



Finance Watch

Making finance serve society


Making Finance Serve Nature

From the niche of Conservation finance to the mainstreaming of Natural Capital approaches in financial systems

A Finance Watch report



May 2019



“Destroying rainforest for economic gain is like burning a Renaissance painting to cook a meal.”

E. O. Wilson

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A Call to Action

There is a reason why this report is called Making Finance Serve Nature: it won't be a spontaneous process. Forty years of financialization have largely removed transmission mechanisms between general interest considerations and decision-making within finance and the economy. Some will argue that this is an understatement and that the primacy of (short-term) shareholder interests has actually accelerated climate change and the depletion of natural resources – while increasing social inequalities.

We need to take a hard look at the current economic paradigm if we are to avoid environmental breakdown. Happily, we are not starting from scratch. There has been amazing work going on in conservation over the past decades – including in conservation finance. Our initial focus is to try to understand why efforts to scale it up have had such limited success so far.

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, a sixth of the estimated global funding need. And of this, 80 per cent comes not from financial markets but from public and philanthropic sources. In this paper, we explain why we think that scaling up finance for nature will need an approach that considers the bigger picture of the financial system.

A key insight is that the environment is a public good which, by nature, is often not well suited to market financing by mainstream private investors. As part of the effort to support an ambitious new Convention on Biological Diversity strategic plan, to be agreed in 2020 at COP 15, we suggest that making finance serve nature requires the following four-step approach:

1 Show political ambition

Recent reports by the [IPCC](#) and [IPBES](#) leave little doubt: the combination of climate change and the depletion of biodiversity and ecosystems puts our societies on the path to environmental collapse. The science-based analysis of both groups calls for a profound transformation of our economic model as the only way to avoid the worst. Young people are calling for immediate action by governments. And rightly so: without additional resources, world leaders can start steering the economy out of fossil fuels and nature-depleting activities. Public subsidies to energy, agriculture, fisheries and other sectors and all public expenditures must be aligned with environmental objectives. Environmental and economic regulation, accounting rules, reporting requirements must be reviewed and enforced to match the scale and urgency of the problem.

2

Draft a plan to bail-out nature

Nature is the ultimate too-big-to-fail. If it goes, the economy – and in fact our very species – goes with it. We cannot just wait for the (private) financial system to be re-designed and re-purposed for conservation finance to scale up. Reforming private finance is a key part of the response but a public investment plan must also be drawn up and activated using the panoply of mission-oriented financial institutions and tools, including monetary policy, to transform our systems of production and consumption (the good news is that such a plan would mechanically draw in substantial private funds). Trillions were made available to save banks following the last financial crisis. Surely nature deserves the same attention.

3

Mandate central bankers to act on environmental risk

While policy-makers around the world, with the EU showing leadership, are looking at ways to align private finance to climate objectives, the most promising push to re-direct mainstream capital flows could come from central bankers. Their considerable monetary policy capacity has to be part of a climate and nature bail-out plan, and they have powerful instruments within the macro-prudential toolbox, which they are already contemplating using in relation to climate-risk. 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.

4

Support a science-based toolkit

The above three steps all require an approach to measurement that captures the complex interactions between economic and financial activities and biodiversity and ecosystems. Techniques have been developed to value natural capital in biophysical or monetary terms, allowing us to identify unaccounted values and to price in negative environmental externalities that are currently not factored in the value chain and so incorrectly perceived as having no benefit or cost. Tools to measure risks and dependencies should be improved where necessary and their use mainstreamed. Biodiversity and ecosystem services indicators should be used at government, financial and business levels to steer the necessary transition to a sustainable economy, supported by a revision of the incentives that drive financial short-termism.

The aim of this paper is to map the landscape and some of the options for action, as we currently see them.

We hope that you will join our call to action and partner with us in pushing for change!



**Benoît Lallemand,
Secretary General
of Finance Watch**

Policy ideas

1

Broaden the scope of the Network for Greening the Financial System (NGFS) to integrate environmental risks

Central banks and supervisors already plan to assess **climate-related risks** and integrate them into prudential supervision, having acknowledged them as a source of financial risk (e.g. mapping risks, conducting stress tests, releasing guidelines). During the next CBD, governments should request central banks and supervisors also to include **natural capital (or environmental) related risks**: the mechanisms, sources of risk and tools are so close to climate-related risks that it makes sense to include the full range of environment-related risks.

As a first and easy step, **financial supervisors and central banks should request financial institutions to disclose how they are taking natural capital-related risks into account**. They should also conduct environmental-related stress test to assess the risks. Once the financial risks are assessed, **central banks and supervisors should use their macro-prudential tools** (e.g. systemic risks buffer, sectoral leverage ratio, maximum credit ceiling) and monetary policy (e.g. collateral framework) to incentivize a shift from unsustainable towards sustainable activities, reducing the (systemic) risks as required by their mandates.

2

Create an international Taskforce for Nature-related Financial Disclosure

The G20's Task Force on Climate-related Financial Disclosure (TCFD) could serve as a model for a **new taskforce on nature-related, or environmental, disclosures**. The new taskforce could serve as a knowledge-sharing platform to **improve and harmonise methodologies** for assessing both **businesses dependencies and impacts on natural capital, and natural capital related financial risks**.

3

Support better data collection to close the data gap

Acting as a one-stop shop, an international platform that integrates government agencies, international organizations, data centres and science institutes to share information and methodologies about natural capital could help to **make data on natural capital more accessible, harmonised, and of even quality**, thus improving the measurement of biophysical and monetary values used in natural capital accounting, reporting and decision-making. As multiple types of value co-exist (e.g. ecological, cultural, monetary), integrated valuation frameworks that allow the consideration of trade-offs should be preferred.

4

Help natural capital accounting to become mainstream by carefully settling the methodology

Various models exist for corporate natural capital accounting. To ensure a consistent way of showing hidden costs and externalities, there is a need to **settle the methodologies** and consider **how to integrate them** with financial accounting practices (e.g. inside IFRS/US GAAP or not). This will need care to avoid negative incentives (e.g. the distinction between representing natural capital as a stream of future receipts or as a liability which has to be maintained).

5

Help natural capital accounting to become mainstream in national accounts and ensure it is used to inform policy making and economic development strategies

As an important component of a national economic development strategy in a “beyond GDP” agenda, a growing number of countries **integrate natural capital accounting in their national accounts**. More should do so, disclose how, and use it in their public policy decisions.

6

Request listed companies to assess and disclose their interaction with natural capital

With the natural capital tools now available, companies can more easily assess their dependencies on natural capital, the associated risks, and the impacts of their operations on natural capital. Meanwhile, companies that undertook natural capital assessments so far mainly did so for reputational or ethical reasons. The next necessary step will be to require **mandatory and harmonised disclosure**, integrated with financial reporting, as a pre-condition for financial institutions, policy makers and supervisors to take this dimension into account.

7

Review the mandate, capitalisation and governance of public and development banks to expand funding towards ambitious CBD objectives

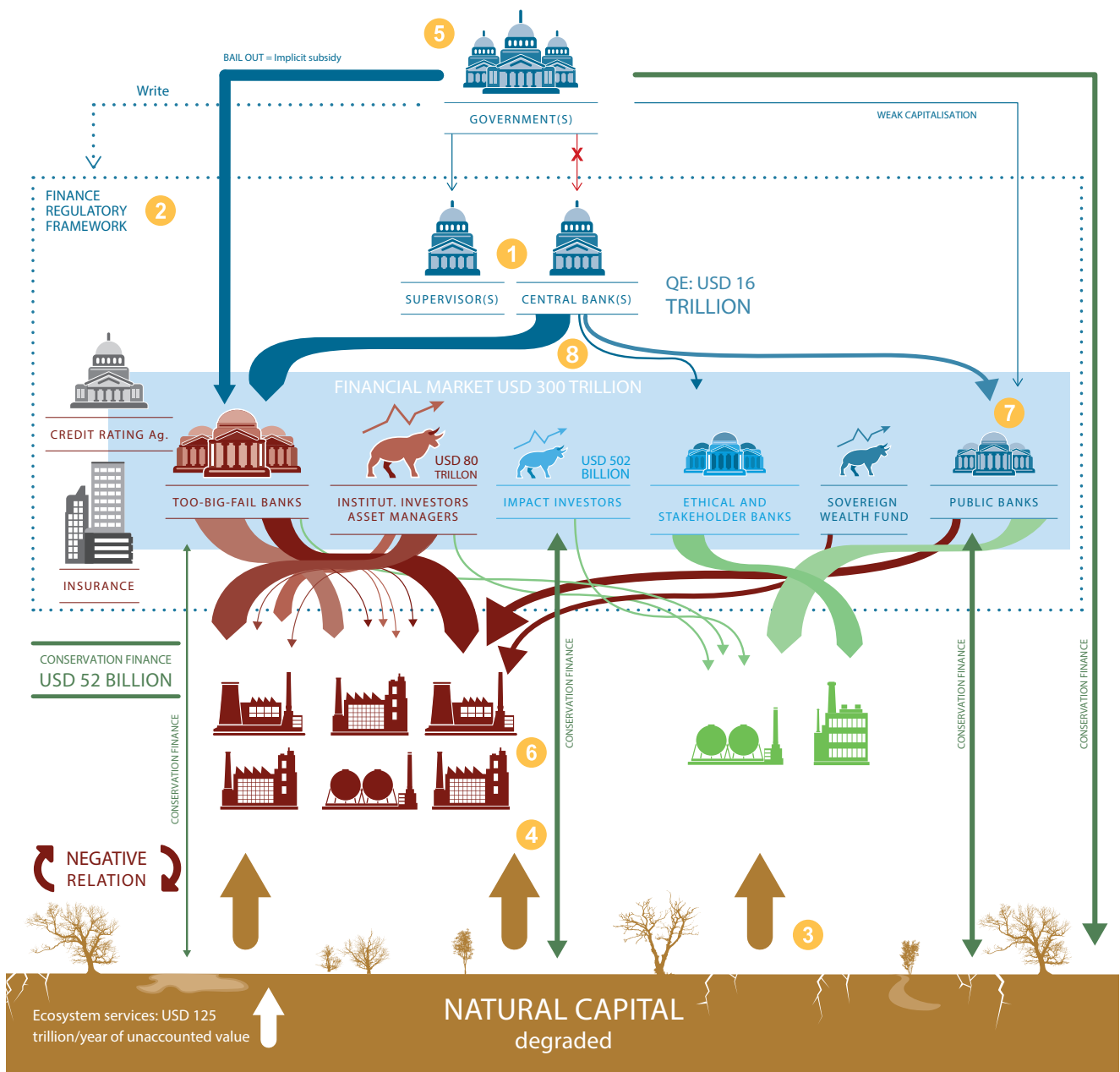
Public and development banks can provide funding that the private sector will not, for example because most conservation projects have public or common goods characteristics with low financial returns, or long-term payback periods (the ‘Tragedy of the horizon’). Governments should **review the mandates of public finance institutions to match CBD and Paris Agreement objectives, and remove potential barriers to their expansion**.

8

Align corporate, investor and supervisory horizons to the long term

Measures to tackle financial short-termism have been proposed but rarely adopted. Ideas worth considering include better disclosure of portfolio churn, tax and governance incentives for longer ownership periods, longer-term remuneration structures for company directors and asset managers, less quarterly reporting by companies, less annual benchmarking by asset managers, revisions to accounting standards (including addressing issues related to the use of ‘fair value’ accounting), and revisions to the supervisory toolkit (e.g. expanding stress test time horizons).

1 . FINANCE IGNORING NATURE



Finance supporting nature – the big picture

The risk of environmental collapse, resulting from natural capital depletion, is more and more described as a **systemic risk** : i) intrinsically systemic because of complex mapping of interdependence and interconnectedness between elements of the ecosystem, ii) but also potentially financially systemic because the financial system shares similar characteristics and risks of contagion. Consequently, there is a need to assess risks at the aggregate level, requesting central banks and supervisory authorities to map these risks, model their interactions with the economic and financial system, and, most of all, to mitigate them by finally acting on the causes.

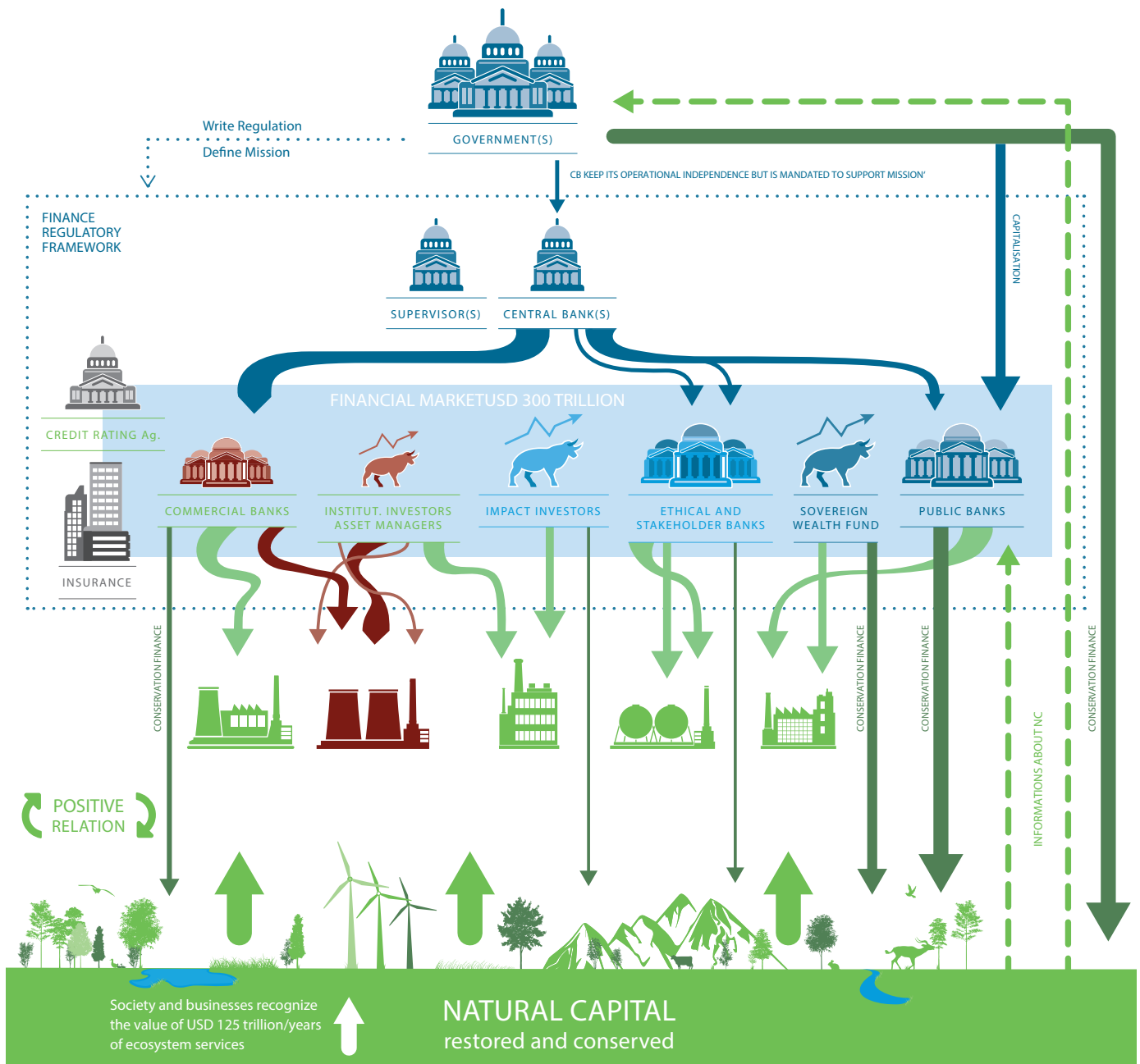
1 2

3 4

5 6

As private financial institutions are driven by a simple **'risk/return' ratio** , 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 impact the return expected from activities they invest in by showing the

2. FINANCE SUPPORTING NATURE



hidden costs of economic activities and internalizing these negative externalities in the production cost. If investing in environmentally harmful activities finally leads to lower returns and more risk than sustainable activity, financial institutions will automatically shift their investment.

8

But 'Finance' cannot **see, think and act long term** when structural characteristics are incentivizing financial institutions to think and act short-term. A prerequisite to a 'Finance supporting nature' will then be to solve this 'Tragedy of the horizon'.

7

As private finance is generally ill-suited to conservation finance, there is a need to **unlock 'mission-oriented' financial institutions**: that is financial institutions which do not only 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).

Introduction

There is a growing awareness that environmental degradation is causing biodiversity and ecosystems as a whole to reach breaking point. Report after report, it appears more clearly that our increasing impacts on nature and the depletion of our stock of natural capital are severely testing the ability of the Earth to regenerate and provide for people's most basic needs.

The Convention on Biological Diversity (CBD) is the most comprehensive global treaty dealing with nature conservation and sustainable use. During the conference of the parties (COP) to the convention of biodiversity in Nagoya, in Japan's Aichi Prefecture, in 2010, world governments agreed to a strategic plan for biodiversity conservation, including 20 targets to be met by 2020. The finance needs for implementing these twenty *Aichi Biodiversity Targets*¹ have been estimated to be USD 150-440 billion per year.²

Prior to and during the negotiation of the CBD's strategic plan 2011-2020, there were substantial discussions about the use of economic instruments and financial mechanisms to facilitate extended conservation and sustainable use of biodiversity. Increasing the involvement of the private sector and markets was emphasized as one of the ways to enhance the financial basis for CBD related actions, and more broadly for conservation projects. Based on the fact that public purses were insufficient, and the assumption in some quarters that public finance could not be raised, a series of innovative financial mechanisms was suggested to help crowd-in private investment - such as *Payments for ecosystem services, Biodiversity offsets, Markets for green products, etc.*

The Convention's Conference of the Parties is expected to update this strategic plan in 2020 – or to adopt a new post-2020 global biodiversity framework. It is an important occasion to adapt the toolbox for the next decade, starting by taking stock and addressing some important questions: are these mechanisms fit for purpose? Can an 'ecosystem service' be actually sold? Is it desirable? Can a market for green commodities make agriculture and forestry more sustainable? What other approaches can we take?

There has been intense debate about this in recent decades among conservationists, NGOs and academics. Some NGOs and academics argue that nature cannot be valued in monetary terms and that trying to do so is a first step to its commodification. Others argue that the depletion of nature is a result of markets attributing zero value to nature, and that giving a money value is a first step to protecting nature. Either way, the urgency and lack of public and private funding calls for a flexible and open approach in which every potential solution has a chance to prove itself.

This report is the first of a series of papers exploring options to make finance serve nature rather than participate in its destruction. In the first two sections of this paper, we present the problem and the main concepts of 'natural capital' and 'ecosystem services'. In the third section we discuss the current mechanisms for conservation finance, the funding requirement, and where we stand now. The fourth section looks at other possible approaches including: using natural capital accounting techniques (valuation, accounting, reporting, risk-assessment) to internalise the costs of negative environmental externalities; reviewing the role of supervisory authorities and central banks; and the case for promoting mission-oriented financial institutions. We conclude with a look at the positive and negative aspects of using natural capital and ecosystem service concepts, and the various approaches they give rise to.

1 E.g. Target 6 - "By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, [...]"; Target 11 - "By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed [...]"; etc. More information: <https://www.cbd.int/sp/targets/>

2 UNEP/CBD/COP/11/INF/20, quoted in: KETTUNEN, M., D'AMATO, D., TEN BRINK, P., MAZZA, L., MALOU, A., WITHANA, S., Potential of sectoral resource mobilisation to implement the Aichi targets in developing countries, 2013, Institute for European Environmental Policy (IEEP), Brussels, Belgium, 87 pp

I. Context



Context

1 The risk of an environmental collapse

Ecosystems and living organisms are experiencing a series of dramatic changes: pollution, ecosystem disruption and increased rate of extinctions. Our increasing impacts and depletion of our stock of Natural Capital are severely testing the ability of the Earth to provide for people's most basic needs. In 2009, the Stockholm Resilience Centre brought together 29 leading Earth-system scientists, who proposed a set of nine critical Earth-system processes with biophysical thresholds, or 'tipping points', called 'Planetary boundaries'.³ Crossing such thresholds could lead to irreversible environmental change, undermining the 'safe space for human development'. Four of them have already been crossed: biodiversity integrity, climate breakdown, land-system change and altered biogeochemical cycle (nitrogen and phosphorus cycles).⁴

As stated in the May 2019 report of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), climate breakdown is the driver of change that will increase most in the coming years, and the one that exacerbates the influence of others by weakening all natural recovery mechanisms.⁵

"75 per cent of the land surface, 66 per cent of the ocean area, 85 per cent of wetlands (area) has now been significantly altered by multiple human drivers"

IPBES 7, May 2019

Regarding biodiversity, the most recent living planet index found that species population sizes have decreased by 60 per cent between 1970-2014.⁶ In the last few decades, habitat loss, overexploitation, invasive organisms, pollution, toxification, and more recently climate disruption, as well as the interactions among these factors, have led to the catastrophic declines in both the numbers and sizes of populations of both common and rare vertebrate species.⁷ In addition, 27 per cent of species assessed by the International Union for Conservation of Nature (IUCN) as part of the 'Red list' process are threatened with extinction.⁸ The values are higher for specific groups e.g. amphibians and corals (40 per cent and 33 per cent threatened respectively). Over 40 per cent of insect species are threatened with extinction.⁹

Heavily mechanized, capital-intensive agriculture is a major cause of environmental pollution, including large-scale nitrogen- and phosphorus-induced ecosystem disruption. At the planetary scale, the additional amounts of nitrogen

3 The global perspective does not reveal critical local or regional thresholds of resource stress (such as for freshwater and phosphorus use), these may have serious consequences long before showing up at the planetary scale.

4 ROCKSTRÖM et al, *A safe operating space for humanity*, Nature, 2009

5 DIAZ, S., et al., Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019, IPBES, 25.

6 2018 living planet UN Global outlook

7 CEBALLOS, G., EHRLICH, P. R., DIRZO, R., *Biological annihilation via the ongoing sixth mass extinction signaled by vertebrate population losses and declines*, 2017, PNAS, 114 (30)

8 <https://www.iucnredlist.org/>

9 SANCHEZ-BAYO, F., WYCKHUYS, K.A.G., *Worldwide decline of the entomofauna: A review of its drivers*, Biological Conservation, Volume 232, April 2019, Pages 8-27

and phosphorus activated by humans significantly disturb the global cycles of these two important elements — especially under conditions of poor water retainment due to local deforestation — resulting in the pollution of waterways (a process known as *eutrophication*)¹⁰ and coastal zones, and in additional contributions to the greenhouse effect via the release of N_2O .¹¹

Figure 1: Planet boundaries



Source: Stockholm Resilience Centre

As far as agriculture is concerned, a recent report from the **Food and Agriculture Organization of the United Nations (FAO)** shows 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. Report also shows that some species that contribute to vital ecosystem function, such as pollinators, earthworms or fungi are in sharp decline as a consequence of pollution, overexploitation, degradation of habitats and pesticides.¹² While forest areas are predicted to decline by 13 per cent from 2005 to 2030, mostly in South Asia and Africa,¹³

10 Synthetic fertilizers are usually highly concentrated in Nitrogen (N) and Phosphorus (P). When lack of physical barriers, due to deforestation and erosion, allow the accumulation of N & P in waterways, the excess of nutrients results in the proliferation of algae, which consume CO₂ to produce oxygen; but when these algae die, bacteria degrade their organic matter and consume the available oxygen to breath, which eventually results in the lack of oxygen (*hypoxia*), threatening the survival of other species, and releasing gases. This process, which may also be triggered by wastewater, does not only damage biodiversity, but may eventually have harmful consequences on economic activity (tourism, fisheries,...etc.). Preventing eutrophication is thus a crucial element in the preservation of our natural capital and ecosystem services. Cf. NIXON, S., "Coastal marine eutrophication: a definition, social causes and future concerns", *Opheleia* 41 (1995), pp. 199-219; Conley et al., 'Controlling eutrophication: nitrogen and phosphorus', *Science*, vol. 323 (2009), pp. 1014-1015.

11 GERBER, P.J., et al., *Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities*, Food and Agriculture Organization of the United Nations report (FAO), Rome, p. 7.

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

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

land degradation hotspots cover approximately 29 per cent of global land, where 3.2 billion people reside.¹⁴ According to IPBES 7, land degradation has reduced productivity in 23 percent of the global terrestrial area.¹⁵ In Europe, 12 million hectares of agricultural areas suffer from severe erosion and are estimated to lose around 0.43 per cent of their crop productivity annually, for an annual cost of loss in agricultural productivity is estimated at around EUR 1.25 billion.¹⁶

While highly valuable in itself, a healthy ecosystem is also essential to human wellbeing and health for numerous obvious reasons. While it is the basis of

our global food system and numerous medical treatments,¹⁷ a failure to integrate strong sustainability concerns leads to very tangible impacts on human health, as illustrated by the number of lives lost as a result of indoor and outdoor air and water pollution which totals nine million each year.¹⁸

At the same time, public information and concerns about the status of the environment are increasing.

The most striking example of changing public attitudes towards environmental degradation, and specifically

climate related issues, is the recent school strikes in which children across the world are demanding action from governments. While protecting the environment is important for 94 per cent of Europeans, they are most likely to say that climate breakdown is one of the most important environmental issues (51 per cent), followed by air pollution (46 per cent) and the growing amount of waste (40 per cent).¹⁹ The rising market for organic food and sustainable agriculture products — USD 89.7 billion in 2016²⁰ — also illustrate the general desire of a growing number of citizens to change their consumption in accordance with health and sustainability concerns.

“Ecosystems are being degraded at an unprecedented rate. Our global food systems and the livelihoods of many millions of people depend on all of us working together to restore healthy and sustainable ecosystems for today and the future.”

José Graziano da Silva, FAO Director General

While environmental regulations are key and their scope is expanding (e.g. the numerous European initiatives such as the *EU action Plan for nature, people and the economy*, the *EU Circular economy action plan*, among others), the scale of the issue calls for a major shift and an integration of the sustainability focus at each level of the society.

The scope of these issues, and the interdependence between them, implies that no solution can be found without agreement on the diagnosis in the first place, the last IPBES report being a huge step in this direction, on the policies that could tackle it and a

14 UNEP, *Global Environment Outlook 6 - Key Messages*, 2019

15 IPBES 7, p.2.

16 PANAGOS, P., STANDARDI, G., BORRELLI, P., LUGATO, E., MONTANARELLA, L., BOSELLO, F., *Cost of agricultural productivity loss due to soil erosion in the european union: from direct cost evaluation approaches to the use of macroeconomic models*, 2018, *Land Degradation & Development*, 29(3), 40p.

17 A recently updated review of “*approved therapeutic agents between 1950 and 2010*” for antitumor drugs showing that 70 per cent of non-synthetic small molecules were from or derived from natural products. Sources: NEWMAN, CRAGG, *Natural Products As Sources of New Drugs over the 30 Years from 1981 to 2010*, 2012; GROOTEN, M., ALMOND, R.E.A. (Eds), *Living Planet Report - 2018: Aiming Higher*, 2018, WWF, Gland, Switzerland

18 UN Environment Global Environmental Outlook [REF CHECK]

19 More than a third consider the pollution of rivers, lakes and groundwater an important issue (36 per cent), while around a third choose the following issues: agricultural pollution and soil degradation (34 per cent per cent), the decline or extinction of species and habitats, and of natural ecosystems (33 per cent per cent) and marine pollution (33 per cent per cent). Source: EC, “Attitudes of European citizens towards the environment”, Special Eurobarometer 468 - October 2017, Url.: http://ec.europa.eu/environment/eurobarometers_en.htm

20 LERNOUD, J., POTTS, J., SAMPSON, G., GARIBAY, S. et al., *The State of Sustainable Markets – Statistics and Emerging Trends 2017*, ITC, Geneva, 196p.

hierarchy of targets. **It is in this context that the CBD's Conference of the Parties is expected to update its strategic plan in 2020 – or to adopt a new post-2020 global biodiversity framework.** This growing awareness on the global unsustainability of a large part of human productive processes is hoping to push for an ambitious agenda.

The question of the impact of economic activities, and of the role of finance in the allocation of capital towards certain activities, is at the heart of the required change.

2 Nature and the economy

The depletion of nature described above is harming the economy and calling into question the sustainability of many activities on which we rely.

2.1 Dependencies on nature and impacts

Most business models are based on a linear production system — which relies on extraction of raw materials, processes into products, consumption and waste — **and assume the ongoing availability of unlimited and cheap natural resources.** This is unsustainable because non-renewable resources (e.g. fossil fuels, metals, minerals) are increasingly under pressure, while renewable resource (e.g. forest, soils, rivers), are declining in their availability and more fundamentally, in their regenerative capacity.²¹

And some specific business activities can cause adverse impacts on biodiversity, nature and ecosystem services very directly by depleting resources. For example, as a consequence of unsustainable practices in the fisheries sector, around three quarters of the world's fish populations are now fully exploited, overexploited or depleted. The UN's Food and Agriculture Organisation noted last year that the share of stocks fished at biologically unsustainable levels more than tripled to 33% between 1974 and 2015.²²

Other sectors have direct adverse impacts on the environment which stem from various segments of the value chain (raw materials, manufacturing, transportation of goods, consumer care and end-of-life disposal). The OECD cites the garment and footwear sector as a good illustration. While *“the fashion industry alone is responsible for around 20 per cent of global wastewater”, “Cotton farming is responsible for 24 per cent of insecticide use and 11 per cent of pesticide spread, despite using only 3 per cent of arable land (UNECE, 2018)”*.²³ Regarding wastewater, more than 80 per cent of the world's wastewater is discharged into the environment without treatment. Thus, 300 to 400 million tonnes of heavy metals, solvents, toxic sludge and other waste from industrial installations are discharged into the world's waters each year, while 40 per cent of the global population lacks access to clean, safe drinking water.²⁴

21 SCHOENMAKER, D., SCHRAMADE, W., “Principles of Sustainable finance”, 2019, Oxford, 394p., p.9-10

22 OECD, *Biodiversity: Finance and the Economic and Business Case for Action*, report prepared for the G7 Environment Ministers' Meeting, 5-6 May 2019

23 OECD, 2019, *Ibid.*

24 DIAZ, S., et al., Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019, IPBES, p 17

From an investor perspective, the profitability and long-term survival of some sectors undoubtedly depends on well-functioning ecosystems — the most obvious being agriculture, forestry and fisheries. As illustration, between USD 235 billion and USD 577 billion worth of annual global food production relies on direct contributions by pollinators. Consequently, the loss of animal pollinators would result in an estimated annual net loss in welfare of USD 160-191 billion globally to crop consumers, and an additional loss of USD 207-497 billion to producers and consumers in other markets.^{25, 26}

Based on the review of more than 2000 studies, **the last report of the IPBES found a sharp decline since 1970 in 14 of the 18 established categories** of nature's essential contributions to human well-being and economic activity (mostly regulating and non-material contributions, such as the pollination mentioned above).²⁷

2.2 The environmental negative externalities

Until now, this unsustainable pressure on ecosystems has not been a factor weighing on the decisions of economic actors.

Recognized as one of the classic market failures, the failure with respect to externalities lies in the fact that prices do not account for environmental costs — costs associated with environmental damage imposed on society. The price of a product in the market typically includes only private costs for inputs (e.g. raw materials, energy, water, labour, packaging, transport, capital, etc.), completely leaving out such external costs. Applying economic valuation (see section 4.2) at an aggregate level, **the environmental negative externalities of the main primary production (e.g. agriculture, forestry, fisheries, mining, oil and gas exploration, utilities) and primary processing (e.g. cement, steel, pulp and paper, petrochemicals) sectors have been estimated to a total of USD 7.3 trillion, which equates to 13 per cent of global economic output in 2009.** The majority of these costs are from greenhouse gas emissions (38 per cent) followed by water use (25 per cent), land use (24 per cent), air pollution (7 per cent), land and water pollution (5 per cent) and waste (1 per cent).²⁸

As largely recognized, incorporating such environmental costs, or negative externalities, in the prices of goods and services is one of the key options to embark on the path towards greater sustainability.²⁹ But nowadays, companies have little to no incentives to internalize such externalities.

It should be pointed that while the internalization of negative environmental externalities is an important step, it is not a perfect tool as the interests of future generations cannot be reflected in the estimation of current environmental costs. This would require a calculation of an intergenerational environmental externality,³⁰ which appears is beyond the scope of the present report.

25 OECD, 2019, *Op.cit.*

26 IPBES, *Summary for policymakers of the assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production*, 2016, Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany, 36 pages.

27 DIAZ, S. et al., *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, 2019, IPBES, p. 10

28 TRUCOST, *Natural capital at risk: the top 100 externalities of business*, 2013, p. 8-9

29 NGUYEN, T. L. T., LARATTE, B., GUILLAUME, B., HUA, A., *Quantifying environmental externalities with a view to internalizing them in the price of products, using different monetization models*, 2016, Resources, Conservation and Recycling, n°109, p.13-23

30 BITHAS, K., *Ibid.*

Box 1: Unsustainable activities still receive public subsidies

While evidence piles up on the unsustainability of many productive activities, those same activities continue to attract public subsidies. As an illustration, government support for agriculture that could potentially harm nature amounted to USD 100 billion in 2015 in OECD countries. Fossil fuel subsidies amount to USD 345 billion (compared with a global cost of USD 5 trillion in negative externalities). The vast majority of government support for maintaining fishing capacity, amounting to tens of billions of US dollars, is spent on investments that cause the degradation of natural resources.³¹ Note, however, that often behind these subsidies stand vested political interests which means that they are difficult to abolish.

2.3 The investment need for ecosystem restoration and conservation

How much financing is needed to meet targets on reducing loss of biodiversity and damage to nature?

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. They notably aimed at reducing the direct pressures on biodiversity, promoting its sustainable use, safeguarding ecosystems, species and genetic diversity, while also agreeing on specific targets — e.g. the restoration of at least 15 percent of degraded ecosystems.³²

The financing needed to implement these targets has been estimated in the range **USD 150-440 billion per year** according to a 2011 study conducted for the Secretariat of the CBD.³³

While the existing ABT are widely seen as too modest to save global biodiversity and ecosystems,³⁴ even they are not being achieved. Indeed, only four of the 20 objectives have had a positive outcome so far, with the last IPBES report denouncing the global increase in anthropogenic causes of biodiversity loss through the destruction of natural habitats (particularly by all marine and terrestrial cultures, and the proliferation of invasive alien species).³⁵ With USD 53-80 bn a year (considering all sources),³⁶ the

31 DIAZ, S. et al., *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, 2019, IPBES, p.19

32 E.g. Target 6 - "By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, [...]"; Target 11 - "By 2020, at least 17 percent of terrestrial and inland water, and 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed [...]"; etc. More information: <https://www.cbd.int/sp/targets/>

33 UNEP/CBD/COP/11/INF/20, quoted in: KETTUNEN, M., D'AMATO, D., TEN BRINK, P., MAZZA, L., MALOU, A., WITHANA, S., *Potential of sectoral resource mobilisation to implement the Aichi targets in developing countries*, 2013, Institute for European Environmental Policy (IEEP), Brussels, Belgium, 87 p.

34 "Recognizing the importance of protected areas for conserving nature and its services, the Convention on Biological Diversity (CBD) established a goal to protect 17 per cent of terrestrial land and inland water areas by 2020 through Aichi target 11. [...] Aichi target 11 is achievable but insufficient. Seventeen percent is not a science-based level of protection that will achieve representation of all species or ecosystems in protected areas and the conservation of global biodiversity, as are required by the CBD [...].", in: DINERSTEIN, E., et al., *An Ecoregion-Based Approach to Protecting Half the Terrestrial Realm*, BioScience, Volume 67, Issue 6, June 2017, Pages 534–545

35 DIAZ, S., Loc cit., p.22

36 MUDALIAR, A., DITHRICH, H., *Sizing the Impact Investing Market*, Global Impact Investment Network, 2019, 16p.; OECD, *Biodiversity: Finance and the Economic and Business case for action*, A report for the G7, 5-6 May 2019, 95p., p.64 & p.71

current resource mobilisation is not sufficient to achieve the ABT. Furthermore, from the six global agreements on nature and environmental protection,³⁷ only one of five fixed objectives is clearly being achieved. For nearly one third of the objectives in these conventions, little or no progress towards their achievement has been made, or even completely abandoned.³⁸

That being said, there is no commonly agreed estimation of the cost for a fully comprehensive global conservation program — which would sustainably manage agriculture, forests, freshwater, coastal and marine ecosystems beyond the ABT. While **the most common estimation is that USD 300 to 400 billion per year is needed worldwide**,³⁹ this may be an incomplete and outdated estimation,⁴⁰ or a selective use of the source information.⁴¹ The cost of halting deforestation in developing countries alone is estimated in the range USD 25 to 185 billion per annum.⁴²

In Europe, the financial costs estimated for restoring 15 per cent of degraded ecosystems and their services (target 2 of the EU 2020 Biodiversity Strategy)⁴³ have been estimated, in 2013, to range from EUR 0.5 to 11 billion per annum up to 2020.⁴⁴ While the annual benefits of the EU program Natura 2000⁴⁵ are estimated at EUR 200-300 billion for a cost of implementation of EUR 5.8 billion per year, the Commission estimated in 2017 that there is still funding shortages which are preventing the network from delivering these benefits in full.⁴⁶

While these remain mere estimates, and some discussions remain on the precise numbers, few would disagree with the conclusion: **while the investment needs are substantial and at least USD 300 billion per year worldwide is needed, a fully comprehensive program of restoration and conservation — let alone the cost of a transition to sustainable processes for each sector — would certainly amount to a much higher number.**

37 Convention on the Conservation of Migratory Species of Wild Animals, Convention on International Trade in Endangered Species of Wild Fauna and Flora, Convention concerning the Protection of the World Cultural and Natural Heritage, International Plant Protection Convention, United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, and Convention on Wetlands of International Importance especially as Waterfowl Habitat.

38 DIAZ, S., Loc cit., p.6

39 For example: HUWYLER, F., KÄPPELI, J., TOBIN, J., *Conservation Finance - From niche to mainstream: The building of an institutional asset class*, Credit Suisse, IUCN, Rockefeller Foundation, McKinsey, 2016, 25p.; PWC, CPIC, *Conservation Investment blueprints - A development guide*, 2018, 88p., p.10; McFARLAND, B.J., *International Finance*. In: *Conservation of Tropical Rainforests*. Palgrave Studies in Environmental Policy and Regulation, 2018, Palgrave Macmillan, 680p.; JAMES, A., GASTON, K. & BALMFORD, A., *Can we afford to conserve biodiversity?*, 2001, Bioscience, 51, p. 43–52.

40 Quoting the range of 300 to 400 billion in a 2014 report, WWF and Credit Suisse recognized that these approximations can only be indicative. They based this estimation on the most cited research results which refer to an estimation of the cost of the adoption of sustainable agriculture practices worldwide (Gutman 2010), to the protection of biodiversity outside protected areas (James, Gaston, & Balmford 2001) or to the total ecosystem protection in the context of climate change (Berry 2007). These sources appear only related to a part of the need, or outdated (e.g. Gutman refer to a paper of James et al. (1999) which quote a 1993's UN report and a 1994's FAO report).

41 One of the source which quote such a number refer to the potential size of the market for the most bankable Conservation finance schemes. In other words, this represent the potential profitable market, not the need. Source: *Ecosystem marketplace, Innovative markets and market-like instruments for ecosystem services*, 2013

42 PARKER, C., BROWN, J., PICKERING, J., ROYNESAD, E., MARDAS, N., MITCHELL, A.W., *The Little Climate Finance Book*, 2009, Global Canopy programme, Oxford, 91p.

43 EU transposition of the Target 15 of the ABT

44 TUCKER, G., UNDERWOOD, E., FARMER, A., SCALERA, R., DICKIE, I., McCONVILLE, A., VAN VILET, W., *Estimation of the financing needs to implement Target 2 of the EU Biodiversity Strategy - Report to the European Commission*, 2013, Institute for European Environmental Policy, London, 507p.

45 Natura 2000 is a network of 26,000 natural protected areas that cover almost 20 per cent of the land territory of the European Union.

46 COM(2017) 198, Communication from the Commission - *An Action Plan for nature, people and the economy*, 2017, 7p.

II. Main definitions



II. Main definitions

During the last three decades, the increasing concern for conservation and restoration of the environment, as well as the quest for sustainable development have fostered dynamic debates among earth scientists, economists, governmental authorities and NGOs regarding the strategies to adopt.

Some of the key concepts to emerge from this debate include ‘natural capital’, ‘ecosystem services’ and ‘critical natural capital’. This section looks at the definitions of these terms, which are now an important part of discussions about conservation and restoration of nature.

A considerable part of this conservation movement has centered in on the concepts of natural capital and ecosystem services, notably via the initiative *The Economics of Ecosystems and Biodiversity* (TEEB), the *Millennium Economic Assessment* (MEA) or the release of the Natural Capital Protocol.⁴⁷ In fact, while the expression “natural capital” in the economic and scientific literature has been in use since the first half of the 19th century,⁴⁸ publications on these topics have increased nearly exponentially from the mid-eighties to the early 21st c.⁴⁹

The term biodiversity is somewhat narrower than natural capital, referring only to living organisms. It is worth noting, however, that it is critical to the resilience, health and stability of natural capital and supports ecological and biochemical processes such as the carbon and water cycles as well as soil formation.⁵⁰

1 Natural Capital

Natural Capital consists of a **stock of living and non-living, renewable and nonrenewable natural resources** (e.g. plants, animals, water, soils, minerals) performing specific ecological functions, and which might yield a **flow of potentially valuable goods and services** under specific conditions of management.

The term capital is used as a metaphor: natural capital is not a fungible asset like financial capital. It is instead a way of describing our relationship with nature and measuring and valuing nature’s role so that we can include it in decision-making, policymaking and capital allocation.

As for the precise inventory of the elements that should be included in the natural capital, the list varies from one author to another. Yet, it may include virtually all types

47 Natural Capital Coalition (2016). The Natural Capital Protocol.

48 It was then mostly used then as a mere synonym for “land”. Only with early 20th c. American economist Alvin Johnson was this concept opposed to artificial – i.e. man-made – capital, in a sense closer to its current use. Missemer, A., “*Natural Capital as an Economic Concept, History and Contemporary Issues*”, *Ecological Economics* 143 (2018), pp. 91-93; Johnson, A.S., *Introduction to Economics*, D.C. Heath & Co., Boston (MA), 1909, p. 197; Missemer, A., loc. Cit., p. 92

49 DE GROOT et al., “*Global estimates of the value of ecosystems and their services in monetary units*”, *Ecosystem Services* 1, n°1 (2012), p. 51; McDonough et al., “*Analysis of publication trends in ecosystem services research*”, *Ecosystem Services* 25 (2017), pp. 82-83. With European research accounting for more than 40 per cent of total publications on ecosystem services, followed by the USA (30 per cent) (Ibidem, p. 84).

50 Natural Capital Coalition (2016). The Natural Capital Protocol.

of elements present in the biosphere, lithosphere, aquasphere and atmosphere: rivers, lakes, seas, forests, grasslands, glaciers, animals, etc..⁵¹

More recently, a group of researchers from the UN Environment World Conservation Monitoring Centre (UNEP-WCMC) have developed a new classification system in an attempt to create a common language.⁵²

In the context of this paper we will focus on elements of natural capital that are biological and renewable, can provide goods and services to people and are of value to *both* people and other species.

2 Ecosystem Services

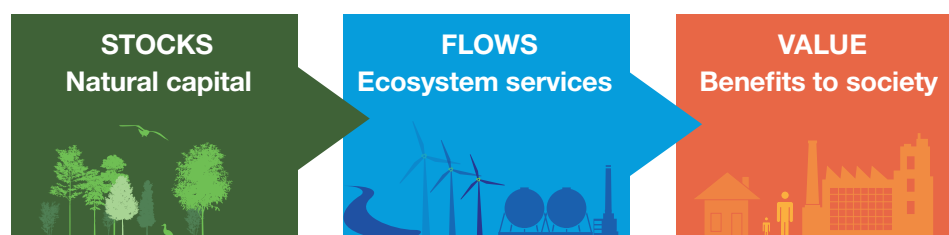
Mainstream definitions refer to ecosystem services as *“the benefits people obtain from ecosystems”*.⁵³

This definition only looks at the benefits of nature for humans, it excludes the benefits for non-human species and ignores any wider, more holistic conception of nature. This is a shortcoming of the term. However, it is worth understanding that the classification of nature’s benefits to humans can help to steer human decision making in ways that protect these other aspects.

Also, as several authors have noted, these definitions are at best incomplete, as they seem to confuse “benefits” with “services”, undermine the ecological dimension of ecosystem services, and overlook the processual character of ecosystem services. Hence a more comprehensive definition defines ecosystem services as *“the ecological characteristics, functions or processes that directly or indirectly contribute to human wellbeing: that is, the benefits that people derive from functioning ecosystems”*.⁵⁴

The following diagram shows the relationship with natural capital from a human perspective.

Figure 2: Natural Capital reproduced from Natural Capital Finance Guide (2018)



As shown in Figure 2 above, natural capital includes ecosystem services. In fact, the literature shows that they are clearly different and complementary, in two important respects. Firstly, whereas the concept of natural capital is focused on *nature*, the notion of ecosystem services highlights the advantages that human societies derive from

51 Cf. WACKERNAEGEL, M. “National natural capital accounting with the ecological footprint concept”, Ecological Economics 29 (1999), pp. 379-380

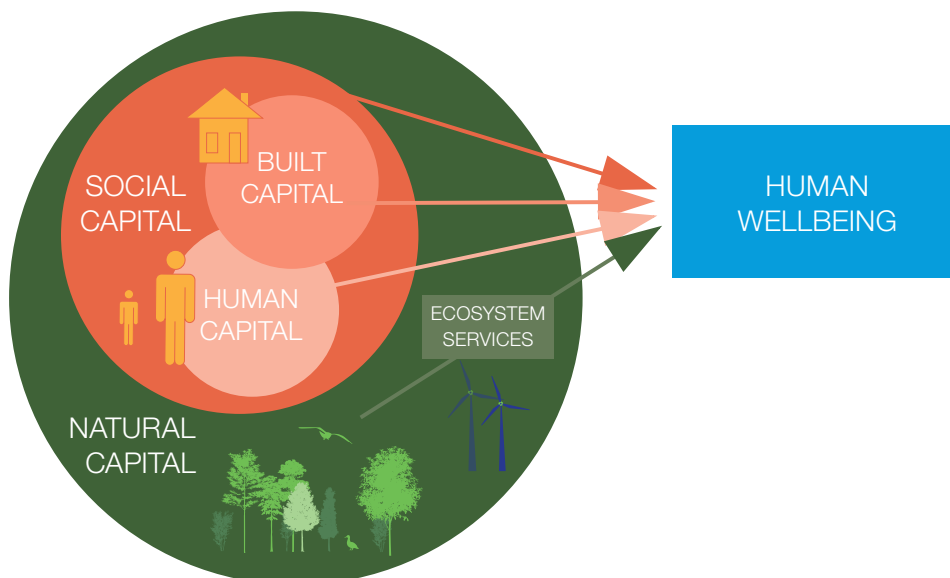
52 LEACHA, K., GRIGGA, A., O’CONNORA, B., BROWNA, C., VAUSEA, J., GHEYSSSENSB, J., WEATHERDONA, L., HALLEB, M., D.BURGESSA, N., FLETCHERA, R., BEKKERA, S., KINGA, S., JONESA, M., *A common framework of natural capital assets for use in public and private sector decision making*, Ecosystem Services 36, 2019, 7p.

53 SALLES, J-M., “Valuing biodiversity and ecosystem services: Why put economic values on Nature?”, *Compte Rendus Biologies* 334, n°5-6 (2011), p. 474; Vassallo P. et al, “Assessing the value of natural capital in marine protected areas: A biophysical and trophodynamic environmental accounting model”, *Ecological Modelling* 355 (2017), p. 12; cf. MEA (2005).

54 COSTANZA, R. et al., “Twenty years of ecosystem services: How far have we come and how far do we still need to go?”, *Ecosystem Services* 28-A (2017), p. 3

nature – this distinction will have an impact on the way to account for both. Secondly, in economic terms, natural capital is a *stock*, generating a *flow* in the form of different ecosystem services to different groups of people. It is also fair to state that a number of ecosystem services are often the result of the interaction of natural, manufactured (built capital), human and social capitals.

Figure 3: Interaction between Natural, Human, Built and Social Capitals



Ecosystem services can be categorised via a number of scientific classifications, however the following list represents the main categories: **Provisioning services:** material outputs from nature, e.g. food and raw materials; **Regulating services:** indirect benefits from nature generated through the regulation of ecosystem processes such as, climate regulation, water purification, pollination, control of pest proliferation, etc.; **Cultural services:** non-material benefits from nature including the recreational, aesthetic and spiritual dimensions of ecosystems; **Supporting services:** the fundamental ecological processes support the delivery of other ecosystem services and that allow the development and reproduction of life.⁵⁵

While the total value of global ecosystem services was estimated in 2011 at USD 125 trillion per year,⁵⁶ the loss of eco-services from 1997 to 2011 due to land use change has been estimated at USD 4.3–20.2 trillion per year.⁵⁷ The Millennium Ecosystem Assessment (2005) concluded that approximately 60 per cent of ecosystem services are being degraded.

55 COSTANZA *et al.* (2017), *Loc. cit.*, pp. 5-6; PELENC, J., BALLEST, J., “Strong sustainability, critical natural capital and the capability approach”, *Ecological Economics* 112 (2015), p. 38; TEEB (2010); MA. 2005a. *Millennium Ecosystem Assessment: Ecosystems and human well being. Biodiversity Synthesis*, Washington DC, Island Press; CICES.

56 COSTANZA, *et al.*, *Changes in the global value of ecosystem services*, *Global Environmental Change* 26, 2014, p.152–158

57 COSTANZA, *Ibid.*

3 Critical Natural Capital

An important expansion (or specification) of the concept of natural capital lies in the notion of **critical natural capital**. Critical natural capital can be understood as **a configuration of natural capital providing and performing essential and irreplaceable ecosystem services**.⁵⁸ The identification of natural capital as critical relies on the identification and determination of the “criticality” of the ecosystem services it provides.⁵⁹

An important aspect of critical natural capital is that it is to some extent context-specific, since ecosystem services that are critical in one location may not be critical elsewhere, this is similar to the context specific consideration of biodiversity.⁶⁰ For example, the mangrove forests in Bangladesh protect shorelines from being devastated by storms and tsunamis, and hence are essential for activities taking place near the coastal areas.

In some cases, damage to critical natural capital may be irreversible and the losses irreplaceable, as where restoration of an ecosystem cannot bring back the previous genetic diversity, or only possible over the very long-term.

The concepts of natural capital and the identification and definition of what constitutes critical natural capital has led to intense debate. In both cases the definitions can be used as a starting point to help estimate economic values of nature. However, it is worth noting that these definitions neither advocate nor discourage the use of economic valuation in any circumstances.

58 EKINS, P. *et al.*, “A framework for Biodiversity is defined as *“The variability among living organisms from all sources including, inter alia, 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.”*. Source: UN. 1992. “Convention on Biological Diversity: Text of the Convention.” United Nations, [Online] Available at: <https://www.cbd.int/doc/legal/cbd-en.pdf> the practical application of the concepts of critical natural capital and strong sustainability”, *Ecological Economics* 44, n°2-3 (2003), p. 161; PELENC, J., “Crossing Sen’s capability approach with Critical Natural Capital theory: toward a new perspective to reconcile human development and Nature conservation goals”, *Bienal conference of the International society of ecological economics “advancing sustainability in time of crisis” - Aug 2010, Oldenburg-Bremen, Germany*; FARLEY, J., ‘Ecosystem services: The economics debate’, *Ecosystem Services*1(2012), p. 42.

59 PELENC, J., BALLEST, J., (2015), *Loc. cit.*, p. 38.

60 *Ibidem*.

III. Finance ignoring nature



III. Finance ignoring nature

During the conference of the parties to the convention of biodiversity (CBD) in Nagoya in 2010, there were substantial discussions about the use of economic instruments to facilitate extended conservation and sustainable use of biodiversity in order to meet the Aichi Biodiversity Targets. At that time, the Global Environmental Facility — which serves as a financial mechanism for the CBD — had just dedicated USD 57 billion total between 1991 and 2012, which fell far short of conservation funding needs.⁶¹

Based on the constraints around public funding and the assumption that public financing cannot be unlocked, emphasis was given to the private sector and the use of market-based mechanisms as a way of funding CBD related actions. The CBD classified six mainly market-based mechanisms known as 'Innovative Financial Mechanisms' (IFMs).⁶² While not being really innovative mechanisms, they include a mix of revenue-raising mechanisms, direct financing mechanisms, and mainstreaming schemes.⁶³

A significant flaw with this approach was that it did not consider whether the fundamental motivations and constraints facing actors in today's financial system are well suited to conservation projects, which are by nature often long-term and bring little immediate financial return.

This section begins with a discussion of conservation finance: its market size, potential evolution and principal limitation; and then launches a discussion about developing a more holistic and integrated approach.

1 Mobilizing the private: the conservation finance niche

Conservation projects and programs have historically been funded largely by public and philanthropic sources. In light of the stagnation and sometimes reduction in this funding,⁶⁴ conservation organizations have increasingly look to diversify their strategies. Impact investing⁶⁵ is one such diversification strategy, which tries to leverage funding from the private sector to support investment that generates a measurable, beneficial social or environmental impact alongside a financial return. The category of conservation finance is sometimes defined as a sub-category of impact

61 BARBIER, E., *The Challenge for Rio+20: Funding*, 2012, Resources article, Web, Url.: <https://www.resourcesmag.org/archives/the-challenge-for-rio20-funding/>

62 Constraints on public finance prevented for years any major increase in north-south biodiversity-related development flows such as the Official Development Assistance (ODA) but many G77 countries suspect IFMs have been promoted by OECD countries to escape what are seen as their historical and economic responsibilities. See LAPEYRE, R., PIRARD, R., KLEITZ, G., *Resource Mobilisation for Aichi Targets: ambiguous lessons from research on market-based instruments*, POLICY BRIEF N°15/12, 2012

63 For these reasons, a dedicated working group inside the CBD has concluded that the term 'Innovative Financial Mechanisms' (IFM) is a confusing and misleading term. They suggested that 'Biodiversity Financing Mechanisms (BFM)' was a better term, and the question is whether the biodiversity community should adopt this or use even broader terms.

64 MILLER, D.C., AGRAWAL, I.A., TIMMONS ROBERTS, J., *Biodiversity, governance, and the allocation of international aid for conservation*, 2013, *Conservation Letters* 6, p.12–20, quoted in: OLMSTED, 2016, Ibid.

65 Social impact investing refers to investments with the "intention to generate a measurable, beneficial social or environmental impact alongside a financial return"

investment, for example they both encompass sustainable agriculture and sustainable forestry.

Conservation finance is the practice of raising and managing capital to support the conservation and restoration of ecosystems and the services they provide over the long term.⁶⁶ Meanwhile, in recent years, practitioners have tended to more narrowly define the area to investments that can generate a revenue stream. At the core of this evolution of conservation finance is the underlying assumption that it is possible to align environmental and economic returns.

Consequently, ‘conservation finance’⁶⁷ vehicles primarily include innovative market-aligned mechanisms, generally based on the conceptual lens of natural capital and ecosystem services, which are deemed to generate returns. **The mainly market-based ‘Innovative Financing Mechanisms’ promoted by the CBD include:** *Ecotourism*;⁶⁸ *Sustainable agriculture*; *Sustainable forestry* (FSC or PEFC certifications); *Green infrastructure*⁶⁹ (where it leads to the conservation of the provision of ecosystem services, such as flood protection, water supply or soil water conservation); or more conceptually debatable mechanisms such as *Payments for ecosystem services*⁷⁰ (payments to land owners or managers to provide or protect ecosystem services, mainly paid by governments), and *Biodiversity offsets* (mechanisms which range from Ecological compensation to Conservation banking).

66 HUWLER, F., KAEPELI, J., SERAFIRMOVA, K., SWANSON, E., TOBIN, J., *Making conservation finance investable*. Stanford Social Innovation Review, 2014

67 Conservation Finance (accessed Feb 2019) <https://conservationfinancenetwork.org/conservation-finance-glossary>. Sometimes the term Biodiversity Finance is also used, although this has a narrower scope than natural capital which includes living and non-living natural capital.

68 Where revenue generated from nature-based tourism is used to conserve and manage natural resources. Revenue streams come from protected area entry, recreation fees (park-related activities such as boat, camping, etc.), sport hunting fees and ‘green’ safaris (...). Source: WWF, *Guide to conservation finance*, p.13-15

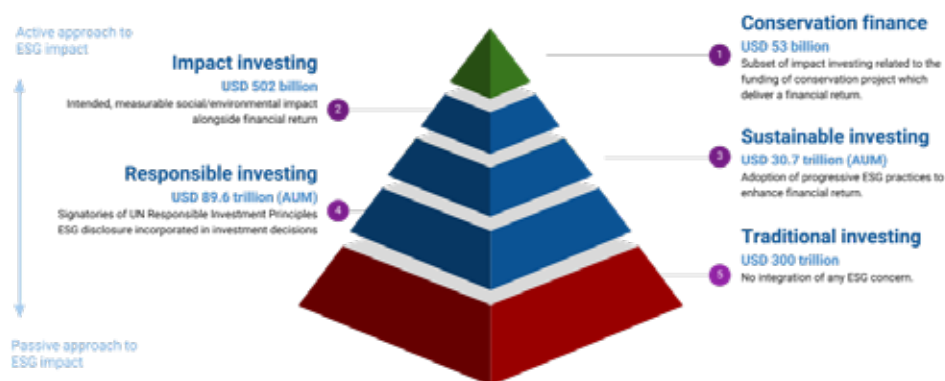
69 Green Infrastructure “is a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas.”

70 Payments for ecosystem services (PES) are defined as payments to land owners or managers to provide or protect ecosystem services. The most common examples are payments for carbon storage, payment for biodiversity conservation or payments for watershed services.

1.1 What is the market size?

As there is some overlap between the categories of responsible investment, sustainable investment, impact investment, and/or conservation finance, we will start by giving some order of magnitude, before exploring the specific category of conservation finance.

Figure 4: Conservation finance and impact, sustainable and responsible investing



Source: Author; based on: City of London, *Specialist Sources of Capital*

Conservation finance constitutes a tiny fraction of total assets, and even of sustainable, responsible, or impact investments. On a total of global financial assets of approximately USD 300 trillion⁷¹ of which ~USD 166 trillion are stocks and bonds, the amount of assets signed up to the UN Principles for Responsible Investment (UN PRI)⁷² represents approximately USD 89.6 trillion. A smaller amount of around USD 30.7 trillion are managed under the label of ‘Sustainable investment’,⁷³ of which USD 14 trillion are for Europe and USD 11.95 trillion for the US.⁷⁴ This label includes many subdivisions unrelated to nature conservation, however the category ‘Sustainable themed investment’ includes investments that address climate breakdown, food, water, renewable energy, clean technology and agriculture. These were said to represent USD 1 trillion in 2018. Another overlapping category is Impact investment with a market size of USD 502 billion in 2018,⁷⁵ from which conservation finance is a subset.

In comparison, the global scale of funding for conservation finance mechanisms in 2010 was estimated between USD 51.5 and 53.4 billion. Of this, 80 per cent comes from non-market sources (mainly government spending and philanthropy) and only 20 per cent comes from market-based activities (13 per cent from green commodities like timber, fisheries, etc. and 7 per cent from direct market payments like carbon offsets).⁷⁶ As an

71 WITOWSKI, W., *Global stock market cap has doubled since QE's start*, Market Watch, 2015

72 Responsible investment is an approach to investing that aims to incorporate environmental, social and governance (ESG) factors into investment decisions, to better manage risk and generate sustainable, long-term returns. Meanwhile, one in 10 of the signatories have been placed on a watchlist for failing to show they are taking their commitment seriously enough, amid wider criticism of the body itself by investors.

73 GSIA, *2018 Global Sustainable Investment Review*, April 2019, 29p., Url.: http://www.gsi-alliance.org/wp-content/uploads/2019/03/GSIR_Review2018.3.28.pdf

74 We should use this figure with prudence as 20 trillion is for only one category, ‘Negative/exclusionary screening’, which is about “The exclusion from a fund or portfolio of certain sectors, companies or practices based on specific ESG criteria”. As the exclusion is made following a screening of a rather long list of potential sector alcohol, fossil fuels, fur, gambling, nuclear, pornography, tobacco, weapons), it's not fully clear what it encompasses and how this relate to our discussion.

75 MUDALIAR, A., DITHRICH, H., *Sizing the Impact Investing Market*, Global Impact Investment Network, 2019, 16p., p.

76 PARKER, C., CRANFORD, M., OAKES, N., LEGGETT, M. ed., *The Little Biodiversity Finance Book*, Global Canopy Programme, Oxford, 2012

illustration, the transactions for biodiversity offsets and compensation projects in Europe for the five-year period 2011-2015 amounted to USD 62.7 million⁷⁷ while the global annual market size was estimated, in 2011, to range from USD 2.4 to USD 4 billion.⁷⁸

The most recent available data tracked a total of USD 31.7 billion in public capital committed between 2009 and 2015 for the three largest categories of conservation finance investments (*Sustainable food and fiber production* —including sustainable forestry, agriculture, fisheries; *Habitat conservation* —including mitigation banking, forest carbon trading; and *Water quality and quantity protection* —including watershed protection, water rights trading). This compares with only **USD 8.2 billion of private capital committed between 2004 and 2015**, of which USD 6.5 billion was committed in sustainable food and fiber production, nearly four times as much as the investment reported in the habitat conservation and water categories combined.⁷⁹

As far as sustainable agriculture is concerned, the data are unclear. While the global market for organic food reached USD 89.7 billion in 2016⁸⁰ and international experts recently argued that organic agriculture has moved out of its niche and is now playing an important role in getting our food and agricultural systems more sustainable and healthy,⁸¹ the 50.9 million hectares of agricultural production certified as organic in 2015 still merely represent 1.1 per cent of agricultural land worldwide.⁸² Two further objections should be kept in mind: (1) **a generally accepted definition of sustainable agriculture has yet to be built**, since organizations, researchers and policy makers seldom specify the precise criteria for agricultural sustainability and since alternative denominations such as ‘smart agriculture’ or ‘agroecological farming’ are also in use — in this respect, it is worth noting that the global market size of smart agriculture was only approximately USD 9.58 billion in 2017 (and expected to reach USD 23.14 billion by 2022);⁸³ and (2) **organic food is far from summing up sustainable agriculture, since ‘organic’-labelled products might often be produced in poorly sustainable ways.** But more importantly, sustainable agriculture broadly defined includes the intrinsic value of sustainably farmed land, biodiversity reserves integrated into the agrarian system. Hence, organic food leaves aside both valuable and invaluable stock components of a sustainably cultivated agro-ecosystem, and merely represents *one* of the ecosystem services it provides.

Regarding the market mechanisms for Green infrastructure for water, the value of these transactions reached nearly USD 25 billion in 2015.⁸⁴ Most of this spending (USD 23.7 billion) came in the form of direct subsidy payments from supranational, national, and state/provincial-level governments to landholders to protect and restore water-critical landscapes and promote a green economy. The rest covers a range of

77 BENNETT, G., CHAVARRIA, A., et al., *State of European Markets 2017 - Biodiversity Offsets and Compensation*, 2017, 47p., p.14

78 BECCA, M., CARROLL, N., et al., *2011 Update: State of Biodiversity Markets*, Washington, DC: Forest Trends, 2011

79 HAMRICK, K., *State of Private Investment in Conservation 2016 - A Landscape Assessment of an Emerging Market*, 2016, Ecosystem Marketplace, 80p.

80 LERNOUD, J., POTTS, J., SAMPSON, G., GARIBAY, S. et al., *The State of Sustainable Markets – Statistics and Emerging Trends 2017*, ITC, Geneva, 196p.

81 IFOAM, *Organic farming drives sustainability in global agriculture*, organics international press release, April 2019

82 LERNOUD, J., et al., *Ibid.*

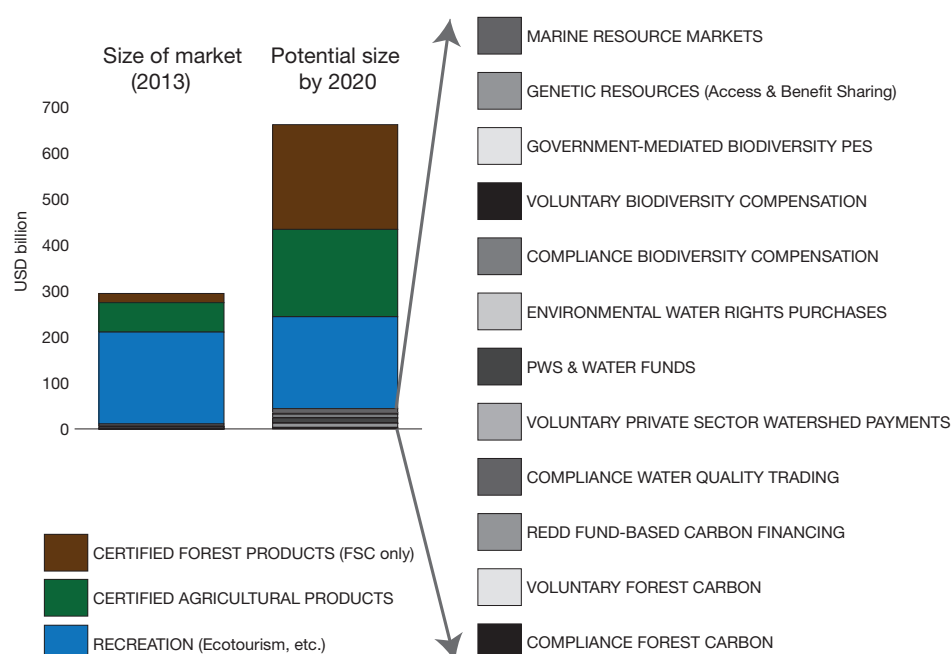
83 Source: statista, Url.: <https://www.statista.com/statistics/720062/market-value-smart-agriculture-worldwide/>

84 BENNETT, G., RUEF, F., *State of Watershed Investment 2016*, Alliances for Green Infrastructure, 76p., Url.: https://www.forest-trends.org/wp-content/uploads/2017/03/doc_5463.pdf

innovative mechanisms, including user-driven watershed investments, water quality trading and offsets, and environmental water markets. Meanwhile, it worth noticing that in 2015, *Green infrastructure for water* payments protected, rehabilitated, or created new habitat on more than 486 million hectares of land around the world — nearly 1.5 times the size of India.

Following the most optimistic — not to say unrealistic — estimation in 2013, **the potential market size for conservation finance projects in 2020 would be around USD 450 to 650 billion** — with sustainable agriculture, recreational activities (e.g. ecotourism, park fees), and sustainable forestry expecting to do the heavy lifting with respectively USD 190, 200, and 228 billion (see Figure 5).⁸⁵ For sustainable agriculture to reach USD 190 billion in four years would require unrealistic rapid growth; as a comparison, the global market for organic food — a broader and less demanding categorisation — reached only USD 89.7 billion in 2016.⁸⁶

Figure 5: Estimation of market size of ‘Innovative financial instruments’ for conservation finance



This compares with a much smaller estimate given for Europe from a 2014 report by KPMG. The report estimated that the potential EU28 market size in 2020 of the four main categories of conservation projects⁸⁷ said to have the potential to generate revenue streams as being in the range EUR 73 million under a business-as-usual scenario to EUR 288 million under a scenario with positive policies.

⁸⁵ Ecosystem Marketplace, *The Matrix 2013 - Innovative markets and market-like instruments for ecosystem services*, 2013

⁸⁶ LERNOUD, J., POTTS, J., SAMPSON, G., GARIBAY, S. et al., *The State of Sustainable Markets – Statistics and Emerging Trends 2017*, ITC, Geneva

⁸⁷ Payments for ecosystem services, biodiversity offsets, green infrastructure, and small innovative pro-biodiversity businesses.

1.2 Challenges and limitations associated with conservation finance in its current form

From a financial perspective, there are some limitations that constrain a large crowding-in of private financing for conservation projects, which have been covered extensively in the literature and past reports. We will briefly summarise those that have been identified most, in order to help illustrate the specific challenges associated with conservation finance:

- Relatively low returns for relatively high risk** - While the biological and even economic benefits of conservation may be evident, a financial return is not necessarily possible, nor desirable, for every type of conservation project. And when it is, it is often insufficient to attract for-profit investors.⁸⁸ In 2016, McKinsey reported that the investment risks and expected returns for conservation projects are often misaligned, with a level of risk comparable to venture capital but with returns closer to those of a stake in a successful, established company.⁸⁹ In a recent survey on the broader and specific category of impact investors, **64 per cent of respondents sought risk adjusted market rates of returns for their investments and 20 per cent were willing to accept below market rates that were ‘close to market rate’.**⁹⁰ It also found that **impact fund managers targeting environmental issues are expecting internal rates of return (IRR) of 5–10 per cent in the conservation area.** Fixed income impact investors will often be willing to **accept a 5 per cent return on debt for conservation as long as risks are managed.** As a matter of proxy, “71 funds have generated aggregate net returns of 5.8 per cent on average and 4.6 per cent at the median” for the broad category of impact investing. While this is low general IRR for the most profit-driven mainstream investors (as a reminder, impact investing still only represents USD 502 billion worldwide, although this is growing), the required IRR can also evolve in function of the level of risks. In one assessment of impact investment, the projects that took place in Africa on average needed IRR to be 5 per cent higher than comparable conservation investments in Latin America because of the associated risks.⁹¹ The fact that the vast majority of natural capital depletion takes place in developing countries adds a further dimension to investors’ views on risk and return.
- Size of the project and scalability** - While the average project size remains small resulting in relatively high transaction costs, only a few projects are scalable beyond the USD 5 million threshold.⁹² Large investors generally prefer projects which range from tens or hundreds of millions of dollars. This is also demonstrated in the wider field of impact investment where “investors often seek to invest larger amounts of impact capital than investees need, leading them to pass over smaller deals”.⁹³ Currently the number of projects which need tens to hundreds of millions of dollars of investment for a single conservation finance project is small.

88 When asked about motivations for investing in conservation in the EKO study, the for-profit investors selected expected financial returns as their top consideration, well before CSR/ESG or diversification consideration. Source: OMLSTED, P., *Social impact investing and the changing face of Conservation finance*, 2016, IUCN, The Social Science for Conservation Fellowship Programme, Working paper 2, 33p.

89 DAVIES, R., ENGEL, H., KÄPPELI, J., WINTNER, T., *Taking conservation finance to scale*, McKinsey, 2016, Url.: <https://www.mckinsey.com/business-functions/sustainability/our-insights/taking-conservation-finance-to-scale>

90 Note: only 3 per cent of the total assets under management for this sample related to conservation finance, despite 16 per cent of respondents allocating investment to the sector. Source: Global Impact Investor Network (2018). Annual Impact Investor Survey.

91 SALTUK, Y., EL IDRISSE, A., BOURI, A., MUDALIAR, H., SCHIFF, H., *Spotlight on the Market: The Impact Investor Survey*, J.P. Morgan and the Global Impact Investing Network, 2014

92 HUWYLER, F., KÄPPELI, J., TOBIN, J., *Ibid.*

93 Global Impact Investor Network (2018). Annual Impact Investor Survey.

- **Long timeline between project start and actual delivery of funds** - Many conservation financing mechanisms take years to develop, and this may not meet stakeholder expectations of seeing results within a certain timeframe.⁹⁴
- **Relatively high transaction costs** - A large portion of the innovative financial mechanisms are based on complex contractual arrangements which involve a high number of contracts, and, consequently, relatively high transaction costs.⁹⁵
- **Replicability** - Financing models are closely tied to local operational conditions, regulatory frameworks, and stakeholder buy-in, and can be challenging to replicate in other countries.⁹⁶
- **Consistent and comparable impact measurement** - Mechanisms to ensure that conservation projects are measurable and verifiable in both financial and conservation terms are sometimes lacking and it is generally challenging to retrieve consistent available data to evaluate success.⁹⁷ Consistent, quantitative metrics for comparison has been suggested by multiple reports as required if this sector is to grow.⁹⁸ In addition, impact investment teams use approximately three different frameworks on average to help monitor and measure their investments, potentially increasing the costs associated with monitoring and evaluation.⁹⁹

These characteristics largely explain why there is still a lack of private investment in conservation projects. Considering that the main driver of the vast majority of financial institutions is profit, it is not very surprising that the three main markets are *sustainable agriculture*, *sustainable forestry*, which are green commodities, and *ecotourism*, for which the revenue stream is pretty clear and easy to assess. Neither is it surprising that with *payments for ecosystem services*, government-financed subsidies constitute 97–99 percent of all payments.

While each type of conservation financing mechanisms has its own characteristics and relative barriers, some proposals have been made to scale them up and create an asset class. We will briefly discuss some of these.

1.3 Proposals to create an asset class

One suggestion to unlock the potential of conservation finance is to move from smaller, *ad hoc* attempts to larger-scale, proven projects by modifying the risk side of the risk-reward ratio. Investors generally require full transparency of the investment product and its characteristics, information on the expected return and risks, required ticket size, duration of the commitment, and insurance. Acting on these risk levers could help to move from medium-scale projects to large-scale and established conservation finance products that are attractive to the mainstream investment market.

94 WWF, *Guide to conservation finance - Sustainable financing for the planet*, 2009, 54p., p.4

95 LAPEYRE, R., LAURANS, Y.. *Innovating for Biodiversity Conservation in African Protected Areas: Funding and Incentives. Insights from Côte d'Ivoire, Sierra Leone and South Africa*, 2016, Study summary, ministère des Affaires étrangères et du Développement international, Institut du développement durable et des relations internationales, and France-IUCN Partnership, Paris., p.12

96 WWF, 2009, *Ibid.*

97 NAEEM, S., INGRAM, J. C., VARGA, A., AGARDY, T., BARTEN, P., et Al., *Get the science right when paying for nature's services*, 2015, Science 347, p.1206-1207

98 (GIIN 2014, Credit Suisse 2013, WEF, 2015). In: OMLSTED, *Ibid.*

99 Global Impact Investor Network, *Annual Impact Investor Survey - 2018*

While it has been proposed to do so through very reasonable proposals such as the establishment and the replication of *homogenous conservation project types* (payments for ecosystem services; Green infrastructure; etc.) and an *increased transparency in the characteristics* of these type of investments, others are more questionable proposals. It has notably been proposed to tackle the question of the scale and of the risk-return by structuring multiple heterogeneous projects and bundling them into a single product with a tailored risk and return sharing vehicle. However, the opportunity to rely on **securitization** should be carefully assessed in light of the serious macro-prudential dangers that can result from tranching securities such as higher interconnectedness, higher procyclicality, higher reliance on external credit assessments etc. (extensively discussed by Finance Watch in the past).¹⁰⁰

While private insurance or liquid collateral can help to mitigate some risks and attract investors, there is a controversial proposal to use **land rights as collateral** in the riskier countries. As most of these projects take place in developing countries, the latter opens the door to **risks of ‘green-grabbing’** — which refers to the appropriation of land and resources for environmental ends.

100 HACHE, F., *A missed opportunity to revive “boring” finance? A position paper on the long term financing initiative, good securitisation and securities financing*, Finance Watch, 2014, 100p., p.5

1.4 Public good aspects of conservation

Some of these proposals could bring more transparency and clarity to conservation projects and so attract specialized impact investors or impact lenders, such as the ethical or stakeholder banks in the Global Alliance for Banking on Values network. However, **the intrinsic characteristics of natural capital and ecosystem services are such that they may not always be attractive for private investors**. They are typically projects relating to services or goods that have **public good, common good or complex good** characteristics, that have **systemic properties**, and problems of **time inconsistency** between incurring the cost and deriving the benefits.

Figure 6: Characteristics related to ecosystem services

Problem	Considerations
'Public' or 'Common' goods	<p>Many ecosystem services have public goods characteristics (i.e. they are non-excludable, non-rival), such as 'regulating services' (e.g. air quality maintenance, climate regulation, erosion control, regulation of floods and droughts), or common goods (i.e. they are non-excludable but rival) such as fresh water or fish. As private owners have less incentive to provide such services, the presence of public and common good characteristics is one of the main justifications for government intervention in the provision of a service. Governments can provide the goods directly or use regulation, fiscal incentives or market measures to provide public goods.</p> <p>[Note: Some ecosystem services are (generally) private goods, such as those related to green commodities (food, fuel, fiber) and have consequently more chance to attract financing.]</p>
Complex goods (no one-to-one correspondence between a service and a benefit)	<p>Simple goods are discrete and separable (e.g. a pizza or a haircut) and are easy to trade. With ecosystem services there is often no one-to-one relationship between a 'service' and a benefit. Several ecological features or processes may be needed for one benefit (e.g. recreation). Alternatively, one ecological feature (say, water quality) may give rise to multiple benefits (such as wildlife watching, drinking, fishing, health). The latter case has given rise to the notion of bundling benefits. Is it possible to get the different beneficiaries to all contribute to the service provider?</p>
Time inconsistency	<p>Some services are delivered over long time periods and will benefit future generations. Carbon avoided through restoring woodlands will deliver benefits over many decades. The beneficiaries will mainly be future generations but those incurring the costs of action are the present generation.</p>
Systemic properties	<p>Many ecosystem services are systemic in nature and require network approaches as in the case of many economic services such as transport, telecommunications, energy and water supply. The solution was traditionally to nationalise delivery and, more recently, to have specific regulatory approaches to manage private supply. Optimal delivery of ecosystems services will almost certainly require systems approaches to future delivery.</p>

Source: RSPB, *Bridging the finance gap How do we increase financing for conservation? A discussion paper, Annex, 2018*

While we are not opposed to scaling up private financial flows for restoration and conservation, the intrinsic characteristics of most ecosystem services described in Figure 6 may help to explain why it has not developed at scale. They may also help to explain why public finance accounts for the largest financial flows, in particular towards biodiversity.

Figure 7: Estimated financial flows for biodiversity

Type of finance	Amount per year	Notes
Public		
Domestic budget	USD 48.96 billion (2015)	74 governments. Includes ODA in some case. Methods not harmonised
	EU: EUR 11 billion (2015)	EU central budget
ODA - bilateral & multilateral	USD 10.3 billion (2017)	Commitments
Debt-for-nature swaps	USD 900 million	Possible double counting with ODA
Biodiversity-relevant positive subsidies	USD 0.89 billion (2012-2016 average)	
Potentially beneficial flows from government support to agriculture	EUR 2.6 billion (OECD countries)	
Total (estimation)	+ - USD 75-80 billion/year	Note: real risk of double-counting
Private		
Payment for ecosystem services (PES)	USD 12 billion	10 large Payments for ecosystem services programme (according to OECD 2018). <i>Note: Some sources said this is 95-97 per cent subsidy-like payments from governments and can therefore not be considered as private.</i>
Biodiversity offsets	USD 4.8 billion (2016)	
Biodiversity-relevant fees and charges	USD 2.29 billion (2012-2016 average)	These instruments include ecotourism fees
Philanthropy	USD 380 million (2017)	Based on 14 foundations (MAVA Foundation, the Ford foundation, etc.)
Total (estimation)	+ - USD 19.5 billion/year	Note: real risk of double-counting

Source: OECD, *Biodiversity: Finance and the Economic and Business Case for Action, A report prepared by the OECD for the French G7 Presidency and the G7 Environment Ministers' Meeting, 5-6 May 2019, 95p., p.71*

2 The need for a more holistic vision

While every project participating in the conservation or restoration of the ecosystem is an investment in the right direction, **a shift from the conservation finance-based approach described above appears to be needed.** Efforts to create a conservation-based asset class may attract more impact investors and lenders but there are significant limitations (small market size, small project sizes, limited types of project with suitable IRR, etc.) and risks (such as from the tranching of securitizations, the risks of green-grabbing, etc.), as well as the intrinsic challenge of attracting private finance to projects that are defined by their **public good or common good characteristics.**

A solely market-centred approach would ignore the root cause: the planet's stock of natural capital is under increasing pressure by an unsustainable economic system which assume the ongoing availability of unlimited and cheap natural resources. While It ignores the systemic production of new environmental problems, it also fails to challenge the political economy of growth as an end in itself.¹⁰¹ There is a need to integrate concern for the impact of the productive system on natural capital at each level of our economy — policymaking, decision-making, value chain, capital allocation. This begins by changing the regulatory environment in which both finance and the economic system operate and interact.

What is needed is another approach which allows environmental concerns to be integrated at each level of the economic and financial systems, while unlocking the kind of financial institutions that are the best fit for the purpose. Thanks to a relatively growing interest in sustainability and the recognition that the scale of the issue calls for fundamental change, a more holistic approach is under development through the conceptual lens of natural capital and ecosystem services.

Main findings

Conservation finance was estimated at USD 51.5-53.4 billion, a tenth of the USD 502 billion 'impact investment' market. As few conservation finance projects are profitable, 80 per cent of this conservation finance came from domestic government spending and philanthropic funds, and only 20 per cent from market-based activities, comprising 13 per cent from green commodities such as timber, fisheries, etc. and 7 per cent from direct market payments such as carbon offsets.

In 2013, the most optimistic estimation of the potential 2020 market size was around USD 450 to 650 billion — with *recreational activities* (e.g. ecotourism, park fees, hunting licenses), *sustainable agriculture* and *sustainable forestry* expecting to do the heavy lifting with respectively USD 200, 190 and 228 billion, while the other mechanisms stay relatively marginal. Half a decade later, doubt can easily be cast on these overly optimistic estimations.

There are intrinsic barriers that limit the potential size of the market: a limited number of projects that can generate sufficiently stable revenue streams, limited IRR, small project sizes, high transaction costs, inconsistent time horizon, etc.

Efforts to create a conservation finance asset class do not answer these drawbacks and have their own problems, including risks related to the tranching of securitization, and the risks of 'green-grabbing' related to the use of land rights as collateral.

More fundamentally, projects directed towards the environment have **public and complex goods characteristics, and systemic properties.**

These call for another approach for a Finance supporting Nature agenda, which can go beyond trying to attract only private financial flows and change incentives embedded in the economic and financial systems

101 PRUDHAM, S., *Pimping climate change: Richard Branson, global warming, and the performance of green capitalism*, 2009, Environment and Planning, A 41, pp.1594–1613.

IV. Finance supporting nature



Finance supporting nature

Moving from the niche of conservation finance to the use of natural capital approaches in financial systems

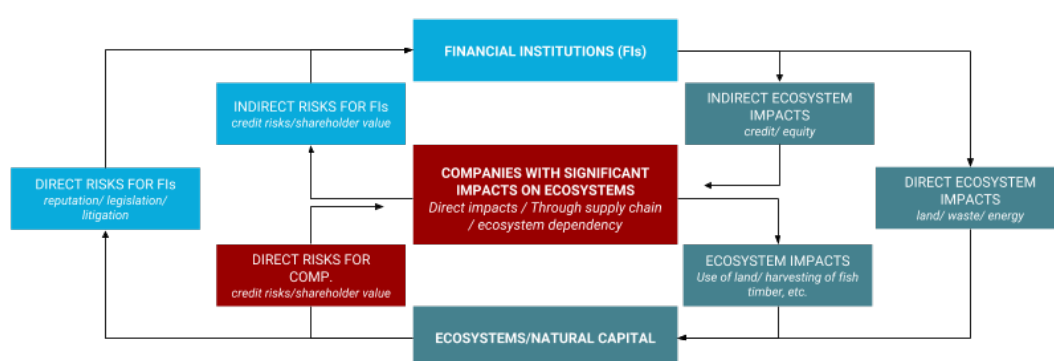
The scale of investment needed to conserve and restore nature will require financing approaches that go beyond the market-inspired approaches. This section looks at those approaches, including how the concepts of natural capital and ecosystem services can drive more environmentally sustainable capital allocation decisions by financial institutions; how macro-prudential and monetary policies can contribute to this goal; and how public and mission-oriented capital can bring scale.

1 Natural capital & the economic and financial system

Environment breakdown carries large risks for the financial system, which need to be measured and tackled in a similar way to climate risks. Natural capital thinking can help with this process and bring into focus some of the opportunities that an economic shift could bring.

As shown in the graph below, **the financial sector is strongly intertwined with natural capital, and may both generate and suffer from natural capital depletion and environmental damage**. While financial institutions have very little direct impact on nature, their impacts are mostly indirect, that is through the investments they make, the credit they grant and the insurance they provide. Yet, as is shown below, they are also exposed to losses endured by the businesses they lend to, or invest in, and are thus at both ends of the chain.

Figure 8: Interaction between companies, ecosystems and financial institutions in terms of risks and impact



Source: NCD (2013)

1.1 Financial risks related to mismanagement of natural capital

As we have seen in the previous chapter, **conservation finance mechanisms such as Payments for environmental services** insufficiently address the issues relating to natural capital depletion and ecosystem services disruption. These entail significant risks for human society, both individual and systemic risks that cannot be ignored, even more so as all elements of natural capital are interdependent on one another in a complex web of interaction. According to the World Economic Forum (The Global Risks Report 2019 - 14th edition), among the most alarming global risks, six were directly related to natural capital, these being: a) extreme weather events; b) failure to mitigate and adapt to climate change; c) natural disaster; d) water crisis; e) man-made environmental disasters; and f) loss of biodiversity and collapse of ecosystems.¹⁰² Moreover, a large set of sectors directly depend on healthy ecosystems and can suffer various types of risk as a consequence of its mismanagement (see table below):

Figure 9: Sectoral risk, biodiversity and ecosystem services

Type of risk ¹⁰²	Related ecosystem services	Mining	Oil and gas	Agriculture and food	Forestry	Utilities	Construction	Real estate and infrastructure	Leisure, hotels and tourism	Food and drug retailers	General retailers	Pharmaceuticals and biotechnology	Household goods	Financial services	Telecoms
Operational															
Scarcity or quality of raw materials: limited natural resources, e.g. timber, fish stocks, fresh water	P,R	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Reduced output or productivity: degraded natural processes, e.g. water cycling, soil nutrients, pollination	R,S			■	■	■							■		
Disruptions to business operations: natural hazards due to degraded ecosystems, e.g. flooding	R	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Supply chain risks: impacts on downstream operators and consequently security of supply or increased costs	P,R,C,S			■			■	■	■	■	■	■	■		■
Regulatory and legal															
Restrictions on land access: restriction to operation in ecologically sensitive sites, e.g. protected areas	P,C	■	■	■	■	■	■	■	■						
Litigation: if causing or have caused damage to ecosystems	P,R,C	■	■	■	■	■	■	■	■			■			■
Resource quotas: restrictions on businesses using ecosystem services	P			■	■										■
Pricing and compensation: growth of compensation mechanisms and price differentials linked to issue	P,R,C,S	■	■	■		■	■								■
Reputational															
Damage to brand or licence to operate: if associated with adverse impact on ecosystem services	P,R,C,S	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Market and products															
Consumer preferences: trends and preferences for products with reduced ecosystem services impacts	P,C		■	■	■	■			■	■	■		■	■	
Purchaser requirements: supply chain requirements that include safeguards on ecosystem services	P,R,C,S	■	■	■	■	■	■	■					■		■
Financing															
Cost of capital or lending requirements: restrictions on finance to companies negatively affecting ecosystem services	P,R,C	■	■	■	■	■	■	■	■					■	

P= Provisioning services, R= Regulating services, C= Cultural services, S= Supporting services;
 Colour code for level of risk of each sector: ■ High risk ■ Medium/High risk ■ Medium risk ■ Low risk

Source: BONNER, J., GRIGG, A., et al., *Is natural capital a material issue? An evaluation of the relevance of biodiversity and ecosystem services to accountancy professionals and the private sector*, 2012, KPMG, Fauna & Flora Intl., ACCA, 44p., p.16

¹⁰² WEF, *The global risks report 2019*, 114p., p.5, Url.: http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf

And the risks related to natural capital may eventually materialize as financial risks — in the best-case scenario affecting only those financial institutions with concentrated exposures, in the worst case, affecting the wider financial system.

Just as each financial institution has its own risk profile, each natural capital risk has its own set of impacts. As private financial capital is deployed on the basis of expected ‘risk-adjusted’ returns, an assessment of natural capital-related risks is needed to identify assets that could become mispriced or stranded (see below) and so avoid capital allocation becoming suboptimal, which may generate excessive investment in unsustainable and riskier activities at the expense of environmentally sustainable ones.¹⁰³

There has been renewed interest in environmental-related financial risks since the Bank of England Governor and Financial Stability Board Chair Mark Carney’s famous 2015 speech¹⁰⁴ in which he introduced the notion of ‘Tragedy of the horizon’ (which is key and will be discussed later on in part IV, section 2.6) and defined three categories of climate-related financial risk:

- **Physical risks** are those arising from material destruction such as damages to infrastructure and disruption of trade, causing economic and financial losses. They arise from the impact of climatic, geologic events or **widespread changes in ecosystem equilibria**, such as soil quality or marine ecology.¹⁰⁵ As the Financial Stability Board notes, they can be event-driven (‘acute’) or longer-term in nature (‘chronic’);
- **Liability risks** refer to compensation sought by damaged parties and the legal procedures pertaining to them — in the EU, such liability risks related to environment are notably framed through the Environmental Liability Directive (ELD) based on the ‘polluter-pays’ principle;
- **Transition risks** encompass the risks from large scale adjustments triggered by policymaking, new institutional and/or technical settings, and market structure. An example is the case of **stranded assets**, that is “*assets that have suffered from unanticipated or premature write-downs, devaluations, or conversion to liabilities*”.¹⁰⁶ From a financial perspective, for instance, the banning or strong limitation of the use of fossil fuels would entail a depreciation in value of the shares of companies whose assets are stranded. Consequently, the shares can only be sold in the private financial markets at a reduced value, negatively impacting the portfolio value of asset owners.

Regarding the risks of climate-related transition policies (e.g. taxes, caps), the materiality of transition risks has been considered too low in the short-term to impact macroeconomic parameters such as GDP,¹⁰⁷ but sector-specific impacts may be material for portfolios with concentrated exposures to these sectors.¹⁰⁸ In comparison with climate-related transition risks, transition risks related to new natural capital-

103 *Enhancing Environmental Risk Assessment in Financial Decision-making*, Report in support of the G20 Green Finance Study Group, 2017, p. 11.

104 CARNEY, M., *Breaking the Tragedy of the Horizon – climate change and financial stability*, Speech delivered at Lloyd’s Bank, London, 29 September 2015.

105 Cambridge Centre for Sustainable Finance, *Environmental risk analysis by financial institutions: a review of global practice*, Cambridge, UK: Cambridge Institute for Sustainability Leadership, 2016, 84p., p.8

106 CALDECOTT, B., HOWARTH N., and McSHARRY P., “Stranded Assets in Agriculture: Protecting Value from Environment-Related Risks.”, *Smith School of Enterprise and the Environment*, University of Oxford, 2013, p. 7.

107 ‘THOMÄ, J., DUPRE, S., *Right direction, wrong equipment: why transition risks do not fit into regulatory stress tests*’, Tragedy of the Horizon Energy Transition Risk - Discussion paper, September 2017.

108 THOMÄ, J., DUPRE, S., *Ibid.*, p.12

related environmental regulations might turn out to be more material in the short-term, especially if they are concentrated on certain sectors and sub-sectors.

This typology of risks has been created in the framework of the industry-led Task Force on Climate-related Financial Disclosures (TCFD) prompted by the G20's Financial Stability Board in 2015. Set up by Mark Carney and chaired by Michael Bloomberg, the TCFD was established to help companies and investors understand the risks associated with climate change and offer a way to help investors identify which companies are most at risk from climate disruption, which are best prepared, and which are taking action. In 2016, the G20 also launched a Green Finance Study Group (GFSG) to investigate possibilities to encourage private investors to increase green investments. In 2018, the GFSG was replaced by the Sustainable Finance Study Group (SFSG), which is continuing the work of its predecessor with a wider mandate. Since then, central banks have started using a slightly simpler typology, looking at just physical and transition risks, where transition risk also includes reputation and liability risks.¹⁰⁹

Box 2: Example of environmental physical risks

As reported by the CISL, the floods that hit Thailand in the second half of 2011 were classed as by far the most expensive natural catastrophe in the country's history with a direct loss of USD 43 billion (12 percent of GDP). While Thailand's own economy consequently shrank by 2.5 per cent, flooding in Thailand's industrial areas also affected Japanese corporations' production facilities, including numerous key electronic component manufacturers.¹¹⁰ This led, by way of example, to hard drive pricing jumps of 20–40 per cent, the production of around 25 percent of the world's computer hard-drive component being concentrated in Thailand.¹¹¹

While the TCFD and the GFSG (mainly) focused on the issue of climate change, there are parallels to the broader environmental context and the risks that financial institutions and investors might be exposed to following the continued loss of natural capital and the consequent disruption to ecosystem services on which their investee companies depend. This represents an important opportunity to include natural capital within financial decision making as broader environmental issues can be added to and encompassed within the existing TCFD recommendations framework, and the work of the GFSG (which will be discussed at a later stage in the section related to risk assessment).

The following summary shows where different natural capital-related risks can fit within the TCFD framework:¹¹²

109 NGFS, First Progress Report from October 2018

110 Cambridge Centre for Sustainable Finance, *Loc. cit.*, p.32

111 PLOY TEN, K., CHANG-RAN, K., *Thai floods batter global electronics, auto supply chains*, Reuters, Cited in: Cambridge Centre for Sustainable Finance, *Loc. cit.*, p.32

112 TCFD, *Recommendations of the Task Force on Climate Related Financial Disclosures (TCFD)*, 2017. Adapted from information in figure 1.

Figure 10: Example of natural capital-related financial risks (based on the TCFD framework)

PHYSICAL RISKS

Acute, short-term or event-based risks e.g. damage from catastrophic crop loss, or damage from extreme weather events and flooding;

Increased insurance claims arising from higher frequency of natural disasters in a given region;

Chronic, long-term change e.g. changes in environmental conditions such as the suitability of land for crop cultivation;

LIABILITY RISKS

Increased costs due to damage compensation and legal procedures;

[Other legal risks related to Natural Capital: penalties due to non-compliance with legal provisions and damages for third parties arising from the activities developed by the institution.]

TRANSITION RISKS

Policy risks, such as the consequences associated with policy changes to protect or adapt to changes in natural capital. One illustrative category is the **stranded assets risk**.

Market risk: possibility of financial or economic losses arising from fluctuation in market values of positions held by the institution, such as changes in supply and supply chains as a result of changes in the demand for commodities, products and services based on changes in consumer preferences, in relation with natural capital concerns.

Reputational risks: possibility of losses arising from negative perception about the institution by clients, counterparties, shareholders, investors, government agencies, community or supervisors that may adversely affect the sustainability of the business.

1.2 Opportunities related to the management of natural capital

However, it is worth mentioning that there are also opportunities, from a financial point of view, associated with a change towards a society that enhances and protects its natural capital. Once again taking the outputs from the TCFD these **opportunities** can be described as:

- **Resource efficiency** - e.g. decreases in costs due to improvements in efficiency, the establishment of circular economy principles, etc. The potential for future cost reductions associated with sustainable use of resources.
- **Product and service opportunities** - a renewed focus on environmental sustainability can foster the development of new products and services that help to protect nature or adapt to changes in nature;
- **Operational opportunities** - e.g. new mutual funds that invest in companies offering innovative solutions to natural capital problems;
- **Reputational opportunities** - e.g. Positive media coverage, improved ratings.¹¹³

¹¹³ 'Connecting Finance and Natural Capital: a supplement to the natural capital protocol', Natural Capital Coalition, Natural Capital Financial Alliance, VBDO, 2018, p.9

2 Implementing natural capital approaches in economic and financial systems

While the capital allocation decisions of financial institutions have a major impact on our common stock of natural capital, this environmental impact is not perceived as material for financial institutions. As stated by the Sustainable Finance Lab, financial institutions “*use decision-making frameworks that to a large extent have been developed in times that natural capital was seen as an infinite source, and thus one whose price was negligibly low.*”¹¹⁴

The concept of natural capital can be helpful in several ways, and its potential is more and more acknowledged and integrated by policy makers as a useful tool for decision-making. The European Union has already embedded the concept of ecosystem services in recent EU (environmental) policies, such as the Biodiversity Strategy Directives 2020 and the Invasive Alien Species Regulation,¹¹⁵ and developed a uniform definition and a standardised typology for ecosystem services (CICES). Several European countries have conducted systematic national ecosystem assessments (e.g. UK and Spain). In the U.S., a guidance from the Executive Office of the President of the United States pointed in 2015 to an interest in more explicitly considering the effects of policies on ecosystem services.¹¹⁶

When applied to economics and finance, the concept could be used as:

- **an analytical function** aimed both at better understanding the embeddedness of the economy into the environment, that is, how the economy depends upon - and relates to - environmental dynamics (risks, constraints and opportunities); and
- **an accounting measure/indicator** as an input to help manage natural resources and for implementing *ad hoc* public policies.¹¹⁷

Based on the various functions which can be derived from this concept, a number of tools and approaches have been developed, or are in development to apply natural capital and ecosystem services approaches in different contexts: in accounting, in decision making, in corporate disclosure (non-financial information) and in risk-assessment. As we will see, an integrated use of these tools, methodologies and common language and metrics, could play a key role in integrating environmental concerns in the economic and financial system.

114 VAN TILBURG, R., ACHTERBERG, E., *The financial sector as a new agent of change – The case of natural capital accounting and reporting*, Report commissioned by the Netherlands Environmental Agency (PBL), Sustainable Finance Lab, 2016, 44p., p.17

115 BOUWMA, I., SCHLEYER, C., PRIMMER, E. et al., *Adoption of the ecosystem services concept in EU policies*, Ecosystem Services 29 (2018) 213–222

116 OMB, Office of Management and Budget, Council on Environmental Quality, and Office of Science and Technology Policy. *Incorporating Ecosystem Services into Federal Decision Making*, Memorandum M-16-01. Executive Office of the President of the United States: Washington, DC, 2015

117 Cf. Müller & Burkhard, “Mapping ecosystem service supply, demand and budgets”, *Ecological Indicators* 21 (2012), pp. 26–27

2.1 Natural capital and ecosystem services valuation

The various risks entailed by the economic and financial system's dependency on natural capital generate a need to quantify the issues at stake, that is to engage in the valuation of natural capital and ecosystem services. In this section, we present the existing methodologies for natural capital and ecosystem services valuation, discuss briefly some of the recurrent debate surrounding the valuation of nature, and present a methodological framework to go beyond such tensions: the integrated valuation.

Natural capital and ecosystem services valuation involves both a **qualitative valuation** (identifying which elements of natural capital and ecosystem services are concerned in the process of valuation) and a **quantitative valuation** (applying a measurement). Broadly speaking, two types of quantitative valuation exist:

1. Monetary valuation
2. Non-monetary valuation (biophysical and sociocultural valuation)

1. Monetary valuation methodologies have been used to evaluate environmental externalities and to capture hidden costs and benefits from economic activities. While at first used only for negative externalities (e.g. pollution or resource depletion), it has increasingly been extended to identify unaccounted value through the conceptual lens of ecosystem services.¹¹⁸ It is generally divided into *use* and *non-use values* which are combined in the so-called '*Total Economic Value*'. Monetary valuation should be distinguished from **pricing**, in so far as pricing implies a transaction. As far as natural capital and ecosystem services are concerned, two main approaches exist.¹¹⁹

- (a) **Direct market valuation** includes market-price based approaches, cost-based approaches — which estimate the cost of avoided damage or ecosystem replacement — and production function-based approaches based on physical inputs and outputs;
- (b) **Non-market valuation** requires information on stakeholder preferences, and includes revealed preference approaches and stated preference approaches (contingent valuation or choice experiments);

2. Non-monetary valuation refers to a collection of valuation approaches that do not rely on monetary metrics and market logics. The two main families are **sociocultural valuation** and **biophysical valuation**. While the former examines "*the importance (including cognitive, emotional, and ethical arguments), preferences, needs, or demands expressed by people towards nature*",¹²⁰ the latter refers to the measurement of natural capital and ecosystem services in terms of physical or biological units. As biophysical valuation assesses value based on "*the intrinsic properties of objects*" rather than on the value that humans can derive from it, it has been described as "*more useful for valuing depreciation of natural capital stocks than ecosystem services flows*".¹²¹

118 GÓMEZ-BAGGETHUN, E., MARTÍN-LÓPEZ, B., BARTON, D., BRAAT, L., et al., *State-of-the-art report on integrated valuation of ecosystem services*, European Commission FP7, 2014, 34p., p.14-15

119 Green Growth Knowledge Platform - Draft Background note, p. 7; '*Demystifying economic valuation*', Valuing Nature paper, June 2016, pp. 6-8.

120 GÓMEZ-BAGGETHUN et al., 2014, p.16-17

121 GÓMEZ-BAGGETHUN et al., Ibid., p.17

There are several variants of biophysical valuation:

- (a) The first variant is the **measurement in MKSA units**, that is, *via* the International System of Units (meter, kilogram, second, ampere). As far as natural capital is concerned, this is probably the measurement method that makes most sense, since elements of natural capital are measured in their actual physical unit (e.g. crops would be expressed in tons, water in m³, etc.). This system has however two important drawbacks: measurements in different units cannot meaningfully be compared (commensurability) and this renders accounting more obscure and complicated. The two other variants of biophysical valuations try to overcome this issue.
- (b) The second variant is the **footprinting methodologies**, which can help to measure corporates' impact on nature. There are four main categories of footprinting methodology under development:¹²²
 - (i) **Biodiversity footprint** aimed at evaluating the impact generated by an activity on biodiversity. It allows the representation of direct and indirect impacts caused by several types of pressures on different components of ecosystems (e.g. the 'Global Biodiversity Score' developed by CDC Biodiversité; The 'Biodiversity Impact Metric' developed by CISEL; 'Biodiversity Indicators for Extractive Companies' (UNEP-WCMC); etc.).¹²³
 - (ii) **Carbon footprint** which aims to measure the total quantities of GHG emitted by an organization, a product or a service.
 - (iii) **Water footprint** which indicates the volume of fresh water consumed, evaporated or polluted, to manufacture the product in all phases of its production.
 - (iv) **Ecological footprint**, which uses a commensurable measuring unit: the global hectare.¹²⁴ One global hectare is equal to one real hectare having a productivity equal to the average productivity of the total bio productive surface. This implies that 1 ha of highly productive land corresponds to more global hectares than 1 ha of less-productive land.
- (c) A third approach is rooted in the concept of **emergy** (embodied energy): inputs are measured in terms of solar *emergy*, defined as "*the total amount of solar available energy directly or indirectly required to make a product or support a given flow*". In order to derive the solar *emergy* of a commodity or resource, one needs to assess all the other resources and energy that have been used to produce this commodity.¹²⁵

The strengths and weaknesses of biophysical and monetary valuation methods have been covered at length by a large body of literature.¹²⁶ The major criticism is probably the dependency of monetary valuation on market-like behaviors, which either renders

¹²² These footprinting methodologies have been well synthesized in: BLUET, H., IONESCU, C., *Into the wild. Integrating nature into investment strategies*, WWF France and AXA recommendations for the members of the G7 Environment meeting in Metz, 5-6 May 2019, 63p., p.42-45

¹²³ For a comprehensive review of existing methodologies for calculating biodiversity footprint, see: LAMERANT, J., MÜLLER, L., KISIELEWICZ, J., *Critical assessment of biodiversity accounting approaches for businesses and financial institutions*, Discussion paper for EU Business @ Biodiversity Platform, 76p.

¹²⁴ MONFREDA C., WACKERNAEGEL M & DEUMLING D., 'Establishing national natural capital accounts based on detailed Ecological Footprint and biological capacity assessments', *Land use policy* 21, 2004, p. 235-236.

¹²⁵ BROWN, M.T., ULGIATI, S., 'Emergy evaluation of natural capital and biosphere services', *Ambio* 28 n° 6, 1999.

¹²⁶ For a comprehensive and accessible summary, see: MODEE, K., WERNER, F., *Business approaches to natural capital valuation*, World Environment Center, 2014, p. 2

monetary valuation more difficult and less accurate in the absence of a market, **or entails the problematic opening of property rights** (more discussion on monetary valuation in Box 3 below). Another drawback, which affects biophysical and monetary valuations alike, is undoubtedly **the quality, access to, and harmonization of the primary data needed for valuation**. More effort should thus be directed towards improved collection of data, harmonized methodologies, collaboration of data centers, etc.

Box 3: Nature valuation: ongoing debates

The attempt to assess monetary values for ecosystem services and natural capital has triggered intense debate. Let us briefly look at the different positions.

Critics say that valuing natural capital in monetary terms overlooks the importance of conflicting interests: no consensual decision would emerge from it, as the hierarchy between the issues to address would largely remain a matter of beliefs, interests, needs and wants. Some have also highlighted that valuation of ecosystem services fails to internalize non-market benefits of conservation because of a lack of information and incompatibility between analytical frameworks, the monetary metric and social goals¹²⁷. More radical critics argued that natural capital and ecosystem services valuation initiates a slippery slope leading to the commodification and financialization of natural resources.¹²⁸ Moreover, opponents of ecosystem services valuation claim that this approach underestimates the performative nature of mainstream accounting, which eventually privileges market-like frameworks, willingness-to-pay methods, and property rights approaches, opening the road to privatization. On the other hand, monetary valuation of ecosystem services could be used solely to build a common measure without implying any given policy option, or assuming marketization.

In terms of policy outcomes, criticisms have also targeted the so-called “no net loss approach”, that is, the idea that only aggregate values for natural capital and ecosystem services matter, and that losses in one location may be acceptable if compensated by equal increases elsewhere. This perspective, which has been seen as a by-product of the accounting-oriented view of natural capital and ecosystem services has already influenced environmental policies such as the EU’s biodiversity strategy, which expressly considers the benefits of offsets.¹²⁹ However, this approach obviously ignores the systemic nature and interconnectivity of ecosystems and, as Farley notes: “*The fact that monetary values are exchange values certainly implies some degree of substitutability or non-essentiality*”.¹³⁰ The criticism is not unique to monetary valuation, since substitutability can equally be assumed through biophysical measures: the deforestation of a certain surface of forest in one place cannot be compensated by an equal increase in forest cover elsewhere, since the ecosystem to which they contribute is location-specific. The main criticisms of monetary valuation include:

- (1) It overlooks the interconnected nature of the biological and other processes in ecosystem services and natural capital, as well as their intrinsically non-linear behaviors, which prevent long term forecasts;
- (2) It could implies that natural resources can be substituted for each other, or for other forms of capital, regardless of their uniqueness or interconnectedness;
- (3) It remains anthropocentric and materialistic: it accounts little for ecosystem services that are not valuable to humans and displays difficulties in valuing ‘cultural ecosystem services’;

127 SALLES, J-M., ‘Valuing biodiversity and ecosystem services: why linking economic values with Nature?’, *Document de recherche n° 2011-24*, Laboratoire Montpellierain d’Economie Théorique et Appliquée, 2011.

128 KILL, J., ‘Economic Valuation & Payment for Ecosystem Services: Recognizing Nature’s Value or Paying for nature’s Destruction?’, A discussion paper for the Heinrich Böll Stiftung, 2015, p. 18

129 “*The potential of biodiversity offsets will be looked into as a way of achieving a ‘no net loss’ approach*” Source: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011SC0541>

130 FARLEY, J., ‘Ecosystem services: The economics debate’, *Ecosystem Services*1(2012), p. 45.

- (4) Market-based approaches, in particular, are problematic, in so far as for most ecosystem services there are no such markets allowing valuation. Hence the will for valuation might here be trapped by the precondition of an existing market requiring enforceable property rights.

Yet, monetary valuation as a whole can hardly be discarded on that basis, since opponents unfortunately present virtually no alternative in the short term. Indeed, natural capital and ecosystem services are nowadays being depleted at nearly zero costs, and there is an urgent need to both internalize externalities - or at least some of them - and account for the value of natural capital and ecosystem services in order to better inform policy-makers and assess the requirement for restoration or conservation investment.

A spirited public debate on the pros and cons of the natural capital approach is drawing attention to the plight of nature and has been useful in showing the potential dangers and limits of natural capital thinking.¹³¹ Yet, as insufficient and inaccurate as natural capital measurements may be, the question is: is poor assessment not better than none at all?

Meanwhile, **a more fundamental criticism of both families of methodology emerged in the mid-1970s: they have been described as ‘monist theories’**, a form of reductionism of environmental value, ignoring that *“there are multiple values which in principle may be equally correct and fundamental, and yet in conflict with each other”*.¹³² The common recognized family of values are: i) **monetary values** which generally aim at capturing a more comprehensive picture of the economic value of the environment through the concept of ‘Total Economic Value’;¹³³ ii) **sociocultural values**, encompassing the moral, spiritual, aesthetic and other non-material values that people give to environment; and iii) **ecological values** which capture mostly the intrinsic values of nature.¹³⁴

To answer this objection, researchers developed a **‘value pluralism’** approach which is built on the assumption that *“recognizing multiple values is required to capture the diversity of needs and wants that nature can contribute to fulfill for society and individuals”*¹³⁵ (e.g. physiological and subsistence needs, safety and protection, sense of belonging). In this approach, values may be combined to inform decisions, avoiding being reduced to a single metric.

Consequently, and as different values (e.g. ecological, cultural, monetary) may depend on one another, can co-exist and correspond to different valuation methods, there was a need to create an **‘integrated valuation’** methodology. Based on the view that human decisions are generally made by weighing and summarizing different values and that consequently most policy decisions *de facto* include diverse values and are rarely based on economic, ecological or social impacts alone, work has been undertaken to develop an ‘integrated valuation’ methodology. **The IPBES nowadays uses such integrated**

131 See MONBIOT, G., ‘*The UK government wants to put a price on nature – but that will destroy it*’, The Guardian 15 May 2018; and TEYTELBOYM et al., ‘*Natural capital: what we don’t value, we destroy - A response to George Monbiot*’, GEC, 22 May 2018

132 GÓMEZ-BAGGETHUN, E., et al., 2014, p. 6-7

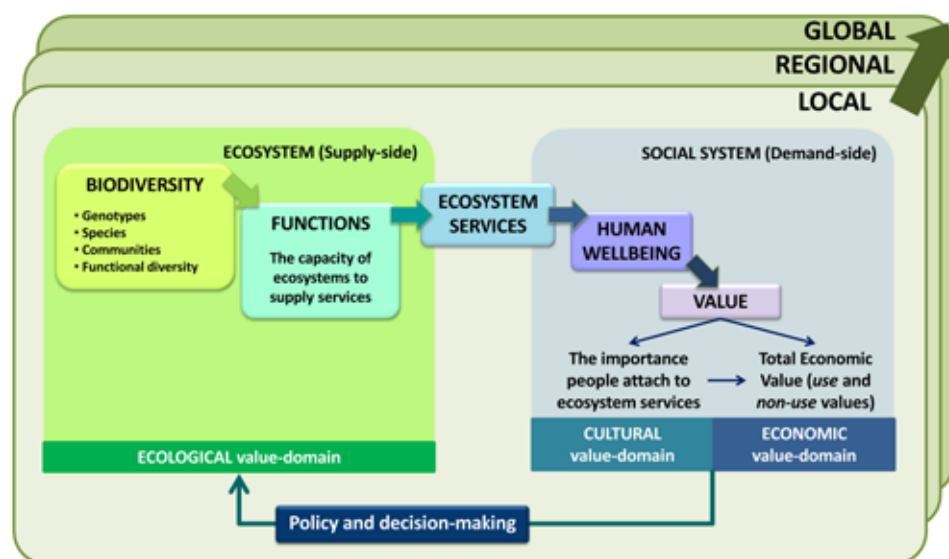
133 GÓMEZ-BAGGETHUN, et al., *Ibid.*, p. 10

134 GÓMEZ-BAGGETHUN, et al., *Ibid.*, p. 12

135 *Ibid.*

valuation directly in its own assessment process,¹³⁶ and recommends it in its guidelines to policy makers in order to achieve “*fair, reliable and policy relevant valuation*”.¹³⁷

Figure 11: Integrated valuation



Source: GÓMEZ-BAGGETHUN, E., et al., *State-of-the-art report on integrated valuation of ecosystem services*, European Commission FP7, 2014, 34p., p.5

Biophysical and monetary valuation methods are thus not mutually exclusive, and even turn out to be complementary. As a matter of example, biophysical approaches might be used to account for assessing natural capital ‘assets’, defining planetary boundaries and assessing ecosystem services that are not directly valuable to humans. But defining a boundary implicitly defines a ‘safe operating space’ which, as Barbier notes, is a capital asset that requires efficient management.¹³⁸ It is in this safe operating space that monetary valuation and natural capital accounting can come into play. Such a combination of monetary and biophysical accounting might allow us to both establish ecological limits and align business activity with it — while partially reconciling the opponents and proponents of monetary valuation.

¹³⁶ As stated by the IPBES in 2018, “*Integrated valuation approaches demonstrate that nature’s contributions have substantial monetary and non-monetary values that can inform policy goals*” in both Europe and Central Asia. Source: IPBES, The IPBES regional assessment report on biodiversity and ecosystem services for Europe and Central Asia, 2018, Rounsevell, M., Fischer, M., Torre-Marín Rando, A. and Mader, A. (eds.). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany, 892 p., p.68, Url.: https://landchange.imk-ifu.kit.edu/sites/default/files/inline-files/2018_eca_full_report_book_v5_pages_0.pdf

¹³⁷ IPBES/4/INF/13: Preliminary guide regarding diverse conceptualization of multiple values of nature and its benefits, including biodiversity and ecosystem functions and services

¹³⁸ Barbier, E., ‘*The concept of natural capital*’, *Oxford Review of Economic Policy* 35, n°1 (2019), p. 30

Box 4: The need for consistent and publicly available environmental data

Available data is often said to be a necessary, but not sufficient, condition for a shift from unsustainable to sustainable activities. As reported by the G20 Green Finance Study Group, the difficulty of accessing relevant environmental data is one limitation on the ability of financial firms and other market participants both to analyze and manage environmental risk exposures, and to finance green investment opportunities.¹³⁹

Data is accessible from two main sources: i) **environmental data disclosed by businesses**; ii) **economy-wide environmental information** (e.g. environmental changes, possible future changes in climate and other environmental risk factors, water stress, health of ecosystems) which comes largely from public sources (e.g. governments, international organizations, science institutes).

The main obstacles identified by GFSG regarding this second category of data are: the lack of comparable future scenarios; data formatting that is unfriendly to financial sector users; high search costs (monetary and non-monetary); and lack of capacities to collect and process adequate information in some countries.¹⁴⁰

POLICY IDEA

Support better data collection to close the data gap

A drawback which affects biophysical and monetary valuations is the uneven quality, access to, and harmonization of the primary data needed for valuation – which can then be used in natural capital accounting. More effort should thus be directed towards **improved collection of data, harmonized methodologies, and collaboration of data centers**, in order to bridge the data gap. Financial institutions should also enhance their data collection, particularly by **requesting project’ precise location data** from borrower or investee companies.¹⁴¹

POLICY IDEA

Promote integrated valuation to assess the ‘value’ of the stock of natural capital and the flow of ecosystem services

Nature has an intrinsic value that cannot, and should not, be evaluated only through the lens of the benefit that mankind derives from it. As multiple, and sometimes conflicting, types of value co-exist (e.g. ecological, cultural, monetary) and their respective valuation methodologies (e.g. monetary, biophysical, sociocultural), an **‘integrated valuation’** framework is proposed to integrate this variety of values emerging at different levels (individual, communities, nations), by relying both on qualitative and quantitative information.

It should be promoted as a way to answer, first, to *the necessity to value nature*, second, *the concern on potential side-effects of monetary valuation* and, third, to *the limitation of relying solely on one method of valuation*.

139 GFSG, *G20 Green Finance Synthesis Report*, 2017, 27p.

140 GFSG, *Ibid.*

141 NCFA, *Integrating natural capital in risk assessments: a step-by-step guide for banks*, 2018, 29p., p.5

2.2 Natural capital accounting

The main purpose of **natural capital valuation** is to facilitate **natural capital accounting**, that is, the integration of natural capital assets into business or national accounts. As stated in the 2017 Science for Environment Policy report, “*the purpose of natural capital accounting is to show how natural resources contribute to the economy and how the activities of the economy affect natural resources*”.¹⁴² In other words, natural capital accounting aims at better quantifying the interdependencies between different economic activities and allowing a better management of natural resources.

Natural capital in National Accounting

Since the 1950s, macroeconomic data and policies have largely been relying upon the System of National Accounts (SNA), which allows the construction of a series of economic indicators – the most used of which is GDP. Yet, as has constantly been pointed out in the last decades, GDP suffers from several biases, one of which is the lack of regard for environmental impacts. Attempts to **better include natural resources in macroeconomic statistics** have been regularly undertaken, an important milestone being the Integrated Environmental and Economic Accounting set up by the UN in 1993, which eventually led to the System of Environmental and Economic Accounting (SEEA), accepted as an international standard in 2012. Initially, the SEEA does not provide a proper definition of natural capital but rather defines assets as being either ‘individual’ or ‘combinatory’. Beyond the mere fact of better taking into account natural resources, the SEEA displays two important features: (a) it presents data in both monetary and biophysical units, and (b) it defines a clear list of indicators aimed at clearly assessing the dependency on natural capital assets and tracking the changes affecting them:¹⁴³

- *What resources does the country depend upon*
- *How efficiently are these resources being used*
- *How does natural depletion affect a country’s real income*
- *Etc.*

Since 2012, the System of Environmental and Economic Accounting – Central Framework (SEEA-CF) has been complemented by an updated framework, the System of Environmental and Economic Accounting – Experimental Ecosystem Accounts (SEEA-EEA). **The SEEA-EEA appears innovative in one important respect: it focuses on the notion of ‘ecosystem’ rather than on isolated assets.** The SEEA-EEA thus addresses questions such as:¹⁴⁴

- *Which ecosystems generate which ecosystem services*
- *What is the extent of the contribution of ecosystem services to economic and other human activities*
- *The level of degradation of the different ecosystems*
- *What monetary value might be attached to specific ecosystems*

¹⁴² Science for Environmental Policy (2017) – *Taking stock: progress in natural capital accounting*. In-depth report 16, produced for the European Commission-DG Environment, by the Science Communication Unit, UWE, p. 6.

¹⁴³ *Accounting for Natural Capital in EU policy Decision-Making: a WWF background paper on policy developments*, pp. 19-20

¹⁴⁴ *Ibidem*, p. 20.

In the meantime, an additional initiative was launched at the CBD 2010: the Wealth Accounting and the Valuation of Ecosystem Services (WAVES), a World Bank-led partnership which promotes **sustainable development through a better inclusion of natural capital in national accounts**,¹⁴⁵ and invites international organizations, financial institutions and governments to engage in an institutional nexus promoting the implementation of natural capital in national accounts, develop scientific methodologies for ecosystem accounting, and demonstrate the socio-economic and environmental outcomes of natural capital accounting.¹⁴⁶ Finally, a parallel yet complementary framework resides in the EU ‘Beyond GDP initiative’,¹⁴⁷ which develops clear and appealing indicators that better include social and environmental aspects.

Meanwhile, the target 2 of the *Aichi targets* adopted during the CBD 2010 urged signatories to “ (...) *map and assess the state of ecosystems and their services in their national territory by 2014, assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020*”. As promising as the various natural capital accounting systems might be, they still do not reveal *per se* how to concretely and consistently explain how natural capital related information should be included in national accounts. The answer to this issue lies in the EU Mapping and Assessment of Ecosystems and their services (MAES) Working Group, which provides a consistent protocol on which data is to be collected and included, which databases interact to provide the required data, and how such natural capital data can be mapped and displayed.¹⁴⁸

Various successful – or at least promising – implementations of natural capital accounting are being undertaken all around the globe, the most comprehensive being the Netherlands and the UK.¹⁴⁹ One interesting outcome of the UK’s assessment of woodland resources was that the value of a tree, considering ecosystem accounting, was about 15 times higher than its timber value.¹⁵⁰ Similarly, a comprehensive study has been undertaken in the US to guide the United States Forest Service (USFS) in a better management of the country’s forest resources, but with the particularity of using an *emergy* approach (see section 4.2.1. Natural capital and ecosystem services valuation).¹⁵¹

A final example of the implementation of natural capital accounting lies in the study led by E. Barbier, which used macroeconomic indicators corrected from natural capital depletion. In practical terms, Barbier corrected Net National Income and Net National Savings, respectively, from net changes in the value of renewable and non-renewable natural resource stocks, hence **applying the capital depreciation to the case of natural capital resources**. This procedure allowed the construction of time series recording the annual depreciation rate of natural capital, showing that **for ‘high income countries’, the annual natural capital depreciation rate remained**

145 Green Growth Knowledge Platform – Draft background note, 2017, p. 4; *Science for Environmental Policy (2017) – Taking stock: progress in natural capital accounting*. In-depth report 16, produced for the European Commission-DG Environment, by the Science Communication Unit, UWE, p. 14.

146 *Science for Environmental Policy (2017) – Taking stock: progress in natural capital accounting*. In-depth report 16, produced for the European Commission-DG Environment, by the Science Communication Unit, UWE, p. 14.

147 SOER 2015 – *The natural capital & ecosystem services*, European environment agency, p. 4.

148 *Science for Environmental Policy (2017) – Taking stock: progress in natural capital accounting*. In-depth report 16, produced for the European Commission-DG Environment, by the Science Communication Unit, UWE, pp. 30-31.

149 *Ibidem*!, p. 33 sqq.

150 ONS, 2015

151 E. Campbell & M. brown, ‘Accounting of natural capital and ecosystem services for the US National Forest System’, *Environ Dev Sustain* 14, 2012, pp. 691–724

roughly constant from 1970, varying between 0.5 and 2.2 per cent per year, while in 'low income countries', the annual natural capital depreciation rate is on the rise since 1985 and is reaching 15 per cent per year.¹⁵² However, such long term series are likely to be underestimated, because they rely on existing World Bank environmental data which, two or three decades ago, obviously did not take into account the level of interactions between ecosystems that is being raised by the different frameworks described above.

A further concern which should receive attention is that, despite the increasing number of countries implementing natural capital in their national accounts, there is very little evidence for the actual use of such data in public policy decisions, a recent study finds.¹⁵³ Hence, further action should probably rather be focused on how to bring governments and policymakers to make use of natural capital accounting.

Corporate Natural Capital Accounting

As promising as some of these achievements may be, a proper accounting of natural capital assets has to start from the bottom, that is the corporation level.

Natural capital accounting is the process of registering a company's liabilities and assets related to natural capital in the form of a balance sheet, which helps making sounder management decisions, better identifying resource uses in the production process, and produce information that might reveal helpful for either governmental institutions or other companies.

Corporate natural capital accounting can be performed through the three following main types of accounting¹⁵⁴:

- **Environmental management accounting (EMA)**, which might display four different avatars, according to the primary users (external or internal) and the valuation method (monetary or physical);¹⁵⁵
- **Environmental financial accounting (EFA)**, which deals with accounting for environment related market transactions that might affect a company's financial position;
- **Environmental economic accounting**, which involves accounting for the interactions between the environment and the economy, and the (changes in) stocks of environmental assets (UN-SEEA, 2014). This includes environmental impacts as well as natural capital.

The table below summarizes natural capital accounting approaches and provides information as to the methods and purposes of different kind of natural capital accounting approaches.¹⁵⁶

152 E. Barbier, 'The concept of natural capital', *Oxford review of Economic Policy* 35, n°1 (2019), pp.22 sqq.

153 L. R. Virto et al., 'Natural Capital Accounts and Public Policy Decisions: Findings from a Survey', *Ecological Economics* 144 (2018), pp. 244-259.

154 J. Spurgeon, *B@B Workstream 1: Natural Capital Accounting for Business: Guide to selecting an approach*, 2014, p. 17.

155 R. Burrit, T. Hahn, & S. Schaltegger, 'Towards a comprehensive framework for environmental management accounting - Links between business actors and environmental management accounting tools', *Australian accounting review* 12 (2), 2002, pp. 41

156 Based on: J. Spurgeon, *B@B Workstream 1: Natural Capital Accounting for Business: Guide to selecting an approach*, 2014, p. 22.

Figure 12 - Summary of Corporate natural capital accounting approaches

Corporate NCA approach	Description	Purpose
Env. Profit & Loss Account (full cost accounting)	Applies societal monetary values to company natural capital and other environmental impacts along the value chain, and can be applied from product to company level.	Assessing the relative scale of costs and benefits to stakeholders in monetary terms associated with natural capital. This is particularly useful for helping to focus where risks are, where improvements should be made, and for assessing net impacts.
Env. Balance Sheet (full cost accounting)	Includes information (physical and/or monetary) on the natural capital assets typically owned or managed by a company.	Determining the nature, extent and value of natural capital assets a company owns/ manages on its land, and how this changes each year.
Env. Financial Accounting	Environmental components Involves including and specifying financial components of a conventional financial profit & loss account and balance sheet that directly or indirectly relate to natural capital and other environmental impacts.	Determining the actual financial implications to a company of natural capital and other environmental impacts in terms of assets, liabilities, profits and losses.
	Site management costs Involves assessing the financial cost implications of maintaining natural capital to a certain quality	Determining what the future financial cost (liability) is for a company if they are to maintain the natural capital they own or manage in good condition in the coming years.
Integrated Financial NCA & reporting	Involves including physical units as well as societal and financial values within a fully integrated set of balance sheets and profit & loss accounts.	(1) Comprehensively accounting for all company impacts and dependencies using a mix of physical, societal value and financial metrics (2) Reporting changes in stocks and flows of value on an annual basis.

Source: J. Spurgeon, *B@B Workstream 1: Natural Capital Accounting for Business: Guide to selecting an approach*, 2014

Despite the various attempts at promoting the inclusion of natural capital assets in companies' accounts, one important issue remained, namely that companies were assessing and measuring their natural capital assets, use and dependencies using different methodologies. This is what motivated the development of the **Corporate Natural Capital Accounting (CNCA)** framework in the UK by the Natural Capital Committee (2014). The CNCA framework aims to provide a consistent framework for business natural capital accounting to ensure comparability and consistency. Its main characteristics are:¹⁵⁷

¹⁵⁷ A. Provins et al., *Developing corporate natural capital accounts - Final report*, pwc - Eftec - Rspb, 2015, p.5 sqq. Cf. <https://eftec.co.uk/services/accounting-natural-capital>.

- The use of a balance sheet structure;
- The inclusion of both ‘private’ values accruing to the organisation and the ‘external’ values accruing to the rest of the society, in order to capture the ‘full’ value of natural capital;
- Asset register showing the quality and quantity of natural capital assets.

Other frameworks for corporate natural capital accounting exist, such as ‘CARE-tdl’, BSI Natural Accounting Standard (under development). Yet, most of the existing corporate natural capital accounting frameworks are not mandatory — except in cases where the materiality of information has been clearly acknowledged.¹⁵⁸ Indeed, the group consolidated financial statements of listed companies follows the IFRS standards, but the current survey could not find any inclusion of natural capital in the existing IFRS norms.

The existence of a consistent accounting framework, in the form of the CNCA or ‘CARE-tdl’, appears to be an important milestone on the road to a better natural capital sustainable management. However, discussion should take place on which methodology would best fit. Then, efforts should be directed towards making natural capital accounting mandatory at least for listed companies, although the opportunity of including non-listed ones should also be discussed.

Box 5: Potential issues related to the choice of NCA methodologies

“Sustainability requires at least a constant stock of natural capital [...]”

Pearce, 1988

Accounting is not a neutral information system for measuring a company’s wealth and income: while it can reflect national traditions, interest or a certain vision of the economy, it can have positive or detrimental impacts both on the ‘Tragedy of the horizon’, by participating to the financial time horizon (short- or long-termism), and on the sustainability of the economy and of the capital it is mean to account for.

In Europe, the opposition principally lies between a Continental model using **‘historical costs’ (HCA)** and the Anglo-Saxon model using **‘fair value’ (FVA)** — which tend to dominate the IFRS/IAS norms. Historical cost accounting reports assets and liabilities at the initial price they were exchanged for at the time of the transaction. Conversely, fair value accounting — also called ‘mark-to-market’ — quotes the prevailing price in the market. Since 2005, **all listed European businesses must apply IFRS standards** to present their financial statements while national accounting rules stay in application for unlisted and small firms. IFRS standards stipulates that the financial statements must comply with the information needs of investors. In order to produce it, the IASB (International Accounting Standard Board — International standard setter) theoretically promotes accounting combining ‘valuations at cost’ and ‘fair value’, but it is this second model which is said to be preferential.¹⁵⁹

While some are saying that neither FVA nor HCA is objectively “better” than the other and can provide useful information for different contexts *when applied rigorously*, other are pointing to the pros and cons of each models: the attractiveness of FVA can mainly be understood by the desire to have comparable and reliable financial information between companies - which can be achieved by the use of a single reference for all companies.

¹⁵⁸ R. Van Tilburg & E. Achterberg, *The financial sector as a new agent of change: the case of natural capital accounting and reporting*, Sustainable Finance Lab, 2017, p. 11.

¹⁵⁹ RIGOT, S., DEMARIA, S., *Potential impediments to long-term and low-carbon investment: The international accounting standards at stake*, International Journal of Sustainable Energy Planning and Management, Vol.15, 2018, p.11-20

Meanwhile, **IFRS norms based on FVA have also been described as not neutral** (higher volatility,¹⁶⁰ procyclicality¹⁶¹ and incentivizing investors and managers short term behaviour), **and being able to have adverse impact regarding certain categories of investments** (in particular equities and some alternative asset classes).¹⁶² It has also been pointed out that they do not take into account environmental issues — only indirectly through IAS 36 and 37 — which is a critical issue on the path towards a sustainable economy.¹⁶³

But a more fundamental criticism has emerged, which plays a very important role while discussing which form natural capital accounting should take, and is based on differences between the theories of capital which underlie HCA and FVA.

Accounting models based on ‘historical costs’ have been described as related to the **historical definition of capital** which gathers several important characteristics: i) capital has an intrinsic existence, aside from its potential utility, and its utilisation is recorded as an asset; ii) it entails the principle of planned depreciation, which connects the consumption and degradation of capital to the way it is used; iii) there is a positive bias in favour of maintaining the capital, which implies the necessity of finding specific ways to counterbalance these degradations. The “traditional” accounting mechanisms are described by A. Rambaud as being organized to guarantee capital integrity: **accounting mechanisms “articulate a precise goal, the obligation of capital maintenance and the complexity of the utilisation of this capital.”**¹⁶⁴

Accounting models based on ‘fair value’ are said to come from another theory of capital, based in particular on the work of the economist Irving Fisher. Considering that the intrinsic characteristic of capital is to ‘provide a service’, Fisher derived that wealth is a stock of future services, and consequently that **the value of the capital is “the present worth of the future income from the specified capital”** (I. Fisher, 1906).

According to A. Rambaud, this modification of the notion of capital (and its related concepts) introduces radical shifts into accounting and financial thinking: **from a focus on the stock and long-term value, to a focus on cash-flow and net-present-value**. And this has a radical impact on how natural capital accounting can play a positive role in allowing for a better management of natural capital, or a detrimental role by exacerbating undue pressure on the environment by allowing for the wrong conceptualization.

160 Faced with volatile financial information, market participants react instantly and abandon their initial long-term strategies.

161 Regarding the procyclicality, this debate between which style of accounting has been a topic of conversation for decades. Widely used in the early 20th centuries, fair value accounting was pointed by many economist as a cause of the US economy collapsed in the 1920's. During the financial crisis of 2008, many financial firms also cited the switch to fair value accounting as a cause of their problems. As the economic cycle falls, asset prices also fall, depressing earnings for companies more than under the historical cost method. This leads to raising capital when company valuations are low, further compounding the problems for a company. Source: LAUX, C., LEUZ, C., *Did fair-value accounting contribute to the financial crisis?*, Journal of Economic Perspectives, Vol. 24, No. 1, 2010, pp. 93-118; JAIJAIRAM, P., *Fair Value Accounting vs. Historical Cost Accounting*, Review of Business Information Systems Volume 17, Number 1, City University of New York, USA, 7p.

162 RIGOT, S., DEMARIA, S., *Potential impediments to long-term and low-carbon investment: The international accounting standards at stake*, International Journal of Sustainable Energy Planning and Management, Vol.15, 2018, p.11-20, p.19

163 RIGOT, S., DEMARIA, S., *Ibid.*

164 RAMBAUD, A., RICHARD, J., *Towards a finance that CARES: From today's Fisherian-(Falsified) Hicksian perspective to a genuine sustainable financial model, designed through accounting principles*, Working paper, 2016, Université Paris-Dauphine, 69p., p.10

“Finance is tackling sustainability by taking into account extra-financial types of capital [such as natural capital], but according to the capital theory underlying this approach, the obtained “sustainable finance” may simply reproduce “the same type of thinking which led, in particular, to the 2008 crisis” and would thus be unsustainable.”

A. Rambaud

The consequence when natural capital accounting methodology builds on the ‘fair value’ approach is that natural capital no longer has an intrinsic essence/value which needs to be maintained (and restored). It is merely a virtual entity, a part of the earth’s ecosystem which is reduced to streams of future receipts, generated through their corporate utilisation. As such, ‘natural assets’ are seen as substitutable with other types of assets and this conception of natural capital is said to follow a ‘weak sustainability’ conception.¹⁶⁵

Figure 13: Natural capital and the two conceptions of accounting (Rambaud/Richard)

	Fair value approach	Historical costs approach
Capital	Capital is virtual: it is a stream of future receipts. Capital is dependent on the activity of the firm	Capital is a “substantial” entity and independent from the activity of the firm.
<i>Natural capital</i>	<i>Natural capital is a virtual entity reduced to streams of future receipts. Natural capital is not a different type of capital</i>	<i>Natural capital is a generic term designating a particular set of entities. It is independent from the corporate activity and its ‘essence’ exists outside the firms.</i>
Capital & income	Capital & income are inter-defined	Capital & income are strictly separated
<i>Natural capital</i>	<i>The definition of Natural capital relies on the future profits it can generate</i>	<i>Natural capital is strictly independent from income</i>
Capital & balance sheet	Capital is a debit concept (defined through assets). Focus on the left-side of the balance sheet	Capital is a credit concept. Focus on the right-side of the balance sheet
<i>Natural capital</i>	Natural capital as a debit concept (as in the case of IAS 41). Natural capital & natural assets are mixed up.	Natural capital as a credit concept: it is a liability that represents the responsibilities a firm has towards the entities that form this capital.
Capital maintenance	Maintenance, asset management and profit maximisation are inter-defined. Maintenance at the level of the owners/ shareholders.	Maintenance of an intrinsic essence of the capital at the level of the firm. Planned depreciations are recorded to guarantee this maintenance.
<i>Natural capital</i>	Because there is only one type of capital, natural assets are substitutable with other type of assets: ‘weak sustainability’. Natural capital maintenance means natural assets managements and maintenance of the whole capital of the shareholders.	Maintenance of natural capital for what it is intrinsically at the level of the firm. Planned depreciations are recorded to guarantee this maintenance.
‘Matter of concerns’	Capital (assets) management and optimisation	Capital protection
<i>Natural capital</i>	<i>Whole capital (natural and non-natural) management and optimisation</i>	<i>Protection of each type of natural capital independently</i>
Income	Possibility to distribute unrealized future gains	Measuring the available surplus, after securing the integrity of the intrinsic essence of the capital
<i>Natural capital</i>	<i>Unrealized future gains increased with natural capital</i>	Measuring the available surplus that does not jeopardize the integrity of natural capital

165 RAMBAUD, A., RICHARD, J., *Ibid.*

The CARE (Comprehensive Accounting in Respect of Ecology) model (also called CARE-“Triple Depreciation Line” model),¹⁶⁶ created by A. Rambaud and J. Richard, provides a complete accounting model, made for the operationalization of this second conception of the natural capital. Therefore, this accounting framework applies symmetrically the historical accounting principles to extra financial types of capital.¹⁶⁷ More precisely, it “*consists of effective integration into [financial corporate accounting] and is based on the principles of strong sustainability. The founding principle of the model is to extend the financial solvency of companies to ecological (and social) solvency. The natural (and human) capital – constituting a liability, i.e. an ecological debt – is assessed in monetary terms through its maintenance costs, defined, in the case of natural capital, as the costs of actions to be implemented to comply with ecological limits. Its implementation within a company thus produces a balance sheet and income statement extended to natural and human capital*”.¹⁶⁸

While we are not prescribing any models at this stage, it appears clear that any discussion of natural capital accounting must be preceded by an intense discussion of the pros and cons of each method, regarding the potential effects it could have on the management of natural capital.

POLICY IDEA

Mainstream natural capital accounting by carefully settling the methodology

Various models exist for corporate natural capital accounting. To ensure a consistent way of showing hidden costs and externalities, there is a need to **settle the methodologies** and consider **how to integrate them** with financial accounting practices (e.g. inside IFRS/US GAAP or not). This will need care to avoid negative incentives (e.g. the distinction between representing natural capital as a stream of future receipts or as a liability which has to be maintained).

POLICY IDEA

Mainstream natural capital accounting in national accounts and ensure it is used to inform policy making and economic development strategy

As an important component of a national economic development strategy in a “beyond GDP” agenda, a growing number of countries integrate natural capital accounting in their national accounts. More should do so, disclose how, and use it in their public policy decisions.

¹⁶⁶ RAMBAUD, A., RICHARD, J., *The “Triple Depreciation Line” instead of the “Triple Bottom Line”: Towards a genuine integrated reporting*, 2015, *Critical Perspectives on Accounting*, 33, 92–116

¹⁶⁷ RAMBAUD, A., RICHARD, J., *Ibid.*

¹⁶⁸ BLUET, H., IONESCU, C., *Into the wild. Integrating nature into investment strategies*, WWF France and AXA recommendations for the members of the G7 ENVironment meeting in Metz, 5–6 May 2019, 63p.

2.3 Natural capital and the reporting of non-financial information

Financial reporting serves an important role as a means of communication between corporate management and the company's stakeholders and is mandatory for listed companies. Nevertheless, a general criticism of **financial reporting** is that it **provides only a partial account of business activities, ignoring environmental and social impact and their related risks** – as previously discussed. As a consequence, there have been **calls to enhance reporting of sustainability factors from investors**, and more recently by supervisors and central banks.

In PwC's 2014 global investor survey, 63% of investors rated disclosures on the company's dependency and impact on the future supply of resources as important.¹⁶⁹ As previously discussed, natural capital and ecosystem services can provide a useful conceptual lens to assess businesses' dependencies on the environment. But to report their natural capital impact and dependencies, companies need more: they need accessible data, metrics, methodologies and a clear and consistent legal framework.

In the last two decades, various methodologies, frameworks and reporting standards have been built to disclose, either only natural capital, or various form of capitals which include natural capital (e.g. the 'six capitals' at the foundation of 'Integrated reporting': financial, manufactured, intellectual, human, social and relationship and natural): Global Reporting Initiative, UN Global compact, International Integrated Reporting Framework, Climate Disclosure Standards Board, Natural Capital Protocol, ISO 26000, to name a few. One of the leading platforms where businesses can report information on various natural capital elements such as carbon, water and land use, is the Carbon Disclosure Project (CDP), a UK-based non-profit. Through their platform, over 7,000 companies which represent more than 50 per cent of global market capitalization disclose non-financial environmental information — mostly on climate breakdown but increasingly on water security and forests — and over 525 investors with assets of USD 96 trillion already request corporate climate and environmental disclosure in line with the TCFD recommendations.

Meanwhile, the road towards consistent environmental reporting is still long and significant pitfalls remain. While such non-financial reporting is supposed to provide a complete and balanced picture of corporate sustainability performance, it is recognized that being either voluntary, or non-harmonised, it is prone to interpretation, lack of consistency and even greenwashing tendencies. Across the many issues pointed out in the literature, reports and investor surveys, the more commonly reported are:

- **Non-harmonised reporting** - A recent study of KPMG and WBCSD records that the principal challenges for investors using such non-financial information arise from the numerous reporting frameworks and initiatives in this area, the sheer volume of information reported and the perceived lack of high-quality, consistent and comparable information.¹⁷⁰
- **Incomplete reporting** - As an illustration, a recent report shows that, in 2017, environmental indicators were only disclosed by a minority of large companies: *"GHGs were disclosed by only 43 per cent of the 6,441 large companies included in this research, followed by energy (40 per cent) and water (38 per cent); a*

¹⁶⁹ PwC, *Corporate Reporting: What do investors want to know?*, 2014, 18p., Url.: <https://www.pwc.com/gx/en/audit-services/corporate-reporting/publications/investorview/assets/pwc-investors-survey-powerful-stories-through-integrated-reporting.pdf>

¹⁷⁰ PWC, WBCSD, *Enhancing the credibility of non-financial information the investor perspective*, 2018, 18p., Url.: https://docs.wbcsd.org/2018/10/WBCSD_Enhancing_Credibility_Report.pdf

majority of large companies are still not disclosing any of the four environmental indicators (energy, GHGs, water and waste) tracked in this research.”¹⁷¹

- **Unequal quality of reporting** - In accordance with the finding that “superior sustainability performers choose high-quality sustainability disclosure to signal their superior performance to the market” and that “poor sustainability performers prefer low-quality sustainability disclosure to disguise their true performance and to simultaneously protect their legitimacy”,¹⁷² the absence of a clear and enforceable reporting requirement leads, unsurprisingly, to unequal levels of quality in the reporting. In some situations, neither the metrics nor the accounting methods are consistent, which limits comparability across companies.¹⁷³ In fact, as most disclosure is gathered through checkbox yes-or-no responses rather than robust quantitative performance indicators, investors have substantial doubts about the quality of sustainability data.¹⁷⁴ A study of 265 companies from six sectors (diversified metals, food products, oil & gas producers, paper products and forestry, precious metals and steel), found that while 80 per cent do report on biodiversity and land use issues, both through the identification of risks and implicitly through their related activities, the average quality of their reporting was considered weak.¹⁷⁵ In general, company-disclosed data on natural resources lacks adequate information about the physical environment where companies operate.¹⁷⁶ As a consequence, investors often have substantial doubts about the reliability of the picture it draws.
- **Separated reporting** - The preferred format for disclosures on ‘non-financial information’ such as ESG factors has typically been a stand-alone report. A concern with stand-alone reports is that they provide non-financial information which is non-integrated and compartmentalised.¹⁷⁷ Meanwhile, it is recognized that ‘non-financial information’ may be an imperfect term as the information may ultimately have a financial dimension or impact¹⁷⁸ and should therefore be integrated in a single and standardized report.

Depending on national and regional regulatory landscapes, disclosure is well advanced or not. In Europe, the so-called Non-Financial Reporting Directive (NFRD) was seen as an important step in the right direction, because the reporting of certain sustainability factors (beyond just climate-related disclosure) is mandatory, but it still fails to specify what concrete information must be disclosed and how (see Box 6) leading to the same lack of consistency and comparability. In the US, where the

171 YOW, M., RUBIN, M., *Measuring Sustainability Disclosure - Ranking the World's Stock Exchanges*, Corporate Knights, 2017, <https://www.comunicarseweb.com/sites/default/files/sse2017final.pdf>

172 HUMMEL, K., SCHLICKB, C., *The relationship between sustainability performance and sustainability disclosure – Reconciling voluntary disclosure theory and legitimacy theory*, Journal of Accounting and Public Policy, Volume 35, Issue 5, September–October 2016, Pages 455–476

173 PINCHOT, A., CHRISTIANSON, G., *What investors want from sustainability data*, World Resources Institute, WRI Commentaries, 2019, 12p.

174 PINCHOT, A., CHRISTIANSON, G., *Ibid.*

175 MACLAUGHLIN, VAN DER KUIJF, VAN DIJK, *Biodiversity in the spotlight? Assessing the coverage and quality of reporting on the issues of land use, biodiversity, water and product sustainability by companies worldwide*, Sustainability, Amsterdam, 2015; Cited in VAN TILBURG, R., ACHTERBERG, E., *The financial sector as new agent of change - The case of Natural capital accounting and reporting*, Study commissioned by the Netherlands Environmental Assessment Agency (PBL), 2016, 44p.

176 PINCHOT, A., CHRISTIANSON, G., *Loc. cit.*

177 BERNARDI, C., STARK, A. W., *Environmental, social and governance disclosure, integrated reporting, and the accuracy of analyst forecasts*, 2018, The British Accounting Review, 50(1), p.16–31

178 PWC, WBCSD, *Enhancing the credibility of non-financial information the investor perspective*, 2018, 18p., Url.: https://docs.wbcsd.org/2018/10/WBCSD_Enhancing_Credibility_Report.pdf

perception of litigation risks is heightened, disclosure lags significantly.¹⁷⁹ Meanwhile, China recently launched a roadmap to 2020 for climate-related disclosure and companies clearly state their intent to act in the next couple of years, if they are not already doing so.¹⁸⁰

Due to these pitfalls, there is still little comparable information available on how companies are adapting their business models to environmental-related risks and challenges. And without harmonized and comparable information, neither financial institutions, nor central banks and supervisors can take these parameters into account.¹⁸¹ As shown in detail in a recent report from the *Alliance for Corporate Transparency* about NFI disclosure in the EU, “the current status of corporate sustainability reporting does not allow investors and other stakeholders to understand companies’ impacts and risks, and their strategies to address them.”¹⁸² It is also recognized by many sources, such as WBCSD and KPMG which state that “many investors don’t have the information they need to make capital allocation decisions based on a company’s sustainability performance”.¹⁸³ Consequently, investors and asset managers such as Blackrock encourage more and more standardized ESG disclosure within a consistent global reporting framework, similar to international accounting standards.¹⁸⁴

Meanwhile, some positive trends are emerging in both methodology and recognition of the current issue with non-harmonized, incomplete and inconsistent disclosure. In 2018, the Climate Disclosure Standards Board (CDSB), a non-profit working to integrate climate-related information into mainstream accounting, launched an updated framework to support market participants in reporting environmental and climate information aligned with the TCFD in their mainstream reports. The same year in Europe, the president of the European Central Bank, Mario Draghi, stated that the ECB would support legislation that strengthens sustainability disclosure, which could contribute to better pricing of environmental risks. The European Securities and Markets Authority (ESMA) also highlighted the need to include “the disclosures of non-financial information, and notably those related to environmental and climate change-related matters.”¹⁸⁵ In January 2019, the European Commission Technical Expert Group (TEG) on Sustainable Finance¹⁸⁶ released a set of useful recommendations for updating the Commission’s non-binding guidelines on NFRD (Box 6). In April, the Network on Greening the Financial System (NGFS) emphasized in its

179 For more information: WBCSD, CDSB, ECODESK, , *Corporate reporting in the United States and Canada*, The reporting exchange, 2017, Url.: https://docs.wbcsd.org/2018/02/Corporate_reporting_in_the_United_States_and_Canada.pdf

180 CDSB, CDP, *Ready or not: Are companies prepared for the TCFD recommendations? A geographical analysis of CDP 2017 responses*, March 2018, 34p.

181 VAN TILBURG, R., ACHTERBERG, E., *The financial sector as new agent of change - The case of Natural capital accounting and reporting*, Study commissioned by the Netherlands Environmental Assessment Agency (PBL), 2016, 44p.

182 <http://www.allianceforcorporatetransparency.org/news/companies-failing.html>

183 PWC, WBCSD, *Enhancing the credibility of non-financial information the investor perspective*, 2018, 18p., Url.: https://docs.wbcsd.org/2018/10/WBCSD_Enhancing_Credibility_Report.pdf

184 BLACKROCK, *Exploring esg: a practitioner’s perspective*, 2016, 14p., Url.: <https://www.blackrock.com/us/individual/literature/whitepaper/viewpoint-exploring-esg-a-practitioners-perspective-june-2016.pdf>

185 ESMA, *European enforcers to focus on new IFRSs and non-financial information in issuers’ 2018 annual reports*, Press news, 26 October 2018

186 The European Commission Technical Expert Group (TEG) on Sustainable Finance, from which Finance Watch is a member, released a Report on Climate-related Disclosures on the request of the European Commission.

first comprehensive report the need to achieve a “*robust and internationally consistent climate and environment-related disclosure framework*”.¹⁸⁷

Box 6: The incomplete European disclosure toolbox

Since 2014, the EU has required the largest companies to disclose certain non-financial information on the way they operate and manage social and environmental challenges — via the so-called *Non-Financial Reporting Directive* (NFRD). While the directive does not explicitly mention natural capital, it does refer to natural capital categories (e.g. GHG; air pollution; water use) and relevant international frameworks (e.g. Global Reporting Initiative, the OECD guidelines for multinational enterprises).¹⁸⁸

But major pitfalls and loopholes remain to making it a useful source of information for financial institutions and supervisory authorities. Firstly, the approximately 6,000 large companies that have to comply with NFRD have certain flexibilities to decide if this information is relevant to disclose to their investors — embedded into the concept of ‘materiality’ which sometimes lacks clarity on the extent of information that has to be disclosed. Secondly, companies can decide how and under which methodology, standards and framework to disclose (GRI, CDP, UN Global compact, International Integrated Reporting Framework, Climate Disclosure Standards Board (CDSB), Natural Capital Protocol, etc.), creating a lack of comparability between sectors and companies. Thirdly, the guidance drafted in 2017 by the Commission which aimed to facilitate “*relevant, useful and comparable disclosure*” of important information for investors, governments and supervisors are non-binding, which means it does not solve the main issues of comparability and uniformity. In 2018, CDP and the Climate Disclosure Standards Board analysed the first year of corporate climate and environmental disclosures under the NFRD by 80 large European companies, finding “*no direct evidence from companies that the Guidelines were being used or having a positive effect on NFRD or TCFD-aligned disclosures*”.¹⁸⁹

Finally, it is also possible to keep the non-financial report separated from the financial report. When the latter is well-harmonized and mandatory, allowing an easy comparison on the financial aspect of these listed companies, it is difficult to support the argument that such comparability would not be relevant when it comes to non-financial information, e.g. on environmental and social challenges.

The recent TEG¹⁹⁰ recommendations for updates to the Commission’s non-binding guidelines have nevertheless been a necessary and welcome step in the right direction. While the TEG has been asked to suggest how to integrate TCFD recommendations into non-binding guidance, the TEG report is more ambitious than the TCFD report because it also recommends the disclosure of the impact of company’s activity on climate change. This is extremely positive, because in no context should climate risk be reduced to the concept of purely financial risk. Regarding the ongoing

187 NGFS, *A call for action Climate change as a source of financial risk*, First comprehensive report, April 2019, Url.: https://www.banque-france.fr/sites/default/files/media/2019/04/17/ngfs_first_comprehensive_report_-_17042019_0.pdf

188 MAAS, K., LAMBOUY, T., VAN TILBURG, R., VAN’T FOORT, S., *Investors and companies’ biodiversity and natural capital reporting and performance - Assessing the request for and use of company reporting on biodiversity and natural capital by asset managers and fund managers*, Sustainable Finance Lab, Nyenrode Business University, Impact Centre Erasmus, 2017, 67p., p.25

189 CDSB, CDP, *First Steps Corporate climate and environmental disclosure under the EU Non-Financial Reporting Directive*, 2018, 52p., p.41

190 The European Commission Technical Expert Group (TEG) on Sustainable Finance, from which Finance Watch is a member, released a Report on Climate-related Disclosures on the request of the European Commission.

recognition of climate-related financial risks, it is becoming increasingly difficult to justify the inclusion of these disclosures under the heading of ‘non-financial reporting’ given their financial materiality.

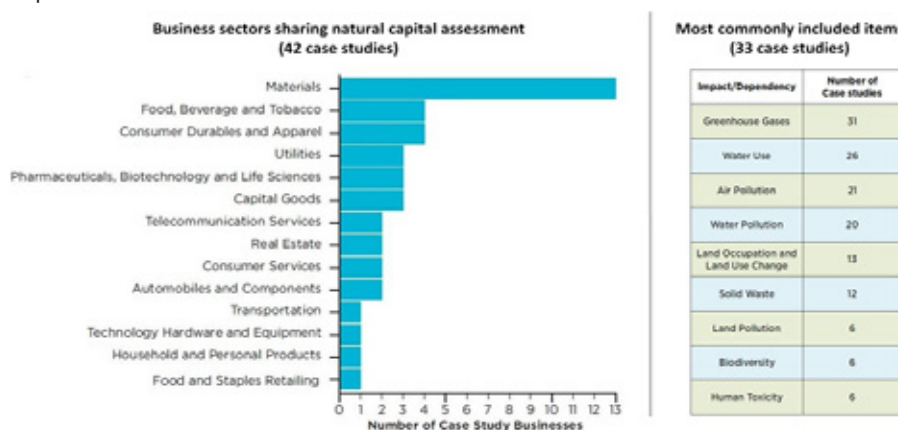
It will not be possible to redirect capital flows and assess the compliance of corporations if companies are not mandatorily required to disclose both their dependencies on and how they are impacting the environment and what they are doing to adapt their business models to the related risks. Finance Watch will encourage the next Commission to review the EU legal framework to make it mandatory, and support the proposal to include TCFD-related requirements into the 2013/34/EU Accounting Directive (article 20) and the 2014/95/ EU Directive on disclosures of non-financial and diversity information (update articles 19a and 29a).

2.4 Natural capital in decision and policy making

The integration of natural capital and ecosystem services frameworks can provide substantial support to decision-making processes, at three different levels:

At the corporate level, accounting for natural capital and natural capital-related risks will help companies to make wiser investment strategies, by acknowledging their dependency on well-functioning specific ecosystems and the services they provide, and by being able to anticipate some potential drawbacks of current decisions that might turn out to be detrimental to them. This however implies a certain level of disclosure and transparency on a company’s use of natural capital and ecosystem services. An important step in this direction is represented by the Natural Capital Protocol which “allows to measure, value and integrate natural capital impacts and dependencies into existing business processes such as risk mitigation, sourcing, supply chain management and product design”,¹⁹¹ by using a harmonized measurement and valuation system. Other frameworks exist such as sector guides or the corporate guide to ecosystem valuation and the ecosystem services review.

In order to acquire a clearer picture of what has already been done and what needs to be done, the graph below displays the result of a study showing which sectors have been including natural capital assessment and which are the most frequent natural capital items recorded.¹⁹²



¹⁹¹ <https://naturalcapitalcoalition.org/natural-capital-protocol/>

¹⁹² R. Pritchard & D. Van der Horst, *Monetary Natural Capital Assessment in the Private Sector: A review of current status and research needs*, Valuing nature Program, 2018, p. 5

In this respect, it is worth noticing that, according to the 42 reviewed case studies, corporations mostly assess natural capital because of reputational or ethical reasons, which reveal that other rationales — mainly the assessment of other forms of risks, dependencies and opportunities — do not sufficiently benefit from conditions that incentivize companies to take them into account, as natural capital costs are currently ‘external’ to businesses.

At the national level, natural capital and ecosystem services accounting and measurement provides a clearer picture of a country’s resources, and most importantly helps to inform policymakers when implementing sound environmental conservation policies, notably by prioritizing governmental actions in environmental matters. A clear example of the interest and utility of natural capital and ecosystem services frameworks in governmental decision making is provided by the UK National Economic Assessment (UKNEA, 2009), which had a strong influence on the UK’s 2011 Natural Environment White Paper (NEWP),¹⁹³ and eventually resulted in the establishment of the Natural Capital Committee. An important outcome of the UKNEA has been the global picture on the state, value and other examples, including the government’s guidance on appraisal and evaluation, the Green Book.

Tools to integrate natural capital and ecosystem services into financial institutions decision-making have been recently developed. The most recent example is the Financial Sector Supplement for the NCP.¹⁹⁴ Other frameworks and methodologies have been developed, but focus more on the risk-assessment side (e.g. the NCFA framework for integrating natural capital-related risks assessment for banks¹⁹⁵ and financial institutions¹⁹⁶), which will be discussed in the next section.

Other instruments of natural capital conservation exist aside from natural capital and ecosystem services valuation and accounting, notably environmental regulations. At this stage, it should be stressed that not only is there no contradiction between them, but natural capital and ecosystem services frameworks appear in fact to be complementary to environmental regulations in so far as they contribute to the spread of a common language, develop a suitable analytical framework, put emphasis on the systemic nature of natural resources, and develop *ad hoc* metrics.

POLICY IDEA

Request listed companies to assess and disclose their interaction with natural capital

As methodologies are now available, companies can more easily **assess their dependencies on natural capital**, the associated **risks**, and the **impacts** of their operations on natural capital. Meanwhile, companies that undertook natural capital assessments mainly did so for reputational or ethical reasons. The next necessary step will be to require **mandatory and harmonized disclosure**, integrated with financial reporting, as a pre-condition for financial institutions, policy makers and supervisors to take this dimension into account

¹⁹³ WWF, *Accounting for Natural Capital in EU Policy Decision-making - A WWF background paper on policy developments*, 2014, p. 13.

¹⁹⁴ NCC, NCFA, *Connecting finance and natural capital - a supplement to the natural capital protocol*, 2018, 80p.

¹⁹⁵ *Integrating natural capital in risk assessment - A step by step guide for banks*, Natural Capital Finance Alliance and PricewaterhouseCoopers (Geneva, Oxford and London), 2018

¹⁹⁶ *Exploring Natural Capital Opportunities, Risks and Exposure: A practical guide for financial institutions*, Natural Capital Finance Alliance and UN Environment World Conservation Monitoring Centre (Geneva, Oxford and Cambridge), 2018.

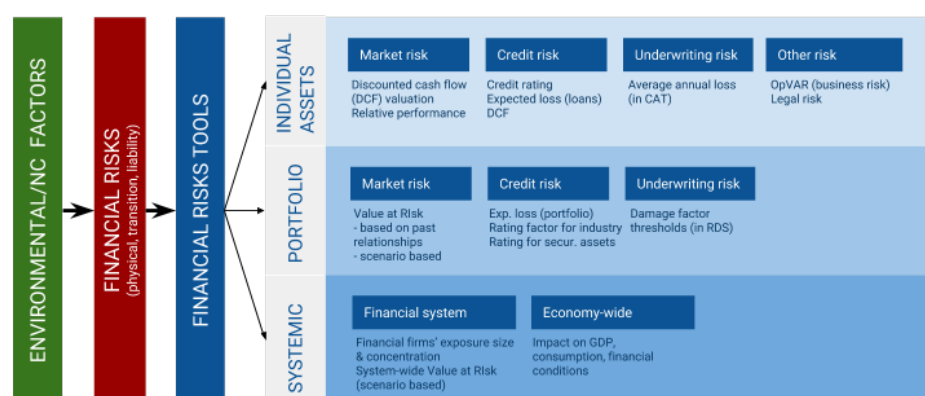
2.5 Natural capital risk-assessment

As private financial institutions are driven by a simple ‘risk/return’ ratio, shifting capital involves changing this ratio. As previously discussed, **natural capital valuation and accounting can impact the returns** expected from the activities that financial institutions invest in by internalizing negative environmental externalities in the production cost, and therefore affecting the profitability of various sectors. We will here discuss how to enhance **the financial sector’s understanding of risks related to natural capital depletion**.

The degradation of natural capital differs from the depreciation of other form of capital in two main ways. First, it is frequently **irreversible** (*critical natural capital*), or requires long-term recovery, and in some cases the losses are irreplaceable, since the restoration of ecosystems is unlikely to bring back the previous genetic diversity. Secondly, **ecosystems may collapse abruptly**, as their tipping point is usually unknown.¹⁹⁷ These characteristics highlight the risks related to the use and under management of natural capital.

As we have seen previously in section 1.1. of this part, several physical risks are related to the under management of natural capital which can become material for financial institutions, as well as for the financial system as a whole. Furthermore, transition and liability risks can also impact the stability of financial institutions, and potentially the financial system in case of contagion. These risks can materialise at three levels — individual assets, portfolio and systemic levels — and impact various type of financial risk — e.g. market,¹⁹⁸ credit,¹⁹⁹ underwriting,²⁰⁰ legal risks²⁰¹ — as reported in the following table:

Figure 14: Toolbox for natural capital risk assessment



Source: adapted from Green Finance Study Group, *enhancing environmental 2017*

¹⁹⁷ *Natural capital risks and opportunities for the financial sector*, Center for sustainability studies at the getulio vargas foundation (gvces / fg-v-aeesp), First edition, 2017, 78p., p.13

¹⁹⁸ Market risk refers to the “risk of losses in on- and off-balance-sheet positions arising from movements in market prices” (Basel Committee on Banking Supervision, 1996)

¹⁹⁹ Credit risk is comprised of issuer and counterparty risk. Issuer risk is the possibility that an issuer/borrower is not able to fulfil its obligations due to its default. Counterparty risk comprises the risk that a counterparty defaults and is not able to fulfil its obligations (Christoffersen, 2003)

²⁰⁰ Underwriting risk is the risk of insured losses being higher than expected. In property and casualty insurance products, significant components of such risk are the reserve and premium risks. In life and health insurance products, biometric and customer behaviour risks are important (Bennett, 2004)

²⁰¹ Legal risk is the risk of significant legal consequences that flow from actions attributable to business (Moorhead and Vaughan, 2016). These are the risks that may arise when parties suffer losses related to environmental change, or their failure to manage appropriately their contribution to it.

Several methodologies and financial risk tools have been developed — or are under development — to address natural capital-related financial risks²⁰² with two different focuses: First, analysis of the financial institution's own processes vis-à-vis natural capital risks (e.g.: Natural Capital Self-Assessment Tool (CREM/VBDO)) and second, natural capital risk analysis of their clients, or investee companies. The tools can either be applicable to any sector of the economy (e.g. The natural capital risk assessment conducted by Trucost, the tool 'SCRIPT' from Global Canopy, or the recent web-based tool '*Exploring Natural Capital Opportunities, Risks and Exposure*' (ENCORE) launched by the NCFA) or they may be about specific elements of natural capital, such as for water (e.g. the Bloomberg water risk assessment tool, the WRI's 'Aqueduct' tool which assesses exposures to different type of water risk based on user uploaded asset location data) or for soft commodities (e.g. Soft Commodity Forest-risk Assessment Tool).

Nevertheless, the risk assessment tools commonly used by financial institutions do not yet cover all the natural capital elements, as some barriers still exist. In 2015, a survey of 36 financial institutions on their current approaches to natural capital reported that almost 50 per cent said that they saw natural capital as very or extremely relevant to their core business strategy and/or portfolio risk management, 75 per cent that they were monitoring natural capital risks at a transaction level. Monitoring natural capital factors at a portfolio level was the next most common approach to natural capital considerations in due diligence/ lending/ investment processes. Some 42 per cent said that they take natural capital factors into account in credit risk assessments.²⁰³ **Meanwhile, there is no evidence of systematic quantification of these risks.** Moreover, the survey found **barriers to incorporating natural capital risk assessment into decision making processes** which range from limited budgets and personnel, to existing capabilities to analyse natural capital risks.²⁰⁴ As generally acknowledged, developing credible analyses on how environmental sources can create financial risks is complex and requires expertise that is often not found in one institution.²⁰⁵ Investors also still face barriers to accessing asset-level data for physical risks assessment.

There is a rationale to further develop and mainstream natural capital risk assessment. As pointed out by the NCFA, there is a need to, firstly, incorporate science-based information and environmental expertise, secondly, transfer technical advances on climate-related financial risk assessments to other areas of natural capital. Thirdly, lessons learned from emerging methodologies and frameworks to capture carbon and climate breakdown-related financial risks linked to portfolios can be translated to other natural capital indicators. Finally, it suggested integrating approaches from a range of methodologies, models, tools and datasets. As concluded by the NCFA, "*this has the potential to contribute to a systematic approach to creating a natural capital risk adjusted cost of capital as the ultimate 'price signal'*".²⁰⁶

202 For a comprehensive list of tools and methodologies for assessing environmental/natural capital related financial risks, see: WWF Singapore, *Resilient and sustainable portfolios: a framework for responsible investment*, April 2019

203 *Towards Including Natural Resource Risks in Cost of Capital, State of play and the way forward*, Natural Capital Declaration, 2015, 54 p., Url.: <https://naturalcapital.finance/wp-content/uploads/2019/02/560396159.pdf>

204 *Ibid.*

205 Cambridge Centre for Sustainable Finance, *Environmental risk analysis by financial institutions: a review of global practice*, 2016, Cambridge, UK: Cambridge Institute for Sustainability Leadership, 84p., p.11

206 *Towards Including Natural Resource Risks in Cost of Capital, State of play and the way forward*, Natural Capital Declaration, 2015, 54 p., Url.: <https://naturalcapital.finance/wp-content/uploads/2019/02/560396159.pdf>

Nevertheless, there is a tremendous and more fundamental issue which is not discussed yet and explains why there is no integration of natural capital-related risks by large investors: the ‘Tragedy of the horizon’.

POLICY IDEA

Create an international Taskforce for Nature-related Financial Disclosure

The G20’s Task Force on Climate-related Financial Disclosure (TCFD) could serve as a model for a new taskforce on nature-related, or environmental, disclosures. The new taskforce could serve as a knowledge-sharing platform to **improve and harmonise methodologies** for assessing both **businesses dependencies and impacts on natural capital**, and **natural-capital financial risks**.

2.6 The tragedy of the horizon

Considering the ever-growing size of assets under management over the past 35 years (now estimated at more than USD 80 trillion), large institutional investors such as pension funds or insurance companies have been presented as well placed to compensate for the lack of public finance in long-term investment and public goods. But while long-term investors such as pension funds have liabilities beyond 20-30 years, the time frame of their investments and risk assessment is typically much shorter. As well acknowledged in the literature (see Box below), institutional investors and asset managers are mostly blind to medium- and long-term risks, including climate and environmental risks such as stranded assets.

Box 7: Individual preferences for sustainable investment

Another road could be to influence institutional investors, such as pension funds, to divest from environmentally harmful activities and reallocate their portfolio towards more sustainable investment.

First, one can argue that **there is a business case to do so as sustainable investment tends to outperform**. In 2015, a study found that sustainable equity mutual funds had equal or higher median returns and equal or lower volatility than traditional funds for 64% of the periods examined.²⁰⁷ In 2017, a MSCI study shows that high ESG-rated companies tended to show higher profitability, higher dividend yield, lower idiosyncratic tail risks as well as less systematic volatility.²⁰⁸

Second, there could also be **a preference from institutional investors’ clients to redirect their investments towards sustainable activities**. A recent research conducted on a sample of ~1000 respondents concluded that 72% of the United States population expressed at least a moderate interest in sustainable investing.²⁰⁹

207 MORGAN STANLEY, *Sustainable reality: Understanding the Performance of Sustainable Investment Strategies*, Institute for sustainable investing, March 2015, 12p.

208 GIESE, G., LEE, L-E, MELAS, D., NAGY, Z., NISHIKAWA, L., *Foundations of ESG investing – Part 1: How ESG Affects Equity Valuation, Risk and Performance*, MSCI, 2017, 41p.

209 SIN, R., O. MURPHY, R., LAMAS, S., *The True Faces of Sustainable Investing - Busting Industry Myths Around ESG*, Morningstar, 2019, 10p.

While investors from the millennial generation are nearly twice as likely to invest in companies or funds that target specific social or environmental outcomes compared with non-millennial investors,²¹⁰ most European investment managers elicit clients' risk preferences but still ignore social preferences.²¹¹ Meanwhile, the results of a recent study show that when given the opportunity to decide the direction of their investment, beneficiaries of pension funds decide in favor of sustainable investment. This experiment ran with a pension fund which granted its members a real vote on its sustainable investment policy and discovered **that 67.9% of the plan's participants were willing to support increased sustainable investments.** While the majority believe that more sustainable investments do not come at the expense of financial returns, even among those who do expect a reduction in financial returns, the majority voted to redirect their pension money towards sustainable investment.²¹²

Nevertheless, it should be noted that this study took place in the Netherlands, a country known for its large share of assets invested sustainably which can be explain by a cultural differences.

Investor duties (also known as fiduciary duties in some jurisdictions) are increasingly seen as an opportunity to promote sustainable investment, provided that investor duty regulations evolve to require investors, first, to consider financially material environmental, social, and governance (ESG) factors in their investment decision-making, and second, to ask their clients about their ESG preferences.

Consequently, even if there is a growing understanding of the natural capital-related financial risks in the medium to long-term, it does not imply that financial institutions are in any case incentivized to take these risks into account or that they are going to become financially material any time soon. The main challenge is related to what Mark Carney called the 'Tragedy of the horizons': While corporate and financial disclosures, credit risk and equity research models, as well as portfolio management are generally limited to 3-5 years, a risk that is not likely to start materializing in this time frame is unlikely to be priced.²¹³ And even if investors want to perform a long-term financial analysis, there is a lack of data (notably explained by the lack of mandatory and harmonized disclosure by investee companies, as detailed above). While demand for financial analysis is heavily driven by short-term traders, even long-term investors actually trade their assets with short horizons.²¹⁴

210 MORGAN STANLEY, "Sustainable Signals: The Individual Investor Perspective", 2015, Url.: https://www.morganstanley.com/sustainableinvesting/pdf/Sustainable_Signals.pdf

211 EUROSIF, 2016, p.82

212 BAUER, R., RUOF, T., SMEETS, P., *Get Real! Individuals Prefer More Sustainable Investments*, February 21, 2019, Available at SSRN: <https://ssrn.com/abstract=3287430>

213 THOMÄ, J., DUPRE, S., 2017, *Loc cit.*, p.15

214 NAQVI, M., BURKE, B., HECTOR, S. JAMISON, T., DUPRÉ, S., *All swans are black in the dark - How short-term focus of financial analysis does not shed light on long term risks*, 2°ii, Generation foundation, Tragedy of the horizon program, 2017,

Figure 15: Time horizons of environmental-related risks, financial actors and financial risk models



Source: based on 2°ii, 2017

Meanwhile, the systemic nature of risks related to breaching planet boundaries, as well as depleted natural capital, calls for an assessment of risks at a systemic level. And this falls under the remit of supervisory authorities and central banks.

Box 8: About investors short-termism

While long-term investors such as pension funds have liabilities beyond 20-30 years, this does not mean that their time frames for investment are similarly long term.

As is clearly acknowledged in the literature, financial institutions are blind to long-term risks, such as stranded assets, climate- and environmental-related risks. Several mechanisms explain such a blindness. First, as their asset allocation decisions are based on a historical view of risk, it generally prevents them from taking into account systemic future events.²¹⁵ Furthermore, as the performance of asset managers — which manage the assets on behalf of a majority of institutional investors — are generally evaluated on a quarterly basis, this does not incentivize them to take into account such medium- to long-term risks, and puts pressure on them to deliver short-term returns.²¹⁶ Second, the 'market' as a whole seems to assume a very low probability that governments will successfully ban fossil fuels and strongly regulate nature-depletion, and may already have factored this risk in to prices to the extent considered appropriate.²¹⁷ Thirdly, investment practice is guided by measurement of short-term performance against peers, where risk is defined in relation to historic short-term volatility and divergence from a benchmark index — not by science-based analysis of physical risks.²¹⁸

²¹⁵ SILVER, N., *Blindness to risk: why institutional investors ignore the risk of stranded assets*, Journal of Sustainable Finance & Investment, 7:1, 99-113, p.111

²¹⁶ Furthermore, 2° Investing Initiative and the Generation Foundation identified four constraints on long-term analysis (beyond 3-5 years): a shortage of data from companies on their long-term plans, the high cost and low benefit of long-term analysis, a lack of standardized frameworks for long-term risk analysis, and a lack of demand from investors.

²¹⁷ SILVER, N., *Ibid.*

²¹⁸ *Ibid.*

Fund managers' investment horizons are, in general, much shorter than the liability of the asset owners as assessed by the rate of turnover of their portfolio²¹⁹ (admittedly an imperfect indicator). Recent research conducted by Mercer and the 2 degrees investing initiative shows that 'long-only equity fund managers' turn over their portfolios on average every 1.7 years and 81 per cent of them do so within three years.²²⁰ In the more specialized area of socially responsible investing, SRI fund managers turn over their portfolios less than average, or every 2.5 years. In 2016, Ned Davis Research shows that investors are holding stocks (NYSE) for shorter time periods (8.3 months in 2016 vs nearly 5 years in the 70s or 2 years in 1980).

From a risk perspective, **the materiality for most ESG issues** (such as exposure to climate- or environmental-related risks, and resource depletion) **appears significantly longer than the investment horizons of average fund managers**, SRI funds included.

In a widely cited study, the Bank of England's chief economist Andy Haldane attributed financial short-termism to **information availability in real time** (partly related to IFRS norms), **the shortening of performance assessment** intervals across financial investors and **the rising frequency of corporate reporting**. The 2011 Kay Review of UK equity markets blamed pay short-term incentives for company directors and asset managers, as well as excessive intermediation and trading in equity markets, among other things.²²¹

Despite such reports and a general acknowledgement that the intrinsic short-termism embedded in the financial system was one of the driving forces behind the last crisis, the problem has not been adequately tackled. It is once again on the agenda thanks to the rising concern on the role of finance in the discussion on climate breakdown. In Europe, the European Commission High Level Expert Group on Sustainable finance (HLEG) presented short-termism as a clear challenge and potential obstacle for the establishment of a sustainable financial system, which led to the European Commission requesting the European Supervisory Authorities (ESAs) to conduct a forthcoming analysis of the determinant of such short-termism. Concerns have also been expressed that financial supervisors are not yet factoring in long-term systemic risks such as climate breakdown and environmental collapse.

Many suggestions have been made to tackle this issue. Andy Haldane recommended better disclosure of portfolio churn, taxes on short ownership, addition voting right for long ownership, fiduciary duties that recognise long-term objectives. The Kay Review recommended longer-term remuneration structures for company directors and asset managers, an end to quarterly reporting, and better disclosure of asset managers' costs, among other things. Dirk Schoenmaker, the former Deputy Director at the Netherlands Ministry of Finance, also proposed long-term oriented reporting structures for company directors (moving away from quarterly reporting), and longer-term investment performance horizons for investment managers (moving away from

219 *Naturally, index funds tend to have lower turnover while actively managed funds are likely to have much higher turnover (e.g. Pax World Small Cap Fund Individual Investor Class (PXSCX) – Actively managed – 167 per cent – 1.24 per cent; Vanguard 500 Index Admiral Shares (VFIAX) – Index – S&P 500 – 2.7 per cent – 0.05 per cent; Vanguard PRIMECAP Fund Admiral Shares (VPMAX) – Actively managed – 10.8 per cent – 0.35 per cent)*

220 BERNHARDT, A., DELL, R., AMBACHTSHEER, J., POLLICE, R., *The long and winding road: how long-only equity managers turn over their portfolios every 1.7 years*, MERCER, Tragedy of the Horizon program, 2^oii, 2017, Url.: <http://2degrees-investing.org/wp-content/uploads/2017/04/The-long-and-winding-road-how-long-only-equity-managers-turn-over-their-portfolios-every-1.7-years-2017.pdf>, 60p., p.41

221 The Kay Review of UK Equity Markets and Long-Term Decision Making, July 2012

quarterly benchmarking) and incentives for long-term investors.²²² There is also a broad consensus that long-term investing and financing are primarily affected by some accounting standards — especially ‘fair value accounting’ promoted by International Financial Reporting Standard (IFRS).^{223 224}

POLICY IDEA

Align corporate, investor and supervisory horizons to the long term

Measures to tackle financial short-termism have been proposed but rarely adopted. Ideas worth considering include better disclosure of portfolio churn, tax and governance incentives for longer ownership periods, longer-term remuneration structures for company directors and asset managers, less quarterly reporting by companies, less annual benchmarking by asset managers, revisions to accounting standards (e.g. addressing issues related to the use of ‘fair value’ accounting), and revisions to the supervisory toolkit (e.g. expanding stress test time horizons).

3 Systemic risks and the role of supervisory authorities and central banks

The global financial crisis showed how quickly risks can spread due to the highly interconnected nature of the financial system and global economy.

Much effort since then has been spent on monitoring potential sources of systemic risk and their transmission routes. The risks of climate change are beginning to be integrated into such thinking but environmental risks including loss of biodiversity are a relative newcomer in this area.

While some financial institutions have been addressing some environmental sources of risk for many years, there is a growing concern that **traditional approaches to incorporating environmental factors into risk management systems are insufficient considering the scale, likelihood and interconnectedness of these risks.**²²⁵ The materiality of environmental-related physical risks is not assessed by most companies yet, and large scale transition risks may only become material if governments succeed in negotiating an ambitious strategic plan 2020-2030 at the next CBD in November 2020. Consequently, these risks are not likely to be assessed by most financial

222 SCHOENMAKER, D., *Investing for the common good: a sustainable finance framework*, 2017, Bruegel, 80p., p.11

223 RIGOT, S., DEMARIA, S., *Potential impediments to long-term and low-carbon investment: the international accounting standards at stake*, *International Journal of Sustainable Energy Planning and Management*, Vol.15, 2018, p.11-20, p.15

224 The 2016 European Parliament’s resolution on IFRS 9, raised concerns about the impact the new accounting standard on financial instruments (IFRS 9) might have on long-term investments.

225 Cambridge Centre for Sustainable Finance, *Environmental risk analysis by financial institutions: a review of global practice*, 2016, Cambridge, UK: Cambridge Institute for Sustainability Leadership, 84p., p.5

“Central banks have a pivotal role to play in mitigating systemic risk by identifying system-wide vulnerabilities and using their panoramic view of the financial system to connect the dots.”

Macklem, T. - Former Deputy Governor of the Bank of Canada

institutions, until they suddenly became financially material as a consequence of the inherent environmental risks that investee companies and borrowers are facing.

To compensate for the short-termism in financial institutions' risk assessment, **central banks and supervisory authorities — which are often the same institution — could play a role in assessing the medium- to long-term risks and impacts of lending practices**, by examining the financial materiality of natural capital related risks:

1. By **identifying the physical and transition risks** related to natural capital depletion that has, or could have, the most materiality (see section 4.1.1. for a quick overview).
2. By **mapping the financial risks that originate from this**²²⁶ (e.g. market, credit, underwriting, legal risks) and affect individual assets at portfolio and systemic levels.
3. They can assess the vulnerability of financial institutions to these risks by conducting **environmental-related financial stress tests**.²²⁷
4. Finally, if the test concludes that risks are material, **a list of tools and policies can be activated**.²²⁸

Box 9: Natural capital stress testing - the impact of drought on financial institutions

A consortium composed of NCFA, UNEP fi, GIZ,(RMS) designed, developed and implemented a drought stress testing tool which looked at **five drought scenarios in four countries and modelled the loan default probabilities of companies in 19 different industry sectors**. The project was implemented in partnership with nine banks representing more than USD 10 trillion in assets under management (e.g. Citigroup, Industrial and Commercial Bank of China, Santander (Brazil), UBS), which tested the tool on a sample of their corporate loan portfolios.²²⁹

Key findings from the report included: i) **Extreme droughts could increase loan default losses ten-fold for specific portfolios** that are most exposed to the effects of drought; ii) Even when exposed to less extreme drought scenarios, **most companies in the analyzed portfolios see their credit ratings downgraded**; iii) The most affected sectors are water supply, agriculture and, in countries with high reliance upon hydroelectric energy, power generation; iv) Significant impacts are also found in water-dependent sectors such as food and beverage production; v) Sectors that are less water-dependent but highly sensitive to general macroeconomic conditions, such as petroleum refining, are also affected by the widespread economic impacts of drought.²³⁰

226 SCHOENMAKER, D., VAN TILBURG, R., *What Role for Financial Supervisors in Addressing Environmental Risks?*, 2016, Comparative Economic Studies, 58(3), 317–334

227 Stress tests are analyses of what would happen to financial institutions' balance sheets and liquidity under various adverse economic scenarios. RAVINA, A., *Assessing the transition risk with a stress test methodology*, Université Paris 1 Panthéon-Sorbonne, Chaire Energie et prospérité, 2017, 18p.

228 SCHOENMAKER, D., VAN TILBURG, R., *Ibid.*

229 CARTER, L., MOSS, S., *Drought Stress Testing Making Financial Institutions More Resilient to Environmental Risks*, 2017, GIZ, NCFA, EMSD, UNEP fi, GCP, RMS, 58 p.

230 *Ibid.*

3.1 The central banks and supervisor toolbox for greening the financial system

Supervisors and central banks have at their disposal a wide range of tools which can both help reduce the risks assessed, and help the transition towards a sustainable economy, respecting nature and planet boundaries. These tools can be classified in three categories according to the level of interventionism in the allocation of capital:

- **Green macroprudential instruments**, designed to safeguard financial stability. Some policymakers have proposed to use these tools to both to incentivize financial institutions to integrate environmental-related risks and to shift investment away from unsustainable investments: *additional capital requirements, systemic risks buffer, sectoral leverage ratio, maximum credit ceilings, minimum credit floors* and many more.
- **Green monetary policy instruments**, which aim at going beyond ‘market neutrality’ by using the tools at the disposal of central banks to support the channeling of capital towards specific activities: *Green refinancing lines, collateral frameworks*, and other tools which have already been tested by some central banks across the world (see Box 13).
- **Soft green banking activities**, which aim at guiding the private financial institution: *Green finance guidelines*, etc.

Box 10: The signaling effects of supervisory risks assessment - the Netherlands case

The actions of one supervisor who starts assessing financial exposure to a given risk can send a strong signal to the market and other supervisors. Following its **review of the Dutch financial sector’s exposures to the energy transition**,²³¹ the Dutch central bank reported that the results of its exercise had had important signaling effects towards the public (substantial attention from the national press), policy makers (the Dutch parliament tabled a separate debate on the risks of energy transition), and also towards financial institutions (a number of them indicated that, as a result of this exercise, they have started their own work on the issue).

Green macroprudential instruments

There is a growing realization that environmental-related risks have the potential to transform into financial losses that could damage financial institutions and financial stability more generally. This opens up the possibility of using macroprudential interventions to manage the threat that environmental risks pose to financial and credit portfolios.

²³¹ REGELINK, M., REINDERS, H.J., VLEESCHHOUWER, M., VAN DE WIEL, I., *Waterproof? An exploration of climate-related risks for the Dutch financial sector*, 2017, De Nederlandsche Bank, 64p.

Figure 16: Examples of ‘green’ macroprudential instruments

Intermediate objective	Category	Instrument
Limit misaligned incentives, channel credit to green sectors	Reserves	<i>Differentiated reserve requirement</i>
Mitigate and prevent excessive credit growth and leverage	Capital	<i>Capital requirement (Brown Penalizing Factor); (sectoral) Countercyclical capital buffer; Sectoral leverage ratio</i>
Limit to concentration of certain exposures	Lending limits	<i>Max (min) credit ceiling (floor); Large exposures limit</i>
Mitigate and prevent market liquidity and maturity mismatch	Liquidity	<i>Liquidity coverage ratio; Net stable funding ratio</i>

Source: D’ORAZIO, P., POPOYAN, L., *Fostering green investments and tackling climate-related financial risks: which role for macroprudential policies?*, LEM, Working paper series, 2018/35, 35p.

The primary forum for this is the Network for Greening the Financial System (NGFS), which set out an ambitious climate risk-related research strategy in its first comprehensive report in April 2019, and opened the door for similar work on other environmental risks. The ClimateWorks-backed INSPIRE program has also published a wide-ranging set of research priorities for central banks, supervision, and greening the financial system.²³²

A full examination of the macroprudential tools under consideration in these and other programs and how they could be used to favor sustainable investment, is beyond the scope of this landscape paper and will be addressed in a later report.

Box 11: Brazilian green banking regulations

The Central Bank of Brazil – Banco Central do Brasil (BCB) – has been at the international forefront of green prudential and macroprudential policy implementation since 2008. As financial sector regulator and supervisor, the BCB has played a crucial role in advancing the sustainable finance agenda in Brazil, mainly using the Basel III framework as a vehicle for prescribing sustainable banking practices.

Green banking regulation started in 2008 with a series of industry-specific regulations related to the agricultural commodity sector and **aiming at influencing commercial banking activities**. As an illustration, Resolution 3545 made the granting of subsidized rural credit to agricultural activities in the Amazon Biome conditional upon

²³² The International Network For Sustainable Financial Policy Insights, Research, And Exchange (INSPIRE) is backed by the ClimateWorks Foundation. This research programme will look at the strengths and limitations of different disclosure approaches; the risk differentials of environmental factors; the relationships between environmental factors and the micro-prudential risks for financial institutions; the role of consumer protection, financial inclusion, financial conduct and market creation; modelling of systemic climate-related financial risk; climate change and the conduct of monetary policy. It will also look at risks of emerging green finance taxonomies and the possibility of developing a ‘brown’ taxonomy for activities that cause high levels of environmental damage.

the provision of proof of compliance with environmental requirements.²³³ This resolution prevented over 2700 km² of forest from being cleared between 2008 and 2011.²³⁴

The BCB start implementing sustainability criteria into the day-to-day practices of commercial banks in 2011 through the Circular 3547 which implemented one of the aspects of Pillar 2 of Basel III – the *Internal Capital Adequacy Assessment Process*, through which banks assess the level of risk their activities expose them to in order to define the amount of equity capital needed. Article 1 of this circular **requires each bank to “demonstrate [...] how it evaluates the risk arising from exposure to social and environmental damage caused by its activities”** when assessing how much capital it needs to cover a range of operational and financial risks. An evaluation and calculation of the institution’s capital needs, first, to cover the broad range of classical risks (e.g. credit, market, operational, concentration risks) but also other relevant risks such as liquidity, strategic and reputational risks. Secondly, it requests the conduct of a stress test and the assessment of its impact on capital.²³⁵

In April 2014, the BCB issued the Resolution 4327 which requires regulated entities to implement a Social and Environmental Responsibility Policy (PRSA), providing guidelines to **implement social and ecological risk management**.²³⁶

Against this backdrop, **the Brazilian banking federation, FEBRABAN, set out to measure the financial resources exposed to such risks by the Brazilian banking industry**, working directly with ten major Brazilian banks and the *Fundação Getúlio Vargas* (a Brazilian higher education institution and think tank).²³⁷

Participating banks were asked to provide their financial exposures to a set of sectors – including agricultural commodity industries, electricity generation, forestry production, waste treatment, extractive industries, beverage and food producers, transportation, textiles and metallurgy – in terms of amounts of contracted loans, amounts disbursed and the balance of the portfolio. These exposures were then aggregated at an industry level to **understand the overall exposure of the banking sector to sectors with potential to cause environmental impacts**, as well as the financing provided by banks to green economy sectors.

The study estimated that the amount of **financial resources disbursed in sectors with the potential to cause environmental impacts was around USD 100 billion in 2013** and 2014, accounting for around 33 per cent of the total corporate lending.²³⁸ The amount of **funds channeled to sectors of the green economy stood at USD 30 billion in 2013** and 2014, accounting for around 9 per cent of total corporate lending.²³⁹ A further step would be to go beyond what appears to be a relative aggregate exercise in the direction of more granular metrics.

233 KUEPPER, B., STEINWEG, T., THOUMI, G., *Sustainable Banking Initiatives: Regulators’ Role in Halting Deforestation*, 2017, Chain Reaction Research coalition, 14p., p. 5-6

234 ASSUNÇÃO, J., GANDOUR, C., ROCHA, R., ROCHA, R., *Does Credit Affect Deforestation? Evidence from a Rural Credit Policy in the Brazilian Amazon*, CPI Technical Report, Climate Policy Initiative, 2013, 50p, P.4

235 *Ibid.*, p.6

236 *Ibid.*, p.6

237 Text of Resolution 4595/2017 can be accessed in Brazil’s Central Bank website in Portuguese version under the link: https://www.bcb.gov.br/pre/normativos/busca/downloadNormativo.asp?arquivo=/Lists/Normativos/Attachments/50427/Res_4595_v1_O.pdf

238 Cambridge Centre for Sustainable Finance, *Loc cit.*, p.37-38

239 Cambridge Centre for Sustainable Finance, *Ibid.*

Green monetary policy instruments

Central banks could play a fundamental role in the transition towards a sustainable economy, as illustrated by some countries (Boxes 11 and 12). Central banks, which in many cases also play this supervisory role and can also take into account environment-related risks in their operations, can set incentives to shift the destination of investment through a set of policies: *Targeted Long Term Refinancing Operations* (TLTRO), *Green refinancing lines* and other tools which have already been tested by some central banks around the world.

While the current toolbox for supervisors and central banks could support both a risk assessment and incentivize a capital shift away from unsustainable activities — as central banks have the power to directly influence the destination and level of credit and the cost of capital on financial markets — they are generally reluctant to engage with environmental issues as a consequence of a lack of recognition of these long-term risks, or of a long-standing policy of market neutrality in most (developed) countries and a narrow understanding of their mandate.

Box 12: The Indian case

The Reserve Bank of India (RBI) has followed its tradition of interventionist approach by maintaining a dual approach: guiding credit to priority sectors but also relying on industry-initiatives for green finance guidelines.

Based on the Banking Regulations Act from 1949, the RBI's **Priority Sector Lending Programme (PSL)** concurs to the objective of allocating credit to some vulnerable sectors such as agriculture, infrastructure, education and micro, small and medium enterprises. By a range of measures such as guidelines and quotas, the RBI ensures that 40% of commercial bank lending goes to those sectors. In 2012 and 2015, the RBI included **loans for renewable energy projects or social infrastructure** into its priorities. Those loans can be used to finance projects for solar or biomass based power generators, wind mills, micro-hydro plants, etc.

Consequently, lending to renewable energy projects has grown at a higher rate than overall credit growth in the 2009-2014 period. However, the impact of the PSL has been mixed as many banks fail to achieve their annual PSL targets.²⁴⁰

“Climate-related risks are a source of financial risk. It is therefore within the mandates of central banks and supervisors to ensure the financial system is resilient to these risks”

NGFS – October 2018

3.2 To act or not to act

These past few years have seen intense debates between proponents of more action from central banks and supervisors to scale up green finance and reduce ‘brown finance’, and those who are reluctant to see central bankers use the tools at their disposal for this purpose (having already taken years to acknowledge the new set of risks relating to climate). As far as climate change related risks are concerned, the debate is now shifting from a recognition of its financial impact to what central banks and regulators should do and how much lies within their mandates. While climate change is only one of the drivers behind environmental physical and transition risks — natural capital depletion and biodiversity loss being two others — we will use it to briefly summarize the main arguments in favor of action. They will be further developed in an upcoming report.

²⁴⁰ SUTTOR-SOREL, L., *Seven central banks leading on climate change*, Positive Money Europe, Blogpost, 2017, Url.: <https://www.positivemoney.eu/2017/11/7-central-banks-climate-change/>

‘It is in the remit of Central banks and supervisors to act’

Two broad types of arguments are generally used to justify why central banks and supervisors should engage with environmental and sustainability challenges:²⁴¹

- **Financial and macroeconomic risks** – authorities in charge of macroprudential policy have been more and more entrusted with the task of monitoring, identifying, and mitigating systemic risks as they emerge. By acknowledging that climate and environmental risks are systemic by nature and will sooner or later lead to deep financial perturbations, either through the channel of ‘transition risks’ (if we adapt), or through the channel of ‘physical risks’ (if climate and environmental crises materialize as a consequence of inaction), central banks and supervisors have a legal duty to act, in accordance with their mission as guardians of financial stability, but also as guardians of price stability. As largely discussed, *“climate change and environmental damages may have very direct consequences for price stability through their impact on food and energy prices”*.²⁴² Furthermore, as recognized by the Bank of England, such *“fundamental changes in the environment could affect economic and financial stability and the safety and soundness of financial firms, with clear potential implications for central banks.”*²⁴³
- **Market failure** – The provision of credit by banks to socially undesirable activities has been characterized as a ‘credit market failure’ by several authors²⁴⁴: **in the presence of externalities, the allocation of credit by commercial banks may be suboptimal from a societal perspective, with too much being allocated to harmful activities.** It is argued that while environmental regulation directed at internalizing negative externalities should be the preferred policy approach to correct this market failure, as long as such policies are not in place, central banks and supervisors may have a case to use their tools, in accordance with their mandate, to affect credit creation and allocation — in application of the theory of the second best.²⁴⁵

More recently, criticisms have emerged that **central banks are mirroring financial markets’ underestimation of risks by extensively relying on external risk assessment** for some of their operations (i.e. the ECB’s collateral framework and asset purchase programs both rely on credit risk assessments made by credit rating agencies, which do not always integrate environmental-related risks).²⁴⁶ By doing so, they are consolidating financial market biases (e.g. short-termism, blindness to long term risks), while they could instead be playing a leading role by developing appropriate environmental risk measures and applying them to their own asset purchase strategies and their collateral frameworks.²⁴⁷

241 VOLZ, U., *On the role of central banks in enhancing green finance*, UN Environment Inquiry, 2017, 27p., p.9, Url.: http://unepinquiry.org/wp-content/uploads/2017/02/On_the_Role_of_Central_Banks_in_Enhancing_Green_Finance.pdf

242 VOLZ, U., *Ibid.*

243 VOLZ, U., *Ibid.*

244 E. CAMPIGLIO (2016); U. VOLZ (2017)

245 VOLZ, U., *Ibid.*

246 MONIN, P., Central banks should reflect climate risks in monetary policy operations, SUERF Policy Note, Issue No41, September 2018, 9p.

247 MONIN, P., *Ibid.*

‘Risks materiality or not, central banks are no governments and need to stay neutral’

Recently, “the ECB has formally identified climate-related risk as one of the key risks facing the banking sector”²⁴⁸ and recognize it was in its remit, as an area of banking supervision.

While the **consensus is growing on the impact of climate-related environmental risks on financial stability**, their **relevance for monetary policy is not yet a full consensus** among central bankers as illustrated by two speeches given by members of the executive board of the ECB in November 2018. In the first speech, Benoît Coeuré described how **climate change will impact monetary policy** through physical and transitional channels and noted that “the ECB, acting within its mandate, can – and should – **actively support the transition to a low carbon economy**, in two main ways: first, by helping to define the rules of the game and, second, by acting accordingly, without prejudice to price stability.”²⁴⁹ Answering almost point to point the arguments made by Benoît Coeuré, Yves Mersch replicated a few days later that while “climate risks have been identified in ECB Banking Supervision’s risk assessment for 2019 and will be among the topics covered in the qualitative discussions held with banks on an individual basis”²⁵⁰ he held a different view, namely that “**climatic events are hardly relevant for monetary policy** as the monetary policy impacts are similar to those associated with other major shocks”. As these events “can affect both supply and demand in the economy”, he implies that we cannot derive that there will be macroeconomic perturbations while also casting doubt on the impact on inflation.²⁵¹

Meanwhile, and importantly, **both reassess that it is not in the remit of a central bank to impact the banking sector’s lending activities**. There is a range of explanations to the reluctance of most central banks from developed countries to act on environmental issues which are well encompassed in the speech of a Member of the Executive board of the European Central Banks (ECB):

“Deviating from market neutrality and interfering with economic policy risks exposing the ECB to litigation. It is not up to the central bank but to elected governments to decide which industry is to be closed and when. [...] And the effectiveness of monetary policy has been bolstered by abstaining from normative judgments on the morality of markets and industries.”²⁵²

Reflecting on the risks that concentrating too much power in the hands of unelected central bankers could undermine the foundation of liberal democracy, Paul Tucker²⁵³ argued that central banks should refrain from favoring particular projects or companies as this fall under the remit of elected policymakers. While backing this claim, Dirk Schoenmaker made an important distinction on the limit of central bank’s role: **by following a general approach, central banks would not assume any active policy**

248 LAUTENSCHLÄGER, S., *Central bankers, supervisors and climate-related risks*, Member of the Executive Board of the ECB, at the NGFS conference, Paris, 17 April 2019

249 COEURÉ, B., *Monetary policy and climate change*, Speech by Benoît Coeuré, Member of the Executive Board of the ECB, at a conference on “Scaling up Green Finance: The role Central Banks”, Berlin, 8 November 2018

250 MERSCH, Y., *Ibid.*

251 MERSCH, Y., *Climate change and central banking*, Speech by Yves Mersch, Member of the Executive Board of the ECB, Workshop discussion: Sustainability is becoming mainstream, Frankfurt, 27 November 2018

252 MERSCH, Y., *Ibid.*

253 TUCKER, P., *Pristine and parsimonious policy: Can central banks ever get back to it and why they should try*, in P. HARTMANN, H. HUANG, D. SCHOENMAKER (eds), *The changing Fortunes of Central Banking*, Cambridge University Press, p.48-64

“If money is economic power and money is issued against collateral, it stands to reason that it is important to understand the nature of the collateral and the terms of the exchange.”

Kjell G. Nyborg – University of Zurich

role but only supporting policy decision.²⁵⁴ Discussing the greening of monetary policy as both supporting EU policy and being legally consistent, he suggested doing so by **carefully calibrating both the central bank’s collateral framework** (see Box 13), impacting haircuts in function of the carbon intensity of the collateral, and by following what he called a **‘tilting approach’ to central banks’ corporate bond portfolios**. Introducing three categories (i.e. low, medium, high carbon) which are all weighted differently according to their carbon footprint (admittedly imperfect indicator), he found that such minor changes could lead to a substantial reduction in the carbon footprint of bank bonds, or increase of the haircut for corporate bonds.²⁵⁵ By doing so, the ECB would lower the cost of capital for low-carbon sectors in comparison to high-carbon sectors, hence supporting the EU’s policy decision to move to a low-carbon economy, instead of hinder it.

Box 13: The role of central banks’ collateral frameworks

A central bank’s collateral framework determines which assets owned by commercial banks are eligible as collateral in exchange for liquidity provision from the central bank.²⁵⁶ Liquidity is provided against collateral at market prices subject to a haircut. The collateral framework can have an important impact on financial markets via two channels: First, **eligible assets become more liquid** as a consequence of their potential use by banks in their operations with central banks, translating into a higher asset prices and lower yields.²⁵⁷ Second, **the rate of haircut**, can also influence investment decision (as shown by Chapman et al.)²⁵⁸ as a lower haircut increases the liquidity of the security and reduces the cost of capital for its issuer.²⁵⁹

Consequently, to incentivize banks to favor green financial assets, central banks could specifically include them in collateral frameworks or give them a better haircut than brown types of asset.

“If central bank money is only available against igloos, or igloo-backed securities, igloos will be built.”

Kjell G. Nyborg – University of Zurich

There are intense debates both on how far central banks and supervisors can go while staying in the remit of their mandates, as well as a growing discussion on the appropriateness of their mandate.

In the end, what central banks and supervisors do will naturally depend on their mandates, it will also depend on its interpretation and *“their willingness to act.”*²⁶⁰

254 SCHOENMAKER, D., *Greening monetary policy*, Bruegel, Working paper, Issue 02, 19 February 2019, 22p., p.6

255 SCHOENMAKER, D., p.16

256 NICOL, M., SHISHLOV, I., COCHRAN, I., *Green Bonds: Improving their contribution to the low-carbon and climate resilient transition*, I4CE, Green Bonds Research Program Work Package 1, February 2018

257 SCHOENMAKER, D., p.16

258 CHAPMANN, J.T.E., CHIU, J., MOLICO, M., *Central bank haircut policy*, *Annals of Finance* 7, p.319-348

259 ASHCRAFT et al, 2011, cited in: SCHOENMAKER, D., Loc.cit., p.7

260 CAMPIGLIO, E., DAFERMOS, Y., MONNIN, P., RYAN-COLLINS, J., SCHOTTEN, G., TANAKA, M., *Climate change challenges for central banks and financial regulators*, *Nature - Climate Change*, Vol.8, June 2018, p.462-468

3.3 Technical barriers

There are some barriers to central banks and supervisors intervening:

- **The data gap** - the availability, accuracy, consistency and comparability of firm level data²⁶¹ are often cited as one of the main challenges to proper risk assessment. What is true for financial institutions is also true for supervisors and central banks. As emphasis by Pierre Monin, *“the assessment of climate credit risk is ideally based on household and firm-level data. At the same time, access to that level of granularity is limited.”*²⁶² This explains the call made by the central banks and supervisor’s Network on Greening the Financial System (NGFS) to policy makers to implement harmonized and mandatory environmental disclosure by businesses.
- **The time horizon** - the ‘Tragedy of the horizon’ also touches supervisory authorities and central banks. As reported by the Bank of International Settlements, the general time horizon used by supervisors for a stress test scenario is two to three years, and only a small minority use a four to five year test horizon²⁶³ (see Figure 15). Consequently, risks that are likely to materialize over the next decades are currently not assessed in the general framework of stress test and still need to be integrated.
- **The methodology gap** - Given the scale, likelihood and interconnectedness of breaching planet boundaries (described in section 1), risk analyses can no longer rely on historic experience to predict future risks arising from environmental sources. This calls for a more complex modelling of the dynamic interactions between the macroeconomy, the financial system, environmental changes and environmental policies — all of which would benefit from the new generation of stress tests and scenario analyses developed to assess the complexity of climate-related risks.²⁶⁴
- **Identifying the relevant risk exposure metrics** - As for climate, the choice of the exposure risks metrics will be important. While relying on biodiversity footprint would probably entail the same limitations for environmental risk assessment than relying on carbon footprinting does for climate risk assessment,²⁶⁵ further research should be conducted to estimate if the use of integrated valuation framework and IPBES biophysical assessment could help bridging the gap.

“We cannot afford to wait until we have a perfect understanding of all these risks to take action. Climate change will not adapt to our research schedules.”

Sabine Lautenschläger, Member of the Executive Board of the ECB, NGFS conference, Paris, 17 April 2019.

261 CISEL, 2ndii, ICBC, NCFA, UNEP FI, *Enhancing environmental risk assessment in financial decision-making*, In support of the G20 Green Finance Study Group, July 2017, p.23

262 MONIN, P., *Integrating Climate Risks into Credit Risk Assessment - Current Methodologies and the Case of Central Banks Corporate Bond Purchases*, CEP, Discussion Note 2018/4, December 2018, 24p., p.

263 BIS, *Supervisory and bank stress testing: range of practices*, 2017, p.7

264 Battiston et al. (2017) assess the exposure of the EU financial system to energy transition risks by analyzing financial institutions’ equity and bond exposures to selected industries that are considered particularly vulnerable to energy transition risk. The same exercise could be done for sectors which could be impacted in case of a transition towards sustainable activities (sustainable agriculture, fisheries, etc.)

265 For more details, see: MONIN, P., 2018, Loc.cit., p.7-8

These are not insurmountable barriers: it is rather a question of political willingness and central banks and supervisors' awareness. Some progress can already be achieved, as some countries have shown. The methodology gap is mainly about expanding and funding knowledge-sharing platforms between academics, experts and supervisors (the NGFS being an excellent example of such platform), while the data gap and time horizon issues are a matter of political choice and could be tackled relatively quickly if consensus to do so emerges in the next CBD.

Considering the scope of the question, and the numerous debates, this will be an important question to return to in future.

POLICY IDEA

Broaden the scope of the Network for Greening the Financial System (NGFS) to integrate environmental risks

Acknowledging it is a source of financial risk, central banks and supervisors plan to assess **climate-related risks** and integrate them into prudential supervision (e.g. mapping risks, conducting stress test, releasing guidelines). During the next CBD, governments should request central banks and supervisors not to leave aside **natural capital (or environmental) related risks**: the mechanisms, sources of risk and tools being so close, it makes little sense not to include the full range of environment-related risks.

As a first and easy step, **financial supervisors and central banks should request financial institutions to disclose how they are taking natural capital-related risks into account**. Once the financial risks are assessed, central banks and supervisors should use the tools and policies at their disposal (e.g. systemic risks buffer, sectoral leverage ratio, maximum credit ceiling, collateral framework) to incentivize a shift from unsustainable towards sustainable activities, reducing the systemic risk.

4 Unlocking ‘Mission-oriented’ finance

While the ‘Grand challenges’ of the 21st century such as climate breakdown and risks of environmental collapse generally call for long-term, dedicated capital, the reality is that there is currently an under-allocation of capital towards businesses following sustainable and long-term value creation strategies and a lack of funding for projects directed towards the restoration and conservation of our stock of natural capital.

As we have previously seen, this is partly due to the ‘Tragedy of the horizon’: while environmental related risks may become material only in the medium- to long- term, the financial sector has both a limited ability to capture long-term risks within short term risk-assessment frameworks, and most financial institutions are structurally driven by short time investment horizons focused on short-term returns.

It is also due to the ‘public good’ characteristics (i.e. non-excludable; non-rival; involve positive externalities) of many conservation projects such as habitat restoration or green and sustainable infrastructure, that do not fit well with private capital thinking. In fact, these are often long-term, potentially risky and comparatively not-so profitable investments. As we saw previously, few conservation finance projects can deliver a revenue stream and a sufficient return to attract private investment. With such limited incentives, the private market is not recognized as an efficient allocator of resources in this area. Furthermore, individuals have an incentive to free ride because each person benefits from everyone else’s contribution. The United Nations Sustainable Development Goals as a whole reflect unmet targets for providing public goods such as clean water and sanitation, biodiversity, and climate breakdown mitigation. In these cases, shortfalls occur because individuals are incentivized to choose immediate personal benefit over collective long-term gains.

At the same time, public spending in these public goods is constrained in many countries by factors including tax avoidance, lack of fiscal stance, misguided public investment, restrictive fiscal rules, sometimes lack of adequate structures to raise taxes, or corrupted elites.

An opportunity to move beyond the current unsustainable status quo in which ‘private has not enough interest to’ and ‘public cannot’ is to explore innovative ways to make public and private interact, such as ‘mission-oriented finance’,²⁶⁶ and to promote models of financial institutions that are more prone to long-term investment. Getting the transition on track will involve the whole range of mission-oriented financial institutions, public or stakeholders governed, for which climate breakdown or the SDGs are a key focus rather one risk or opportunity among others.

Three decades ago, numerous countries had a so-called “three pillars” banking system composed of *private commercial banks*, *public banks* and (*mutual*) *cooperative banks* which played complementary roles. But the vogue for liberalization of the late 80’s and 90’s changed that equilibrium by strongly reducing the role of the two last pillars in many countries, leaving the field clear for private commercial banks to grow and grow, until they became today’s “systemic important banks”.

²⁶⁶ ‘Mission-oriented policy’ focuses on problem-specific societal challenges, which many different sectors interact to solve. On the financial side, this comes with a rethinking of the role of government and public policy in the economy and their interaction with private actors at many level of the value chain. This concretely means for policy-makers to be more future focused, and go hand-in-hand with a rethinking of the role of State Investment Banks (such as KfW, CDC, ICO, CDP) which has to move beyond a role of ‘fixing market failures’ towards a role of creating and shaping new markets. More information: MAZZUCATO, M., PENNA, C.C.R., 2014, *Ibid*.

Promoting a greater diversity of bank business models, including stakeholder and local savings banks, is a central aspect in promoting mission-oriented finance and would be worth exploring in detail in a separate paper. So would the role of sovereign wealth funds. For the purposes of this paper, however, we will focus on the evolving role of state investment banks as a flagship example.

4.1 The role of state investment banks

Unlike private commercial banks, **state investment banks (SIBs) are created with a public interest mandate** to provide medium and long-term credit for productive — and sometimes green — activities. Well known examples include the German *Kreditanstalt für Wiederaufbau* (KfW), the Italian *Cassa Depositi e Prestiti* (CDP), the French *Caisse des Dépôts et des Consignations* (CDC), and the Brazilian *Banco Nacional de Desenvolvimento Econômico e Social* (BNDES).

For decades, state investment banks (SIBs, sometimes also called ‘national promotional banks’ or ‘development banks’) have played many important roles in directing credit to priority sectors for the society. As shown by Mazzucato and Penna,²⁶⁷ SIBs have historically promoted countercyclical, developmental, venture capitalist, and mission-oriented funding. They are historical providers of countercyclical finance to offset credit contractions during economic recessions²⁶⁸ — finance that would otherwise be in short supply due to the higher risk-aversion of private financial institutions during crises.

SIBs also provided funding for long-term projects, industrialization and development of the economy; for example KfW still plays a developmental role in the German economy while the China Development Bank (CDB) play a very active development role, as the key financier of China’s five-year strategic plans.²⁶⁹ They also target investments in high-risk R&D and lengthy innovations – areas in which private capital has proved to be too short-termist or risk averse to engage²⁷⁰ – and promote investments around complex societal problems, such as climate breakdown.²⁷¹

The financial liberalization since 1980 lead to a decrease of the role of SIBs in many economies,²⁷² as part of the hegemony of a discourse centred on the ‘Efficiency Market Theory’, the ‘distortion’ critique and a post-Bretton Woods agenda. SIBs have been presented either as inefficient structures which tend to misallocate resources — notably due to political biases and risks of corruption — supposedly leading to a lower average growth rates,²⁷³ or, when they did support bankable projects, as structures which crowd out credit that would otherwise have been supplied by private commercial banks. This overly simplistic vision has been

267 MAZZUCATO, M., PENNA, C.C.R., Beyond market failures. The market creating and shaping roles of state investment banks, SPRU – Science Policy Research Unit, University of Sussex, UK, Working Paper Series, SWPS 2014 F21, 2014, 37p

268 Gutierrez et al., 2011; Luna-Martinez and Vicente, 2012; cited in: MAZZUCATO, M., PENNA, C.C.R., 2014, *Ibid.*

269 Griffith-Jones and Tyson, 2013; cited in: MAZZUCATO, M., PENNA, C.C.R., 2014, *Ibid.*

270 George and Prabhu, 2003; Schapiro, 2012; Hochstetler and Montero, 2013; Sanderson and Forsythe, 2013; cited in: MAZZUCATO, M., PENNA, C.C.R., 2014, *Ibid.*

271 SCHRÖDER et al., 2011; cited in: MAZZUCATO, M., PENNA, C.C.R., 2014, *Ibid.*

272 The World Bank estimates that in emerging economies state bank ownership has fallen from 67 per cent in 1970 to 22 per cent in 2009. In: MAROIS, T., *State-owned banks and development: dispelling mainstream myths*, SOAS, 2016, 26p., p.2

273 LA PORTA, R., LOPEZ-DE-SILANES, F., SHLEIFER, A., *Government ownership of banks and economics growth*, The Journal of Finance, 57(1), p.265-301

robustly challenged: while governance structures and accountability mechanisms are key to avoid mission drift and political capture,²⁷⁴ research has shown that government ownership of banks was in fact associated with higher average growth rates for a global panel of countries during 1995-2007.²⁷⁵ More fundamentally, **the role assigned to SIBs is not to allocate credit only towards what can be described as the most economically efficient** — i.e. towards “those able to pay the highest rates, hence those able to use resources most productively ...[resulting in] an improvement in investment efficiency”²⁷⁶ — **but to use their public mandate to provide concessional funding towards collectively-defined societal needs and priority sectors**, to finance innovation, to reach small economic actors (e.g. SMEs, small farms, conservation specialized organizations) which are too small for the stock market and too risky for most mainstream commercial banks, and to compensate for the lack of credit flowing to projects with public good characteristics, such as conservation projects.

“Their approach is typically to assess whether public banks are as efficient as private banks at making money. One might as well ask if oranges are better at making apple juice than apples”²⁷⁷

Thomas Marois, SOAS

The financial and economic crisis brought SIBs back in the spotlight. These often-underestimated institutions played an important countercyclical role,²⁷⁸ increasing the size of their loan portfolios by 35 per cent on average, or more than 100 per cent in some cases, between 2007 and 2009.²⁷⁹ They were actually returning to one of their original roles: providing financial stability throughout the business cycle.²⁸⁰

Despite four decades of privatisation efforts, public banks remain important actors at the global, regional, national and provincial levels in some countries. Nowadays, some SIBs are also large relative to their countries' GDPs, e.g. measured in total assets the Italian CDP, at EUR 305bn, and the German KfW, at EUR 497bn, are both worth around 19 per cent of their respective GDP (2012).²⁸¹ In fact, as the business activities of SIBs have under some conditions no effect on general government deficits/surpluses or on general government gross debt,²⁸² it is one of the ways that European

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- 274 SCHERRER, C., “The challenge of keeping public banks on mission”, p.243-254, in: SCHERRER, C., *Ed., Public banks in the age of financialization - A comparative perspective*, Edward Elgar Publishing, 2017, 265p.
- 275 ANDRIANOVA, S., DEMETRIADES, P., SHORTLAND, A., *Government ownership of banks, institutions and economic growth*, University of Leicester, Working Paper No. 11/01, September 2010, 34p.
- 276 ALEXANDER, et al, 1995, cited in: BEZEMER, D., RYAN-COLLINS, J., VAN LERVEN, F., ZHANG, L., *Loc cit.*, p.12
- 277 MAROIS, T., *How public banks can help finance a green and just energy transformation*, TNI, Public alternatives issue brief, November 2017, 15p.
- 278 Which means stabilizing credit over the business cycle as well as during periods of financial instability. It's one of the well-documented roles that SIBs played across time. in: BERTAY, A. C., DEMIRGUC-KUNT, A., HUIZINGA, H., *Bank ownership and credit over the business cycle: Is lending by state banks less procyclical?*, 2015, *Journal of Banking and Finance*, 50, p.326-339
- 279 DE LUNA-MARTINEZ, J., VICENTE, C.L., *Global Survey of Development Banks*, Policy Research Working Paper 5969, The World Bank, 2012, Url.: <http://documents.worldbank.org/curated/en/313731468154461012/pdf/WPS5969.pdf>, p.13
- 280 MAZZUCATO, M., PENNA, C.C.R., 2014, *Ibid.*, p.8
- 281 VALLA, N., “Investment in Europe needs a new architecture: the Eurosystem of National Promotional Banks”, 112-129, p. 122, in: PAOLO, G., REVIGLIO, E., (eds.), “Investing in Long-Term Europea. Re-launching fixed, network and social infrastructure”, Luiss University Press, 2015, Url.: <https://iris.luiss.it/retrieve/handle/11385/171786/48525/Investing%20in%20long%20term%20Europe.pdf>
- 282 Investments made by the SIBs are not allocated to the government sector according to the *European System of National and Regional Accounts* (ESA 2010) framework, at least when they act as a financial intermediary and is sufficiently autonomous in performing its duties. Source: ROMANO, C., THEODORE, S., *Issuer Rating Report of Kreditanstalt für Wiederaufbau (KfW)*, Scope Ratings, Berlin, 30 August 2018

States have found to release the constraints of EU fiscal rules in order to maintain public investment and foster in some cases a discreet industrial policy through loans targeted towards specific sectors within the scope of EU State Aid legislation.²⁸³

Box 14: The case of the Brazilian BNDES

As part of its Nationally Determined Contributions (NDC) in the framework of the Paris Agreement, Brazil has committed to reforest 12 million hectares by 2030, restore 15 million hectares of agricultural land by 2030 and reduce illegal deforestation to 0% by 2030.²⁸⁴

The Banco Nacional de Desenvolvimento Econômico e Social (BNDES), Brazil's main public bank, plays a significant role in the pursuit of this goal. One of the biggest and most important world initiatives to fight deforestation, the Amazon Fund, is managed by the BNDES in cooperation with the Brazilian Ministry of the Environment, while mainly funded by the Norwegian and the German government.²⁸⁵

BNDES has a mandate to “*foster sustainable and competitive development in the Brazilian economy*”. However, reflecting priorities from an earlier period, the bank still retains stakes in the country's oil and mining industries and has been heavily involved in the sugarcane industry, which is said to contribute to deforestation.²⁸⁶

SIBs are often required to provide public guarantees and/or to purchase the riskiest tranches of investment to incentivize institutional investors to get on board.²⁸⁷ This reflects a strategy promoted by the World Bank and the OECD, among others, to use public guarantees to mobilise some of the US\$80 trillion of private assets under management²⁸⁸ by large institutional investors such as pension funds or insurance companies.

Such guarantees have significant barriers to overcome, however. As we saw in Section 3.1.2, several characteristics of conservation projects – such as poor risk/return profiles and long time horizons – make them less attractive for private investors and lenders (outside of green commodities related to *Sustainable agriculture* and *Sustainable forestry*, and ecotourism). This is especially so for some conservation finance mechanisms, where the intrinsic characteristics of some ecosystem services mean that *Payments for ecosystem services, for example*, will always be limited to very specific cases.

283 For example, “Germany, continues to use state-owned banks to allocate credit to priority sectors in order to conduct industrial policy [...] [through] its largest national development bank, the Kreditanstalt für Wiederaufbau (KfW)”, in: NAQVI, N., HENOW, A., CHANG, H.-J., *Kicking away the financial ladder? German development banking under economic globalisation*, Review of International Political Economy, 2018

284 ABRAMSKIEHN, D., HALLMEYER, K., et al., *Supporting National Development Banks to Drive Investment in the Nationally Determined Contributions of Brazil, Mexico, and Chile*, IDB, 2017, 81p., p.6

285 BNDES, *Amazon Fund/BNDES offers R\$ 150 million for new projects*, 2017, Url.: https://www.bndes.gov.br/SiteBNDES/bndes/bndes_en/Institucional/Press/Noticias/2017/20170809_amazon_fund_bndes.htm

286 JUSYS., T (2017) A confirmation of the indirect impact of sugarcane on deforestation in the Amazon, *Journal of Land Use Science*, 12:2-3, 125-137

287 *Ibid.*

288 JEMIMA, K., *Global assets under management hit all-time high above \$80 trillion*, Reuters, October 30, 2017

4.2 Expand the role of state investment banks

Public banks appear to be well equipped to answer to some of the issues faced by conservation finance.

- **Relatively low returns for relatively high risk** – While the biological and even economic benefits of conservation may be evident, a financial return is not necessarily possible, nor desirable, for every type of conservation project – as they generally have public, common and complex goods characteristics. And when a financial return is possible, it appears to be often insufficient to attract for-profit investors.²⁸⁹ Also, the fact that the vast majority of natural capital depletion takes place in developing countries means that most projects to secure our international stock of natural capital have to take place in countries that often do not have sufficient fiscal stance or capability to attract private financial flows (as they will generally require a risk premium which raises the cost of capital).²⁹⁰
- **Long timeline between project start and actual delivery of funds** – Many conservation financing mechanisms take years to develop, and this may not meet stakeholder expectations of seeing results within a certain timeframe.²⁹¹ Public banks, on the other hand, could play one of the traditional roles of banks and assist with ‘maturity transformation’: they can use their good rating and public guarantee to finance themselves on international markets, and lend with longer maturities to conservation associations, small sustainable farmers, etc.
- **Relatively small size of conservation projects** – As conservation projects are generally too small in scale to get onto the radar of the largest private investors (only a few projects are scalable beyond the USD 5 million threshold),²⁹² governments could mandate their public investment banks to act as a one-stop-shop for such projects.

Furthermore, public (development) banks often offer highly qualified technical support for creating and managing projects, ensuring their long-time success. Consequently, **there is a strong case to make that public development banks from developed countries should be mandated, and better capitalized, to expand the funding of conservation finance as part of a broad, ambitious CBD agreement.** It is worth recalling that some public banks from prominent developed countries such as Germany’s KfW benefit from a triple A credit rating thanks in large part to their government backing, which allows them easily to finance their activities on national and international markets.

While not all states benefit from such a public banking sector, those that do need their institutions to be well mandated and governed in order to play a full role in tackling the lack of funding for public goods such as the environment (see Figure 17). As an illustration, the mandates of the KfW, BNDES, EIB and CDB are all linked to overcoming specific societal challenges and a broader vision of achieving smart, sustainable, and inclusive growth, but this is not the case for Italy’s CDP, whose mandate is more static, focusing on ‘economic

289 When asked about motivations for investing in conservation in the EKO study, the for-profit investors selected expected financial returns as their top consideration, well before CSR/ESG or diversification consideration. Source: OMLSTED, P., *Social impact investing and the changing face of Conservation finance*, 2016, IUCN, The Social Science for Conservation Fellowship Programme, Working paper 2, 33p.

290 As a reminder, the projects that took place in Africa on average needed IRR to be 5 per cent higher than comparable conservation investments in Latin America because of the associated risks. In: SALTUK, Y., EL IDRISSI, A., BOURI, A., MUDALIAR, H., SCHIFF, H., *Spotlight on the Market: The Impact Investor Survey*, J.P. Morgan and the Global Impact Investing Network, 2014

291 WWF, *Guide to conservation finance - Sustainable financing for the planet*, 2009, 54p., p.4

292 HUWYLER, F., KÄPPELI, J., TOBIN, J., *Ibid.*

development’ and ‘competitiveness’.²⁹³ **There will therefore be a need to change some mandates to include CBD and Paris Agreements objectives.**

Figure 17: Mission and vision of selected public banks

Bank	Mission	Vision / challenges that guide activity
KfW (Germany)	To “support change and encourage forward-looking ideas – in Germany, Europe and throughout the world.”	Activities are guided by three key challenges: (1) climate change and environmental protection , (2) globalisation and technical progress and (3) demographic change.
BNDES (Brazil)	To “foster sustainable and competitive development in the Brazilian economy, generating employment while reducing social and regional inequalities.”	Investments are guided by the three major challenges: (1) innovation, (2) socio-environmental development , (3) local and regional development, prioritising the less developed regions in Brazil.
CDB (China)	To “enhance national power and improve the livelihood of the people.”	Five core values shape the bank’s activities: (1) responsibility, (2) innovation, (3) green growth , (4) prudence, (5) win-win development.
CDP (Italy)	“We promote Italy’s future by contributing to economic development and investing in competitiveness.”	Four core values that characterise the activity of the people working in the bank: (1) accountability, (2) skills, (3) collaboration, (4) courage.
EIB (EU)	To “support the achievement of EU policy goals, acting as the EU’s catalyst for change in the drive to become a yet more dynamic inclusive green knowledge-based economy.”	Activities are aligned to two overarching policy goals: (1) social and economic cohesion, (2) climate action . In addition to four “primary public policy goals”: (1) innovation, (2) SMEs and Mid-cap financing, (3) infrastructure, (4) environment.
NIB (Nordics)	To “finance projects that improve competitiveness and the environment of the Nordic and Baltic countries.”	The vision is “a prosperous and sustainable Nordic-Baltic region ”. Core values are “competence, commitment and cooperation”.

Source: MAZZUCATO, M., MacFARLANE, L., *Patient strategic finance: an opportunities for state investment banks in the UK*, Working Paper, IIPP WP 2017-05, 79p., p.

293 MAZZUCATO, M., MacFARLANE, L., *Patient strategic finance: an opportunity for state investment banks in the UK*, Working Paper, IIPP WP 2017-05, 79p., p.28

POLICY IDEA

Review the mandate, capitalisation and governance of public and development banks to expand funding towards ambitious CBD objectives

Public and development banks can provide funding that the private sector will not, for example because most conservation projects have public or common goods characteristics with low financial returns, or long-term payback periods (the ‘Tragedy of the horizon’). Governments should **review the mandates, capitalisation and governance of public finance institutions to match CBD and Paris Agreement objectives and remove potential barriers to their expansion.**

While they have the potential to finance the transition towards a sustainable economy faster than most solely profit-driven financial institution, the potential of public banks is often constrained in advanced economies. The constraints typically include measures designed to prevent public banks from competing with private financial institutions and to limit their role to ‘fixing market failure’ – lending where private financial institutions do not want to – instead of expanding towards any form of organized economic development. Given the CBD objectives, the debate should not be any more on the merit of ‘market-based’ allocation but on its boundary: where public interest is at stake and market finance has proven to be inadequate, public banking should be free to fill the gap.

Conclusion

Much of the human-caused damage to biodiversity and ecosystems is result of ‘normal’ economic activities that have unaccounted environmental costs. Avoiding or reversing this damage will involve bringing these costs into decision-making, which requires new ways to measure environmental impact and risk. It will need accounting methodologies and disclosures, market interventions and restrictions to change behaviours, as well as public and innovative financing for conservation activities that can bring environmental benefits but little immediate financial return. Amid these efforts, it will be important that attempts to financialise or speculate on these processes are resisted, and that the tools of natural capital tools are not misused to justify counterproductive financing techniques (such as certain types of offset and other financial innovations that fail to change underlying economic activity). The overall response will need creativity and political commitment.

The concepts of natural capital and ecosystem services and their related approaches can help to pave the way to a consistent and integrated agenda to report the impact and dependencies that our economic system has upon nature and to fix them with proper capital allocation policies. While there are some potential risks that can arise from an incorrect use of the concepts of natural capital and ecosystem services, failing to consider the impact and dependency of our economy on nature is not an option neither. Finance Watch will therefore keep in mind the potential risks and draw very clear redlines which should not be crossed (see Figure 18), while advocating for appropriate use of all the tools that can help to integrate nature in decisions around allocating capital.

Figure 18: The double-edged sword of Natural Capital

	'Natural capital' ignoring Nature	'Natural capital' supporting Nature
Policies	<ul style="list-style-type: none"> • Establishment of market for ecosystem services • Innovative financial mechanisms (e.g. 'Biodiversity derivatives') • Land right as collateral • Securitization of conservation finance projects • etc. 	<ul style="list-style-type: none"> • Natural capital risk assessment ('ENCORE', natural capital-related stress-test, etc.) • Natural capital-related harmonized disclosure (CDSB; IIRC; et.) • Natural capital framework to assess dependencies • Natural capital accounting (while being conscious of potential side-effects of some form of NCA) • 'Subsidy-like' Payment for Ecosystem Services • etc.
Risks/ Opportunities	<p>The conceptual lens of natural capital and ecosystem services is used to create market-like mechanisms directed towards attracting private financial flows. By doing so, it ignores the facts that most of these mechanisms do not allow for sufficient revenue stream, IRR, or are too small to attract institutional investors beyond the specialized 'impact investors' — which accept below-market IRR.</p> <p>Moreover, it ignores the intrinsic characteristics of most of the natural capital and ecosystem services (public and complex goods, systemic properties, time inconsistency, etc.).</p> <p>Potential risks:</p> <ul style="list-style-type: none"> • When ecosystem services are appropriated and sold, as with natural resource extraction, there is an incentive to maximize the provision of income-generation services at the expense of broader ecosystem function. • When there can be a market because of the intrinsic characteristic of the ecosystem service, one of the side-effect is to distract policy-makers from finding viable solutions • As investors generally request risk mitigations, there is a risk with the use of land right as collateral (green grabbing) 	<p>The conceptual lens of natural capital and ecosystem services are used to:</p> <ul style="list-style-type: none"> • Allow for the production of harmonized data on natural capital uses, dependencies and risks • Allow for showing the 'real value' of natural capital related goods and services • Assess and internalize negative externalities through environmental regulations • Integrate considerations for natural capital true value and risks of depletion inside policymaking, decision-making (at firm or national level) • Allows for assessment of natural capital financial-related risks by financial institutions and supervisory authorities • Can help redirecting flows from natural capital harmful activities towards sustainable activities

References

- ABRAMSKIEHN, D., HALLMEYER, K., et al., Supporting National Development Banks to Drive Investment in the Nationally Determined Contributions of Brazil, Mexico, and Chile, IDB, 2017, 81p.
- Alliance for corporate transparency, Companies failing to report meaningful information about their impacts on society and the environment, Url.: <http://www.allianceforcorporatetransparency.org/news/companies-failing.html>
- ANDRIANOVA, S., DEMETRIADES, P., SHORTLAND, A., Government ownership of banks, institutions and economic growth, University of Leicester, Working Paper No. 11/01, September 2010, 34p.
- ASSUNÇÃO, J., GANDOUR, C., ROCHA, R., ROCHA, R., Does Credit Affect Deforestation? Evidence from a Rural Credit Policy in the Brazilian Amazon, CPI Technical Report, Climate Policy Initiative, 2013, 50p.
- Banco Central do Brasil, Resolution 4595/2017, https://www.bcb.gov.br/pre/normativos/busca/downloadNormativo.asp?arquivo=/Lists/Normativos/Attachments/50427/Res_4595_v1_O.pdf
- Banque de France, A call for action Climate change as a source of financial risk, First comprehensive report, April 2019 Url.: https://www.banque-france.fr/sites/default/files/media/2019/04/17/ngfs_first_comprehensive_report_-_17042019_0.pdf
- BARBIER, E., The concept of natural capital, Oxford Review of Economic Policy 35, n°1 (2019).
- BARBIER, E., The Challenge for Rio+20: Funding, 2012, Resources article, Web, Url.: <https://www.resourcesmag.org/archives/the-challenge-for-rio20-funding/>
- BATTISTON et al., Assess the exposure of the EU financial system to energy transition, 2017
- BAUER, R., RUOF, T., SMEETS, P., Get Real! Individuals Prefer More Sustainable Investments, February 21, 2019, <https://ssrn.com/abstract=3287430>
- BECCA, M., CARROLL, N., et al., 2011 Update: State of Biodiversity Markets, Washington, DC: Forest Trends, 2011
- BENNETT, G., CHAVARRIA, A., et al., State of European Markets 2017 - Biodiversity Offsets and Compensation, 2017.
- BENNETT, G., RUEF, F., State of Watershed Investment 2016, Alliances for Green Infrastructure.
- BERNARDI, C., STARK, A. W., Environmental, social and governance disclosure, integrated reporting, and the accuracy of analyst forecasts, 2018, The British Accounting Review, 50(1).
- BERNHARDT, A., DELL, R., AMBACHTSHEER, J., POLLICE, R., The long and winding road: how long-only equity managers turn over their portfolios every 1.7 years, MERCER, Tragedy of the Horizon program, 2°ii, 2017, Url.: <http://2degrees-investing.org/wp-content/uploads/2017/04/The-long-and-winding-road-how-long-only-equity-managers-turn-over-their-portfolios-every-1.7-years-2017.pdf> , 60p.
- BERTAY, A. C., DEMIRGUC-KUNT, A., HUIZINGA, H., Bank ownership and credit over the business cycle: Is lending by state banks less procyclical?, 2015, Journal of Banking and Finance, 50.
- BIS, Supervisory and bank stress testing: range of practices, 2017.
- BLACKROCK, Exploring esg: a practitioner's perspective, 2016, 14p., Url.: <https://www.blackrock.com/us/individual/literature/whitepaper/viewpoint-exploring-esg-a-practitioners-perspective-june-2016.pdf>
- BLUET, H., IONESCU, C., Into the wild. Integrating nature into investment strategies, WWF France and AXA recommendations for the members of the G7 Environment meeting in Metz, 5-6 May 2019, 63p.
- BNDES, Amazon Fund/BNDES offers R\$ 150 million for new projects, 2017, Url.: https://www.bndes.gov.br/SiteBNDES/bndes/bndes_en/Institucional/Press/Noticias/2017/20170809_amazon_fund_bndes.html
- BOUWMA, I., SCHLEYER, C., PRIMMER, E. ET al., Adoption of the ecosystem services concept in EU policies, Ecosystem Services 29 (2018) 213–222
- BROWN, M.T., ULGIATI, S., Emergy evaluation of natural capital and biosphere services, Ambio 28 n° 6, 1999.
- BURRIT R., HAHN T., SCHALTEGGER S., Towards a comprehensive framework for environmental management accounting - Links between business actors and environmental management accounting tools, Australian accounting review, 12 (2), 2002.
- CALDECOTT, B., HOWARTH N., AND MCSHARRY P., Stranded Assets in Agriculture: Protecting Value from Environment-Related Risks., Smith School of Enterprise and the Environment, University of Oxford, 2013.
- Cambridge Centre for Sustainable Finance, Environmental risk analysis by financial institutions: a review of global practice, Cambridge, UK: Cambridge Institute for Sustainability Leadership, 2016, 84p.

- CAMPIGLIO, E., DAFERMOS, Y., MONNIN, P., RYAN-COLLINS, J., SCHOTTEN, G., TANAKA, M., Climate change challenges for central banks and financial regulators, *Nature - Climate Change*, Vol.8, June 2018.
- CARNEY, M., Breaking the Tragedy of the Horizon – climate change and financial stability, Speech delivered at Lloyd's Bank, London, 29 September 2015.
- CARTER, L., MOSS, S., Drought Stress Testing Making Financial Institutions More Resilient to Environmental Risks, 2017, GIZ, NCFA, EMSD, UNEP fi, GCP, RMS, 58 p.
- CDP, CDSB First Steps Corporate climate and environmental disclosure under the EU Non-Financial Reporting Directive, 2018, 52p.
- CDP, CDSB Ready or not: Are companies prepared for the TCFD recommendations? A geographical analysis of CDP 2017 responses, March 2018, 34p.
- CEBALLOS, G., EHRLICH, P. R., DIRZO, R., Biological annihilation via the ongoing sixth mass extinction signalled by vertebrate population losses and declines, 2017, *PNAS*, 114 (30)
- CHAPMANN, J.T.E., CHIU, J., MOLICO, M., Central bank haircut policy, *Annals of Finance* 7.
- CISL, 2ndii, ICBC, NCFA, UNEP FI, Enhancing environmental risk assessment in financial decision-making, In support of the G20 Green Finance Study Group, July 2017.
- COEURÉ, B., Monetary policy and climate change, Speech by Benoit Coeuré, Member of the Executive Board of the ECB, at a conference on "Scaling up Green Finance: The role Central Banks", Berlin, 8 November 2018
- COM (2017) 198, Communication from the Commission - An Action Plan for nature, people and the economy, 2017, 7p.
- CONLEY ET AL., Controlling eutrophication: nitrogen and phosphorus, *Science*, vol. 323 (2009), pp. 1014-1015.
- COSTANZA, R. et al., Twenty years of ecosystem services: How far have we come and how far do we still need to go?, *Ecosystem Services* 28-A (2017).
- COSTANZA, R. et al., Changes in the global value of ecosystem services, *Global Environmental Change* 26, 2014
- DAVIES, R., ENGEL, H., KÄPPELI, J., WINTNER, T., Taking conservation finance to scale, McKinsey, 2016.
- DE GROOT et al., Global estimates of the value of ecosystems and their services in monetary units, *Ecosystem Services* 1, n°1 (2012); MCDONOUGH et al., Analysis of publication trends in ecosystem services research, *Ecosystem Services* 25 (2017).
- DE LUNA-MARTINEZ, J., VICENTE, C.L., Global Survey of Development Banks, Policy Research Working Paper 5969, The World Bank, 2012
- DIAZ, S. et al., Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019, IPBES.
- DINERSTEIN, E., et al., An Ecoregion-Based Approach to Protecting Half the Terrestrial Realm, *BioScience*, Volume 67, Issue 6, June 2017, Pages 534–545
- CAMPBELL E., BROWN. M., Accounting of natural capital and ecosystem services for the US National Forest System, *Environ Dev Sustain* 14, 2012, pp. 691–724.
- Ecosystem Marketplace, The Matrix 2013 - Innovative markets and market-like instruments for ecosystem services, 2013
- ESMA, European enforcers to focus on new IFRSs and non-financial information in issuers' 2018 annual reports, Press news, 26 October 2018.
- European Commission, Attitudes of European citizens towards the environment, Special Eurobarometer 468 - October 2017, Url: http://ec.europa.eu/environment/eurobarometers_en.htm
- EUROSIF, European SRI Study, 2016, Url: <http://www.eurosif.org/wp-content/uploads/2016/11/SRI-study-2016-HR.pdf>
- FAO, The State of the World's Biodiversity for Food and Agriculture, 2019, 576p.
- FARLEY, J., Ecosystem services: The economics debate, *Ecosystem Services* 1 (2012).
- Financial Alliance, VBDO, Connecting Finance and Natural Capital: a supplement to the natural capital protocol', Natural Capital Coalition, Natural Capital 2018.
- First Progress Report from October 2018
- First Steps Corporate climate and environmental disclosure under the EU Non-Financial Reporting Directive, 2018, 52p.
- G20 Green Finance Study Group, Enhancing Environmental Risk Assessment in Financial Decision-making, 2017.
- GERBER, P.J., et al., Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities, Food and Agriculture Organization of the United Nations report (FAO), Rome.

- GFSG, G20 Green Finance Synthesis Report, 2017, 27p.
- GIESE, G., LEE, L-E, MELAS, D., NAGY, Z., NISHIKAWA, L., Foundations of ESG investing – Part 1: How ESG Affects Equity Valuation, Risk and Performance, MSCI, 2017, 41p.
- Global Impact Investor Network (2018). Annual Impact Investor Survey.
- GÓMEZ-BAGGETHUN, E., MARTÍN-LÓPEZ, B., BARTON, D., BRAAT, L., et al., State-of-the-art report on integrated valuation of ecosystem services, European Commission FP7, 2014, 34p.
- GGKP, Demystifying economic valuation, Valuing Nature paper, Green Growth Knowledge Platform, June 2016.
- GRIFFITH-JONES S., TYSON J., The European Investment Bank: Lessons for developing countries, 2013.
Url: <https://www.econstor.eu/bitstream/10419/80948/1/737679514.pdf>
- GROOTEN, M., ALMOND, R.E.A. (Eds), Living Planet Report - 2018: Aiming Higher, 2018, WWF, Gland, Switzerland
- GSIA, 2018 Global Sustainable Investment Review, April 2019, 29p. Url: http://www.gsi-alliance.org/wp-content/uploads/2019/03/GSIR_Review2018.3.28.pdf
- HACHE, F., A missed opportunity to revive “boring” finance? A position paper on the long-term financing initiative, good securitisation and securities financing, Finance Watch, 2014. Url: <https://www.finance-watch.org/wp-content/uploads/2018/08/FW-report-LTF-dec-2014.pdf>
- HAMRICK, K., State of Private Investment in Conservation 2016 - A Landscape Assessment of an Emerging Market, 2016, Ecosystem Marketplace.
- HUMMEL, K., SCHLICK, C., The relationship between sustainability performance and sustainability disclosure – Reconciling voluntary disclosure theory and legitimacy theory, Journal of Accounting and Public Policy, Volume 35, Issue 5, September–October 2016, Pages 455–476
- HUWLER, F., KÄPPELI, J., SERAFIRMOVA, K., SWANSON, E., TOBIN, J., Making conservation finance investable. Stanford Social Innovation Review, 2014
- HUWYLER, F., KÄPPELI, J., TOBIN, J., Conservation Finance - From niche to mainstream: The building of an institutional asset class, Credit Suisse, IUCN, Rockefeller Foundation, McKinsey, 2016, 25p.
- IFOAM, Organic farming drives sustainability in global agriculture, organics international press release, April 2019
- IPBES, Summary for policymakers of the assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production, 2016, Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany.
- J. SPURGEON, B@B Workstream 1: Natural Capital Accounting for Business: Guide to selecting an approach, 2014.
- JAIJAI RAM, P., Fair Value Accounting vs. Historical Cost Accounting, Review of Business Information Systems Volume 17, Number 1, City University of New York, USA, 7p.
- JAMES, A., GASTON, K. & BALMFORD, A., Can we afford to conserve biodiversity?, 2001, Bioscience, 51, p. 43–52.
- JEMIMA, K., Global assets under management hit all-time high above \$80 trillion, Reuters, October 30, 2017
- JOHNSON, A.S., Introduction to Economics, D.C. Heath & Co., Boston (MA), 1909.
- JUSYS., T (2017) A confirmation of the indirect impact of sugarcane on deforestation in the Amazon, Journal of Land Use Science, 12:2-3, 125-137
- KAY, J., The Kay Review of UK Equity Markets and Long-Term Decision Making, July 2012
- KETTUNEN, M., D'AMATO, D., TEN BRINK, P., MAZZA, L., MALOU, A., WITHANA, S., Potential of sectoral resource mobilisation to implement the Aichi targets in developing countries, 2013, Institute for European Environmental Policy (IEEP), Brussels, Belgium, 87 pp
- Kill, J., Economic Valuation & Payment for Ecosystem Services: Recognizing Nature's Value or Paying for nature's Destruction?, A discussion paper for the Heinrich Böll Stiftung, 2015.
- KUEPPER, B., STEINWEG, T., THOUMI, G., Sustainable Banking Initiatives: Regulators' Role in Halting Deforestation, 2017, Chain Reaction Research coalition, 14p.
- L. R. VIRTO et al., Natural Capital Accounts and Public Policy Decisions: Findings from a Survey, Ecological Economics, 144 (2018).
- LA PORTA, R., LOPEZ-DE-SILANES, F., SHLEIFER, A., Government ownership of banks and economic growth, The Journal of Finance, 57(1).
- LAMERANT, J., MÜLLER, L., KISIELEWICZ, J., Critical assessment of biodiversity accounting approaches for businesses and financial institutions, Discussion paper for EU Business @ Biodiversity Platform, 76p.

- LAPEYRE, R., LAURANS, Y., Innovating for Biodiversity Conservation in African Protected Areas: Funding and Incentives. Insights from Côte d'Ivoire, Sierra Leone and South Africa, 2016, Study summary, ministère des Affaires étrangères et du Développement international, Institut du développement durable et des relations internationales, and France-IUCN Partnership, Paris.
- LAUTENSCHLÄGER, S., Central bankers, supervisors and climate-related risks, Member of the Executive Board of the ECB, at the NGFS conference, Paris, 17 April 2019
- LAUX C., LEUZ, C., Did fair-value accounting contribute to the financial crisis?, Journal of Economic Perspectives, Vol. 24, No. 1, 2010.
- LEACHA, K., GRIGGA, A., O'CONNOR, B., BROWNA, C., VAUSEA, J., GHEYSSSENSB, J., WEATHERDONA, L., HALLEB, M., D.BURGESSA, N., FLETCHERA, R., BEKKERA, S., KINGA, S., JONESA, M., A common framework of natural capital assets for use in public and private sector decision making, Ecosystem Services 36, 2019, 7p.
- LERNOUD, J., POTTS, J., SAMPSON, G., GARIBAY, S. et al., The State of Sustainable Markets – Statistics and Emerging Trends 2017, ITC, Geneva, 196p.
- MAAS, K., LAMBOOY, T., VAN TILBURG, R., VAN'T FOORT, S., Investors and companies' biodiversity and natural capital reporting and performance - Assessing the request for and use of company reporting on biodiversity and natural capital by asset managers and fund managers, Sustainable Finance Lab, Nyenrode Business University, Impact Centre Erasmus, 2017, 67p.
- MACLAUGHLIN, VAN DER KRUIF, VAN DIJK, Biodiversity in the spotlight? Assessing the coverage and quality of reporting on the issues of land use, biodiversity, water and product sustainability by companies worldwide, Sustainalytics, Amsterdam, 2015;
- MAROIS, T., How public banks can help finance a green and just energy transformation, TNI, Public alternatives issue brief, November 2017, 15p.
- MAROIS, T., State-owned banks and development: dispelling mainstream myths, SOAS, 2016, 26p., p.2
- Mazzucato, M., Macfarlane, L., Patient strategic finance: an opportunity for state investment banks in the UK, Working Paper, IIPP WP 2017-05, 79p.
- MAZZUCATO, M., Penna, C.C.R., Beyond market failures. The market creating and shaping roles of state investment banks, SPRU – Science Policy Research Unit, University of Sussex, UK, Working Paper Series, SWPS 2014 F21, 2014, 37p.
- MCFARLAND, B.J., International Finance. In: Conservation of Tropical Rainforests. Palgrave Studies in Environmental Policy and Regulation, 2018, Palgrave Macmillan, 680p.;
- MERSCH, Y., Climate change and central banking, Speech by Yves Mersch, Member of the Executive Board of the ECB, Workshop discussion: Sustainability is becoming mainstream, Frankfurt, 27 November 2018
- MILLER, D.C., AGRAWAL, A., TIMMONS ROBERTS, J., Biodiversity, governance, and the allocation of international aid for conservation, 2013, Conservation Letters 6, quoted in: OLMSTED, 2016.
- MISSEMER, A., Natural Capital as an Economic Concept, History and Contemporary Issues, Ecological Economics 143 (2018).
- MODEE, K., WERNER, F., Business approaches to natural capital valuation, World Environment Center, 2014, p. 2
- MONBIOT, G., The UK government wants to put a price on nature – but that will destroy it, The Guardian 15 May 2018;
- MONFREDA C., WACKERNAEGEL M & DEUMLING D., Establishing national natural capital accounts based on detailed Ecological Footprint and biological capacity assessments, Land use policy 21, 2004.
- MONIN, P., Central banks should reflect climate risks in monetary policy operations, SUERF Policy Note, Issue No41, September 2018, 9p.
- MONIN, P., Integrating Climate Risks into Credit Risk Assessment - Current Methodologies and the Case of Central Banks Corporate Bond Purchases, CEP, Discussion Note 2018/4, December 2018, 24p.
- Morgan Stanley, Sustainable reality: Understanding the Performance of Sustainable Investment Strategies, Institute for sustainable investing, March 2015, 12p. Url: https://www.morganstanley.com/sustainableinvesting/pdf/Sustainable_Signals.pdf
- MUDALIAR, A., DITHRICH, H.,
- MÜLLER, BURKHARD, Mapping ecosystem service supply, demand and budgets, Ecological Indicators 21 (2012).
- NAEEM, S., INGRAM, J. C., VARGA, A., AGARDY, T., BARTEN, P., et Al., Get the science right when paying for nature's services, 2015, Science 347, p.1206-1207

- NAQVI, M., BURKE, B., HECTOR, S., JAMISON, T., DUPRÉ, S., All swans are black in the dark - How short-term focus of financial analysis does not shed light on long term risks, 2^oii, Generation foundation, Tragedy of the horizon program, 2017,
- NAQVI, N., HENOW, A., CHANG, H.-J., Kicking away the financial ladder? German development banking under economic globalisation, Review of International Political Economy, 2018
- Natural Capital Finance Alliance and UN Environment World Conservation Monitoring Centre Exploring Natural Capital Opportunities, Risks and Exposure: A practical guide for financial institutions (Geneva, Oxford and Cambridge), 2018.
- Natural capital risks and opportunities for the financial sector, Center for sustainability studies at the getulio vargas foundation (gvces / fgveaesp), First edition, 2017, 78p.
- NCFA, Integrating natural capital in risk assessment - A step by step guide for banks, 29p., (Geneva, Oxford and London), 2018
- Natural Capital, Towards Including Natural Resource Risks in Cost of Capital, State of play and the way forward, Natural Capital, 2015, 54 p., Url.: <https://naturalcapital.finance/wp-content/uploads/2019/02/560396159.pdf>
- NCFA, NCC, Connecting finance and natural capital - a supplement to the natural capital protocol, 2018, 80p.
- NEWMAN, CRAGG, Natural Products As Sources of New Drugs over the 30 Years from 1981 to 2010, 2012
- NGUYEN, T. L. T., LARATTE, B., GUILLAUME, B., HUA, A., Quantifying environmental externalities with a view to internalizing them in the price of products, using different monetization models, 2016, Resources, Conservation and Recycling, n°109, p.13-23
- NICOL, M., SHISHLOV, I., COCHRAN, I., Green Bonds: Improving their contribution to the low-carbon and climate resilient transition, I4CE, Green Bonds Research Program Work Package 1, February 2018
- NIXON, S., "Coastal marine eutrophication: a definition, social causes and future concerns", Ophelia 41 (1995), pp. 199-219
- NYBORG, K.G., Collateral frameworks: The open secret of central banks, 2017, Vox Cepr Policy Portal.
Url: <https://voxeu.org/article/how-central-bank-collateral-frameworks-distort-economy>
- OECD, Biodiversity: Finance and the Economic and Business Case for Action, report prepared for the G7 Environment Ministers' Meeting, 5-6 May 2019
- OECD, OECD Environmental Outlook to 2030, 2008
- OMB, Office of Management and Budget, Council on Environmental Quality, and Office of Science and Technology Policy. Incorporating Ecosystem Services into Federal Decision Making, Memorandum M-16-01. Executive Office of the President of the United States: Washington, DC, 2015
- OMLSTED, P., Social impact investing and the changing face of Conservation finance, 2016, IUCN, The Social Science for Conservation Fellowship Programme, Working paper 2.
- PANAGOS, P., STANDARDI, G., BORRELLI, P., LUGATO, E., MONTANARELLA, L., BOSELLO, F., Cost of agricultural productivity loss due to soil erosion in the European union: from direct cost evaluation approaches to the use of macroeconomic models, 2018, Land Degradation & Development, 29(3), 40p.
- PAOLO, G., REVIGLIO, E., (eds.), "Investing in Long-Term Europe. Re-launching fixed, network and social infrastructure", Luiss University Press, 2015
- PARKER, C., BROWN, J., PICKERING, J., ROYNESAD, E., MARDAS, N., MITCHELL, A.W., The Little Climate Finance Book, 2009, Global Canopy programme, Oxford, 91p.
- PARKER, C., CRANFORD, M., OAKES, N., LEGGETT, M. ed., The Little Biodiversity Finance Book, Global Canopy Programme, Oxford, 2012
- PELENC, J., Crossing Sen's capability approach with Critical Natural Capital theory: toward a new perspective to reconcile human development and Nature conservation goals, Biennale conference of the International society of ecological economics "advancing sustainability in time of crisis" - Aug 2010, Oldenburg-Bremen, Germany;
- PELENC, J., BALLEST, J., Strong sustainability, critical natural capital and the capability approach, Ecological Economics 112 (2015)
- PINCHOT, A., CHRISTIANSON, G., What investors want from sustainability data, World Resources Institute, WRI Commentaries, 2019, 12p.
- PLOY TEN, K., CHANG-RAN, K., Thai floods batter global electronics, auto supply chains, Reuters
- PRITCHARD R., VAN DER HORST D., Monetary Natural Capital Assessment in the Private Sector: A review of current status and research needs, Valuing nature Program, 2018.

- PRUDHAM, S., Pimping climate change: Richard Branson, global warming, and the performance of green capitalism, 2009, Environment and Planning.
- PROVINS, A., et al., Developing corporate natural capital accounts - Final report, pwc - Efttec - Rspb, 2015, p.5 Url.: <https://efttec.co.uk/services/accounting-natural-capital> .
- PWC, Corporate Reporting: What do investors want to know?, 2014, 18p., Url.: <https://www.pwc.com/gx/en/audit-services/corporate-reporting/publications/investorview/assets/pwc-investors-survey-powerful-stories-through-integrated-reporting.pdf>
- PWC, CPIC, Conservation Investment blueprints - A development guide, 2018, 88p.
- PWC, WBCSD, Enhancing the credibility of non-financial information the investor perspective, 2018, 18p., Url.: https://docs.wbcsd.org/2018/10/WBCSD_Enhancing_Credibility_Report.pdf
- RAMBAUD, A., RICHARD, J., The “Triple Depreciation Line” instead of the “Triple Bottom Line”: Towards a genuine integrated reporting, 2015, Critical Perspectives on Accounting, 33, 92–116
- RAMBAUD, A., RICHARD, J T., Towards a finance that CARES: From today’s Fisherian-(Falsified) Hicksian perspective to a genuine sustainable financial model, designed through accounting principles, Working paper, 2016, Université Paris-Dauphine, 69p., p.10
- RAVINA, A., Assessing the transition risk with a stress test methodology, Université Paris 1 Panthéon-Sorbonne, Chaire Energie et prospérité, 2017, 18p.
- REGELINK, M., REINDERS, H.J., VLEESCHHOUWER, M., VAN DE WIEL, I., Waterproof? An exploration of climate-related risks for the Dutch financial sector, 2017, De Nederlandsche Bank, 64p.
- RIGOT, S., DEMARIA, S., Potential impediments to long-term and low-carbon investment: The international accounting standards at stake, International Journal of Sustainable Energy Planning and Management, Vol.15, 2018.
- ROCKSTRÖM et al, A safe operating space for humanity, Nature, 2009
- ROMANO, C., THEODORE, S., Issuer Rating Report of Kreditanstalt für Wiederaufbau (KfW), Scope Ratings, Berlin, 30 August 2018
- SALLES, J-M., Valuing biodiversity and ecosystem services: why linking economic values with Nature?, Document de recherche n° 2011-24, Laboratoire Montpellierain d’Economie Théorique et Appliquée, 2011.
- SALTUK, Y., EL IDRISSE, A., BOURI, A., MUDALIAR, H., SCHIFF, H., Spotlight on the Market: The Impact Investor Survey, J.P. Morgan and the Global Impact Investing Network, 2014
- SANCHEZ-BAYO, F., WYCKHUY, K.A.G., Worldwide decline of the entomofauna: A review of its drivers, Biological Conservation, Volume 232, April 2019, Pages 8-27
- SCHERRER, C., Ed., Public banks in the age of financialization - A comparative perspective, Edward Elgar Publishing, 2017, 265p.
- SCHOENMAKER, D., Greening monetary policy, Bruegel, Working paper, Issue 02, 19 February 2019, 22p.
- SCHOENMAKER, D., Investing for the common good: a sustainable finance framework, 2017, Bruegel, 80p. Schoenmaker, D., Schramade, W., “Principles of Sustainable finance”, 2019, Oxford, 394p.
- SCHOENMAKER, D., VAN TILBURG, R., What Role for Financial Supervisors in Addressing Environmental Risks?, 2016, Comparative Economic Studies.
- Science for Environmental Policy (2017) – Taking stock: progress in natural capital accounting. In-depth report 16, produced for the European Commission-DG Environment, by the Science Communication Unit, UWE.
- SILVER, N., Blindness to risk: why institutional investors ignore the risk of stranded assets, Journal of Sustainable Finance & Investment, 7:1, 99-113.
- SIN, R., O. MURPHY, R., LAMAS, S., The True Faces of Sustainable Investing - Busting Industry Myths Around ESG, Morningstar, 2019, 10p.
- Sizing the Impact Investing Market, Global Impact Investment Network, 2019, 16p.; OECD, Biodiversity: Finance and the Economic and Business case for action, A report for the G7, 5-6 May 2019, 95p.
- SOER, The natural capital & ecosystem services, European environment agency, 2015, p. 4.
- SUTOR-SOREL, L., Seven central banks leading on climate change, Positive Money Europe, Blogpost, 2017, Url.: <https://www.positivemoney.eu/2017/11/7-central-banks-climate-change/>
- TCFD, Recommendations of the Task Force on Climate Related Financial Disclosures (TCFD), 2017.
- TEEB, 2010; MA. 2005a. Millennium Ecosystem Assessment: Ecosystems and human well being. Biodiversity Synthesis, Washington DC, Island Press, Washington DC

- TEYTELBOYM et al, Natural capital: what we don't value, we destroy - A response to George Monbiot, GEC, 22 May 2018
- THOMÄ, J., DUPRE, S., Right direction, wrong equipment: why transition risks do not fit into regulatory stress tests', Tragedy of the Horizon Energy Transition Risk - Discussion paper, September 2017.
- TRUCOST, Natural capital at risk: the top 100 externalities of business, 2013.
- TUCKER, G., UNDERWOOD, E., FARMER, A., SCALERA, R., DICKIE, I., MCCONVILLE, A., VAN VILET, W., Estimation of the financing needs to implement Target 2 of the EU Biodiversity Strategy - Report to the European Commission, 2013, Institute for European Environmental Policy, London, 507p.
- TUCKER, P., Pristine and parsimonious policy: Can central banks ever get back to it and why they should try, in P. HARTMANN, H. HUANG, D. SCHOENMAKER (eds), The changing Fortunes of Central Banking, Cambridge University Press.
- UNEP, Global Environment Outlook 6 - Key Messages, 2019
- United Nations, Convention on Biological Diversity: Text of the Convention, 1992, Url.: <https://www.cbd.int/doc/legal/cbd-en.pdf> the practical application of the concepts of critical natural capital and strong sustainability", Ecological Economics 44, n°2-3 (2003).
- VALLA, N., Investment in Europe needs a new architecture: the Eurosystem of National Promotional Banks, p.112-129.
- VAN TILBURG, R., ACHTERBERG, E., The financial sector as new agent of change - The case of Natural capital accounting and reporting, Study commissioned by the Netherlands Environmental Assessment Agency (PBL), 2016, 44p.
- VASSALLO P. et al, Assessing the value of natural capital in marine protected areas: A biophysical and trophodynamic environmental accounting model, Ecological Modelling, 355 (2017)
- VOLZ, U., On the role of central banks in enhancing green finance, UN Environment Inquiry, 2017, 27p., Url.: http://unepinquiry.org/wp-content/uploads/2017/02/On_the_Role_of_Central_Banks_in_Enhancing_Green_Finance.pdf
- WACKERNAEGEL, M., National natural capital accounting with the ecological footprint concept, Ecological Economics 29 (1999).
- WBCSD, CDSB, ECODESK, Corporate reporting in the United States and Canada, The reporting exchange, 2017, Url.: https://docs.wbcsd.org/2018/02/Corporate_reporting_in_the_United_States_and_Canada.pdf
- WITOWSKI, W., Global stock market cap has doubled since QE's start, Market Watch, 2015
- WWF, Guide to conservation finance - Sustainable financing for the planet, 2009.
- WWF Singapore, Resilient and sustainable portfolios: a framework for responsible investment, April 2019
- WWF, Accounting for Natural Capital in EU policy Decision-Making: a WWF background paper on policy developments., 2014
- YOW, M., RUBIN, M., Measuring Sustainability Disclosure - Ranking the World's Stock Exchanges, Corporate Knights, 2017, Url.: <https://www.comunicarseweb.com/sites/default/files/sse2017final.pdf>

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