

Making Nature Investable: from Legibility to Leverageability in Fabricating 'Nature' as 'Natural Capital'

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Abstract

In response to perceived valuation problems giving rise to global environmental crisis, 'nature' is being qualified, quantified and materialised as the new external(ised) 'Nature-whole' of 'natural capital'. This paper problematises the increasing legibility, through numbering and (ac)counting practices, of natural capital as an apparently exterior 'matter of fact' that can be leveraged financially. Interconnected policy and technical texts, combined with observation as an academic participant in recent international environmental policy meetings, form the basis for a delineation of four connected and intensifying dimensions of articulation in fabricating 'nature' as 'natural capital': discursive, numerical-economic, material and institutional. Performative economic sociology approaches are drawn on to clarify the numbering and calculative practices making and performing indicators of nature health and harm as formally economic. These institutionalised fabrications are interpreted as attempts to enrol previously uncosted 'standing natures' in the forward-driving movement of capital.

Keywords: nature, natural capital, accounting

fab ri cate

1. To make; create.
2. To construct by combining or assembling diverse, typically standardized parts ...
3. To concoct in order to deceive¹

Introducing the fact(ish) of 'natural capital'

In 1973 economist E.F. Schumacher published *Small is Beautiful: Economics as if People Mattered*. In this text, Schumacher argued for a downsizing of economic production, such that the (re)productive life of the 'irreplaceable capital' of nature – which he termed 'natural capital' – would remain

abundant (Schumacher, 1973: 4; also Boulding, 1966). Schumacher argued that instead modern economies were committing the grave error of consuming their capital, leading to its use at an alarming and even 'suicidal' rate. He attributed this error to a lack of recognition of the "capital provided by nature and not by man", because "[m]odern man does not experience himself as a part of nature but as an outside force destined to dominate and conquer it" (Schumacher, 1973: 3–4).

Fast forwards four decades to November 2013, and we arrive at the inaugural World Forum on Natural Capital², held in Edinburgh amidst a technological and global context that would have

been unrecognisable to Schumacher writing in 1973. Established with the support of an assemblage of now powerful international organisations – including 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 Forum website claimed that “a revolution is taking place in how businesses and governments account for natural capital”³. In its intention to be “a focal point for business leaders and others to explore the full implications of this rapidly evolving issue [i.e. how to factor natural capital values into business practice]”, and “with the aim of turning the debate into practical action”, the Forum captured the attention of major international corporations and financial institutions. An invite- or application-only CEO’s club offered high-level networking over drinks and breakfast for the Forum’s most senior delegates. This club was sponsored by Alliance Trust Plc., a self-managed investment company whose top invested companies include oil companies such as Royal Dutch Shell, BP, and Gulf Keystone Petroleum, financial institutions such as Lloyds’ Banking Group and HSBC Holdings, and construction companies such as Barrett Development Plc.

This inaugural World Forum on Natural Capital was held against a background of concern regarding global environmental degradation and the roles of corporate and financial investment in contributing to this. The emphasis, however, was far from approaches to downsize economic activity, as urged by Schumacher in the 1970s. Instead, the focus was on how corporate and financial worlds might account for environmental costs and assets so as to both maintain and enhance profits and competitive advantage within this context of global environmental concern.

The World Forum on Natural Capital, repeated in November 2015 and returning in November 2017, exists alongside a number of initiatives designated with the noun ‘natural capital’ to indicate a fact in the world that requires increasingly little explanation. The Natural Capital Committee⁴, for example, is charged with advising the UK government on “the sustainable use of England’s natural capital” and advocates a target of incorporating natural

capital losses and gains into national GDP (Gross Domestic Product) accounts by 2020. The Natural Capital Declaration⁵ prepared for the UN Rio+20 ‘Earth Summit’⁶ commits the financial sector to voluntarily mainstream “natural capital considerations” into all financial products and services. The global Natural Capital Protocol encourages inter-organisational alignment to create a world where business both enhances and conserves natural capital⁷. The Natural Capital Financing Facility⁸ is a financial instrument of the European Investment Bank (EIB) and the European Commission aiming “to prove to the market and to potential investors the attractiveness of biodiversity and climate adaptation operations in order to promote sustainable investments from the private sector”. All these initiatives approach ‘natural capital’ as an apparently exterior, measurable and (ac)countable matter of fact, sharing definitions along the lines of the Forum that “Natural Capital can be defined as the world’s stocks of natural assets which include geology, soil, air, water and all living things” from which “humans derive a wide range of services, often called ecosystem services, which make human life possible”⁹.

These multiple utterances and institutional convergences notwithstanding, ‘natural capital’ does not exist in any *a priori* sense. It is a new ‘Nature-whole’ (Asdal, 2008) being conjured into being through particular practices of conceiving, framing, measuring, numbering and calculating the so-called natural world (see Spash and Clayton, 1997; Sullivan, 2013a, 2014; Coffey, 2016; Nadal, 2016). This new nature-whole is being made both legible (i.e. ‘readable’, cf. Scott, 1998) and leverageable (i.e. able to be advantageously leveraged as an asset), even as ‘Nature’ is simultaneously being conceptually disassembled in many disciplinary engagements. Indeed, the analytical-empirical encouragements of Actor-Network-Theory and Science and Technology Studies (STS) (e.g. Latour, 2004; 2007), combined with acknowledgement of contemporary ‘Anthropocenic’ forcing of the biophysical by the socioeconomic (Crutzen and Stoermer, 2000), are both acting to reduce a ‘naturalist’ (cf. Descola, 2013) emphasis on an external nature distinct from human endeavour. In doing so, world-making participations combining the social with the natural are (re-)energised, both

conceptually and materially (cf. Deleuze and Guattari, 1987[1980]). The outcomes of such participations, however, are as disparate as the values with which they are infused. Consider, for example, the relational, egalitarian and deeply participatory ontologies described and theorised for Khoe and Sān actors in southern Africa (see Biesele, 1996; Marshall, 2006; Sullivan and Low, 2014) in contrast with the Promethean techno-science participations proposed for humans as the 'God species' (Lynas, 2012) in the *Ecomodernist Manifesto* (Asafu-Adjaye et al., 2015).

In this paper, I explore a range of social dimensions leading to the consolidation of the noun and 'Nature-whole' of 'natural capital'. I follow a growing number of studies concerned with 'how nature is enacted' through bringing 'nature into account/ing', such that 'the enactments of nature and the enactments of economy go together' (Asdal, 2008: 125, 123). Asdal (2008), for example, studies the technical inscription of critical limits or thresholds that enabled nature to be taken into account in the context of managing atmospheric acid rain pollution loads in Europe. Lohmann (2009, 2014) details the making of marketable carbon emissions reductions, setting this fabrication in a historical context of pollution trading, cost-benefit methodologies and performative equations. Lippert (2014) documents how carbon data entities are created, enrolled and stabilised by corporate environmental managers so as to link carbon sustainability practices with broader agencies in sustainability and carbon accounting. Verran (2013: 36) assesses how through numbering practices a "very particular nature" is brought into being, one that "humanity can do business with" (also Scott, 1998; Robertson, 2006; Sullivan, 2009, 2013b; Pawliczek and Sullivan, 2011; Dempsey, 2015; Carver and Sullivan, 2017).

These analyses suggest that the practices now fabricating nature-as-natural-capital can also be documented empirically and subjected to critical assessment regarding their world-making implications. In the current paper, and following a performative economic sociology approach that asks *how* previously external(ized) dimensions of social and ecological life become formally calculated as economic (Mennicken and Miller, 2012: 18), I aim to draw attention to the discourses,

technologies and practices through which the object of 'natural capital' is created. I am guided by a core research question, namely: how is nature-as-natural-capital becoming legible as an increasingly fetishised 'object' (or set of objects) in the world, charged technically (through numbering and calculative practices) and socially (through institutionalised expert agreement) with authoritative, objective power?

This core question is complemented by a secondary question regarding how nature as the objectified fact(s) of 'natural capital' is becoming financially materialized, i.e. leveraged, as such. I invoke 'materiality' here in the sense used in accounting and auditing to indicate the importance or significance of a financial amount or transaction (see, for example, *UNEP FI, 2010*).

The paper is structured as follows. After a section on method and interpretive framework, I identify and trace a series of connected 'dimensions of articulation' (also see Wilshusen and MacDonald, 2017) through which 'nature' is being progressively qualified and quantified – i.e. fabricated metaphorically and materially – as 'natural capital'. I close with a brief conclusion noting the propensity for natural capital thinking to affirm the conditions of continuity for capital(ism).

Method and interpretive framework

As noted above, the metaphorical noun and category of 'natural capital' is taking hold in productively interesting ways that can be documented and diagnosed empirically. The observations and reflections on which this analysis is based derive from two main sources of data. The first is review of a range of recent and interconnected grey literature policy documents. Whilst not subjected to a formal textual analysis (although see Sullivan and Hannis, 2015), these texts were read closely and were selected because they frequently refer to each other and are representative of a broader constitutive move towards the natural capital accounting practices considered in this paper. These researched grey literature texts are signaled below with italics in the in-text references (for example, *WBCSD, ERM, IUCN, PwC, 2011*). The acronyms of authoring organisations, which are themselves illustrative of the assemblage of actors and institutions articulating around 'natural capital',

are detailed in full in the bibliographic listings for these documents.

My second source of data derives from 'observant participation' and 'event ethnography' (Brosius and Campbell, 2010; MacDonald and Corson, 2012; Dempsey, 2015) conducted between November 2011 and May 2016 as a participant and occasional speaker at fourteen events concerned with 'green economy' policy solutions to losses of 'natural capital and biodiversity'. As noted in Table 1, a number (n=5) of these events were closed meetings intended to inform national and international policy, some designated as 'high-level' policy dialogues. Others (n=6) were open beyond-academia workshops, conferences and seminars regarding strategies for the management of nature-as-natural-capital. The remainder (n=3) were social movement 'counter-forums' and campaigns-organising meetings. Participation in these events and subsequent communications has enabled direct observation and discussion regarding the orchestrated uptake of, and struggles over, 'natural-capital-thinking' in these contexts (cf. Macdonald, 2013), as well as facilitating access to many of the grey literature texts drawn on below. Following Bracking (2015) I thus utilise these ethnographic events, field-notes made during and in reflecting on these events, and associated document stores as 'keyholes' or windows through which to see wider characteristics of emergent natural capital materialisation and governance. Although my role as an academic researcher was clear at these events, with the exception of the direct quote opening 'Dimension 3' below, I observe confidentiality and anonymity by not identifying or quoting participants directly.

In analysing and interpreting these two sources of material, and in response to my core research question (as stated above), I utilise two key approaches:

1. an STS emphasis on the social fabrication of entities treated as positioned in the world so as to engender socio-economic effects (Latour, 2010);
2. an economic sociology focus on economization, i.e. the framing, numbering and performative dimensions that enact both people and entities as formally economic (Çalışkan and Callon, 2009, 2010).

As the following analysis makes clear, I am drawn in particular to:

1. social fabrications, including numbering practices, that *enact* (cf. Mol 2002) and fetishise 'natural capital' as an apparently exterior 'matter of fact' or 'factish' (after Latour, 2010) that inspires actions in the world with identifiable effects;
2. the design and application of numbering and calculative practices and devices so as to "render technical" (Murray Li, 2007a, b) and perform entities as formally economic (after Mackenzie and Mollo, 2003; Callon and Muniesa, 2005; Callon, 2006; MacKenzie et al., 2007; Çalışkan and Callon, 2009, 2010); and
3. practices of 'articulation' in both senses of the word, i.e. as speech act utterances that shape discursive reality as understood amongst those participating in relevant speech communities (Austin, 1962), and as acts of 'joining' and connection between people, organisations and practices associated with the qualification, quantification and materialisation of nature-as-natural-capital (MacDonald and Corson, 2012; Corson et al., 2013; MacDonald, 2013; Wilshusen and MacDonald, 2017).

Following Foucault (2008[1979]), I consider these overlapping practices to combine to consolidate a neoliberal governmentality in environmental governance (as discussed in Sullivan, 2006, 2013b; Murray Li 2007a; Fletcher, 2010; also Mennicken and Miller, 2012). The conduct of multiple actors, organisations and policies is thereby oriented towards the truth regime of the market (Foucault 2008[1979]) such that environmental health and harm become governed through market-based instruments applied to social and ecological parameters that are overwhelmingly economized. In alignment with other studies of economization processes (see Table 2) this analysis is structured into three overlapping and currently consolidating 'dimensions of articulation', namely:

1. *discursive* – the systematic metaphorical 'authorising knowledge' (Murray Li, 2007a, 2007b) of 'external nature' in economic and financial terms, amongst which 'natural capital' and 'ecosystem services' are paramount;
2. *calculative and accounting* – the numerical and technical inscription of delineated nature aspects as capital assets, such that these can

- be added to and offset against other forms of accounted capital and in economic models more generally; and
3. a nascent *materialisation* of these inscriptions, through which nature-as-natural-capital is able to be leveraged in financially material terms. Each of these shaping dimensions of articulation is *traversed* by a fourth dimension:
 4. the consolidating and co-functioning *institutional* articulations effecting joinings between

individuals and organisations so as to fabricate natural-capital-relevant institutional and governing assemblages. These assemblages can be thought of as ‘dispositifs’ (Foucault, 1980: 194) and ‘agencements’ (Deleuze and Guattari, 1987[1980]) that shape, reproduce and amplify the articulations forming the basis for the next three sections of the paper (also see MacDonald and Corson, 2012; Wilshusen 2014; Wilshusen and MacDonald, 2017).

Table 1. Non-academic policy-oriented events, participation in which by the author informs the present analysis.

Event and website (listed in chronological order)	Location & Date	Open/closed	Author's role
1. High-level policy workshop on <i>Markets for Biodiversity and Ecosystem Services: Challenges and Opportunities</i> https://www.chathamhouse.org/events/view/179829	Chatham House, London, UK 11/2011	Closed	Invited opening speaker
2. High-level UN Convention on Biological Diversity (CBD) ‘Dialogue Seminar’ on <i>Biodiversity and Finance</i> http://www.dialogueseminars.net/quito/summary/summary/executive_summary.html	Quito, Ecuador 03/2012	Closed	Invited ‘expert participant’
3. 7 th Trondheim Conference on Biodiversity (organised by the Secretariat of the UN CBD, the United Nations Environment Program (UNEP) and the Norwegian government) entitled <i>Ecology and Economy for a Sustainable Society</i> http://www.naturoppsyn.no/tk7	Trondheim, Norway 05/2013	Closed	Invited speaker on plenary panel
4. <i>Ecosystems Offsetting and Trading</i> workshop (organized by NGOs FERN and re:Common)	Brussels, Belgium 10/2013	Closed	Invited speaker
5. <i>Inaugural World Forum on Natural Capital</i> http://naturalcapitalforum.com/2013highlights/	Edinburgh, UK 11/2013	Open	Non-corporate delegate
6. Protests associated with the <i>Counter-Forum on Natural Commons</i> , held to coincide with #5 above http://www.counter-balance.org/forum-on-natural-commons-nature-is-not-for-sale/	Edinburgh, UK 11/2013	Open	Participant
7. <i>To No Net Loss of Biodiversity and Beyond</i> policy conference organised by Forest Trends, the Business and Biodiversity Offsets Programme (BBOP) and the UK Department for Environment, Food and Rural Affairs (DEFRA) http://bbop.forest-trends.org/events/no-net-loss/	London, UK 06/2014	Open	Participant
8. <i>Challenging Biodiversity Offsetting and the Financialisation of Nature</i> counter-forum, held to coincide with #7 above http://www.fern.org/publications/presentations/nature-not-sale	London, UK 06/2014	Open	Invited panel chair
9. <i>Naturally Speaking Public Dialogue on the National Ecosystem Assessment</i> organized by Valuing Nature Network, DEFRA, NERC, Sciencewise, University of Exeter http://valuing-nature.net/naturally-speaking	Royal Society, London, UK 10/2014	Closed	Invited ‘expert speaker’
10. <i>Payments for Ecosystem Services (PES) Workshop</i> for policymakers, practitioners and PES scholars http://www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/lifesciences/grandchallengesinecosystemsandtheenvironment/eventsummary/event_9-4-2015-14-45-14	Imperial College, London, UK 04/2015	Closed	Invited plenary speaker
11. <i>Second World Forum on Natural Capital</i> http://naturalcapitalforum.com/ nb. unable to attend, but stayed in touch with event	Edinburgh, UK 11/2015	Open	Invited plenary speaker

Table 1 cont.

12. <i>The Future for Policy on Biodiversity and Natural Capital in the UK: Priorities, Practicalities and Targets</i> – Westminster Energy, Environment & Transport Forum Keynote Seminar http://www.westminsterforumprojects.co.uk/forums/agenda/natural-capital-2016-agenda.pdf	London, UK 04/16	By application	Participant plus co-author of article in final seminar transcript
13. <i>Accelerating Green Bonds Uptake</i> http://www.sustainableinvestmentforum.org/knowledge-centre/webinars/accelerating-green-bond-uptake-webinar	Webinar 05/2016	By application	Participant / listener
14. <i>Earthwatch Debate - Does Nature Come With a Price Tag?</i> http://eu.earthwatch.org/events/2016/02/09/earthwatch-debate-does-nature-come-with-a-price-tag-	London, UK 05/2016	Open	One of six invited debate speakers

Table 2. Correspondences between a series of tripartite distinctions in social studies of created numerical objects that come to count.

Source	Distinction 1	Distinction 2	Distinction 3
Present paper 'dimensions of articulation'	qualification #1 discursive	quantification #2 technical-numerical (numbering, accounting & calculative practices)	materialisation #3 material
	legibility		leverageability
	traversed by #4, institutional alignments and practices of assemblage		
Miller and Rose, 1990; Rose and Miller, 1992. Influenced by Foucault on governmentality, discussed by Mennicken and Miller, (2012: 16)	rationalities (political principles to which government should be directed)	technologies (mechanisms and instruments through which political rationalities and government programmes are made operable)	programmes of government (designs that configure specific relations and locales)
Hacking (1992) studying conjoining modes of representation and of intervening in laboratory science (discussed in Miller and O'Leary, 2007: 707)	ideas theories	things instruments	marks inscriptions
Hornborg (2016: 62) discussing dimensions of money	idea	sign (i.e. unit of account)	potent material force

I proceed with review of the accelerating discursive and institutional changes translating 'nature' into 'natural capital'.

Dimension 1: Discursive equations of 'nature' and 'capital' – two institutional histories of metaphorical translation

Metaphorical thinking is intrinsic to human conceptual, creative and communicative life (Lakoff and Johnson, 2003[1980]). 'Natural capital' is a potent metaphorical device asserting that one multiplicitous category, namely 'nature', can be known through invoking another multiplicitous category, namely 'capital' (as reviewed in Spash and Clayton, 1997; Cooper 2000; Åkerman, 2005; Read and Scott Cato, 2014; Sullivan, 2013a, 2014; Coffey, 2016; Nadal, 2016).¹⁰ As noted above, the metaphorical connection between 'nature' and 'capital' has a long pedigree. Its ascendancy in formal and popular parlance has intensified in recent years, however, such that in many contexts the term 'natural capital' has come to mean what previously would have been denoted by the terms 'nature' or 'the natural environment'. Here I draw attention to two parallel and connected social histories of the metaphor to illustrate the contingent nature of shifts in thought and practice associated with its use (cf. Murray Li, 2007b: 274).

'Natural capital' in environmental and ecological economics

Conceptualising 'nature' as 'natural capital' has been a significant, even foundational, move in environmental and ecological economics over the last three decades. Intensified usage of the term tends to be attributed to the late David Pearce (as, for example, in Foster and Gough's 2005 volume on *Learning, Natural Capital and Sustainable Development*, also review in Åkerman, 2005). Pearce was an influential environmental economist and UK government advisor who wrote several defining environmental economics texts (for example, Pearce et al., 1989; Pearce, 1993, 1998; Pearce and Moran, 1994). In 1988, Pearce stated that "[s]ustainable development is categorised by economic change subject to 'constancy of natural capital stock'" (Pearce, 1988: 598), such that, and as Åkerman (2005: 35) describes, "natural environments are thought of as a stock of natural assets serving economic functions". In the then emerging discipline of *ecological economics*, this notion

of 'natural capital' as a stock of value-generating assets was also confirmed in statements such as:

what natural capital and manufactured capital have in common is that they both conform to the working definition of capital as a stock (collection, aggregate) of something that produces a flow (a periodic yield) of valuable goods or services (Prugh et al., 1999: 49).

This 'stock of natural capital' is increasingly conceived as all of 'external nature': the beyond-human natures constituting 'the environment' that in conventional economic models have tended to be treated as 'externalities', i.e. as non-costed resources whose use may become overuse causing degradation (cf. Hornborg, 2016: 62). In Daily et al.'s (2011: 3) introduction to *Natural Capital: The Theory and Practice of Mapping Ecosystem Services*, "living natural capital" thus encompasses "Earth's lands and waters and their biodiversity" and provides the "ecosystem services" that flow from these. The UK's Natural Capital Committee (NCC), established in 2013, uses a similar definition, namely:

[n]atural capital refers to the elements of nature that produce value or benefits to people (directly and indirectly), such as the stock of forests, rivers, land, minerals and oceans, as well as the natural processes and functions that underpin their operation (*Natural Capital Committee, 2013: 10*).

'Nature' as 'natural capital' is thus framed in environmental and ecological economics and associated policy (con)texts as physical *stocks* of 'nature', both renewable (i.e. living) and nonrenewable (i.e. 'fixed', as in stocks of mineral wealth), that produce 'natural resources' as definable 'goods', 'services' and 'values'.

As argued by Åkerman (2005: 37, 39), however, the polysemic metaphor of nature-as-natural-capital, whilst metaphorically strong and heuristically powerful, is analytically weak. This enables the metaphor to perform different work for different groups of people in diverse contexts, a disparate mobilisation that permits the metaphor to act in the world with varying effects. Indeed, in its inauguration in both environmental and ecological economics the metaphor already

meant contrary things, and was used for varied ends and with diverse outcomes (as summarised in Table 3 in Sullivan, 2014: 12). Åkerman (2005: 36) states that in environmental economics “the accountant’s view of nature” was underlined through an emphasis on “natural capital” as value-generating “environmental assets” with varying degrees of substitutability. In ecological economics, on the other hand, “ecosystem processes and ecological knowledge” informed by “the ecosystem modeller’s view of nature” provided the underlying focus, and the possibility of substitutabilities between the material natures on which these models were based was resisted (Åkerman 2005: 36; also Wackernagel and Rees, 1997; see discussion in Hannis, 2015: 24–28).

This complexity notwithstanding, popular environmental literature and media are increasingly embracing and publicizing versions of the metaphor (see, for example, Daily and Ellison, 2002; Juniper, 2013). Noticeable in this popularisation is an association and elision between ‘natural capital’, ‘finance capital’ and accounting. Former Friends of the Earth director Tony Juniper (2013: 268), in *What Has Nature Ever Done for Us? How Money Really Does Grow on Trees*, thus states 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’”. In his foreword to Juniper’s text, HRH The Prince of Wales refers to “what is known in the jargon as ‘natural capital’ ... a set of economic assets which ... can produce dividends that flow from these assets indefinitely” (in Juniper, 2013: xi).

In these statements, then, the metaphorical functioning of ‘natural capital’ is working to extend both an environmental economics preference for calculative practices of accounting for nature, and an elision between ‘natural’ and ‘financial’ spheres of capital. As discussed below, a normalising conception of ‘nature’ as a dividend-generating capital asset is coming further into focus through initiatives that seek to account for this asset and financially materialise its ‘dividends’. This diversely legible and leverageable ‘natural capital’ has arguably been boosted through a parallel history of the metaphor that conceives of ‘nature’ more

systematically as ‘a bank of natural capital’ from which ecosystem services flow as ‘dividends’. It is to this history that I now turn.

‘Nature’ as a ‘Bank of Natural Capital Assets’

Alongside the increasing legibility of nature-as-natural-capital asserted in environmental and ecological economics is a parallel vision of nature more literally as a bank of financial assets. Two global moments stand out in the creation and consolidation of this vision. The first is associated with the leadership of the WBCSD, established at the first United Nations (UN) Earth Summit in Rio de Janeiro in 1992. This CEO-led 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 (and previously for the 1972 UN Stockholm Conference on the Human Environment). One of the first key assertions of nature as akin to a financial bank account can be traced to this powerful player in global environmental governance. In various speeches in the early to mid-1990s¹¹, Strong asserts repeatedly that: “[i]n addressing the challenge of achieving global sustainability, we must apply the basic principles of business. This means running “Earth Incorporated” with a depreciation, amortization and maintenance account” (also discussed in Sullivan, 2010, 2013b).

This sentiment has become almost a truism in environmental governance. It has been used, for example, as a marketing hook by private sector organisations such as the US-based Environmental Consultancy Agency¹² and formerly by the global investment fund Eko Assets Management (discussed in Sullivan, 2010) – now ‘Encourage Capital’¹³, and is echoed directly by former UNEP official Don de Silva (2008). More recently, Caroline Spelman, as Environment Minister for the UK’s Conservative coalition government, launched DEFRA’s (2011) Natural Environment White Paper *The Natural Choice: Securing the Value of Nature* by stating that: “... if we withdraw something from Mother Nature’s Bank, we’ve got to put something back to ensure that the environment has a healthy balance and a secure future.”¹⁴ The UK’s Prince of Wales, similarly asserts that “[t]he ultimate bank on

which we all depend, the bank of natural capital, is in the red" (*HRH Prince of Wales, 2013*: online; also quoted in *van Herwijnen, 2016*: 2). This metaphor of nature as 'a bank of natural capital' is presented in rather literal form by the United Nations and European Union TEEB (The Economics of Ecosystems and Biodiversity) project, through its *Bank of Natural Capital* website¹⁵ in which nature's stocks and flows are depicted such that they accord with the format of a standard online current bank account.

'Capital' is plural

These two brief historical tracings of the term 'natural capital' indicate that whilst the metaphor qualifies thinking about 'the natural world' in terms of capital, the ways the metaphor does this are multifaceted. This is because 'capital', like 'nature', is incommensurably plural, even when restricting consideration of capital to physical and economic capital only.¹⁶ Capital exists variously as:

- i. heterogeneous and not fully commensurable or substitutable physical factors of production (including goods such as machinery, as well as land-as-property as a fixed capital asset) that on balance sheets also constitute liabilities with maintenance costs;
- ii. the medium (i.e. money) through which factors of production may be valued, bought and sold and thus fabricated as interchangeable or substitutable on the same market (*Hornborg, 2016*: 62); and
- iii. interest-bearing assets that in a capitalist economy can accumulate financial value so as to generate flows of money dividends (*Read and Scott Cato, 2014*: 155; *Nadal, 2016*), and that can be leveraged through credit/debt and securitization mechanisms.

In other words, thinking of nature as capital engenders confusion rather than clarity. Although rarely explicitly foregrounded, framing (cf. *Lakoff, 2010*) and thus cognitively conceiving of nature-as-natural-capital always begs the question: is the focus of attention on maintenance costs, possibilities for substitution, or dividends? Whatever the answer to this question, it is noticeable that the metaphor works by pulling attention *away from* the diverse biophysical entities of which nature is

comprised and *towards* any or all of these different 'dead', albeit variously 'liquid', capitals (as discussed in *Cooper, 2000*; *Büscher, 2013*; *Read and Scott Cato, 2014*; *Walker, 2016*).

At the same time, for variously conserved natures to be fabricated as countable capital in any of the above aspects, they need to be signified numerically and priced (*Helm 2015*: 110, 116). In the next section, then, I explore some methods and applications through which aspects of nature *qualified* as capital are also being imagined, articulated and performed as units that can be quantified, accounted for and priced as such.

Dimension 2: Accounting for 'nature' as 'natural capital'

Hawken (1999: xiii) asserts that "capitalism cannot be fully attained or practiced [*sic*] until... we have an accurate balance sheet" that places 'natural capital' on "on the balance sheets of companies, countries, ... [and] the world". In the last few years, a series of connected transnational governance endeavours has indeed been underway to account for nature-as-natural-capital on corporate, national and international accounts (see *UNEP-FI and GCP, 2013*: 38, and the various TEEB reports¹⁷).

In the corporate world, for example, the WBCSD, with the assistance of global accounting firm PricewaterhouseCoopers and a staff secondment from IUCN, have developed an influential 'Corporate Ecosystem Evaluation' (CEV) methodology (*WBCSD, ERM, IUCN and PwC, 2011*). CEV introduces a detailed accounting methodology to facilitate "better-informed *business decisions* by explicitly *valuing* both *ecosystem degradation* and the *benefits* provided by *ecosystem services*", defined as flowing "from natural capital" (*WBCSD, ERM, IUCN and PwC, 2011*: 4, emphasis in original). CEV is now promoted as a core valuation technique in the Natural Capital Protocol developed by the global Natural Capital Coalition (*Natural Capital Coalition, 2015a*).

At a national level, the Green Accounting of Indian States Project, funded by Deutsche Bank India, Centurion Bank of Punjab and Green Indian States Trust (GIST) and co-authored by the leader of the TEEB project, affirmed in 2006 that: "biodi-

versity should be treated as an asset and its loss should be adequately represented in the national accounts”, at the same time as functioning as ‘natural capital’ that can represent genuine net additions to accounted for national wealth (*GIST, 2006: 3, vii*). In the UK, the government’s Natural Capital Committee is charged with better integrating “the value of natural capital into decision making at all levels” and “creating and trialling an experimental accounting framework that organisations can use to value the natural capital they own or are responsible for”¹⁸ (discussed further in Sullivan and Hannis, 2017):

At a global level, and invigorated by the Rio+20 ‘Earth Summit’ in 2012, a number of significant interventions have recently been publicised for more robust and transparent ‘green accounting’ that incorporates non-manufactured environmental elements. The WAVES (Wealth Accounting and Valuation of Ecosystem Services) initiative of the World Bank Group (WBG), as a key element of the Bank’s new ‘Environment Strategy’ (*World Bank Group, 2012a*), comprises 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 extends a World Bank trajectory of “Expanding the Measure of Wealth” (*World Bank, 1997*; see discussion in Wilshusen, 2014: 133–134). It 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 ‘natural capital’ and ‘ecosystem services’, into a single global accounting system (*EC et al., 2012; UN SEEA, 2012; WAVES, 2012: 10*). At the Rio+20 event in 2012, and amidst an array of interventions resisting a corporate-led ‘green economy’¹⁹, powerful networks (including the WBCSD) and financial institutions issued the ‘Natural Capital Declaration’ (NCD). This is a private sector voluntary finance initiative signed by the CEOs of financial institutions which, as noted above, commits the financial sector to voluntarily mainstream ‘natural capital’ considerations into all financial products and services (*NCD, 2012*). The NCD was followed in June 2013 by publication of

the NCD ‘Roadmap’ providing further details and advice regarding implementation of the commitments made in the declaration (*UNEP-FI and GCP, 2013*). As well as creating inter-organisational corporate alignments around ‘natural capital’ (cf. Miller and O’Leary, 2007), an objective of this roadmap is to “[d]evelop practical tools and metrics to integrate natural capital into all asset classes and relevant financial products” so as to increase the visibility of ‘natural capital’ “on the balance sheets of financial institutions” (*UNEP-FI and GCP, 2013: 4*). Natural capital accounting is also being mobilized to demonstrate the extent to which economic activities create costs in the form of running down the capital value of natural capital (e.g. *Trucost Plc and TEEB for Business, 2013*).

These initiatives aim to generate balance sheet structures (*eftec, RSPB, PwC, 2015: iii*; also collection edited by Jones, 2014) that account for risks and opportunities posed by economic reliance and impacts on environmental parameters. In doing so they extend into environmental domains an older social accounting and “full cost accounting” impetus to account for those social costs that conventionally have been external to financial transactions (see discussion in Gray and Bebbington 2001[1993]; Milne, 2007). Natural capital accounting practices propose numbering and calculative applications to generate mathematical objects as a new set of numerical entities fabricated through practices of numerical abstraction and the creation of commensurability between these thus numbered entities. Through these numbering acts, mathematical objects are vested with the power to act as surrogate or proxy measures that represent the productive nature aspect under consideration. These surrogate numbers are then economized, i.e. are connected with some notion of market performance as denoted by priced values (cf. Lohmann 2009; Moor and Lury, 2011: 442; Helm, 2015). As Hornborg (2016: 70–71) asserts, since economic value is “a concept deriving from the market ... the only conceivable metric for measuring it is money”, despite the rather obvious fact that nature thus described “has itself no use for money”.

Monetized values for ‘natural capital’ and ‘ecosystem services’ tend to arise through indirect methods including contingent valuation (such

as estimates of ‘willingness to pay’ for specified aspects of nature), or ‘benefit transfer’. In these techniques, valuation is projected from unit values (dollar estimates of economic value on a per-unit basis) derived from particular use and non-use values measured at specific different sites (for overviews of techniques, see Pearce et al., 1989; Pearce, 1998; WBCSD, ERM, IUCN, PwC, 2011; *Natural Capital Coalition, 2015a*: 6–7). Frequently, valuation techniques involve the use of ‘dummy’ or proxy numerical variables to stand in for qualitative observations (see *GIST, 2006*: 15–19 for worked examples). Estimated discount rates may also be applied that pull estimates of the worth of future environmental health and damage into present calculations of value (Roberts, 2012). These accounting and valuation techniques generate numbers for nature units that are in monetary terms – thereby valuing nature “in terms of non-nature” (Read and Scott Cato, 2014: 162). These monetized values can then be made to work for cost-benefit analyses and cognate economic and accounting models. Table 2 distils the interconnected layers involved in arriving at these numbers, with examples worked through further below.

In ‘sum’, iterative processes of abstraction, counting and measurement are applied that

conceptually *extract* ‘entities’ from the broader relational assemblages in which they are embedded (cf. Castree, 2003; Fourcade, 2011). This extraction enables the fabrication of ‘natural entities’ as atomised units that can be counted as cardinal numbers signalling quantities that can subsequently be added together to indicate aggregate values (on such numbering practices see discussion in Crump, 1992: 68–69, 77, 89; also Dauguet, 2015). Aspects of nature numbered in this way are able to undergo a further ordering in which counted quantities are utilised to create ordinal rankings of the numbers signalling levels of nature-value (Layer 3 in Table 2). It is this particular fabrication that guides offset exchanges or ‘trade-offs’ between sites of harm and health so as to facilitate an apparent ‘no net loss’ of the numbered quantity in aggregate (discussed further below). At every step of this process, specific value-laden choices shape the entities that become counted (see broader discussion in Maier, 2013), whilst also continually creating new externalities that overflow these calculations (Lohmann, 2009, 2014: 178).

Having delineated these relatively consistent and constructive layers in emergent ‘natural capital accounting’, I now work through three examples of their application at different scales of

Table 3. Identification of six interacting and stabilising layers of qualification, numbering/calculation, commensuration and monetization/pricing practices involved in making nature health and harm (ac)countable on balance sheets, based on close reading of nine interconnected policy texts as referenced.

Layer	Fabrication	Indicative source documents
1	Qualification / selection / measurement of aspects of ‘nature’ as ‘indicators’ of ‘environmental assets’, ‘natural capital’ and ‘ecosystem services’	<i>GIST, 2006</i> : 3; <i>Wentworth Group, 2008</i> : 8; <i>Natural Capital Committee, 2015</i> : 18
2	Conversion of units of selected environmental indicators into a single numerical metric that can act as a ‘currency’.	<i>Wentworth Group, 2008</i> : 8 <i>eftec and IEEP, 2010</i> ; <i>DEFRA, 2012</i> : 7
3	Numerical scoring, rating and ‘trading-off’ of these numbered indicators against each other, between places and over time. Aggregate values for an indicator may thereby be maintained (numerically at least), despite exchanges between sites of loss and gain. These leads to a ‘no net loss’ in the overall ‘balance sheet’ of indicators.	<i>GIST, 2006</i> : vii; <i>Wentworth Group, 2008</i> : 8; <i>WBCSD, ERM, IUCN, PwC, 2011</i> : 4; <i>eftec, RSPB, PwC, 2015</i> : iii; <i>Natural Capital Committee, 2015</i> : 18
4	Application of valuation techniques that involve a monetizing and pricing dimension.	<i>GIST, 2006</i> : 3; <i>WBCSD, ERM, IUCN, PwC, 2011</i> : 12; <i>UN SEEA, 2013</i> ; <i>Natural Capital Committee, 2015</i> : 18, 21
5	Combination of the above steps into a linear sequential methodology.	<i>WBCSD, ERM, IUCN, PwC, 2011</i> ; <i>Natural Capital Coalition, 2015b</i> : 6–7
6	The identification of policy actions influenced by the information generated through the above procedures.	<i>Natural Capital Committee, 2015</i> : 2

analysis (local/regional, national, global), demonstrating the similar principles at work at each of these scales.

Maintaining aggregate renewable natural capital through small-scale biodiversity offsetting in England

Biodiversity offsetting (BDO) is proposed as a technique for maintaining renewable natural capital “in aggregate” (DEFRA, 2012; Natural Capital Committee, 2015: 70; Helm, 2015). In England, BDO is an option that becomes available for organisations causing detrimental impacts to biodiversity if other conservation activities urged by the mitigation hierarchy (avoid, minimise, restore) have been exhausted. BDO methodologies create equivalence in biodiversities at different places and times and thereby facilitate compensatory mitigation. The aim is to confirm a measurable ‘no net loss’, and preferably a ‘net gain’, in numerical indicators of ‘biodiversity’ over a larger scale of observation, even though losses have occurred through development impacts at specific sites (BBOP, 2012; see discussion in Sullivan, 2013c; Sullivan and Hannis, 2015). Portfolios of biodiversity damages may thereby be compensated for by portfolios of conservation investments elsewhere (as advocated in Pearce and Turner, 1990; see review in Spash and Clayton, 1997: 157–158).

In England, BDO is currently guided by a non-mandatory numerical metric developed by DEFRA and associated consultants (*eftec and IEEP, 2010*) (see Table 4). This calculative device disaggregates subjective scores for condition and distinctiveness applied to areas of habitat²⁰, such that different places and times can become counted in equivalent numerical terms.

Metrological devices like the DEFRA BDO metric are intended to standardise measures, thereby creating certainty and precision. Case research indicates, however, that in application this metric

is mobilised in diverse ways (for example Burrows, 2011). Studies of BDO contracts as they are negotiated in practice suggest that scoring practices are contentious and frequently struggled over, particularly when these numbers translate into prices for offset payments (see Carver and Sullivan, 2017; Sullivan and Hannis, 2017). In application, then, such standardising devices can in fact generate *imprecision* that then enters recommendations for compensatory measures, as well as creating conflict over what the correct numbers are that represent losses and gains of the environmental measure under consideration.²¹

Observed struggles over arriving at the ‘right’ numbers for habitat and biodiversity values are in part related to the inescapable subjective element in applying habitat scores. To provide a hypothetical illustration, in Table 5 a selection of three habitat types is scored using the online biodiversity calculator devised by the BDO brokerage firm, The Environment Bank Ltd²². The table shows the different outputs generated when condition is scored first as ‘good’ for each habitat type, and then as ‘poor’. Of course, the expectation is that subjective scoring of habitats is supported by site visits and expert assessment. What this simple example illustrates, however, is that different scores attached to observed natures through these scoring practices can produce large divergences in numerical values for predicted impacts. In ‘real world’ cases of the application of this BDO metric economic, political and other interests have been observed to shape the weighting of values (Sullivan, 2013c: table 2; Carver and Sullivan, 2017; Sullivan and Hannis, 2017). This means that application of the DEFRA metric can generate diverse numerical outcomes for the same areas thus numbered. Such divergences and the (perspective-dependent) errors they may introduce have implications for calculations of aggregate values at larger scales.

Table 4. Habitat scoring system for biodiversity offsetting in England. Source: DEFRA, 2012: 7.

		Biodiversity distinctiveness		
		Low (2)	Medium (4)	High (6)
Habitat condition	Good (3)	6	12	18
	Moderate (2)	4	8	12
	Poor (1)	2	4	6

Table 5. Hypothetical example of two iterations of habitat condition scores ('good' and 'poor') made using the online biodiversity calculator for developers and landowners designed by the Environment Bank Ltd²³.

Habitat type	Hectares	'Biodiversity Value' in # 'biodiversity units'	
		habitats scored as 'Good'	habitats scored as 'Poor'
Intensively managed horticultural land	4	24	8
Amenity grassland	8	48	16
Native broad-leaf woodland	6	108	36
Total 'biodiversity units':		180	60

The 'aggregate natural capital rule', UK

Applications of BDO suggest it is hard to generate robust numerical calculations of damages to biophysical entities that can confirm a 'no net loss' of such entities over wider spatial and temporal scales. Nonetheless, 'aggregate rules' and calculations of total economic values are becoming entrenched in natural capital accounting, making it possible to claim that damage in one place or time can be neutralised through gain in a different place and time, so as to maintain numerical and economic (priced) values for natural capital in aggregate. At a national level, the UK government's Natural Capital Committee promotes an aggregate natural capital rule permitting losses and gains to be exchanged between different 'capitals', the thinking being that 'no net loss' may be calculated as occurring in aggregate and that 'natural capital' overall has thus been 'maintained' (Helm, 2014, 2015; Mace, 2014). A key intention of

national natural capital accounts is to calculate stocks of nature-as-natural-capital (i.e. overall) in such a way as to support maintenance of measured elements above relevant thresholds (echoing Boulding, 1966, see discussion in Spash and Clayton, 1997: 145). Maintenance 'in aggregate' productivity and economic growth is connected with permitting substitutabilities between calculated values for different types of capital, as well as between different types of 'natural capital' (at the broadest level between 'non-renewable' and 'renewable' natural capitals) (discussed at length in Helm, 2015). This, then, is a compensatory approach advocating, for example, that exploitation of a non-renewable resource should be matched by investment in a renewable 'substitute' (Daly, 1990, discussed in Spash and Clayton, 1997: 157). Figure 1 represents the aggregate natural capital rule in schematic form, depicting current levels of national 'natural capital' as the (already

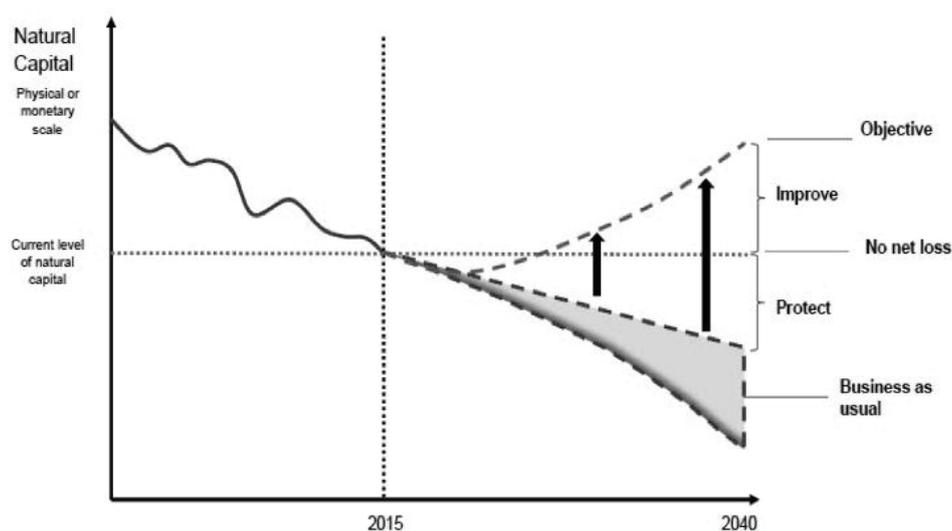


Figure 1. Schematic representation of 'natural capital' trends in the UK leading up to 2015 and thinking forwards towards 2040, indicating a framing of natural capital in aggregate terms, from which 'no net loss' is the desired aim of natural capital accounting, asset maintenance and investment. Source: *Natural Capital Committee (2015: 7)*.

greatly depleted) level that should be sustained and improved so as to ensure ‘no net loss’ into the future.

Establishing “a set of properly maintained and enhanced natural assets” (*Natural Capital Committee, 2015: 1*) is associated here with the attribution of monetary value for these assets (reviewed in more detail in Sullivan and Hannis, 2017). The UK’s Office of National Statistics, in partnership with DEFRA, thus recently produced an initial estimate of the ‘aggregate’, i.e. total, value of natural capital in the UK as approximately £1.6 trillion (*ONS, 2014*). This figure is calculated more-or-less indexically (i.e. based on measured quantities of material entities) (see for example *ONS, 2016*), but also acts iconically so as to perform an order of value from ‘nature’ (after Verran, 2013). This iconic performance, however, acts additionally to conceal various discounted elements. These include:

- i. the intrinsic non-substitutabilities of *man-made* capital(s) (as reviewed in Spash and Clayton, 1997: 146–147; Read and Scott Cato, 2014; Nadal, 2016);
- ii. the values-in-themselves embodied by elements of ‘natural capital’ and their interrelationships into the future (Spash and Clayton, 1997: 154);
- iii. the socio-economic causes of ecological decline as depicted in Figure 1.

With respect to the latter point, natural capital thinking promotes financial reward structures to incentivize a shift in practices by existing producers and land-owners into ‘green economy’ renderings (of which BDO is one, see above). Little attention is paid to the ecological debt experienced by broader society that often has been generated through historical productive and appropriation practices associated with these same actors (discussed further in Sullivan and Hannis, 2015; Sullivan, 2017).

Aggregate rules in generating a global green economy

These perhaps ‘anti-ecological’ and ‘anti-social’ aspects of natural capital logics notwithstanding, balance sheet and aggregate rules are also increasingly important at the global scale, par-

ticularly in the management of carbon emissions and sinks. Notions of global ‘zero-carbon’ and ‘net carbon neutrality’ are being reinforced as critical for climate change management (see review of the UNFCCC Paris Agreement in Reyes, 2015). These notions indicate a consolidation of aggregate thinking in the international environmental policy arena. They propose management around measurable aggregate levels that should be maintained. Possible substitutabilities between the materialities calculated as constituting this aggregate are thereby permitted (as detailed in Lohmann, 2009, 2014). In carbon management, this means that fossil fuels can continue to be burned since their emissions may be offset through purchase of validated certificates representing carbon additionalities beyond a counter-factual scenario without a formalized carbon market (Ehrenstein and Muniesa, 2013). As discussed further below, such aggregate budgets, coupled with market mechanisms asserting prices for measured and thus numbered carbon units in standing forests, are leading additionally to new capitalizations of this counted carbon as a form of ‘natural capital’.

This section has elaborated some mechanisms whereby by nature conceptualised and thus qualified as capital is being quantified, accounted for and exchanged as such. Similar enactments of numbering, aggregate rules and exchangeability have been highlighted for different scales of analysis and for different environmental units for which frequently subjective evaluations are applied that nonetheless create numerical comparability and commensurability. The next section traces some of the institutional work being enacted so as to enable these numbered and monetized fabrications of ‘natural capital’ to be leveraged in financial terms.

Dimension 3: Leveraging natural capital: the financial materialisation of numbers denoting ‘nature’

There’s an emergent view that natural capital is the new asset class for the future.

(Peter Carter, formerly Chief Environmentalist, European Investment Bank (EIB), summing up final session on finance at the conference *To No Net Loss of Biodiversity and Beyond*, London, June 2014, personal notes)

Conservation finance ... needed to preserve healthy ecosystems on land and in the oceans, and with them the earth's natural capital stock of clean air, fresh water and species diversity ... represents an undeveloped, but emerging private sector investment opportunity of major proportion. (*Credit Suisse and McKinsey Centre for Business and Environment, 2016: 3*).

The preceding two sections document ways in which 'nature' is being both *qualified* and *quantified* as 'natural capital'. In this section I present examples of how nature-as-natural-capital is being *materialised* as financial capital. I draw on work being conducted by financial institutions and collaborators to create 'natural capital' as a major new asset class, and thereby to make "conservation finance investable" (Huwyler et al., 2014). A range of financial products, instruments, mechanisms and funds are being fabricated in this regard, including various green bonds, climate bonds and rainforest bonds. Work is being undertaken to mobilize and accelerate such conservation finance, so as to transform this 'asset class' from "niche to mainstream" (*Credit Suisse and McKinsey Center for Business and Environment, 2016*). The aspiration is to capitalize the scarcity of "Earth's last healthy ecosystems" into a profitable private sector investment opportunity of "major proportion" (Huwyler et al., 2014; iterated by Huwyler and two co-authors in *Credit Suisse and McKinsey Center for Business and Environment, 2016*).

Loans financing green economy projects deemed to support natural capital beyond a projected 'counterfactual' of 'business-as-usual' increasingly take the form of various financial bond structures. To date, these 'green bonds' have focused on financing infrastructure developments considered to assist with a transition to a low carbon or 'green' economy. Climate bonds and green bonds 'frontload' future funds by encouraging government borrowing from investors with the debt secured on future economic and environmental (especially climate) benefits expected to flow from these investments (*Climate Bonds Initiative, 2009: 2, 4*; discussed further in Sullivan, 2013b). The World Bank Treasury thus currently issues a variety of bonds secured on climate-related goals, including 'Cool Bonds'²⁴, 'Eco Bonds'²⁵ and 'Green Bonds'²⁶. In the UK, 'environ-

mental bonds', including 'green investment bank bonds, green infrastructure bonds, and woodland creation bonds' issued by either the government or the private sector, have been encouraged as a means of linking investment to pledges of environmental improvement by bond issuers (*EMTF, VNN and GHK, 2012: 22, 32, 57–58; EMTF, 2013*). Targeting an emerging class of investors in 'sustainability', the global market in 'green bonds' was estimated to be US\$41.84bn in 2015, up from US\$36.59bn in 2014²⁷, and is projected to rise to between US\$55bn and US\$80bn in 2016 (Ridley, 2016: 5²⁸).

Increasingly, bond structures are being designed so as to leverage, i.e. materialize, financial value from the natural capital of 'standing natures' from which 'dividends' may flow through, for example, payments for ecosystem services and carbon values (*WWF, GCP, Climate Bonds Initiative, Goldman Sachs and Lombard Odier, 2011: 5–6; GCP, 2011; Bretton Woods, 2014; Credit Suisse, WWF and McKinsey&Company, 2014; Credit Suisse and McKinsey Center for Business and Environment, 2016*). The standing forests and other ecosystems of the global south are thereby fabricated as a store of projected natural-capital-based income streams that can be leveraged so as to service new conservation-impact-related financial products secured on their potentially legible value (discussed further in Sullivan forthcoming). In recent years, an array of reports arising through articulations between environmental NGOs, consultancies and financial institutions, have thus urged that public-sector funds and incentives such as tax breaks be mobilised to support private-sector investment in forests and other conserved ecosystems. As indicated in Figure 2 and associated references, investments would be linked to government issued bonds, purchased via brokers by private sector investors and based in part on the anticipated future incomes offering 'repayments' from the 'standing natures' thus invested (also see *Forum for the Future and Enviro-Market Ltd, 2007; WWF, GCP, Climate Bonds Initiative, Goldman Sachs and Lombard Odier, 2011: 5–6; GCP, 2011; EMTF, VNN and GHK, 2012: 56*).

In April 2015, for example, ADM Capital²⁹, an investment manager seeking long-term capital appreciation through opportunities in Asia and

Eastern Europe, with the environmental NGO (ENGO) Flora and Fauna International³⁰, launched a \$1 billion bond programme in 'Rainforest Impact Bonds' as a finance mechanism for tropical forest conservation that stimulates green economic growth (*ADM Capital, 2015*). This initiative has been boosted in 2017 by a new grant to support the design of a Tropical Landscapes Finance Facility (TLFF) and Tropical Landscapes Bond (TLB), developed in partnership with UNEP, ICRAF (the International Center for Research in Agroforestry), and the bank BNP Paribas (Genasci, 2017). These bond structures are designed in connection with sovereign aid commitments from developed countries to stem global climate change by reducing forest carbon emissions through deforestation and habitat degradation. As indicated schematically to the left of in Figure 2b, the flow of repayments to investors in Rainforest Impact Bonds is thus projected to derive from newly commodified and marketable carbon values in tropical forests whose value has been made legible in part via sovereign aid commitments derived from public monies.

ADM Capital is not alone in voluntarily creating financial products linked with projected returns from capitalised values accruing to standing tropical natures. The Althelia Climate Fund is one of a handful of investment funds raising capital to invest in emerging markets associated with REDD+³¹, and Payments for Ecosystem Services (PES) markets (Abusaid, 2011; see review in Kill, 2016). Established and managed by asset management platform Althelia Ecosphere, and advised by Ecosphere Capital LLP and environmental NGO Conservation International, the fund is working through REDD+ accounting to bind legible natural capital carbon values embodied by standing tropical forests to investors from elsewhere. These investments are deemed to create "new environmental assets that reflect the value of natural capital"³². Initial investments in Althelia from the EIB amongst other investors totalled \$80 million in June 2013, enhanced with more than \$130 million lent from the USAID in 2014³³. The fund, asserted as fully invested in 2017 (*Althelia Ecosphere, 2017*), comprises "a diversified portfolio of investments in Africa, Latin America and Asia that take the form of real assets (certified

commodities and agricultural produce) and environmental services (verified emissions reductions and other ecosystem services [including carbon accounted for under REDD+³⁴])" that will deliver "cash dividends to investors" (*Althelia Ecosphere, 2013: 1*). Althelia Ecosphere states that "[e]cosystem goods and services from Natural Capital" are "worth trillions of US dollars per year" (*Althelia Ecosphere, 2013: 3*), projecting this value to materialise from "future streams of payments for expected emissions reductions" (*World Bank Group, 2012b: 1*).

More recent proposals emphasise possibilities for scaling-up conservation investments from institutional investors and (Ultra-)High Net Worth Individuals ((U)HNWIs), i.e. the super-super-rich, through financial products linked with emerging or predicted conservation markets (Huwlyer et al. 2014: online; also *Credit Suisse, WWF and McKinsey&Company 2014; Credit Suisse and McKinsey Center for Business and Environment 2016*). As stated in all these reports, investors loaning finance to projects associated with conservation expect returns from their investments. Again, these returns are projected to materialise in part from new markets in ecosystem services and carbon. Indeed, in October 2016 the first forestry bond was issued that repays its investors with either cash or carbon credits generated from avoided emissions through reduced deforestation in Kenya's Kasigau Corridor, invested in via the portfolio of the Althelia Climate Fund mentioned above. Issued by the International Corporation (IFC) of the World Bank and developed with mining conglomerate BHP Billiton and ENGO Conservation International, this "[i]nnovative \$152 million bond to protect forests and deepen carbon-credit markets" (Klopfer and Panjyan, 2016) represents the first link between two accounting modes in green finance architecture: the green bond market and the carbon-accounted offset market. The bond is designed to scale-up private sector climate change finance and conservation liquidity, albeit in a context of concern regarding local socioeconomic impacts of offset provision (Chomba et al., 2016). In these new impact-related conservation finance structures, investor risk is projected to be reduced through mobilising such newly legible-leverage-

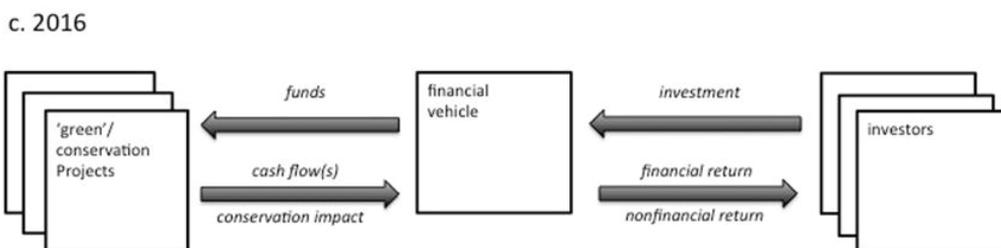
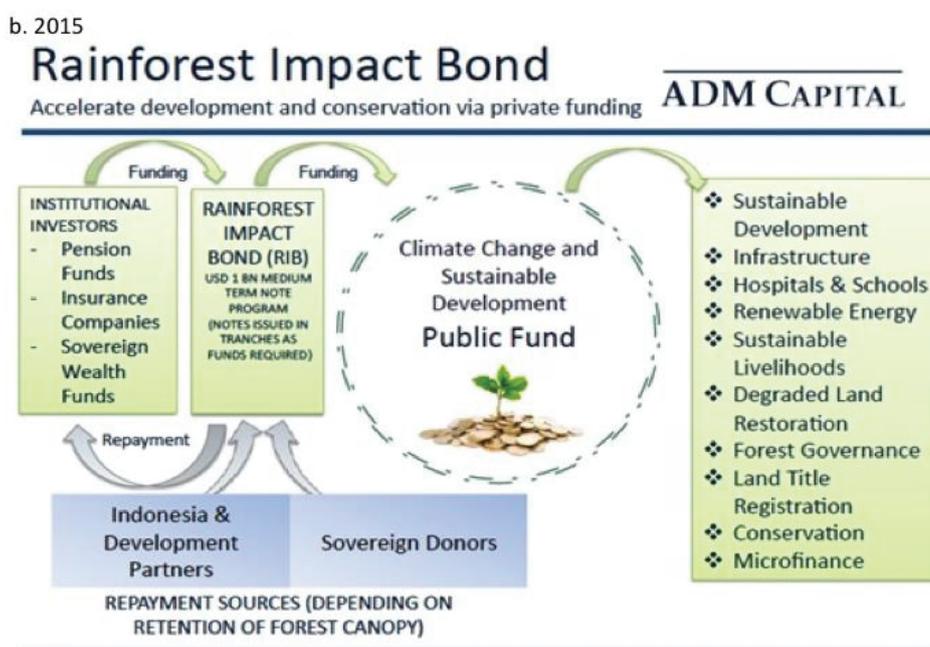
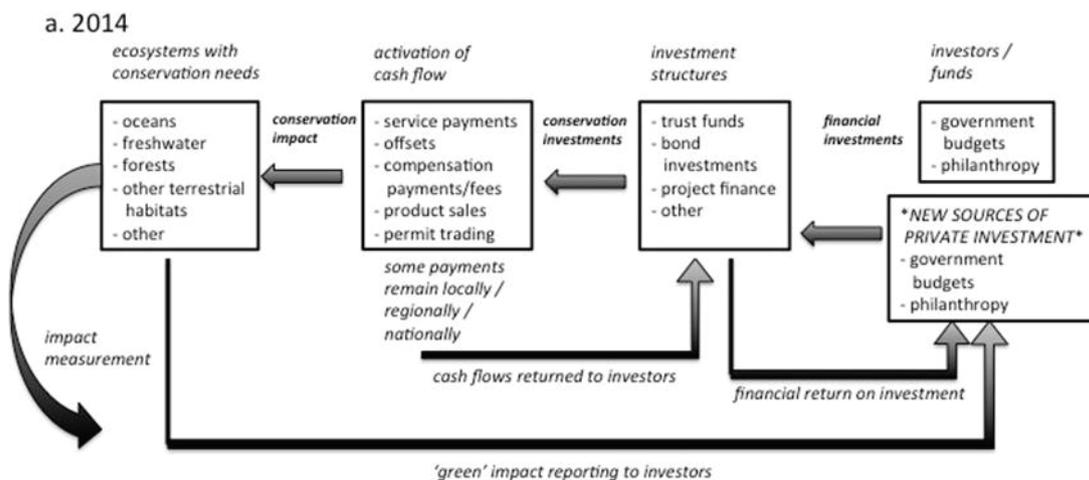


Figure 2. Versions of schematic representations of new forms of private sector conservation finance leveraged on increasingly legible natural capital value flows: **a.** Conservation finance framework, redrawn from Credit Suisse, WWF and McKinsey&Company (2014: 11) **b.** Rainforest Impact Bonds, source: ADM Capital (2015); **c.** 'Demand and supply side of conservation finance', redrawn from Credit Suisse and McKinsey Center for Business and Environment (2016: 9).

able assets and the 'land or usage rights' from which they derive as underlying collateral (see, for example, *Credit Suisse and McKinsey Centre for Business and Environment, 2016: 17*).

These financing proposals imply that countries of the global south with remaining high levels of globally valuable living 'natural capital' may become indebted to ultra-high-net-worth investors who will access returns on their investments from new income streams arising from conserved tropical natures. These possibilities are likely to be boosted through recent UNFCCC consolidation of an approach to global carbon management that emphasises an aggregate "balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases" (UNFCCC Paris Agreement 2015, Article 4.1), thereby consolidating global carbon management through offsetting, including through purchase of tropical forest carbon (Ehrenstein and Muniesa, 2013). At the same time, such structures are emerging in a context of poor standardisation and verification practices and guidelines, and few safeguards. Practices fall far short, for example, of established mandatory asset valuation rules detailed for real estate, infrastructure and construction in the UK (Royal Institute of Chartered Surveyors, 2014), or for the harmonisation of property valuation practices in Europe (The European Group of Valuers' Associations, 2016).³⁵ This 'gap' is now potentially being filled by a 'cottage industry' of valuers and verifiers (Ridley, 2016: 4), which perhaps in time will mirror the army of professional auditors swarming around carbon valuation, verification and trading (Lohmann, 2009, 2014; Ehrenstein and Muniesa, 2013). A host of opportunities thus also exists for diverse intermediaries to find and create niches in new natural capital audit and investment structures (Munden Project, 2011; Sullivan, forthcoming).

What we have in the examples above, then, is a financing approach in which nature's qualification as the fact(ish) of 'natural capital', coupled with its quantification through (ac)counting and valuation technologies, is permitting translations of these emerging natural capital quantities into financially material, i.e. leverageable, forms of value. In my next and final section I briefly consider some

of the broader implications of this capitalization of 'nature'.

Conclusion: The forward-driving force of (natural) capital?

It is certainly a complex exercise to put a value on natural capital, although that value becomes clearer once it becomes scarce (*van Herwijnen [Responsible Investment Analyst], 2016: 2*).

Capital is the driving force of the series of payment exchanges: money in the making; money beyond money. At each payment, a punctual return is made to capital. Profit is fed back into investment, replenishing the forward-driving force of capital. Money loops from its punctual exercise as means of payment into a feeding of the conditions of its own continuing. (Massumi, 2015: 72).

This paper has documented a series of articulations whereby the external(ised) 'Nature-whole' of 'nature' is being fabricated metaphorically and materially as 'capital'. Through these fabrications, technical 'modes of existence' (Latour, 2013) in environmental and economic spheres of activity are combined as a response to global crisis in both these spheres (Sullivan, 2009). Notwithstanding the diverse dimensions of 'capital', detailed above, in each application of the natural capital metaphor entities become defined through a category distinct or apart-from their immanent, dynamic materialities (cf. Cooper, 2000; Joronen, 2013: 627). An 'illusion of equivalency' between materialities in their conception as 'capital(s)' is thereby fabricated and sustained (Wilshusen, 2014: 138). Monetized numbers bringing 'natural capital' into iconic presence in the world act additionally to assert factual status even though their object is so "ineluctably vague and spatially indeterminate" as to be unquantifiable with any deep certainty (Verran, 2013: 34; also Dauguet, 2015). In addition, and despite desires for standardization (cf. *Natural Capital Coalition, 2015b: 3*) and the production of certainty, a proliferation and hybridization of calculative tools is being generated (also Mennicken and Miller, 2012: 19). Indeed, this aspect has been observed for a range of social and environmental domains into which accounting practices have been extended, and perhaps is intrinsic to this expansion: see Moor and Lury (2011) for calcula-

tions of brand value; Lohmann (2009, 2014) and Lippert (2014) for corporate carbon accounting; the list of tools in *Natural Capital Coalition (2015a)*; and Carver and Sullivan (2017) for BDO metrics. The above observations indicate that a series of category errors may be amplified in the metaphorical work that links 'nature' with 'capital'. Indeed, it seems important to ask whether a more appropriate metaphorical strategy for 'valuing nature' would be to propose and affirm metaphors that pull attention towards life's immanent diversity, unpredictability and liveliness, rather than towards the dead, albeit 'lively', artefact of money as a measure of all value (Read and Scott Cato, 2014; Hornborg, 2016). Category errors notwithstanding, the numbers linking 'nature' with 'capital' are becoming able to be invested so as to generate further financial value. This is the performative shift from legibility to leverageability to which my title alludes. The fabrication of 'natural capital' abstractions and articulations is thus indeed "a process of 'definition' or social construction in a substantive sense", as Fourcade (2011: 1769) writes.

The narrative woven together in this paper has drawn on multiple observations and documentations to suggest that a performative shift is taking place in the fabricating of nature-as-natural-capital, but is limited in terms of providing empirical detail for specific cases and contracts. This moving frontier is ripe for empirical, comparative and independent case research to trace and clarify specific fabrications and flows of value, combined with their financial, social and ecological effects, for selected financial(ised) products and their contexts (see, for example, the cases documented in Ehrenstein and Muniesa, 2013; Lippert, 2014; Carver and Sullivan, 2017). The articulations documented above, however, indicate that the increasing legibility of nature-as-natural-capital is consistent with a "calculated management of life" (Foucault, 1998[1976]: 140; discussed in Mennicken and Miller, 2012: 6) able to realise new financially leverageable values. These values seem additionally positioned to replenish the entrepreneurial and accumulative tendencies of a neoliberal governmentality oriented towards a truth regime of the market (Foucault, 2008[1979], discussed in Sullivan, 2013b: 211;

Asiyanbi, 2017). These effects are especially clear when we consider some of the examples explored in Dimension 3 above. Here, the foregrounding of returns to large-scale private sector investors and (U)HNWIs appears set to complete possibilities for plutonomic captures of 'natural capital'. Through new mechanisms for debt-based impact investing in conservation finance, those contributing disproportionately to both environmental damage and to unequal wealth differentials appear potentially able to gain additionally from new revenue streams becoming legible from increasingly scarce 'standing natures'. To return to the advocacy of Schumacher in the 1970s with which I opened this paper, this emphasis seems diametrically opposed to the downsizing of economic activity he urged as an appropriate response to global environmental degradation.

The stakes of this enterprise are high. They promise nothing less than both measurable recovery of nature health through its enrolment and technical rendering in natural capital accounts; at the same time as offering routes whereby market growth can be sustained and amplified, in part through the better valuing of 'natural capital' that such accounting practices promise to perform. As emphasised by Mennicken and Miller (2012), however, the expansion of accounting into social and ecological domains also requires understanding as a *territorializing* activity, through which calculative, market and privatising regimes of governance extend into new areas of social and ecological life. In doing so, modalities of governing, as well as forms of personhood and power, are modified (Mennicken and Miller, 2012: 4), as are socioecologies that become thus valued and thereby governed. Indeed, although not emphasised in detail above, significant tensions arise as property rights over land, ecosystem services and carbon are of necessity individualised in processes of accounting for and selling new natural capital values (Ehrenstein and Muniesa, 2013). Formulating possible responses and resistances thereby requires both appreciation of the will to design and enact the new environmental-financing models detailed above, as well as understanding of the structures of investment products that wrap local peoples and ecologies further into global financial(ising) structures.

Incompleteness of translation, loss of precision in the layers of calculation, and unacknowledged ideological structuring, also constitute openings for poor financial performances (Dempsey and Suarez, 2016), multiple ecological and societal 'overflows' (Callon, 1998; Lohmann, 2009, 2014), 'counterperformativities' (Fredriksen, 2014) and 'pushbacks' (Bracking, 2015). Space does not permit a full discussion of the roughness contributed to natural capital thinking by these tendencies. We might simply conclude by observing that this is a productive and lively moment in the social fabrication of nature-as-natural-capital that invites critical and diagnostic attention.

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Notes

- 1 <http://www.thefreedictionary.com/fabricate>. Unless otherwise stated, all websites cited in this paper were accessed in February 2017.
- 2 <http://naturalcapitalforum.com/>
- 3 <http://www.naturalcapitalforum.com/who-should-attend>, accessed 10.11.2013.
- 4 <http://www.naturalcapitalcommittee.org/>
- 5 <http://www.naturalcapitaldeclaration.org/>
- 6 <http://www.uncsd2012.org/>
- 7 <http://www.naturalcapitalcoalition.org/natural-capital-protocol.html>
- 8 <http://www.eib.org/products/blending/ncff/index.htm>
- 9 <http://naturalcapitalforum.com/about/>
- 10 Also see Devadason (2011: 633) who critiques the creative rhetorical force of ‘the metaphor of capital to represent sociable and normative aspects of everyday life’.
- 11 See, for example, <http://www.mauricestrong.net/index.php/speeches-remarks3/34-asia>; <http://www.mauricestrong.net/index.php/speeches-remarks3/79-korea-economic-policy>; <http://www.mauricestrong.net/index.php/speeches-remarks3/46-scenarios>, all accessed 21.05.2016..
- 12 <http://www.slideshare.net/Denette/denettes-international-alliance-presentation>, slide 2, accessed 21.05.2016.
- 13 <http://encouragecapital.com/>

- 14 <http://www.defra.gov.uk/news/2011/06/07/natural-environment/>, accessed 21.05.2016.
- 15 <http://bankofnaturalcapital.com/>
- 16 i.e. without extending the term to 'human', 'social' and 'cultural' domains, as delineated by Bourdieu (1986) in his use of 'capital' as 'a surrogate for [accumulations of] power', as well as more normatively in multiple development and corporate models (see discussion in Wilshusen, 2014: esp. 140-145; also Devadason, 2011).
- 17 At <http://www.teebweb.org>
- 18 <http://www.naturalcapitalcommittee.org/>
- 19 <http://rio20.net/en/>
- 20 As classified by the Joint Nature Conservation Committee, a public body that advises the UK central and devolved Governments on nature conservation (see <http://jncc.defra.gov.uk>).
- 21 As documented in exhaustive detail for the performativity of climate/carbon equations in Lohmann (2014).
- 22 <http://www.environmentbank.com/index.php>
- 23 <http://www.environmentbank.com/impact-calculator.php>
- 24 <http://treasury.worldbank.org/cmd/htm/CO2LBond.html>, accessed 18.05.2016.
- 25 <http://treasury.worldbank.org/cmd/htm/Eco3PlusNotelnaugural.html>, accessed 18.05.2016
- 26 <http://treasury.worldbank.org/cmd/htm/WorldBankGreenBonds.html>, accessed 18.05.2016
- 27 <http://www.climatebonds.net/>
- 28 Thank you to James Vause, Lead Economist, UNEP-WCMC, for drawing my attention to this presentation, pers. comm. 16.05.2016.
- 29 <http://admcapital.com/>
- 30 <http://www.fauna-flora.org/initiatives/innovative-finance-for-conservation/>
- 31 i.e. the UN programme for Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (<http://www.un-redd.org/>), programmatic implementation of which is coordinated in particular by the Food and Agriculture Organisation (FAO), the UN Development Programme (UNDP) and the World Bank's Forest Carbon Partnership Facility (FCPF) (Kill pers. comm. 6 August 2017).
- 32 <https://althelia.com/our-approach/>
- 33 <https://althelia.com/2014/05/29/usaid-announce-new-partnership-with-althelia/>
- 34 i.e. the UN Programme for Reducing Emissions from Deforestation and Forest Degradation in Developing Countries, see <http://www.un-redd.org/>, accessed 21.05.2016.
- 35 Thank you to Tom West, Economics and Law Researcher (Biodiversity), ClientEarth, for encouraging consideration of this point, pers. comm. 16.05.2016.