Burning Rembrandts: A Focus On Biodiversity

Photo by Eutah Mi-

Biodiversity is the net diversity of living organisms in all habitats including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems. Biodiversity forms the foundation of the vast array of ecosystem services, such as flood protection, waste decomposition and food production that support human well-being and economic systems.

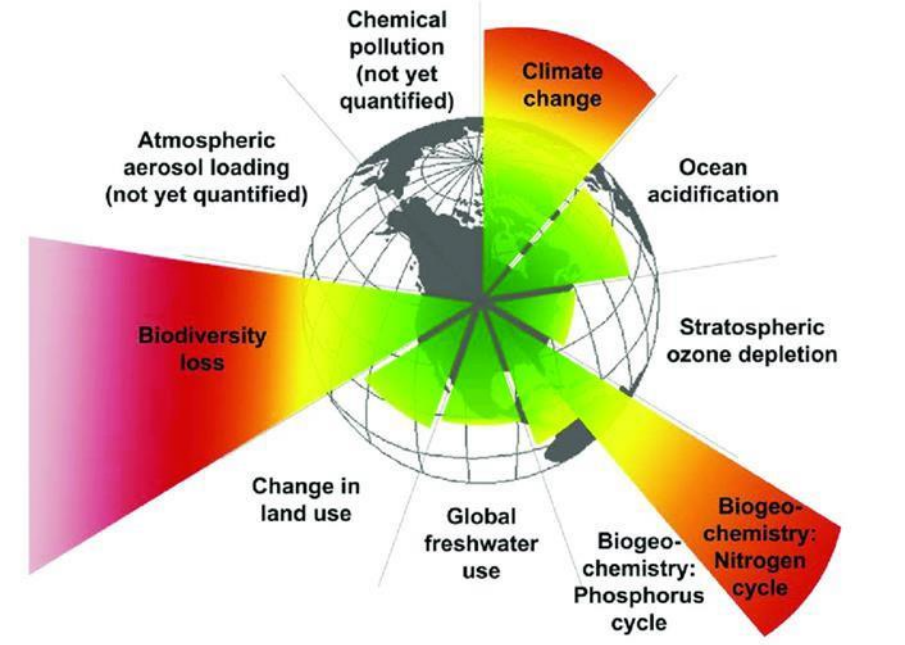
Ecosystem services are complex and highly interdependent (see box 1). However, a defining and sometimes problematic feature of current economic models is the concept that some forms of natural capital can be substituted by other goods and services which perform similar functions[2], for example, livestock or fish farming replacing hunting or fishing as a source of calories. But substitution ignores the unique features and inter-dependencies of ecosystems that cannot be replaced by new plantations, even if they are 'economically' equivalent. As Michael Sandel has commented: "*Sometimes, market values crowd out nonmarket values worth caring about".*

Substitution is not without cost. With today's linear production systems (as opposed to circular) at full speed, the environment is suffering badly. In 2009, the Stockholm Resilience Centre brought together 29 leading Earth-system scientists, who identified a set of nine critical Earth-system processes with biophysical thresholds, or 'tipping points', called 'Planetary Boundaries'. Crossing these boundaries will lead to irreversible environmental change, undermining the 'safe space for human development'.

Three of the planetary boundaries have already been crossed: biosphere integrity, climate change and biogeochemical cycle (nitrogen and phosphorus cycles); and ocean acidification is entering the danger zone.

2 Carpenter S 1997 ***Towards Refined Indicators Of Sustainable Development***, Phil & Tech 2:2 Winter 1997 Georgia Institute of Technology

Figure 1 | Planetary Boundaries



Source: Figgis et al 2015[3]

Box 1: What Are Ecosystem Services?

The Economics of Ecosystems and Biodiversity (TEEB)*, a global initiative focused on "making nature's values visible", defines ecosystem services as the "direct and indirect contributions of ecosystems to human well-being"

Ecosystem services can be categorized in four main types:

- ***Provisioning services, which include products obtained from ecosystems such as food, fresh water, materials, such as wood and fibre, genetic resources and medicines;***
- ***Regulating services, which are a by product of ecosystem processes such and include climate regulation, flood control, waste management and pollination;***
- ***Habitat services, which maintain population control (especially of pest species) and a viable gene-pool (particularly important for food crop resistance to disease);***
- ***Cultural services, including mental well being, spiritual enrichment, intellectual development, recreation, inspiration and aesthetic values.***

**http://www.teebweb.org/about/unep-teeb-office/*

3 Figgis P *et al* 2015 ***Valuing Nature: Protected Areas and Ecosystem Services,*** Australian Committee for IUCN Isbn: 978-0-9871654-5-9

There is a growing awareness that environmental degradation is causing biodiversity, and the ecosystems supported by it, to reach breaking point. Recent reports by the IPCC[4] and IPBES[5] leave little doubt: the combination of climate change and the depletion of biodiversity and ecosystems puts societies on the path to environmental collapse.

The last few years have seen a plethora of reports charting the havoc being wrought on the planet:

- 40% of insect species, the bedrock of eco-systems, face extinction[6].
- Huge numbers of plant species, crucial for food and pharmaceuticals, are going extinct[7].
- The UN is alarmed that plant diversity in farmers' fields is decreasing, that nearly a third of fish populations are overfished, and a third of freshwater fish species assessed are considered threatened[8].
- Driven by acidification and rocketing temperatures, marine species are going extinct even faster than those on land[9].
- Forest areas are predicted to decline by 13% by 2030, mostly in South Asia and Africa[10], although there is also concern at the rapid surge in deforestation currently occurring in Brazil[11].

The public is becoming alarmed at the scale and pace of the threats facing the planet. From an increase in vegetarian and veganism to campaigns against fast fashion and plastic packaging, both businesses and politicians are coming under increasing pressure to address environmental issues as policy priorities.

Complacent, Indifferent Or Enabler? The Role Of Financial Systems And Services In The Destruction And Protection Of Biodiversity

Unlike heavy industry, the most significant impacts of the financial services sector on biodiversity and natural capital are not associated with direct resource consumption or the emission of pollutants or greenhouse gases by individual financial services firms. Impacts arise from the enabling role that these organisations play in providing capital for infrastructure or activities that direct society down pathways that are unsustainable.

4 ***Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments***, Intergovernmental Panel on Climate Change (IPCC), October 2018

5 ***Global Assessment of Biodiversity and Ecosystem Services***, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), May 2019

6 Sánchez-Bayoa F & Wyckhuysbcd K 2019, ***Worldwide Decline Of The Entomofauna: A Review Of Its Drivers*** Biological Conservation Volume 232, April 2019, Pages 8-27

7 Humphreys A, Govaerts R, Ficinski S, Lughadha E & Vorontsova M 2019 ***Global Dataset Shows Geography And Life Form Predict Modern Plant Extinction And*** Rediscovery Nature Ecology & Evolution, Vol 3, July 2019, 1043–1047

8 FAO, The ***State of the World's Biodiversity for Food and Agriculture***, 2019, 576p.

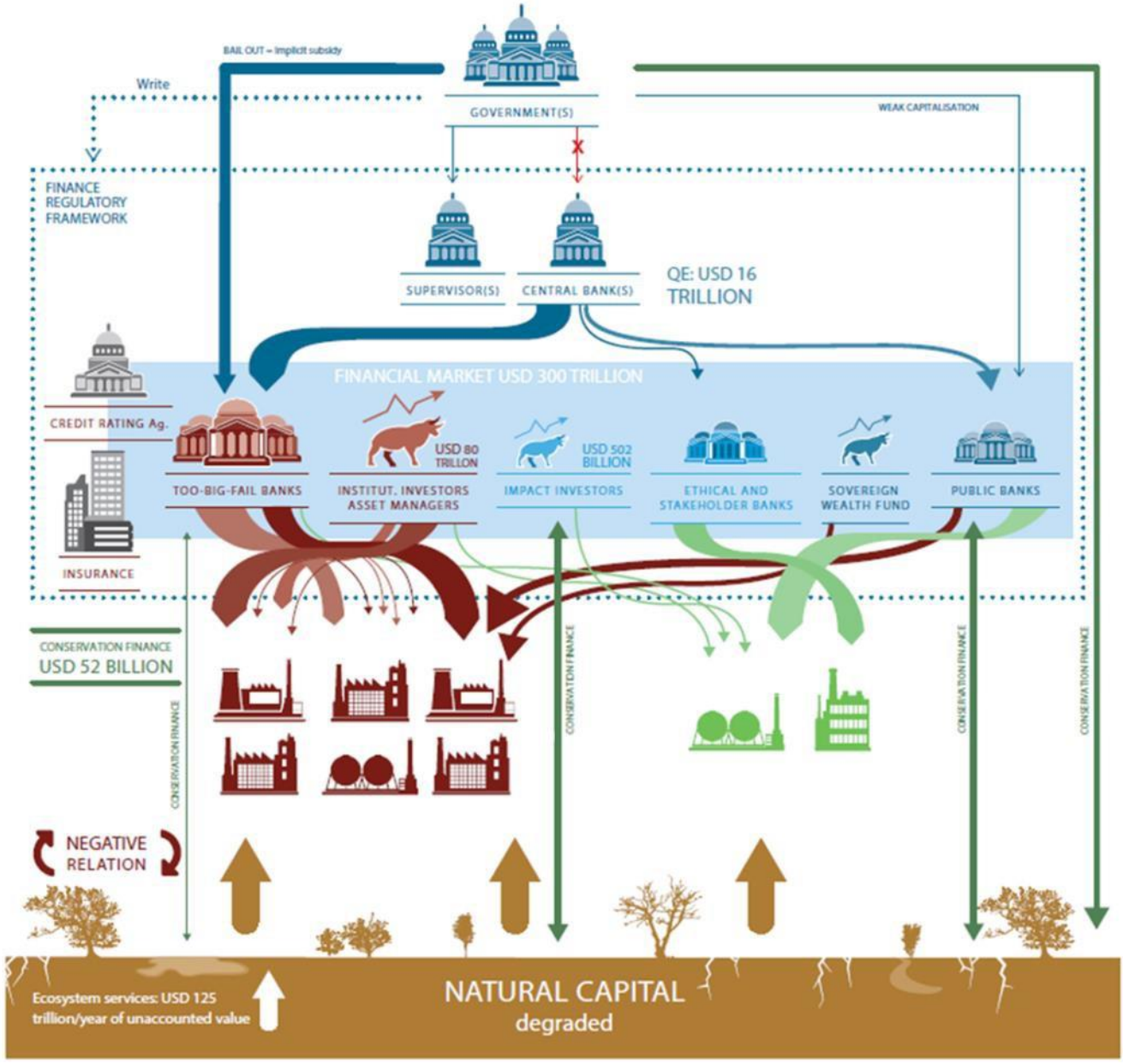
9 Pinsky M, Eikeset A, McCauley D, Payne J & Sunday J 2019 ***Greater Vulnerability To Warming Of Marine Versus Terrestrial Ectotherms*** Nature, Vol 569 2 May 2019

10 OECD 2008 ***Environmental Outlook to 2030***, 2008

11 https://www.theguardian.com/world/2019/jun/04/deforestation-of-brazilian-amazon-surges-to-record-high-bolsonaro

The risk of environmental collapse, resulting from natural capital depletion, can be described as a systemic risk because of the complex interdependence and interconnectedness between the elements of ecosystems; and also financially systemic, because the financial system shares similar characteristics and risks of contagion. The ability of the financial system to harm the ecosystems on which it depends raises questions about whether the financial sector has the right mix of institutions to meet environmental goals. As Figure 2 illustrates, the quantities of finance being made available for fossil fuel and other unsustainable activities are far larger that the amounts directed to sustainable activities, and private banks and institutional investors are far more dominant than the impact investors, stakeholder banks, sovereign wealth funds and public banks that are likely to have sustainability at the core of their missions.

Figure 2 | Finance Ignoring Nature



Source: Finance Watch 2019

The root cause of the issue is linked to short-term horizons for risk and reward, and a failure to deal effectively with externalities (see Mark Carney's speech "Breaking the tragedy of the horizon"). These challenges, as pointed out in Mainelli and Gifford's 2009 paper The Road To Long Finance: A Systems View of the Credit Scrunch[12], already pose significant risks to the global financial system, and, according to many commentators[13], have not been addressed effectively in the decade since the financial crisis occurred.

There is an urgent need to assess risks at the macro-economic level. Central banks and supervisory authorities are responsible for mapping these risks, modelling their interactions with economic and financial systems, and taking steps to mitigate them.

Private financial institutions are driven by a simple 'risk/return' ratio, and shifting capital involves changing this ratio. There is, therefore, a need, first, to enhance the financial sector's understanding of risks related to natural capital depletion and, second, to amend the return expected from activities they invest in by showing the hidden costs of economic activities and internalizing these negative externalities in the production cost. If investing in environmentally harmful activities leads to lower returns and more risk than sustainable activity, financial institutions will automatically shift their investment.

But the players in the financial system find it difficult to see, think and act long term, when structural characteristics incentivise short-term returns. As **private finance is currently ill-suited to conservation finance**, there is a need to address this issue at three levels:

- First, to address market failures at a macro-economic level by **extending time horizons and internalising externalities**. As Mainelli and Gifford (2009) state, "*Wicked problems, [problems which are difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize] cannot be solved by larger government intervention, but equally, we cannot just sit back and wait for the free market to save the day. What may be needed is bolder, yet more pointed, government intervention*".
- Second, **finance from 'mission-oriented' financial institutions must be unlocked**: that is, financial institutions which do not follow a logic only of profit, but also answer to a public interest mission (public and development banks), or to social and environmental criteria (ethical banks and impact investors).
- Finally, while attempts to create markets for ecosystem can have unintended side effects that do more harm than good, there is a role for **financial products earmarked for conservation projects**, which derive income streams from the protection and sustainable exploitation of biodiversity and ecosystems. (e.g. mutual funds, bonds, loans or equities).

12 ***Mainelli*** M & Gifford B 2010 ***The Road to Long Finance: A Systems View of the Credit Scrunch*** https://www.zyen.com/media/documents/Road_to_Long_Finance.pdf

13 IMF ***2018 A Decade after the Global Financial Crisis: Are We Safer?*** https://www.imf.org/en/Publications/GFSR/Issues/2018/09/25/Global-Financial-Stability-Report-October-2018

Economic System Reliance On Ecosystems

Natural capital can be defined as the world's stocks of natural assets which include geology, soil, air, water and all living things[14]. Natural capital yields ecosystem services, such as energy (fuel), calories (food) and raw materials, as well as providing homeostatic functions such as climate regulation and flood control. These ecosystem services are often closely interlinked, so that over-exploitation or poor stewardship in one area may have detrimental effects in another.

Managing costs and ensuring long-term value creation across supply chains requires businesses to understand better their dependencies on biodiversity and ecosystem services, and to integrate these considerations into long-term business strategies, risk-management approaches and other business activities[15].

From an investor perspective, the profitability and long-term survival of some sectors depends on well-functioning ecosystems, notably agriculture, fisheries and pharmaceuticals. The last of these sectors is

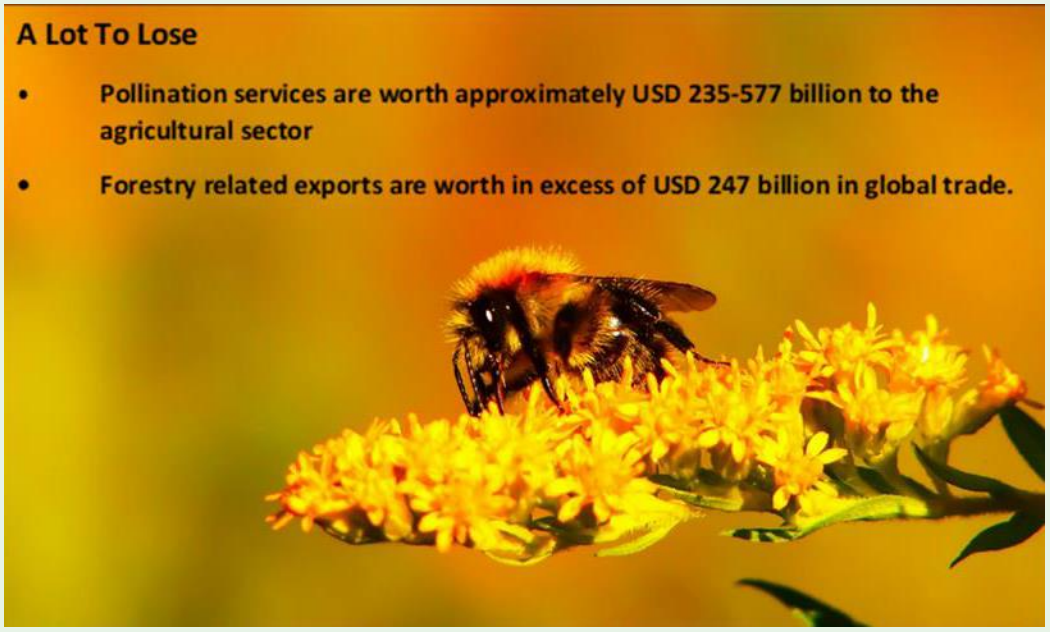


Photo by Krzysztof Niewolny on Unsplash

14 ***World Forum On Natural Capital*** https://naturalcapitalforum.com/about/

15 OECD ***2019 Biodiversity: Finance and the Economic and Business Case for Action*** https://www.oecd.org/environment/resources/biodiversity/G7-report-Biodiversity-Finance-and-the-Economic-and-Business-Case-for-Action.pdf

especially reliant on biodiversity, as *"nature, the master of craftsman of molecules, provides the bedrock resource for drug development, novel chemotypes and pharmacophores, and scaffolds for amplification into efficacious drugs for a multitude of diseases and other valuable bioactive agents"*[16].

Systemic failures by the financial system to value biodiversity and ecosystem services have long been recognised. In 1999, Forest Trends (a trans-national NGO), launched the Katoomba Initiative – an international working group dedicated to advancing markets and payments for ecosystem services – including watershed protection, biodiversity habitat, and carbon sequestration.

During the conference of the parties (COP) to the Convention on Biological Diversity (CBD) in Nagoya in 2010, world governments agreed to a strategic plan for biodiversity conservation, including the 20 Aichi Biodiversity Targets (ABT) to be met by 2020. Assuming that public finance would not be made available for conservation at sufficient scale, the CBD's strategic plan for 2011-2020 placed much emphasis on innovative financial mechanisms to help stimulate private investment, such as payments for ecosystem services, biodiversity offsets, markets for green products, etc.

The financing needed to implement the 20 Aichi targets (widely denounced as too modest to avert a crisis), was estimated in the range $150 to $440 billion per year. Yet even this has not been achieved.

Even with innovative market mechanisms, few conservation projects are bankable: most have low revenues, low rates of return, and relatively high transaction costs. Only around USD 50 billion of conservation finance is being raised annually[17], a sixth of the estimated global funding need. And of this, 80% comes not from financial markets but from public and philanthropic sources.

The CBD's Conference of the Parties is expected to update its strategic plan at the 15th COP in Beijing in October 2020.

Valuing Nature

At the heart of humankind's problematic relationship with the planet is how we value nature and natural services.

For much of human existence, nature was an elemental force to be tamed, with enclaves of civilization carved out of a threatening wilderness. Once humanity entered the Anthropocene (a theoretical geological epoch, marking indelible human impact on geology and natural systems, and defined as

16 Veeresham C 2012 **Natural Products Derived From Plants As A Source Of Drugs** Journal Of Advanced Pharmaceutical Technology & ***Research*** 2012 Oct-Dec; 3(4): 200–201 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3560124/

17 Finance Watch 2019 **Making Finance Serve Nature** https://www.finance-watch.org/publication/making-finance-serve-nature-report/

starting either with widespread agriculture or the industrial revolution) philosophers and scientists have been concerned at the damage humans were having on the natural world, and by extension, themselves.

Functioning ecosystems are essential to life on earth, yet economics and society at large either fails to place any value on natural capital or focuses on individual species without taking account of the systems of which they are part.

Placing a value on nature is fundamentally problematic. We may be able to place a commercial value on a human kidney, and live donors can earn life-changing sums of money in some jurisdictions by selling one, but no one would be willing to sell their heart or liver. Likewise, we may be able to place a commercial value on a tree, but what realistic price can be placed on a forest, the flood protection and pollution amelioration it provides, the as yet undiscovered medicines that are locked in its biodiversity and the mental well-being it provides.

As the political philosopher Michael J. Sandel said in his 2012 Atlantic article[18] "*Economists often assume that markets are inert, that they do not affect the goods being exchanged. But this is untrue. Markets leave their mark."*

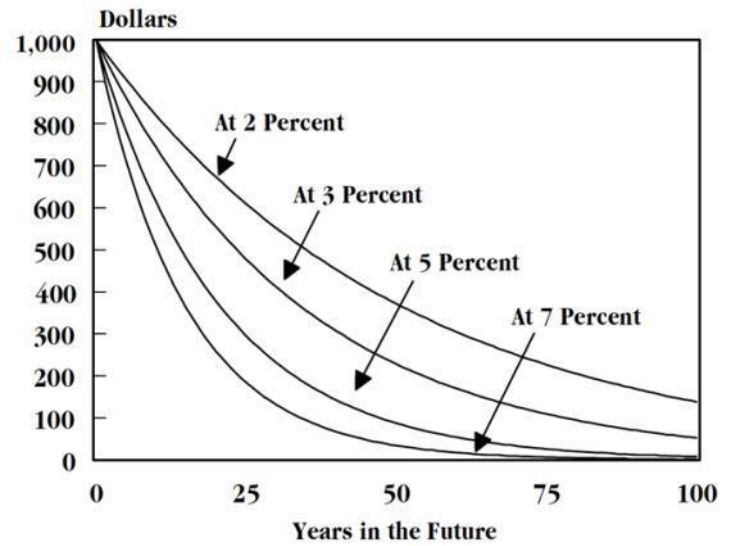
Just as there are difficulties in valuing nature's benefits, so there are difficulties valuing the costs to nature of environmentally harmful activities. In a study for UNPRI, Trucost estimated the global costs associated with the environmental impact of the operations of the largest 3,000 companies in the world, to be in the order of US$2.15 trillion[19]. This analysis, however, acknowledged limitations in relation to global data availability for natural resources, other than fisheries and timber, as well as for environmental impacts such as water pollution, heavy metals, land-use change and waste, particularly in non-OECD countries. Moreover, Trucost stressed the fact that its results could be significantly higher if methodological and data obstacles could be overcome in order to account for ecosystem services degradation (e.g. climate regulation).

At present these costs are borne by society as a whole, not by industry and shareholders. This situation is compounded by the fact that markets do not value conservation, only consumption – so an endangered rhino is worth more as an aphrodisiac or hunting trophy than as a living animal. The discounting of assets (see figure 3), which is standard accountancy practice, may be useful for investors assessing the timing of financial returns but is highly problematic for decisions about conservation and sustainability.

18 Michael J. Sandel 2012 What Isn't For Sale?, The Atlantic https://www.theatlantic.com/magazine/archive/2012/04/what-isnt-for-sale/308902/

19 Trucost 2010 ***Universal Ownership: Why Environmental Externalities Matter To Institutional Investors*** https://www.unpri.org/environmental-issues/universal-ownership-why-environmental-externalities-matter-to-institutional-investors/4068.article

Figure 3 | Curves Representing Constant Discount Rates Of 2%, 3%, 5%, And 7%



Source: US Congressional Budget Office[20]

As Jeffery Sachs points out[21], we are subject to the "tyranny of the present over the future", particularly when the rate of interest diminishes the incentive for the resource owner to harvest the resource at a sustainable rate and a natural asset discounts to zero over the span of a few decades, whilst a forest or a whale can take a century to reach maturity.

Challenges To Positive Action

Several key challenges present themselves in harnessing the power of markets to protect biodiversity:

- **Externalities And Income** – classical economic theory imbues biodiversity with some of the properties of a public good: individuals cannot (or should not) be excluded from consuming a particular commodity (for example, the flood protection qualities of upland forests), and available supply is more or less independent of the number of consumers[22]. These properties drive the "Tragedy of the Commons".

20 US Congress 2003 The Economics of Climate Change: a Primer https://www.cbo.gov/sites/default/files/108th-congress-2003-2004/reports/04-25-climatechange.pdf

21 Sachs, G 2008, ***Common Wealth: Economics For A Crowded Planet***, Penguin (Allen Lane)

22 Wiesmeth H. (2012) ***Public Goods in Environmental Economics. In: Environmental Economics.*** Springer Texts in Business and Economics. Springer, Berlin, Heidelberg

- **Who benefits?** – many of the issues fundamental to the protection of species lie in the hands of the communities where those resources exist. Unfortunately, custom and culture are rarely a match for economic necessity, and unless there are substantial direct economic and social benefits for communities associated with the conservation of species and habitats, over-exploitation is inevitable. Deriving sustainable income streams from biodiversity, and the ecosystems and habitats which support it, is extremely challenging.

- **Metrics And Data** - the concept of biodiversity is well established, though its measurement has yet to be pinned down in the same way that carbon emissions have been established as the unit of measurement for climate change impact assessments[23]. Calculations to derive diversity and species richness were first developed by Robert MacArthur and Edward O. Wilson in 1967[24]. The results of their and subsequent formulae designed to measure natural systems, require interpretation and are ill-suited to the needs of the financial services sector. As Z/Yen highlighted in its 2011 report for the NERC, without standardised metrics, it is more difficult to measure and compare the performance of financial instruments designed to promote biodiversity and protect biodiversity and ecosystem services[25].

Image by Evan Dennis on Unsplash

23 Mainelli M & Harris I 2011 ***The Price Of Fish*** p285 Nicholas Brealey ISBN 978-1-85788-571-2

24 MacArthur R and Wilson E O 1967 ***The Theory of Island Biogeography*** Princeton University Press (Revised edition 26 Feb. 2001) ISBN-10: 0691088365

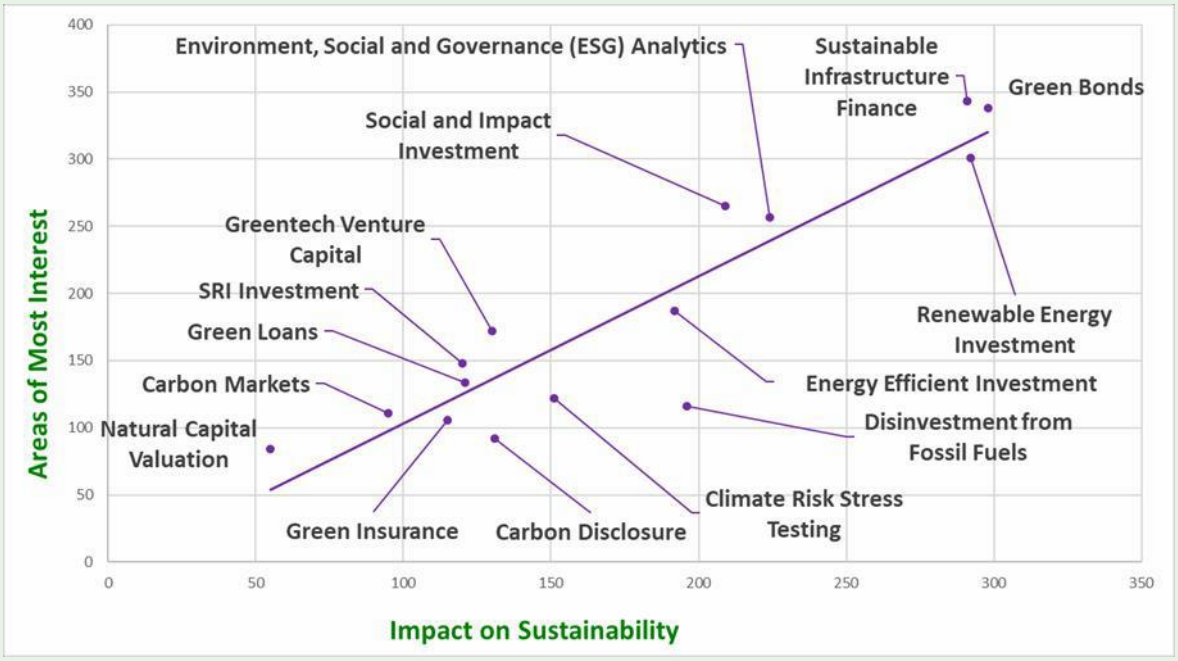
25 Z/Yen 2011 Finance***, Biodiversity And Managed Ecosystems: Where's The Data?*** https://www.zyen.com/media/documents/nerc_biodiversity_2011.pdf

Awareness Amongst Financial Service Professionals

For each issue of the Global Green Finance Index, practitioners have been asked to identify the areas that they consider to be of most interest to them, and the areas they consider to have the greatest impact on sustainable development. Despite the high potential impact of biodiversity loss on economic and financial system stability, the valuation of natural capital (and by extension biodiversity) has consistently ranked very low (see figure 4).

In part this may be a result of the issues discussed in the previous section. However, it is also likely to be a result of the shortage of tradable financial products which have a focus on this issue.

Figure 4 | The Views of Financial Services Professionals On Green Financial Products And Services



Connecting Finance With Nature

There is growing recognition that environmental aspects, including biodiversity and ecosystem service-related ones, have a material impact on investment risks and returns. Driven by increasing awareness of the positive impact of sustainable business practices on long-term profitability, the business and financial services sectors have come to recognise the importance of a sustainable environment.

Initiatives such as UN Principles for Responsible Investment or UNEP Finance Initiative are illustrative of efforts to demonstrate and further explore the relationship between environmental, social and governance issues and financial performance.

Many investors active in socially responsible investment (SRI), particularly pension funds and other institutional investors, are taking a growing interest in the environmental, social and governance (ESG) aspects related to their investments, including environmental issues such as climate change, water scarcity and biodiversity.

These risks have a serious systemic dimension. The loss of biodiversity and interruption of ecosystem services is a material risk for the financial system – certainly in the long-term, even in the short-term for some investments/sectors – and needs to be included in stress tests by institutions and their supervisors. Macro-prudential instruments should be used to penalize nature-depleting investments where relevant.

Policy makers have already indicated that a regulatory response will be needed although, so far, no firm commitments have been proposed. The Network for Greening the Financial System (NGFS), a group of central bankers and financial supervisors set up to address financial system concerns linked to climate change, wrote in April 2019 that "*there are compelling reasons why the NGFS should also look at environmental risks relevant to the financial system. For instance, environmental degradation could cascade to risks for financial institutions, as reduced availability of fresh water or a lack of biodiversity could limit the operations of businesses in a specific region. These could turn into drivers of financial risks and affect financial institutions' exposures to those businesses*"[27].

This suggests that regulatory action will be forthcoming. In the meantime, the destruction of biodiversity and ecosystems is continuing to accelerate.

26 GSIA 2018 ***Global Sustainable Investment Review*** http://www.gsi-alliance.org/wp-content/uploads/2019/06/GSIR_Review2018F.pdf

27 NGFS, First comprehensive report, ***"A call for action Climate change as a source of financial risk",*** April 2019, https://www.dnb.nl/binaries/NGFS%20Call%20for%20action%20report_tcm46-383435.pdf

Four paths are essential for financial services to connect with biodiversity:

1. **Effective reporting** of the impacts of investment decisions on biodiversity in order to ensure that investors and fund managers are aware of the potential biodiversity risks associated with investment decision making.

   Non-financial reporting is mandatory in Europe (i.e. NFRD 2014), but an absence of common metrics and methodologies means quality is variable and comparison impossible; a frequent complaint among central banks and investors. Nevertheless, some tools are already available, such as:
   - UNEP's The Economics of Ecosystems and Biodiversity (TEEB) programme[28]. TEEB is a global initiative focused on "making nature's values visible". Its principal objective is to mainstream the values of biodiversity and ecosystem services into decision-making; and
   - InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs)[29] - a suite of models developed by Stanford University used to map and value the goods and services from nature that sustain and fulfil human life.

   What is required, as with reporting on other sustainability risks (particularly those associated with climate change), is intervention by regulators to mandate harmonised, mandatory ESG reporting by large companies.

2. The **phasing out of environmentally-harmful subsidies** (EHS) which encourage the depletion of biodiversity and damage ecosystems, particularly with respect to forestry, agriculture and fisheries. The European Union (EU) has committed to remove or phase out EHS[30], although the EU and other nations and economic areas have a long way to go to ensure that EHS are removed.

3. The **unlocking of public finance to fund non-bankable conservation projects**, notably those with public good characteristics, long payback periods, or low risk/reward ratios, and a review of State Aid rules and other barriers to the use of national and regional development banks.

4. For projects that are bankable, **encourage the flow of private finance to protect biodiversity**. The flow of private finance into ecosystem service and biodiversity protection must be encouraged. Over the last few decades, conservation projects which aim to protect or enhance biodiversity have primarily been funded from public and philanthropic sources. As public finances have come under strain, conservation organisations have been under pressure to diversify their funding strategies.

One solution they have sought is "Impact Investment" - private capital invested with the specific intention of achieving a measurable or environmental impact alongside financial returns. Impact investment designed to meet an environmental goal is sometimes referred to as conservation finance. The feat of overcoming the 'tragedy of the commons, and unlocking the value of ecosystems is made possible using a number of financial products tailored for specific purposes (see table A).

28 TEEB http://www.teebweb.org/about/unep-teeb-office/
29 InVest https://naturalcapitalproject.stanford.edu/invest/
30 IEEP 2012 ***Study Supporting The Phasing Out Of Environmentally Harmful Subsidies*** https://www.cbd.int/financial/fiscalenviron/eu-studyehs.pdf

Table A | Financial Products Supporting Biodiversity

AIM	PRODUCT	ISSUES
PRESERVATION	**Equity (ownership or usage rights).** This establishes conservation as an asset class, structured into investable modules. These can focus on: • Ecosystems (such as forests which through the Programme for the Endorsement of Forest Certification (PEFC) or equivalent accreditation can be managed sustainably) • Establishing and maintaining infrastructure (such as ecotourism; and • Investments into additional mechanisms centred on environmental markets (such as carbon or biodiversity offsets).	This effectively transfers the ownership of public goods into private hands, and has implications with respect to indigenous communities, water and land rights. More specifically, offsetting poses a series of problems such as lack of true substitutability because natural habitats can never be fully replaced; dependencies as conservation projects derive income from harmful activities; 'green grabbing' (land-grabbing for environmental reason)'; poor ESG track records[31].
IMPROVEMENT	**Green Loans** are loans offered by banks at preferential interest rates linked to the achievement of specific environmental targets. Several large banks, particularly in the Netherlands, have pioneered the development of this type of financing vehicle, although whilst the Loan Market Association's "Green Loan Principles"[32] include biodiversity in their definitions, to date most green loans have focussed on carbon reduction. Some NGOs have also stepped into this space, for example Conservation International have founded CI Ventures as an investment fund that provides loans to small- and medium-sized enterprises that operate in the forests, oceans and grasslands where Conservation International works.	A key issue, which may have held back the issue of these instruments in connection with biodiversity, is performance measurement.
	Policy Performance Bonds (PPBs)[33] are government bonds where interest payments are linked to the delivery of an environmental policy specific target. If a target is missed, the yield on the bond increases. In other words, policy makers will be held to their promises, and if they fail to deliver there will be a financial penalty. PPBs could be issued against a variety of different policy objectives, including biodiversity protection or enhancement. Currently no nation has been willing to issue PPBs.	PPBs may be one of the most powerful instruments that could be used in improving biodiversity, but governments have been reluctant to explore this innovation.
	Green Bond issuance in 2018 reached USD167.3bn worldwide. The majority of these issuances focussed on infrastructure development designed to reduce carbon emissions and pollution. However, the Republic Of The Seychelles issued the world's first blue sovereign bond in October 2018. Proceeds will be allocated to eligible activities related to sustainable fisheries and marine projects, including the expansion of marine protected areas, improved governance of priority fisheries and development of the Seychelle's blue economy.	In the absence of specific tax incentives, green bonds may differ little from mainstream bonds: issuers are often the same (especially sovereigns and large corporates), credit assessments are very similar, and the activities funded may be the same. There are also still doubts over the existence of a 'greenium' (a premium given by investor to green bonds)[34].

31 Green Finance Observatory 2019 ***50 Shades Of Green. Part. II: The Fallacy Of Environmental Markets*** https://greenfinanceobservatory.org/2019/05/23/second-policy-report-50-shades-of-green-part-ii-the-fallacy-of-environmental-*markets*/

32 LMA 2018 ***Green Loan Principles*** https://www.lma.eu.com/application/files/9115/4452/5458/741_LM_Green_Loan_Principles_Booklet_V8.pdf

33 Mainelli M 2019 ***Policy Performance Bonds For ESG & Climate Change – A Primer*** https://www.longfinance.net/news/pamphleteers/beyond-words-why-london-climate-week-needs-policy-performance-bonds/

34 Dupre S et al 2018 Shooting For The Moon In A Hot Air Balloon, 2° Investing Initiative; Ekeland I, Lefournier J 2019 L'obligation verte: homéopathie ou incantation?, Working paper, CEREMADE, Chair Energie Et Prospérité

Table A (Continued…) | Financial Products Supporting Biodiversity

AIM	PRODUCT	ISSUES
MANAGEMENT	**Quotas, Permits and Trading Schemes:** quotas and permits for fishing, logging, and water abstraction are already issued by regulators. Whilst the levels for abstraction or catches are, in the main, set in the light of scientific advice, the process is subject to lobbying and political influence. Furthermore, the holder of a licence is incentivised to exploit the resource to the maximum that a permit allows. Establishing a market to trade surpluses, would incentivise permit holders to reduce overexploitation, as water or trees in the ground, or fish in the sea would still hold a value to them. Markets in tradable permits can be effective in the management of environmental resources, as proven by carbon trading in the EU and NOX and SOX trading in the US. Reducing Emissions from Deforestation and Degradation (REDD) is a permissible mechanism for carbon offsetting under the Kyoto Protocol. The mechanism has met with some controversy (with allegations that it has been used to fund palm oil plantations in Indonesia), but it has been used to fund conservation projects in developing nations such the Valparaiso Project in Brazil and Keo Seima Wildlife Sanctuary in Cambodia.	Markets in quotas and permits are not without controversy, and require a stable policy environment to be effective, as an over-supply of permits can damage markets and the resources they seek to protect.

Leadership

Biodiversity projects have been part of firms' corporate social responsibility toolkit for decades, and organisations such as HSBC have done excellent work with international conservation foundations such as IUCN and WWF[35]. However, this type of work, although extremely worthwhile, does not address the systemic threats facing global biodiversity which arise from unsustainable development patterns.

Biodiversity still has low recognition amongst financial services professionals, and although societal awareness of the threats facing ecosystems is growing, it still has only a marginal impact on the consciousness of financial service organisations.

Momentum does appear to be growing, and awareness of biodiversity issues is beginning to penetrate investment analysis, where risks arising from new legislation, breaching of quotas, fines and third-party claims, usage rights, suspension of permits or licences, refusals to grant licences, legal proceedings (particularly around transaction risks and major developments) are prompting analysts to take taking firms' biodiversity management into account in valuations and estimates of future profitability, particularly in the SRI sector.

35 WWF 2017 ***Five Years Five River Basins: Funding Freshwater Conservation Through The HSBC Water Programme*** https://www.wwf.org.uk/sites/default/files/2017-06/170324_HWP-five-years-five-rivers.pdf

UNEPFI's Biodiversity Principles Recommendations for the Financial Sector[36], published in 2011, have been followed by some positive signs - ASN Bank from The Netherlands has put biodiversity at the heart of its corporate plans, with the target that all investments and loans of ASN Bank result in a positive effect on biodiversity in 2030[37].

Unlocking Forest Finance (UFF)[38] brings together NGOs, environmental and social sector safeguarding institutes, financial sector experts and strategic advisors including Credit Suisse, the European Investment Bank and Althelia Ecosphere in order to catalyse the creation of new financial mechanisms to stop the conversion of tropical forest for commodity production, and to support a shift towards more sustainable modes of development.

Furthermore, awareness is growing of the 'physical risks' stemming from climate change and environmental depletion. One estimate puts the financial losses from physical risks related to climate change at between $2.5 and $24.2 trillion[39].

Supervisory authorities and central banks are beginning to take a closer look to the new categories of environmental-related financial risks, which sends a strong signal to market participants. For example, in its '2019 risk map for the banking sector', the ECB features for the first time climate risk as one of the key risks for the European banking sector. These initiatives are still small scale and are dwarfed by the flow of finance into unsustainable activity, but indicate a shift in awareness and understanding at the margins.

As Finance Watch has argued in a recent report (see Box 2)[40], while there is much that can be done to help private finance address biodiversity loss, the scale of the problem will also require a substantial public investment plan, using a range of mission-oriented financial institutions and tools, including monetary policy, to transform systems of production and consumption as well as crowding-in more private funds.

36 UNEPFI & VfU 2011 **Biodiversity Principles – Recommendations For The Financial Sector** https://www.unepfi.org/fileadmin/documents/biodiversity_principles_en.pdf

37 https://www.asnbank.nl/over-asn-bank/duurzaamheid/biodiversiteit/biodiversity-in-2030.html

38 https://www.globalcanopy.org/what-we-do/financing-sustainable-landscapes/unlocking-forest-finance

39 Dietz S, Bowen A, Dixon C, Gradwelli P 2016 C*limate Value At Risk Of Global Financial Assets*, Nature Climate Change, Vol 6, No 7 pp676-679

40 Finance Watch 2019 ***Making Finance Serve Nature*** https://www.finance-watch.org/publication/making-finance-serve-nature-report/

Box 2: Recommendations from "Making Finance Serve Society", Finance Watch 2019

- ***Broaden the scope of the Network for Greening the Financial System (NGFS) to integrate environmental risks***
- ***Create an international Taskforce for Nature-related Financial Disclosure***
- ***Support better data collection to close the data gap***
- ***Help natural capital accounting to become mainstream by carefully settling the methodology***
- ***Help natural capital accounting to become mainstream in national accounts and ensure it is used to inform policy making and economic development strategies***
- ***Request listed companies to assess and disclose their interaction with natural capital***
- ***Review the mandate, capitalisation and governance of public and development banks to expand funding towards ambitious CBD objectives***
- ***Align corporate, investor and supervisory horizons to the long term.***

Conclusions

Awareness of biodiversity risk within the financial services sector is still at an extremely low level. Macro-economic systems, regulation, and classical economic theory continue to drive unsustainable growth patterns.

Markets can be a powerful force for good, but they require direction and parallel, complementary initiatives in the public sector.

The damage that society continues to inflict on biodiversity, and the ecosystems which support it, arise from economic activity that fails to take account of externalities. Reducing this damage will require:

- significant intervention by regulators in order to internalise costs into decision-making;
- effective metrics to measure performance;
- a combination of private and public finance; and
- a realisation that ecosystems do not exist in isolation, and that unlocking the value of nature requires that the rights and interests of indigenous populations must be harnessed in the protection of biodiversity.

Acknowledgement
This supplement builds on the work done by Finance Watch in their 2019 report "*Making Finance Serve Nature From The Niche Of Conservation Finance To The Mainstreaming Of Natural Capital Approaches In Financial Systems*"

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