services, this tendency is not necessarily supported (or widely acknowledged) by proponents of the Natural Capital approach, but it nonetheless stems from a belief that economic growth and conservation can be aligned.

The translation of complex ecosystems into a series of discrete, individualised ecosystem services is not a neat, even or linear process; nor is the translation of these ecosystem services into assets capable of generating monetary returns. Returning to the Yasuni example, the momentum is towards devising ways of generating revenue from a range of ecosystem services, rather than just relying on public or donor funds to sustain conservation projects. As with other sectors previously reliant on public funding, the challenge for conservationists is how, at a time of reduced public funding and greater conservation need, novel funding and financing strategies can be developed: self-financing conservation that remains like 'the legendary Holy Grail… elusive' (Ferraro and Kiss, 2002: 1719). Globally, it is estimated that investors must allocate $300 to $400 billion to meet worldwide conservation needs. From this amount, funders provide only around $52 billion per year to conservation finance (Huwley *et al.,* 2014). Increasingly, conservationists are embracing a broader range of funding and financing options.[20] It is in this context that the development of payments for ecosystem services must be understood.

4.1. History of PES

Payment for ecosystem services (PES) is based on the relatively simple premise that the beneficiaries of ecosystem services pay the providers; this is the case both for direct subsidies paid by the state (public benefits from ecosystem services), and for

[20] Conservation Finance describes the practice of raising and managing financial capital to support conservation projects. Conservation financing options vary and can include loans, grants, tax incentives and market mechanisms. Conservation projects have historically relied on public funding or donor funding (particularly in the Global South).

payments from companies seeking, for example, to offset the costs of a development. In one sense, the concept provides a positive version of the 'polluter pays principle', which sought to tax or charge those who exploited resources or polluted the environment. And just as the 'polluter pays principle' can take many forms, so too can PES; it describes any payment made for maintaining or generating an ecosystem service. PES schemes have attracted increasing interest as a mechanism to translate external, non-market values of the environment into financial incentives for local actors to provide environmental services (Fletcher & Buscher, 2017).

Historically, early forms of PES involved initiatives such as Integrated Conservation and Development Projects (ICDP) and Community-Based Natural Resource Management (CBNRM). These projects were based on indirect payments designed to encourage rural communities to maintain biodiversity by helping them to use it sustainably – by developing alternative sources of income or social benefits as a means of encouraging communities to cooperate. The EU's agri-environment schemes, first implemented in the 1980s, are an early form of PES; under these schemes, farmers are paid to carry out various activities that enhance and protect ecosystem services and biodiversity, such as preserving hedgerows or leaving uncultivated strips of habitat for wildlife. In the US, wetland mitigation banking has been under way since the early 1970s, and is now worth over $3 billion annually (Madsen *et al.,* 2010). A form of offsetting, mitigation banking involves the preservation, enhancement, restoration or creation (PERC) of a wetland, stream or habitat conservation area that compensates for planned adverse impacts to a similar ecosystem due to new development. Wetland mitigation banking has inspired similar schemes in the US such as species banking whereby landowners are paid to conserve rather than 'take' species on their land. The money is raised through government-awarded species credits paid for by developers who may damage protected species on land elsewhere. Species banking was estimated to be worth US$ 100–370 million per annum in 2008 (Sullivan, 2014).

From the 1990s, eco-labels and environmental accreditation schemes emerged as another form of PES scheme. Largely initiated by international NGOs in collaboration with businesses, eco-labels sought to reward producers and businesses that met defined environmental standards and thus provided environmental services. Well-known examples include the Forest Stewardship Council and Marine Stewardship Council accreditation schemes, established by WWF and Unilever in the 2000s. The difference between these accreditation schemes and the agri-environment schemes is that the former are market-based instruments largely governed through a transnational network of non-state actors, while the latter is a state scheme that redistributes public funds to encourage environmental conservation (Bresnihan, 2016).

In the context of Natural Capital and the ecosystem service literature, the most common PES schemes tend to relate to payments for carbon sequestration in biomass or soils; provision of habitat for endangered species; protection of landscapes, and various hydrological functions related to the quality, quantity or timing of freshwater flows from upstream areas to downstream users. Costa Rica pioneered the use of PES mechanisms for such services, establishing a country-wide programme called Pago por Servicios Ambientales (PSA) in 1997, which aimed to reverse the severe deforestation rates occurring at that time (Pagiola, 2008). Costa

Rica's PSA programme aims to maintain forest cover by compensating landowners for the external benefits provided by their forests. The finance for these services comes from the National Forestry Fund, which intended to raise money through the sale of carbon sequestration services to the world market and hydrological services to the domestic market (Chomitz *et al.,* 1999). As with most PES schemes, however, there is a difference between the ideal of raising private finance and the reality.

The aspiration of PES schemes is that the users of services make payments to the providers of those services (such as through water charges for those maintaining watersheds). In reality, only about three per cent of areas under the PSA scheme in Costa Rica are financed according to 'user pays' (Fatheuer, 2014: 42). The most substantial financing sources are a fuel tax (approx. 40%) and international cooperation (45%).[21] Numerous and detailed empirical case studies demonstrate that a number of prominent PES programmes around the world, including in Cambodia (Milne & Adams, 2012), Costa Rica (Fletcher & Breitling, 2012), Mexico (McAfee & Shapiro, 2010; Shapiro-Garza, 2013), and Vietnam (McElwee, 2012), contained little if any actual market exchange, instead relying almost entirely on state appropriation and redistribution of revenues, thus functioning more like the public subsidies they were often intended to replace (Fletcher & Buscher, 2017). Globally, 97 per cent of all PES systems are paid for through public funds.

Inspired by the PSA programme in Costa Rica, the most ambitious PES scheme to date is the UN REDD+ programme. REDD+ stands for 'Reducing Emissions from Deforestation and Forest Degradation in Developing Countries' and has been part of climate-change negotiations since the Bali Climate Change Conference in 2007. The scheme effectively seeks to apply the PES concept on a global scale: paying for forest conservation in the Global South as a means of reducing emissions. In theory, it is a 'win-win-win' approach, as Sam Knight (2016) writes:

> If the whole thing works as it is supposed to, the benefits would be remarkable. Carbon emissions would go down and forests would be saved – the same forests that shelter 77% of the world's threatened bird species, supply water to a third of the world's large cities, and are home to 60 million indigenous people, among the most vulnerable communities on Earth. Money would flow from north to south and new kinds of forest economies, based on living things and biodiversity, rather than denuded landscapes, would arise.

The TEEB report (2009) claimed that REDD+ could lead to the halving of deforestation rates by 2030, cutting emissions by 1.5 to 2.7 Gt CO2 per year. While the ecological rationale may be simple enough (though not without problems), the estimated costs of implementing REDD+ on this scale range from US$ 17.2 billion to US$ 33 billion per year (Eliasch, 2008). The TEEB report urges action on REDD+,

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[21] Costa Rica and the pharmaceutical company Merck have also agreed an innovative deal in which Costa Rica conserves an area of forest, supported by a payment from Merck; Merck has access to the results of biological prospecting in this forest, and will pay Costa Rica a royalty on products developed from the prospecting. The deal represents a first step in providing a conservation agency in a developing country with a financial stake in the intellectual property of its biodiversity (Chichilnisky & Heal, 1999).

arguing that delaying action would reduce its benefits dramatically: 'waiting 10 more years could reduce the net benefit of halving deforestation by $500 billion'.

One of the attractions of the REDD+ scheme (it was initially proposed by Papua New Guinea as a means of receiving funds to conserve its forests) is that money raised for forest conservation is intended to come from the sale of forest credits to polluters in the Global North. The idea was that poor countries in the Global South would be happy to protect their forests (more specifically, the carbon storage capacity of their forests) in return for money raised by the sale of forest credits to polluters aiming to offset their CO2 emissions. This represents a form of 'offsetting'; continued CO2 emissions in the industrialised world could be mitigated by the purchase of forest certificates in less developed parts of the world. Extending a core principle of the PES concept, the REDD+ scheme would thus aim to ensure that the beneficiaries of an ecosystem service (CO2 polluters) would directly pay the providers (forested countries in the Global South). As with other PES schemes, REDD+ does not rely on a market mechanism, but the only way it can sustain itself is by attracting a sufficient flow of private finance (through sale of forest credits). In other words, the system relies on the financial value of forest credits being greater than the financial value generated through timber, crop growing, livestock farming or mining.

As with the unrealised financial potential of the PSA scheme in Costa Rica, the REDD+ scheme has failed to generate the flows of money from North to South, from CO2 polluters to forest conservation projects, that it promised. At a cost of around $6m each, 51 countries, from Ethiopia to Ecuador, have spent the past six years preparing for the REDD+ programme. Some $7 billion has been pledged from donor countries and the UN to get the system up and running, and REDD+ continued to be pushed by negotiators at the Paris climate-change summit. Yet the performance of REDD+ has been far from convincing. Substantial amounts of public funds continue to be invested in the construction of a market-compatible mechanism, producing credits for which no demand exists, with the result that the public purse is called upon to buy them up. The aim is to create a situation in which the financial returns generated through the conservation of forests outweigh the returns from other economic uses of the forests and land. But in contexts where forest conservation may be competing with industrial-scale soy farming, palm-oil plantations, cattle grazing, mining or oil extraction, the financial incentive is far from becoming a reality.[22]

If PES schemes are to put theory into practice (*realising* nature's economic value), thereby generating revenue from nature conservation, then mechanisms for monetising ecosystem services need to be designed and implemented (Turnhout *et al.,* 2013). Rather than the state or a donor funding conservation projects because of the environmental (and often social) value of those projects, the rationale behind direct PES schemes is that a clear and stable equivalence between the provision of

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[22] Partly in response to this, REDD was rebranded as 'REDD+' in 2010, representing a move away from its single-minded focus on reducing emissions through carbon markets, towards a more holistic view of the value of forests and the lives of the people who dwell in them. Activities that could now be funded under the programme came to include 'non-carbon benefits' such as 'opportunities for wealth creation and wellbeing'.

specific ecosystem services (carbon storage or bee pollination) and the beneficiaries of those services can be constructed and mediated through market instruments. One of the main obstacles to this strategy (so far) has been the generation of effective demand for ecosystem services (the REDD+ programme being an obvious example). In most existing PES schemes, therefore, funds are provided to service providers by the government or through donors because there is little or no demand (no market) for the services that are socially and environmentally desirable. Thus, Breitling and Fletcher argue that while the PSA programme in Costa Rica (and some REDD+ schemes) may have been a success in combating deforestation, the relative inability to establish a free-standing market to accomplish this aim undermines one of the main justifications for the PES approach: to make conservation profitable, and thus relinquish the need for the state to finance, manage and oversee environmental conservation. Furthermore, as with the agri-environment schemes in the EU, state subsidies for environmental conservation do not require precise valuations to align the value of services performed with the payments received. Thus, despite the complex work involved in measuring and monetising the ecosystem service provided, such projects have more in common with past conservation projects (in terms of state funding and intervention) and certainly fall short of the lofty goal of reconciling economic development (and investment) with conservation. It is in seeking to 'correct' this situation, to better align ecosystem conservation with direct payments, that the need for more formalised, uniform and market-like PES schemes are being developed.

4.2. How to make nature pay?

As with the difficulties in establishing standardised valuation of ecosystem services, the absence of effective PES programmes (in terms of being able to generate money independently of state funding) gives rise to calls and efforts to 'improve' PES schemes by making the monetary value of ecosystem services more apparent and the mechanisms used to generate payments for those services more refined. Engel *et al* (2008), for example, emphasise the importance of 'programme design' as a means of making conservation a more 'attractive' option for 'ecosystem managers, thus inducing them to adopt it'. Ferraro and Kiss argue that: 'If we want to get what we pay for, we must start tying our investments *directly to our goals*' (2002: 1719; my emphasis). At the heart of this is the challenge of weaning conservation projects off a reliance on 'welfare' payments: 'paying an individual or community for "not doing something" might be seen as a form of social welfare rather than development. However, the idea that conservation payments are a form of welfare belies what conservationists have been arguing for decades: Biodiversity is a valuable commodity and biodiversity protection is an alternative land use' (Ferraro & Kiss, 2002: 1719). This line of argument has resulted in a move away from indirect payments (such as funding for community-based and -led conservation projects), towards direct payments that tie the provision of specific ecosystem services (and the ability to accurately measure these services) with beneficiaries of those services; by refining the valuation and pricing of ecosystem services, the argument

goes, we can ensure that providers are incentivised and users willing to pay.[23] For an 'ecosystem service provider' to be paid directly by the beneficiary of that service, a formalised system of monetisation must be put in place that requires additional institutional, accounting, scientific and regulatory work.[24] Presented as a 'technical' challenge (getting the valuation and pricing 'right') ignores how the move towards monetising of ecosystem services involves further degrees of abstraction, with potentially far-reaching consequences. As geographer Morgan Robertson puts it: '[t]he successful ecosystem entrepreneur must be so lucky as to operate in a world where such things [ecosystem services] are understood to exist in a stable and widely-acknowledged form. *This is a remarkable achievement*' (2006: 387; my emphasis).

Direct PES schemes rely on 'result-based financing': payment is dependent on quantifiable outputs. In the case of REDD+ programmes, for example, forest communities are provided with financial incentives for maintaining, or expanding, the carbon-carrying capacity of trees. Once the financial incentive is integrated into ecosystem service valuation, things begin to change on the ground – which is ultimately the intention of such schemes. This can lead to distortions as projects are tied to an externally defined valuation system: specific, complex and unique ecosystems are shaped by the need to *demonstrate* (measure) the performance of particular ecosystem services. Countries with forests, and potentially (but not always) the communities living in them, are not just 'encouraged to conserve forests', but to accurately assess and assign monetary value to the forests in terms of carbon-storing capacity (and the exchange value this service can demand in credit markets). This can lead to distortions as the complexity and non-financialised values that inhere in an ecosystem and place are sidelined and excluded. For example, it may be the case that certain trees hold less carbon, even though they may have greater biomass or provide habitat for more biodiversity; once financial value can be derived from a good or service, it changes how places and activities are viewed and valued, often with unintended consequences. As Carse clearly shows through his research on the role of ecosystem services in the management of the Panama Canal: '[w]hen a landform is assigned value in relation to one cultural system of production (transportation) rather than another (agriculture), different environmental services become relevant and the landscape is reorganized to prioritize the delivery of those services that support that system' (Carse, 2012: 557).

Direct ('results-based') PES schemes can also lead to problems where indigenous peoples and local communities practise traditional forms of agriculture, subsistence livelihoods and environmental management that do not register with what is demanded within the PES scheme. In most cases, these communities are not the main drivers of environmental degradation, but their rights to use and live in specific places of 'High Natural Value' may come to rely on their ability to 'verify'

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[23] This is the same argument made against the Yasuni Fund initiative: the failure to *adequately* monetise the ecosystem services of the Park.

[24] As Gomez-Baggethun *et al* write: 'Valuation is a necessary but not sufficient condition for commodification, as valuable goods and services have to be alienable in order to become commodities. In other words, a complementary institutional structure that allows appropriating ecosystem services (property rights) and their sale or exchange (a market) has to exist before commodification can take place' (2010).

their 'ecological credentials' to NGOs, state agencies and other intermediaries in the PES field.[25] Of particular concern here is the transformation of property rights. In many cases, property rights over land must also be formalised before payments can be made for the provision of ecosystem services associated with the land. This requires replacing customary use rights with private property rights; Corbera *et al* (2007) suggest that the assumed need for well-defined land titling for the creation of direct PES schemes can act as a driver of privatisation of common property systems relying on customary rights. This can mean existing customary use rights becoming illegal (such as taking wood for fuel), generating new inequalities and conflicts within communities. And while questions of inequality and poverty are debated in the ecosystem services literature, PES schemes tend to involve many intermediaries (international organisations, national governments, carbon and forest credit brokers, local development agencies, NGOs, financial institutions) and it is not clear how such multiscale, globally coordinated governance networks can be effectively monitored, regulated and implemented in an accountable manner. Experience to date suggests that the promotion of indigenous peoples and local communities as 'service providers' is often dependent on externally defined performance measures that are mediated through *ad hoc*, nationally and locally specific contexts that are open to corruption and abuse (Böhm & Dabhi, 2009; Kill, 2014).[26] Research also shows how 'green' infrastructure projects have resulted in land-grabbing and displacement as customary rights to land or forests are disregarded in the interests of the 'environment' and economic development.

As well as tying conservation finance to externally defined financial and scientific values, the development of direct PES schemes can also create a dependency on pricing systems that are far from stable or secure. REDD+ provides another warning: the drop in the price of CO2 after the financial crash ensured that many REDD+ projects were left decimated, or reliant on public funding and donors. REDD+ produces this path-dependency: 'the hope of generating additional and immense resources via the CO2 market gives way to the nightmare of dependency on these markets' (Knight 2016).[27] The private funds that were thus earmarked for forest conservation did not materialise, and national governments, donors and NGOs had

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25 McDermott and Schreckenberg (2009) report, for example, that poorer people tend to be underrepresented in Tanzanian village natural resource committees, and consequently are rarely involved in forest income-generation (from timber, for instance) and may be precluded from accessing ecosystem services.

26 An example illustrates the opaque and complex chain of responsibility involved in transnational PES schemes. In 2013, the European Investment Bank agreed to invest up to €25m in the Althelia Climate Fund, a public-private partnership that aims to profit from PES, including offsets from forests. In February 2014, of the US$60m in total assets, the fund invested US$10m in the expansion of the Taita Hills Conservation and Sustainable Land Use Project in Kenya, in cooperation with Wildlife Works Carbon LLC based in California, owned by the London-based Wildlife Works Carbon UK Ltd. The Taita Hills project aims to profit from REDD+ credits and charcoal production. The Kenyan government is already involved in the mass displacement of Sengwer Indigenous Peoples from their ancestral lands to pave the way for REDD+ projects in the Embobut forest (Gilbertson & Coelho, 2014).

27 Another problem of relying on PES schemes is that they can lead to distortions in so far as the price requires continued use of resources, development or pollution. This has been shown to happen in wetland mitigation banking where conservation actually tends towards net losses of habitat (Wilcove & Lee, 2004; Fox & Nino-Murcia, 2005). That is, it occurs against the assumption that more development will occur which, under current regulatory contexts, will require purchase of conservation credits so as to offset impacts (Mead, 2008). Indeed, development that produces transformation of habitats is required for conservation credits to attain the prices that will encourage the establishment of conservation banks and bankers, thereby generating trade in conservation credits as a funding strategy for conservation management.

to step in to maintain fledgling projects. Similarly, if the financial incentive is perceived not to be large enough to compensate for the opportunity cost of conservation, then market mechanisms like PES might be counterproductive, achieving the opposite effect to that expected. This dependency will arise wherever ecosystem service provision depends on direct payments vulnerable to market fluctuations. In Costa Rica, for example, a study found that native bees from two areas of forest adjacent to the Finca Santa Fe coffee plantation saved the coffee plantation owner approx. $60,000 a year (the cost of having to rent hives of bees to pollinate his crops). An ecosystem service payment contract was drawn up between the plantation owner and the owner of the forest, and presented as an example of a 'win-win' scenario for agriculture and biodiversity conservation. However, not long after the contract had been agreed, the price of coffee dropped dramatically. The coffee plantation was transformed into a pineapple plantation; however, in the case of pineapples, pollination is harmful to crop productivity because the presence of seeds negatively affects the fruit (Kill, 2014). Such adverse and unintended consequences are always a risk when environmental goals are reliant on economic incentives and market pricing. Not only is this mission flawed (as outlined above), it also ignores (and excludes) the diversity and value of different forms of social organisation, ecological knowledge practices and sustainable livelihood.[28]

A considerable body of empirical and theoretical literature and policy evidence contradicts the argument that aligning conservation to direct payments is the best means of achieving environmental goals. From anthropology, development studies, feminist economics and the broad field of political ecology, there is ample evidence to suggest that collective, community-based forms of environmental governance not only demonstrate more sustainable environmental practices but also view, understand and value nature in very different ways to dominant Eurocentric perspectives. Crucially, these accounts identify and value diverse forms of ecological praxis that emphasise the dynamic inter-connections between humans and non-humans within specific places (Escobar, 2008; Rose, 2004; Turnhout *et al.,* 2013). These forms of situated knowledge depart from dominant scientific approaches to resource management in so far as the environment is not a 'backdrop' for human culture and production, but rather dynamic, lively and shared with others – both human and non-human. Environments, in this perspective, do not precede the interactions and activities of humans and non-humans but rather emerge out of them. Growing awareness of the complexity, inter-relatedness and dynamism of socio-ecological systems has now given rise to experiments with community-based resource management and institutions for collective action around the world.[29]

PES schemes, particularly direct payments, not only challenge these situated, socially and ecologically sensitive modes of communal environmental governance,

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[28] Based on a review of empirical data from behavioural experiments, Bowles (2008) suggests that policy design based on economic incentives that signal self-regarding behaviour as an appropriate response can undermine the moral sentiments for conservation. As a consequence, a potential threat of market-based mechanisms relates to potential changes in the logic of conservation from ethical obligation or communal regulation to economic self-interest.

[29] Environmental theorist Tim Forsyth writes, 'This alternative conception of science [was] willing to surrender claims to universal validity in exchange for knowledge *that nears some local and circumscribed utility*' (2003: 165; emphasis added). The emphasis shifts toward 'how we can make good decisions the right way'.

but can undermine and displace them. This is partly because the PES framework tends to assume that services are provided by ecological entities (wetland or forest, for example), while human interaction with these ecosystems is largely framed as potentially negative (development or deforestation), and thus in need of curtailing through financial incentives (Sullivan, 2014). But PES schemes can also have the effect of training the attention, investments and labour of local communities or landowners towards the provision of a single ecosystem service at the expense of other areas, and of viewing and valuing environmental practices in terms of pre-defined, measurable outputs (how much carbon storage capacity has been generated, for example). As Jackson & Palmer, (2015) write:

> There is then an inherent risk for indigenous land managers in the current conception of eco-system services. It is conceivable that willingness to pay for ecosystem services provided by indigenous people will be confined to financial support for only those activities or functions that measurably improve environmental conditions and not the practices and relations that generate less tangible or non-observable eco-social results. (Jackson & Palmer, 2015: 142)

Recognition of such risks has led grassroots environmental justice movements in the Global South to reject the ecosystem services framework, arguing that it is simply not compatible with indigenous, agro-ecological practices (Lohmann, 2016). In place of PES schemes, demands are made to further non-finance-linked community-based projects and support for diverse economies through redistributing public funds and stronger regulation of destructive economic activities such as mining, industrial-scale farming, logging and drilling.

4.3. Debt-based conservation finance

Much of the discussion so far has focused on the implementation of PES in the Global South. There is no doubting that this is where most of the world's natural capital continues to exist, and where efforts have been concentrated, with the promise of a 'win-win-win'[30] solution that appeals to many of the political leaders, international NGOs and organisations occupying the field of global environmental governance. But PES schemes are also being advanced in Europe and North America through new forms of debt-based conservation finance. This is a relatively new field of conservation finance that aims to respond to the failure of past efforts to effectively monetise ecosystem services.

The development of debt-based conservation finance has taken on new momentum since the global financial crisis, particularly in the EU. On one hand, fiscally constrained governments are eager to seek out new sources of external, market-based repayable finance to fill the investment gap in core infrastructures (water, energy, transport, housing) and, potentially, 'green' infrastructures and natural capital. On the other, potential investors are increasingly interested in financial

[30] Continued economic production in the North (and areas of the South), environmental conservation and development funding to the South.

opportunities around sustainability, particularly pension funds keen to direct funds towards longer-term, low-risk investments (Castree & Christophers, 2015; Turner, 2014). Debt-based conservation finance aims to kick-start external financial investment into conservation projects in the present. As with other forms of debt-based financing, this involves the creation and issuing of 'green' bonds. A bond can take many forms, but essentially it is a promise by its issuer to repay its holder the agreed amount at a fixed future time (the maturity date), and with an agreed rate of interest. Green bonds allow borrowing from investors with the debt secured on the future economic and environmental (especially climate) benefits predicted to flow from these investments. The green bond market has taken off in recent years; $42 billion was issued in 2015 (almost four times the 2013 issuance), and 2017 is set to continue this growth, with issuance topping $50 billion (Climate Bonds Initiative[31]).

One of the few researchers examining these fast-emerging financial arrangements in the context of environmental governance is Sian Sullivan (2013, 2014). She has shown how the UK government has been designing, facilitating and issuing 'environmental bonds' – 'including green investment bank bonds, green infrastructure bonds, and woodland creation bonds' – as a means of linking investment to pledges of environmental improvement by issuers. She quotes a recent report on 'Opportunities for UK Business that Value and/or Protect Nature's Services', which promotes environmental bonds as 'vehicles for [direct] investments in nature' for '[c]orporate industries wishing to purchase bonds as a means of offsetting their residual environmental impacts through the supply chain'. The report goes on to suggest that '[a] number of asset classes such as biodiversity, water, carbon, which are co-located on the same area of land, could be "stacked" and an environmental bond created, providing a stable investment return', and that '[f]inancing by government could leverage scaled-up investment which would help fund green growth and jobs' (Duke *et al.,* 2012: viii, also 57-58). These 'asset classes' of 'nature' are understood here as 'components of ecosystem markets' that 'provide the natural capital on which society depends' (Duke *et al.,* 2012: 32). In this context, 'conservation bonds' (as termed in the report) would be underpinned by government, such as through the UK's Green Investment Bank, established to accelerate 'transition to a green economy', in part through capitalising natural capital in terms of 'green asset classes' that can generate rates of return on investments (Sullivan, 2014).

If green bonds are to become established as a new asset class, national governments (or EU institutions) will need to facilitate this through the provision of 'bridging' loans.[32] In Europe, this 'bridging' function has been formalised through the Natural Capital Financial Facility (NCFF). The NCFF is a joint facility of the

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[31] The Climate Bonds Initiative is an 'international, investor-focused not-for-profit' organisation, 'the only organisation in the world working solely on mobilising the $100 trillion bond market for climate change solutions': https://www.climatebonds.net.

[32] In a recent presentation, Sean Kidney, the CEO of the Climate Bonds Initiative, called for all interested parties to 'market the hell out of the environment'. By this he meant creating a clear and secure link between the supply of 'green' services (including ecosystem services) and demand for these services. In this process, the public sector, Kidney argued, had to act as the 'bridge' to provide 'fiscally efficient guarantees to meet the risk-rewards of clients (pension funds)' (Kidney, 2016).

European Commission (EC) and the European Investment Bank (EIB) with a total budget of €100 million, and an additional €10m for technical assistance. The aim is to leverage private investments for 10-12 revenue-generating or 'cost-saving' pilot schemes. Each pilot project will be awarded funding of between €5m and €15m. The NCFF pilot projects fall into four categories: payments for ecosystem services, green infrastructure projects, biodiversity offsetting, and pro-biodiversity and adaptation investments. The fund has been developed to respond to 'barriers to the uptake of many natural capital projects, *including lack of experience, long investment and project payback periods, and uncertainties about target markets, revenue streams and profit margins*' (EC, 2014; my emphasis). The NCFF is a pilot to establish a pipeline of replicable, bankable projects that will serve as 'proof of concept' and demonstrate the attractiveness of such projects to potential investors. In other words, the NCFF will provide loans and investments to support projects in EU member states that can demonstrate that the preservation of natural capital can indeed generate revenue. Proving the financial value of ecosystem services is considered a necessary step towards attracting external financial investment into further natural-capital projects.

While the need for conservation finance is undoubted, mechanisms such as the NCFF and the strategy of attracting private financial capital more generally raise troubling questions. Returning to the 'results-based' character of direct PES schemes, the assessment of conservation projects under a scheme like the NCFF explicitly identifies financial profitability as one of the main indicators of 'success'. What does this mean for non-financial values that conservation projects have historically been (and should be) allied to? Shifting from public-based to debt-based funding could also create undesirable consequences into the future. For example, if a conservation project is tied into a medium or long-term loan repayment schedule, decisions over the direction of that project will be shaped by financial concerns (potentially sidelining social or environmental needs and concerns). Debt necessarily generates a relationship of dependence, narrowing possibilities for the future (Bresnihan, 2016a). In the rush to draw in external, private sources of conservation finance, it is also not clear how sufficient long-term plans are being put in place to ensure secure sustainable revenue streams. As illustrated by other market-dependent PES schemes, fluctuating prices and economic dynamics can leave conservation projects vulnerable. The upshot of this may be a future of indebted conservation projects that must be bailed out by the transfer of public funds to lenders. While this is speculation at present, Sullivan reminds us that 'we have only to remember the way that the recent subprime mortgage crisis, wherein lenders fell over themselves to advance loans onto books without adequate assurance of repayment strategies, facilitated the massive foreclosure of the capital "securing" such loans when repayments were not forthcoming' (Sullivan, 2014: 27).

4.4. 'Getting the prices right'

Despite claims to the contrary, the vast majority of PES schemes today involve payments from public authorities or donors to conservation projects that are not in themselves financially viable or profitable. In the context of many countries in the Global South, the monetisation of a range of ecosystem services (biodiversity, carbon storage, water treatment) has not led to the materialisation of direct payments, nor have these payments come anywhere close to outweighing the

short-term economic benefits derived from traditional (unsustainable) economic activities such as logging, industrial agriculture, mining and construction (Böhm & Dabhi, 2009).

Despite the inability to align conservation objectives to development goals through PES schemes, the narrative of the 'win-win' solution that is central to the appeal of the Natural Capital approach remains undaunted. In this section I have indicated how ongoing efforts to tie the protection of ecosystems to economic incentives has not only failed but also given rise to new layers of abstraction (quantifying, standardising and stabilising the 'performance' of ecosystems) and unintended consequences in terms of how realities on the ground are being shaped in order to fit the ideal of the PES model (financial incentives eroding moral norms, changing property rights, elite capture of resources, exacerbation of social inequalities).

The effort to translate ecosystem services (carbon storage, water treatment) into financial values intensifies the process of abstraction involved in ecosystem accounting. Not only are complex ecosystems (sub-tropical forests, for example) reduced to discrete, measurable services (carbon storage) but the provision of these services becomes increasingly tied to financial incentives that can act as powerful drivers of social and ecological change. Two inter-related tendencies are likely to continue into the future. First, government and financial support will be forthcoming for 'classes' of ecosystem services that enable the continuation of economic growth strategies (carbon storage); second, financial products and mechanisms will be developed for debt-based conservation finance.

In a context of fiscal constraints on public funding, global economic competition, and little let-up in levels of consumption, there is a strong likelihood that the 'nature that will count' in the eyes of policy-makers and businesses is going to be the nature that enables the continued profitability of core economic sectors. In the context of Ireland, this has been made clear by the government's consistent efforts to have offsetting through afforestation included in the calculations of Ireland's GHG emissions budget (Stop Climate Chaos, 2016). In this case, the value of investing in afforestation is understood in terms of allowing for continued expansion of the agricultural sector (beef and dairy primarily); conservation and economic growth are supposedly aligned through the offsetting potential of forestry projects. This deployment of the ecosystem services approach is clearly shaped by prevailing economic demands, policies and models of agricultural development, not by a desire to realign agricultural policy with the environment at its core (Stop Climate Chaos, 2016). It is also possible to see how the economic benefits of certain ecosystem services (carbon storage being the obvious example) can shape the direction of research and conservation as funding is made available (from the Irish Government and European Commission) to further map, assess and design projects that can fulfil prioritised functions (CO2 offsetting). In this way, conservation is aligned with economic growth, but in very limited and problematic ways. This is not to say that offsetting is the only application or inevitable consequence of Natural Capital approaches, but, when the goal is to align continued economic growth with conservation objectives, this is always going to be a likely outcome. The EU's position is revealing here: the Commission has stated that 'offsets should only be a last resort', and yet money has been made available for offsetting projects through the NCFF, and member states such as Ireland have successfully lobbied the Commission to have offsetting included in its annual GHG emission calculations.

One of the additional consequences of this kind of environmental 'fix' is that it can allow decision-makers and business interests to say: 'Look what we have done, we have offset pollution, there is nothing left to discuss'. Besides criticisms and doubts about the actual efficacy of such offsetting schemes (in terms of absorbing CO2), and their environmental impacts (reducing biodiversity), such projects also deflect attention from underlying moral and political questions. This point has been made most forcefully by social and environmental justice movements, NGOs and certain governments in the Global South,[33] where most of the world's 'High Value Nature' is located. The main concern here is that the 'poor' will be made 'environmental stewards' for the rich North when these are precisely the people with 'much lower impact degrading ecosystem services' (Muradian *et al.,* 2010; Bumpus & Liverman, 2008). This redistribution of responsibility through offsetting projects could ensure the continuation (and deepening) of uneven development and inequality in the name of 'protecting the environment'.

Finally, shifting from public grant-based funding for conservation requires the success of the environmental project to be measured by profitability rather than added environmental or social values. The success of a project within the NCFF, for example, will be measured by the extent to which it can raise revenue, rather than social and environmental goals. This has already been the experience with REDD+ projects. What is novel about debt-based conservation finance is that it is based on the promise of future revenue from ecosystem services. What form this revenue will take is not clear – charges paid for individual services (water treatment), carbon and forest credit markets (REDD+) or government payments – but regardless of whether the money is forthcoming or not, ecosystems will be locked into future trajectories because of the need to repay loans. Building new financial instruments for 'nature' thus not only replaces public grants in order to meet short-term conservation finance requirements, but also prescribes the future direction of development. Furthermore, as with offsetting, the focus on developing financial instruments that demonstrate that 'nature can pay' are not only far from being a reality, they also divert attention from the need for diverse and substantial action on climate and the environment.

[33] At the People's Summit for Climate Change in 2010, the Vice-President of Bolivia declared: 'We [the people of the Global South] are not forest rangers for those causing pollutions and climate change'.

Section 5: Conclusion

5.1. Making nature count–for whom?

The overwhelming momentum behind the Natural Capital approach is to transform the range of values derived from nature into a common measure (monetary, or otherwise) that will, ideally, enable ecosystem services to be properly accounted for in decision-making and economic modelling. While many ecologists and conservation scientists engaged in the project of ecosystem services may baulk at the idea of reducing ecosystem services to a single (monetary) value, it is important to recognise that the justifications and methods for mapping, categorising and measuring ecosystem services have moved conservation in this direction. This is not because valid scientific information has been incorrectly applied, but because the transformation of nature into natural capital takes place within prevailing political and economic contexts that drive the likelihood of certain outcomes, such as economic valuation and monetisation. As Morgan Robertson puts it, '[t]he "red-legged frog habitat" service is not out there waiting; rather, it is fundamentally defined as a service in the process of its marketing and sale' (Robertson, 2012: 387).

In this paper, I have traced the evolution of the concept of Natural Capital from its origins in ecological economics and critiques of economic growth, to its adoption at the highest levels of policy-making and corporate business strategy keen to advance 'green' growth. Natural Capital has advanced along this trajectory because it is led by a pragmatic desire to 'make nature count' in the eyes of high-level policy-makers, businesses and investors. On one hand, this is about condensing the complexity and uncertainty of ecosystems (and their many functions and values) into a common measure, thereby facilitating economic (calculable) decision-making and trade-offs. As described in Section three, the scientific and valuation work involved in transforming diverse socio-natures into discrete, measurable ecosystem services is not neutral or value-free, because the explicit goal is to influence 'decision-makers', namely those state and private actors who have the power to effect change. Thus, while it is correct to distinguish between the concept of ecosystem services and its application through payments schemes, for example, it is also important to recognise the political and economic forces that are likely to shape, deploy and possibly exploit the valuation of ecosystem services in ways that depart from the best intentions of conservation scientists and environmentalists (Gomez-Baggethun & Ruiz-Perez, 2011).

On the other hand, Natural Capital offers the promise of making conservation pay, thereby overcoming the opportunity costs of forgoing economic development to conserve biodiversity. As outlined in Section four, this involves further levels of abstraction that ultimately aim to establish markets for ecosystem services – direct payments for ecosystem service provision. While in theory ecosystem accounting is not the same as (or destined for) the monetisation and financialisation of ecosystem services, the goal of overcoming the economic costs associated with conservation pushes the development of Natural Capital in this direction. This is illustrated most clearly by the relatively new field of debt-based conservation finance and the continued financial and political support for PES schemes such as REDD+ by global organisations (World Bank, UN), national (and supranational) governments, businesses, investors, and financial institutions. The momentum behind these

developments will not be easily checked by merely acknowledging the risks and problems associated with it.[34]

Should we persist in pursuing a conservation strategy that effectively requires translating nature into the metaphors, metrics and values that currently dominate high-level policy-making and the global economy? As compelling (and reassuring) as it sounds, should we go on imagining that more accurate and refined economic valuations of the range and diversity of global ecosystem services will effectively align conservation goals with continued economic growth? Should we continue to redesign PES schemes and debt-based conservation financing arrangements until we 'get the prices right'? Or, conversely, should we be more concerned that persistent efforts to make conservation pay will put biodiversity at risk by reducing the diverse ways of viewing and valuing nature to monetary value, financial incentives and market mechanisms? Instead of investing public funds and energy into constructing PES mechanisms and markets, should we be investing more resources and energy into limiting those economic activities that destroy biodiversity while cultivating alternative models of socio-ecological development in the process?

5.2. Widening the debate on value, nature and development

The ascent of the concept of Natural Capital over the past twenty-five years marks a more general turn towards economic methods, including measurement and valuation, as a means of governing social and environmental affairs. By translating diverse, complex phenomena (such as ecosystems) into a common system of (monetary) value, decision-making is understood to move from the partial, corruptible and ineffective political institutions of old to value-free, transparent and accurate calculations of the future. In the context of the Natural Capital debates, this position is demonstrated through the pragmatic support for economic valuation methods, as well as the dominance of experts from the fields of environmental science, accounting and economics (rather than representatives from environmental justice movements and NGOs, or the fields of politics, philosophy and the humanities).

Part of the justification for Natural Capital accounting is an implicit (or explicit) critique of environmental movements and state-led environmental policy because of their apparent failure to make substantial progress on conservation goals. While acknowledgement of these failures and critique of past strategies is necessary, it is equally important to not throw the baby out with the bathwater. As the philosopher John O'Neill argues, '[w]hile there may be much that is unsatisfactory about existing procedures for making decisions in the management of biodiversity, these do not include the failure to use monetary values. We can manage without prices. We ought to continue to manage without prices' (O'Neill,1997: 546). I conclude by arguing that any progressive mobilisation of Natural Capital needs to foreground

[34] Redford and Adams (2009) note that payments for ecosystems services schemes are being adopted with great speed, and often without much critical discussion. This raises important questions about how a utilitarian framing of ecological concerns might modify the way humans perceive and relate to nature in a way that in the long run may be counterproductive for conservation purposes (Gomez-Baggethun & Ruiz-Perez, 2011.

(rather than ignore or sideline) the normative, value-laden dimensions of decision-making in the inter-related areas of conservation and development. These differences and conflicts cannot be settled through the generation of more accurate information, economic modelling or price signals. As Thomas Fatheuer puts it succinctly: '[t]he dilemma in most cases is quite clear: we do not lack the information to behave in the (environmentally) right way, but the capacity to follow through on it politically' (Fatheuer, 2014: 63). Recognising this requires returning to the roots of Natural Capital in ecological economics and political ecology, and the heterodox paths they continue to occupy on the margins of the mainstream policy debates.

One of the recurring statements in the Natural Capital literature is that economic valuation of nature can bring about 'win-win' solutions in terms of achieving conservation goals and ensuring continued economic growth and development. As outlined in Section two, this idea of 'win-win' conservation policy emerges with the concept of sustainable development in the 1990s. Efforts to align biodiversity conservation with economic development goals have, however, largely involved the implementation of PES schemes that seek to monetise the provision of ecosystem services. Rather than using ecosystem valuation to demonstrate the range of values generated by unique ecosystems in order to halt environmentally destructive development, the pragmatic strategy has been to avoid such trade-offs through an emphasis on 'win-win' solutions. Not only has this belief in 'win-win' solutions proven ineffective (in terms of continuing to rely on public investment and oversight), it can also mask the fact that there are always winners and losers when it comes to environmental change, and the process of deciding and managing this is politically contested. Thus, Bond and Sharife (2013) argue that Natural Capital accounting and associated valuation instruments could be mobilised around campaigns for ecological debt reparations, whereby retributive payments for 'ecological debt' are based on both 'loss and damage' accounting *and* the idea of environmental justice, and take the form of fines for damages and prohibitions on further pollution. The New York watershed scheme provides an example of this: the long-term benefits of clean water, habitat conservation and other ecosystem functions relied on economic valuation methods *and* well-organised campaigning for environmental justice. This resulted in the redistribution of public money towards conservation and environmental regulation of private commercial activity and development (the 'losers' in this scenario). In other words, the enthusiasm for economic valuation methodologies should not obscure the continued significance of questions of ownership, uneven distributions of power, and the distribution of environmental goods and bads. As O'Neill counselled nearly twenty years ago:

> These and other problems are not primarily about the technical instruments of management. They are about power, the economic structures that sustain certain paths of economic development, the disappearance of public spaces for deliberation and other larger social dimensions to the current environmental crisis. *The debate needs to move on from the criticism of economic methods of valuations to consideration of the nature of proper deliberative institutions for resolving environmental problems and of the social and economic framework that will sustain these.* (O'Neill, 1997: 550; my emphasis)

Underlying the idea of 'win-win' solutions to biodiversity loss is a critique of previous forms of environmentalism that sought to defend the 'intrinsic' value of nature against economic development (Juniper, 2013). While this criticism may be justified in the context of mainstream environmental NGOs, particularly in the Global North, it does not apply to the geographically, culturally and politically diverse global environmental justice movements that are principally concerned with protecting the 'intrinsic' value of nature. Environmental justice movements, particularly in the Global South, revolve around disagreements over visions and strategies for development, not simply a concern about the degradation of 'nature'. Communities adversely affected by pollution and toxic waste, deforestation, infrastructural developments or, increasingly, 'green' projects, mobilise against what they perceive as the unequal distribution of the (social and environmental) costs of economic development. This 'environmentalism of the poor' (particularly in the Global South) generates struggles that are as much about questions of social justice, equality and cultural expression as they are environmental conservation[35] (Bonneuil & Fressoz, 2016; Nixon, 2011). What should be the topic of more reflection and examination in debates on environmental conservation is just how central these local and popular movements have been in allying with scientists, health professionals and others in raising awareness and driving the more progressive, regulatory frameworks that have ensured clean air, clean water and moderate conservation successes over the past thirty years.

The past twenty years has seen an upsurge in such movements: Via Campesina organising to achieve food sovereignty against the corporate-dominated, global food system; the many indigenous movements across North and South America fighting against mega-dams, mining and other infrastructure projects that facilitate the breaking-up of their ecological territories; the climate justice movement that takes many forms, from transition town initiatives to the blocking of infrastructure. In all these cases, it is a complex of economic, cultural, aesthetic and spiritual values associated with the defence of particular places and environments that has been to the fore. In other words, it is not because nature has not been valued that it has been destroyed, but rather that these many diverse values (and diverse natures) have been sidelined and ignored by state and private actors intent on furthering narrowly defined development goals. The cause of environmental degradation is not primarily the absence of values for nature (economic or otherwise) but the dominance of particular models of extractive, industrial development that have benefited some at the expense of many others.[36]

In the context of Ireland (and Europe more generally), environmental disputes also frequently involve basic questions of fairness and democratic accountability (from

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[35] The following passage from the Millennium Ecosystem Assessment is indicative of the undifferentiated, reductive accounts of global environmental change: 'Between 1960 and 2000, the demand for ecosystem services grew significantly as world population doubled and the global economy increased more than six fold. At the same time, the assessment revealed that nearly two thirds of global ecosystem services are in decline. As the report puts it, "the benefits reaped from our engineering of the planet have been achieved by running down natural capital assets"' (MA, 2005).

[36] It isn't necessary to turn to other parts of the world for examples of this. In Ireland, recent environmental conflicts such as the Corrib pipeline, waste incinerator developments, energy infrastructure developments, and aquaculture developments, amongst others, have demonstrated the diversity of values associated with the environment and the limits of technical appraisals for determining decisions.

opposition to water charges to resistance to wind turbines). Natural Capital approaches, rather than subsuming environmental contradictions within dominant models of development, could provide a tool to help further connections between environmental and alternative development agendas. This brings us back to the beginnings of Natural Capital in the writings of ecological economists such as Ernst Schumacher. From his perspective, the non-substitutability of natural capital posed a fundamental challenge to economic paradigms that sought perpetual growth. Such a proposal required radical rethinking and experimentation with alternative models of production and consumption, as well as the design of new social, political and economic institutions. The legacy of this thinking has been revived today through concepts such as degrowth (Kallis, 2011), the commons (Bollier & Helfrich, 2014) and diverse economies (Gibson-Graham, 2008). Significantly, something that ties these alternative economic visions together is an emphasis on diversity – not just biodiversity, but social, cultural and economic diversity – that rests not on the extension of a common (monetary) value, but rather on the articulation of different, incommensurable values and value systems. In this light, efforts to protect and enhance biodiversity do not rely on 'making conservation pay', but on learning to recognise, value and cultivate a diversity of social, economic and ecological practices that does not aim for commensurability.

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