

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



EDITORIAL ISABELLE AUTISSIER

Global wildlife populations have declined on average by 60 percent in the past 40 years, largely due to threats and pressures induced by human activities. This is an alarming wake-up call that nature is in a state of emergency. And it is not just wildlife that is in crisis. Each year, around US\$125 trillion worth of ecosystem services are provided to the global economy through drinkable water, food and pollination, fresh air, heat absorption, and forests & oceans that soak up carbon dioxide - the equivalent of 1.5 times the global GDP.

But these crucial ecosystem services provided by nature, which underpin human well-being and survival, are at risk - as the last Global Assessment Report of the IPBES demonstrates again. Overexploitation, habitat loss and pollution, among others, generate an ecological debt, which future generations will have to bear.

We need a global action to bend the curve of nature loss, protect our natural capital and secure the future of humanity. For that, we have before us an unparalleled opportunity as we head into 2020. In China in autumn 2020, the world leaders will gather to agree on a new 10-year strategic plan for biodiversity under the UN Convention on Biological Diversity. This framework will have to set the targets and strengthened mechanisms to put us on the path towards a more sustainable future.

We need a real New Deal for Nature and People where everybody has a role to play - from business to civil society, governments and local authorities, youth and indigenous people, private finance actors and development banks - to, altogether, reverse the trend of nature loss and preserve our natural capital. This deal should focus on tackling the underlying root causes of nature's decline for the benefit of People and the Planet. We need a New Deal for Nature and People to unite world leaders behind the biggest issue of our generation and catalyze a new movement that can and will preserve the habitability of our planet.

That is why WWF France is proud to publish this report together with Axa, one of the first institutional investors to have really engaged in the fight against climate change.

We thank the French Ministry for the Ecological and Inclusive Transition, which commissioned this report for the G7 Environment Ministers meeting in May 2019. It is the first time a leading global institutional investor and an international environmental NGO are exploring together the consequences of biodiversity loss for investors and how the financial sector can have a positive impact to help protect and restore nature for the benefit of the whole society. It is a first step on a long and necessary path towards a future where people can live in harmony with nature.

Isabelle Autissier,
Chairman, WWF France

EDITORIAL THOMAS BUBERL

Addressing eroding biodiversity is a complex but increasingly pressing challenge. Nature produces elements essential to human activity and to our very survival, from food and shelter to medicines' active ingredients. Moreover, diverse ecosystems are key to tackling climate change, as flourishing forests and well-preserved oceans absorb carbon emissions. Conversely, climate change accelerates biodiversity loss, creating a vicious circle. Our dependence on diverse ecosystems to thrive, if not survive, is therefore not to be doubted.

The implicit contributions of each species in our economies are also far-reaching: their roles can be seen as “services” provided free of charge by nature. For example, artificial pollination would cost an estimated 153 billion euros per year, generating labour and technological costs far exceeding any economic viability. Yet species are disappearing at a fast rate, endangering these services and threatening human integrity. Whilst this situation has not yet attracted as much political and media attention as the equally challenging concerns related to climate change, more and more analyses are starting to highlight the rate of species decline and its inherent threat to human welfare.

As a company which, over the past 5 years, took important decisions in the fight against climate change, we are convinced that the preservation of biodiversity requires an equally broad collective commitment from all stakeholders: from private sector actors, including financial institutions, to governments, NGOs and civil society.

The potential loss of key ecological services endangers not only populations but also certain businesses that depend on them and can therefore become a concern for investors. Investors' ability to understand and map these potential risks would enable them to identify opportunities and in doing so, help support solutions rather than environmentally unsustainable business practices.

This is why AXA decided in 2018, in the context of the “Act4Nature” project, to investigate this issue, by conducting an analysis of our exposure to biodiversity-related risks and opportunities in our insurance and investment activities. In 2019 we decided to support WWF's development of this report, which is a first attempt to map existing initiatives and call for a new public-private collaboration.

Insurers, in their capacity as risk carriers, can leverage their expertise to provide solutions. We also have a strong role to play by engaging with the investment community, not least in sectors and companies that are committed to “transition” towards more sustainable activities. Having been among the first large institutional investors engaged in the fight against climate change, we know that the financial sector cannot drive sustainable change on its own: operating in a predictable environment, relying on robust and harmonized methodologies, using clear scientific definitions and being able to have sufficient “investment depth” to progressively shift investments towards the targeted sectors are key to ensure a positive impact in the long run. Only this way can we avoid generating binary, pro-cyclical effects. A forward-looking, dynamic view will also be essential to avoid the pitfalls of static approaches.

Finally, the adoption by governments of international science-based biodiversity targets can help provide further clarity. General aspirations will not be sufficient to generate tangible outcomes. Only

then, provided these targets are clear enough, many companies, financial institutions, and civil society organizations attempt to translate these nature conservation objectives into investment strategies.

We are happy to have, thanks to the mission we were given by the French Ministry of Environment, the opportunity to share our experience and learnings on responsible investments and insurance with WWF, a world leading NGO on the fight for preserving biodiversity. We are aware that this is only the starting point of a long journey which will require a much broader collaboration, dialogue and mobilization of governments, private sector, international organizations, regulators and civil society. It is crucial that we build collective awareness and willingness to take action.

Thomas Buberl,
CEO, AXA Group

EXECUTIVE SUMMARY AND RECOMMENDATIONS

1. SEEING THE BIGGER PICTURE: BEYOND CLIMATE, FINANCIAL INSTITUTIONS MAY BE EXPOSED TO THE “BANKRUPTING” OF NATURE

Nature is currently being degraded at an unprecedented pace and scale. The rate of global loss of nature has been increasing drastically in the last 50 years, leading to a global environmental crisis. The degradation of our planet’s natural ecosystems, such as the oceans or land-based ecosystems is undermining its ability to provide vital goods and services that enable our economies to thrive.

Crossing the ecological limits of our planet may also put the profitability of some investments at risk. Certain financial returns are inextricably linked to nature through the dependencies and impacts of economic activities they finance. For example, a European pharmaceutical company lost almost 40% of its market capitalization in less than one year, causing shareholders billions in losses, after acquiring an agrochemical company accused of causing adverse impacts on bee populations and facing multiple health-related trials.

CLIMATE IS NOT THE ONLY PIECE OF THE NATURE “PUZZLE” FOR FINANCIAL INSTITUTIONS

Concerns over environment-related threats, starting with climate-related financial risks, are growing. Since the launch of the Taskforce on Climate-related Financial Disclosures (TCFD), a growing number of policy-makers have been acknowledging the importance of climate change for financial institutions. The mainstreamed mobilization of companies and financial institutions on climate can inspire similar initiatives to address other nature-related issues such as biodiversity; but systematically replicating the same approach is not the answer. For instance, it might be useful to take stock of this approach and shift to a more integrated and impactful strategy: investing in and accompanying countries, companies and projects supporting the transition to a low carbon economy, a healthier and a fairer & more resilient society.

IF COMPARED TO THE WORLD’S TOP 10 ECONOMIES, THE OCEAN WOULD RANK 7th WITH AN ANNUAL VALUE OF GOODS AND SERVICES OF \$ 2,500 BILLION

RECOMMENDATION 1

We recommend to launch a **Task Force on Nature Impacts Disclosures**, to create the conditions to transition towards protection, restoration and promotion of biodiversity. Financial institutions have an important leadership role to play in supporting awareness and decision taking around biodiversity loss. Achieving meaningful change, however, will require a broad-based coalition gathering the full spectrum of actors that are part of the issue and of the solution. With this Task Force, we recommend to foster an open dialogue with the private & public sector, including policymakers, with the objective to promote cross sectorial and cross border engagement.

This Task Force should identify and analyze business activities that have a material impact on biodiversity as well as activities with “transition” potential to support biodiversity protection and restoration. This analysis should be careful to avoid pitfalls that would hamper transition efforts rather than encourage them, such as: generating pro-cyclical effects by highlighting niche activities only, or creating rapid, uncontrolled exclusion mechanisms that would lead to sudden divestments from companies at a moment when they need to invest on their transition efforts.

2. NAVIGATING THE ISSUES ASSOCIATED WITH NATURE DEGRADATION - AND THE OPPORTUNITIES FOR ITS PROTECTION

Identifying impacts on nature is an essential starting point to analyse, manage and ultimately report on them. For this purpose, the following report proposes to review existing frameworks to understand business dependencies on ecosystem services and their impacts on nature, to provide financial institutions with an insight into existing initiatives.

THE ABSENCE OF MATURE, EFFECTIVE
METHODOLOGIES HINDERS
FINANCIAL INSTITUTIONS' CAPACITY
FROM HAVING A COMPREHENSIVE
VIEW OF IMPACTS ON NATURE

RECOMMENDATION 2

To improve on methodologies, we urge **non-financial rating agencies** to ensure the inclusion of material biodiversity considerations within their ESG criteria and rating methodologies. We also advise governments to help structure the market for non-financial rating agencies by way of more rigorous accrediting processes. The Task Force should review how to best **integrate biodiversity impact measurement into existing frameworks on climate change and ESG** criteria and not create a new, separate framework, which would risk creating undue complexity and hampering mobilization rather than fostering it. In terms of available data, we advocate for governments to create conditions to facilitate the harmonization of biodiversity-related data, for instance through the development of **open source platforms, which would contain information on the transition plan of private and public actors.**

**IN THE SHORT
RUN, EXTRA-
FINANCIAL
AGENCIES ARE
PIVOTAL FOR
MAINSTREAMING
AND
HARMONISING
ASSESSMENT
TOOLS
EVALUATION
METHODOLOGIES**

The lack of accurate, comprehensive and tailored nature-related data prevents financial institutions from developing investment strategies taking them into account and engaging effectively with companies. While tools for sectoral and geographical analyses of assets are emerging, there is a knowledge gap by non-financial companies on their value chain. This does not allow them to monitor their impact/dependency relation on nature in a comprehensive way and, in turn, to provide financial institutions with reliable and useful data. In the short term, financial institutions can use the ratings and information provided by extra-financial agencies that are supposed to have larger datasets, proxies and scoring methodologies. These methodologies are largely heterogeneous and are unlikely to provide standardized and comparable information. In the long-run, the development of comprehensive metrics and conventions for reporting on them should be encouraged, either by market players and financial rating agencies, or by regulators, or via new forms of collaboration.

RECOMMENDATION 3

The Task Force should include institutional investors and **develop a framework for investors to use in analyzing biodiversity risk and engaging with the businesses in which they invest, especially in the sectors that can be most damaging for biodiversity.** This framework should promote a direct dialogue with businesses on transition towards protection, restoration and promotion of biodiversity and appropriate reporting.

There are also promising opportunities for financial institutions in meeting the rising societal demand for nature conservation. Among them are the potential for new financial products, investments, and markets as well as early mover advantages. Private-public financing solutions can play a decisive role in bridging the ever widening gap between the need for new investments to protect nature and current capital flows.

**THE BIOFIN ESTIMATES
THAT THE NEEDS OF
FINANCIAL FLOWS TO
PROTECT NATURE RUN
UP TO US \$440bn**

RECOMMENDATION 4

We propose that governments create the conditions for a continuing and constructive dialogue between public authorities and the full spectrum of private sector actors concerned by these issues with a view to addressing rising societal demand for nature conservation. This should include specific initiatives to raise public awareness including, for example, such as **labels for financial products with a positive impact on nature.**

3. EXPLORING AN INTEGRATED SUSTAINABILITY APPROACH: TAKING INTO ACCOUNT ECOLOGICAL LIMITS INTO INVESTMENT STRATEGIES

The risks and opportunities for financial institutions in managing the protection of nature may not be enough to preserve its ecological limits or maintaining the resilience of our biosphere. This is because in the conventional approach to pressures, mitigation is neither systematic nor built to fit within ecosystem functioning. A new ecological approach to integrating nature into financial institutions in order to address this issue in a more systematic way is required. In the climate context, a similar approach – that is the call for alignment with the Paris Agreement in absolute terms - has attracted a considerable amount of attention among various actors of civil society as well as public and private organizations. Many financial institutions are working towards this objective, in a “test and learn” phase.

RECOMMENDATION 5

Governments should establish clear priorities in this field of biodiversity protection since it is particularly vast and holistic and they should encourage the full spectrum of actors (private and public) concerned by these issues to be part of this effort. Governments should provide visibility to economic actors on areas that are the most sensitive and where transition efforts should urgently start.

Ensuring financial activities are compatible with the viability of ecosystem functionality is a major issue, with three main considerations: 1) understanding, characterizing, quantifying and monitoring the impact on nature of the activities investors are financing, 2) defining the level of impact that can secure ecological functionalities and the resilience of the biosphere, and 3) managing business and financial activity in order to maintain this level of impact.

There are two complementary paths for integrating of these considerations into financial strategy. The first path, which is already underway, is initiated by companies. It requires them to measure their impacts, define individual ecological limits and to make this information available for financial institutions. The second path, which is only now emerging, is initiated by financial institutions. It assumes that the financial institutions measure themselves the impacts of their portfolios on nature, and define associated ecological limits.

REPORT

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This report was produced by WWF France, with the inputs and the careful rereading of Axa.

It relies on the analysis of the current, relevant available literature and 23 interviews conducted from February to March 2019 and the list of which is available in the annex.

Axa and WWF France co-produced and support the recommendations that are set out from pages 6 to 9 of the document.

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INTRODUCTION

Reversing the alarming degradation of nature will inevitably require collective action. Achieving meaningful change will require a broad-based coalition gathering the full spectrum of actors that are part of the issue and of the solution, among which the financial sector has a key role to play. The repeated and science-based warnings of the implications of the environmental crisis on the economy should not be underestimated by investors. On the contrary, the financial sector should take advantage of the numerous financial opportunities that the conservation and restoration of nature presents. On the one hand, financial institutions face new challenges stemming from the degradation of nature; but on the other they are part of the solution toward its preservation.

In contrast to climate, standardized data and methodologies do not yet exist for other nature-related risk analysis. There are no “tons of CO₂” to factor in when it comes to mitigating biodiversity loss. As a result, financial institutions are not yet capable of measuring, monitoring or reporting the impacts and dependencies of their portfolios on nature in a harmonized manner. This also prevents them from assessing the ensuing nature-related risks and opportunities and ultimately changing their investment behaviour.

Several tools are currently under development that aim to capture the impact of financial institutions on nature – we are not starting completely from scratch on biodiversity metrics. While none of them are yet sophisticated enough to be applied at scale, they represent useful foundations for further development nonetheless. This report will review existing initiatives regarding their analysis of nature-related impacts, risks, and opportunities for financial institutions (in particular for their investment activities into large corporates¹).

In parallel with commissioning this report on the links between nature-related risks and private financial institutions, the French Ministry of the Environment also asked the OECD to explore Biodiversity Finance and the Economic and Business Case for Action (OECD, 2019).

¹ Given the time constraint for conducting the interviews and drafting the report, it focusses on investment activities into corporate equity and debt markets. As a result, other types of financial activities and of investments (real estate, SMEs...) have not been explored in this report.

I – THE BANKRUPTING OF NATURE

The interrelations between nature and financial institutions

1.1 Clarifying the central concepts and the main issues

1.1.1 From nature to human well-being

Nature is a general term that is usually used to refer to the biosphere, i.e. to all ecosystems worldwide collectively, or sometimes to specific ecosystems. Ecosystems are defined by the Convention on Biological Diversity (CBD) as dynamic complexes composed of a biotic fraction (i.e. communities of living organisms such as plants, animals and microorganisms) and an abiotic one (i.e. the non-living environment) that interact together and form a functional unit (United Nations, 1992). The ecosystem concept is interrelated to biodiversity, which corresponds with “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” (United Nations, 1992).

Ecosystem characteristics, structures, and processes control ecosystem functions, i.e. the properties of ecosystems that are useful for human populations. The Millenium Ecosystem Assessment (MA, 2005) specifies that there are four types of ecosystem functions: production (e.g. production of food, medicinal products, etc.), regulation (e.g. water regulation, biological control, etc.), habitat, and informational (e.g. aesthetics, culture, etc.). These functions create ecosystem services (comprising also goods derived from ecosystems) which are their contributions to human well-being: in other words, all the ecological outcomes that ecosystems generate and that can ultimately benefit people.

The Common International Classification of Ecosystem Services (CICES ; cf. Haines-Young and Potschin, 2018) references three types of ecosystem services:

- Provisioning: All nutritional, non-nutritional material and energetic outputs from living systems as well as abiotic outputs (e.g. crops, animals for nutrition, etc.)
- Regulation and maintenance: All the ways in which living organisms can mediate or moderate the ambient environment that affects human health, safety or comfort, together with abiotic equivalents (control of erosion, pollination, storm protection, disease control, etc.)
- Cultural: All the non-material, and normally non-rival and non-consumptive, outputs of ecosystems (biotic and abiotic) that affect physical and mental states of people (health or enjoyment through active interactions, symbolic or religious meaning, existence value, etc.)

The abiotic dimension was added in the last version of the CICES. It highlighted additional abiotic services following the same structure as the biotic ones: provisioning (wind energy, geothermal, etc.), regulation and maintenance (regulation of liquid flows, dilution of wastes, etc.), and other cultural services.

From ecosystem services, human populations can collect different types of benefits, which can either have a monetary aspect (and be evaluated economically) or some other positive characteristics (e.g. health, social, conservation values).

Figure 1 illustrates the “ecosystem services cascade” described above, i.e. how ecosystem functions are transformed into monetary value.

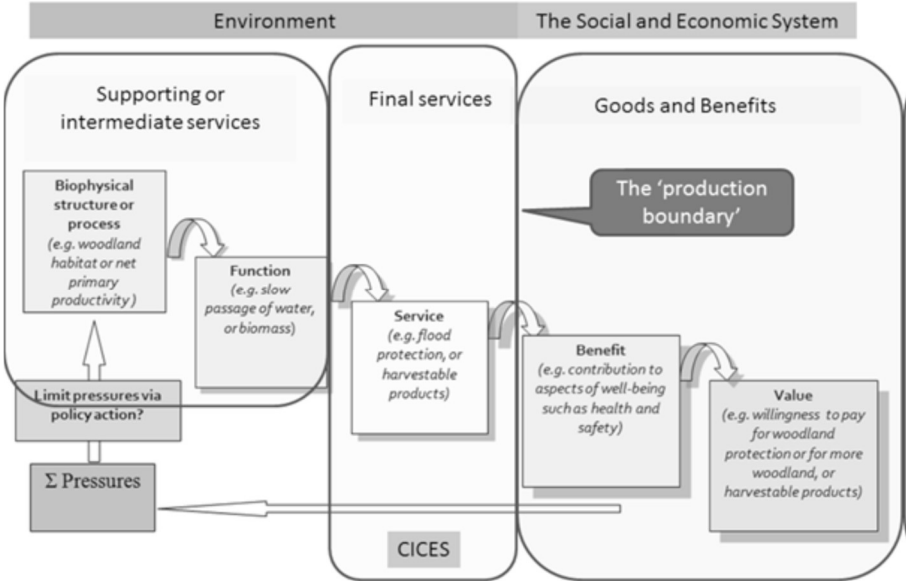


Figure 1. The cascade model (Haines-Young et Potschin, 2018)

The benefits derived from ecosystems are diverse and closely related to the main human well-being constituents: security, basic material, health, and social relations (cf. Figure 2).

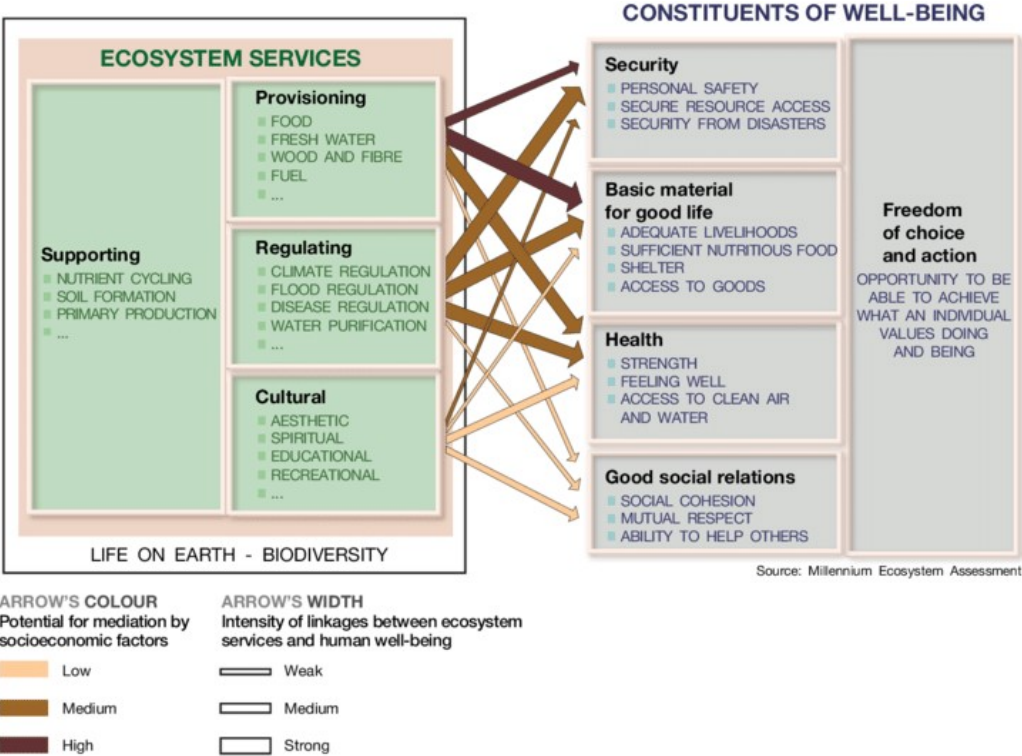


Figure 2. Conceptual framework of the interactions between ecosystem services, and human wellbeing (MA, 2005)

Clearly human well-being, human activities, and economic system that organises the production, exchanges, and consumption of goods and services, are highly dependent on ecosystem services and their central component, biodiversity.

1.1.2 Current trends in nature and suspected retroactions on human populations

Current trends in nature

The declining state of nature has been documented for many decades. In 2005, the Millennium Ecosystem Assessment provided a global estimation of the degradation of ecosystems and biodiversity. The report stated that during the past 50 years, human populations had modified ecosystems faster and more profoundly than in any other period. For the last two centuries, the species extinction rate has been estimated to be between 10 and 100 times higher than the natural rate, and it is feared that it could be 1000 times higher by 2050. This finding alone should cause widespread alarm. The latest living planet report (WWF, 2018) confirms this trend: the living planet index, an indicator for the state of global biodiversity and of health of our planet, shows that populations of wild vertebrates declined by 60% between 1970 and 2014.

Some in the scientific community believe that we are experiencing the sixth mass extinction crisis and, as the cause is largely due to human activities, that we have entered a new geologic era: the Anthropocene.

According to the Intergovernmental Platform on Biodiversity and Ecosystem Services, only a quarter of the land mass on the planet is unaffected by human activities, and this proportion could fall to 10% by 2050. The ecological footprint monitoring, which measures natural resource consumption, gives further insight: During the past 50 years, the ecological footprint has increased by 190% (WWF, 2018). A recent article (Maxwell et al., 2016) highlights the main human pressures on biodiversity: first came the overexploitation of ecosystems and the cultivation of agricultural land, followed by urban development, invasive species, pollution, system perturbations (dams, fires, etc.), and climate change.

Economic implications

As stated above, ecosystems and biodiversity are fundamental to human well-being and to economic activities. As a result, today's severe environmental degradation has considerable adverse impacts for human societies. Likewise, from an economic point of view, the last decades have seen an increasing number of studies showing the significant financial implications of the loss of ecosystems and biodiversity. One of them, the Economics of Ecosystems and Biodiversity (TEEB) programme, provided a collection of significant economic data. For example, at a sector level, it has been determined, for example, that the global overexploitation of fishing resources leads to a US\$50 billion shortfall each year, and that the annual economic value of insect pollinating activity is estimated at US\$153 billion (9,5% of the global agricultural output). At the ecosystem level, the benefits associated with coral reefs in terms of living conditions are estimated between 30 and US\$172 billion per year. The TEEB

programme also calculated the cost of the ecosystems degradation at the global level: the economy is losing land-based ecosystem services worth around 50 billion dollars each year. If these ecosystem losses continue over time, i.e. if nothing is done to stop the environmental degradations, the associated **cost of inaction could be equivalent to 7% of GDP by 2050** (Braat et ten Brink, 2008). More recently, Robert Costanza has estimated the annual value of the global ecosystem services to be about US\$125 trillion dollars (Costanza et al., 2014).

1.1.3 The subsequent need to ensure ecological resilience and to comply with ecological limits

The current multiplication of ecosystem disturbances, the amplification of global changes, and their implications for human societies demonstrate the need to ensure functional ecosystems, and importantly, the need to maintain functionality in a disrupted context. Ecological resilience (Holling, 1973), the ability of an ecosystem to maintain its functionality and properties despite shocks and disturbances, addresses these challenges.

Ecosystem resilience appears to be closely linked to biodiversity, owing to the participation of species or groups of species in key ecosystem functions. More specifically, within these functional groups, it is the variability of species' responses to environmental changes that is fundamental to ecosystem resilience (Folke et al., 2004). An illustrative example of this link is semi-arid grazed grasslands: the resilience of the production of these ecosystems to external pressures is due to the maintenance of a significant number of common species, considered redundant and less important from the point of view of maximizing production, but each with a different capacity to respond to exogenous disturbances (drought, grazing, etc.). These species can thus appear alternately according to the intensity of changes in external factors, and replace each other over time, ensuring that pasture functions are maintained over a wide range of environmental conditions (Walker et al., 1999). This functional redundancy is essential in maintaining resilience: ecosystems with a high diversity of responses increase their probability of reorganization or renewal in a desirable state after disruption. Biodiversity as a whole, as a comprehensive set of functional responses to environmental change, that must therefore be considered as fundamental to ecosystem resilience, and that can be qualified. It could in fact be called the life insurance of life itself (McNeil et Shei, 2002).

Ecosystem resilience is also strongly correlated to ecological thresholds: resilience has to be understood as the capacity of an ecological system to absorb an environmental disturbance and to maintain its structure and functioning, before beginning a transition to another alternative state. "Ecological thresholds" are the points at which abrupt changes in ecosystems occur and lead them to an alternative state, as a result of a progressive disruption in external factors.

Many research studies have focused on the identification and description of ecological thresholds. The majority of empirical studies at the local level have been conducted on agricultural, forest, and aquatic ecosystems, subject to varying degrees of modification, loss, or fragmentation. Regulatory institutions are currently making extensive use of scientific data on ecological thresholds for environmental management, in particular for the regulation of releases of liquid or gaseous pollutants: current regulations often depend on dose-response relationships, with thresholds, for the determination of

exposure restrictions to pollutants (Groffman, 2006). This is also sometimes the case for conservation programmes for species of special interest (Rompré et al., 2010; Srebotnjak et al., 2010).

At the global level, the Stockholm Resilience Center has studied for more than a decade the Earth system's "tipping points". Since 2009, the Planetary Boundaries concept (PB ; Rockstrom, 2009 ; Steffen, 2015) offers a framework for a "safe operating space" for the human development. It is based on the identification of nine critical environmental processes that influence the functioning of the biosphere (cf. Figure 3). For each of these processes, the PB framework aims to determine the levels of anthropogenic perturbations below which the risk of destabilization of the Earth system is likely to remain low. This work is based on the study of the related biophysical thresholds: the PBs are identified as slightly before the position of the thresholds. This allows to manage the uncertainties associated with the precise position of the thresholds, and allows a reaction time for society before abrupt changes occur. Seven PBs have so far been established: for climate change, stratospheric ozone depletion, ocean acidification, biosphere integrity, biogeochemical flows, landsystem change, and freshwater use. In the case of atmospheric aerosol loading, not all regional boundaries have been established, and specialists have been unable to identify a single PB for novel entities (new substances, newforms of existing substances, and modified life forms that have the potential for unwanted geophysical and/or biological effects). Two of the PBs are considered as "core" PBs, because of their fundamental importance for the biosphere: these are **climate change and biosphere integrity**.

The PBs framework allows objective evaluations of the level of global sustainability of human activity (i.e. the risks it poses to the stability of the Earth system), by comparing the current level of anthropogenic pressures with the proposed PBs. Steffen et al. established in 2015 that the anthropogenic perturbation levels of four of the critical processes exceeded their proposed PBs: climate change, biosphere integrity, biogeochemical flows, and land-system change (cf. Figure 3).

Ecological thresholds are very close to other concepts aiming to characterize the maximum persistently supportable anthropogenic pressure on the environment, including carrying capacity, biocapacity, science-based frameworks, etc. In this report we use the general term of "ecological limits" to express this idea.

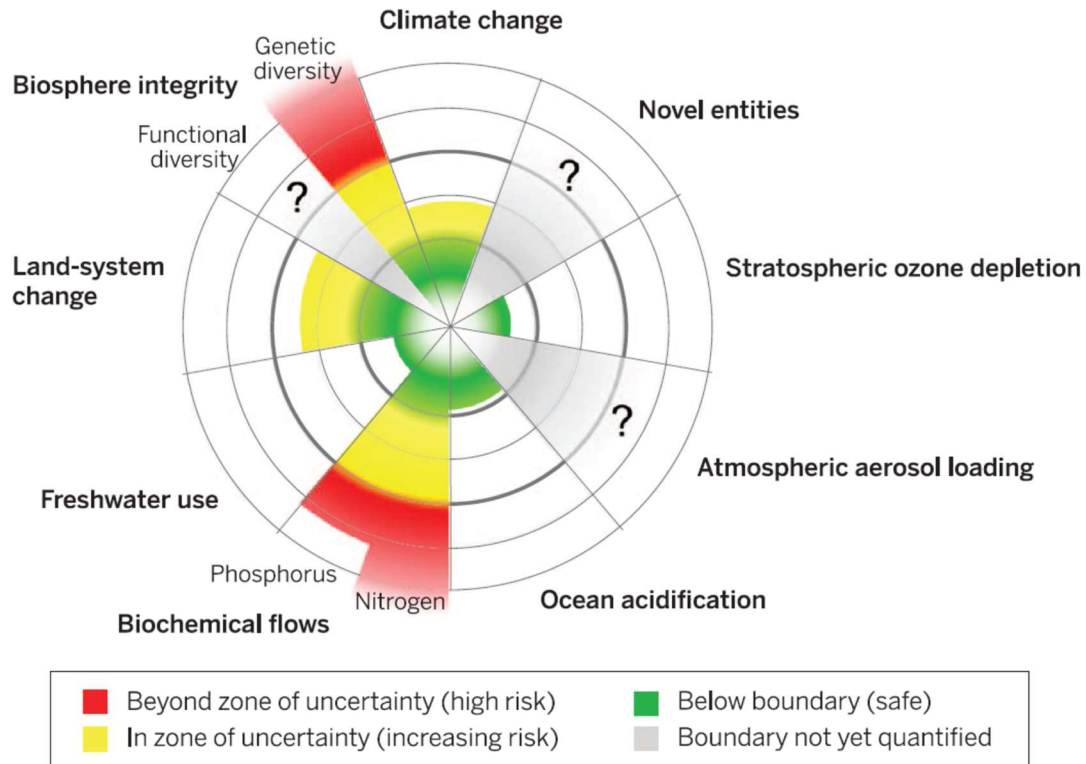


Figure 3. Current status of the control variables for seven of the planetary boundaries (Steffen et al., 2015)

1.1.4 Integrating nature into economic systems: natural capital, weak and strong sustainability

The modern concept of natural capital proposed by David Pearce (1988) as a metaphor illustrating the role of nature in the economy: production has to be considered as a function of physical, human (including social aspects), and natural capital. This concept builds upon the classical 18th century economic vision which comprised of (physical) capital, work, and soil.

Usually, natural capital is defined as a stock of biotic and abiotic natural resources, some renewable and other non-renewable (plant and animal species, air, water, soil, minerals, etc.) (cf. for example Natural Capital Coalition², UNEPFI³). This stock generates a variety of goods and services, i.e. ecosystem services (natural capital is defined by some as also encompassing these services, e.g. MAES, 2013). As these services derive from the ecosystems functioning, it is important to note that the natural capital stocks cannot be disconnected from the ecosystems themselves. Finally, natural capital is closely related to the concept of ecosystem and therefore it has to be considered in a dynamic sense (both stocks and flows).

The natural capital concept is used in two different – almost opposite – approaches that nonetheless share the aim of integrating ecology and economy, in a balanced, sustainable way (Missemer, 2018). The first one aims at internalizing the economic values related to nature within the general framework of the standard economy (Pearce 1988), proposing a sort of economization of ecology. The second approach

² <https://naturalcapitalcoalition.org/natural-capital-2/>

³ <https://www.unep-wcmc.org/news/a-new-global-language-for-natures-resources>

aims at placing the economy within the ecological framework, thus proposing to green the economy. These two approaches differ fundamentally in the way they consider sustainability (Neumayer, 1999). From an economic point of view, sustainable development is translated into the general principle of non-decrease in human well-being – expressed in utility – from one generation to the next. Sustainability thus consists in maintaining capital over time (with capital being considered as an aggregation of manmade, natural and human capital). According to the first approach (the “low sustainability” economist version), capital maintenance is based on the preservation of the aggregate value of the capital stock, since different capital is substitutable with respect to each other. The degradation of one form of capital is not harmful if it is offset by the accumulation of another capital asset: it is important that the total value of the asset portfolio is passed on to future generations, regardless of its composition. According to the second approach (the “strong sustainability” ecologist version), the conservation of capital is not only based on the capital aggregate value, but also on its composition, principally because of the particular properties of natural capital that other capital assets cannot replace. On the one, natural systems perform a multiplicity of functions, so that their substitution by artefacts cannot cover all these functions. On the other hand, changes in natural systems caused by human activity are often irreversible, resulting in losses of well-being without possible compensation. The principle of strong sustainability rejects the hypothesis of capital substitutability, in particular by introducing the concepts of threshold effect and scientific limits. The aim is then to maintain the "critical natural capital" (Ekins et al. 2003), associated with the non-substitutable part of natural capital, the loss of which would be irreversible and entail considerable costs because of its vital role for human well-being. This interpretation does not prohibit the exploitation of natural capital; however, it sets the condition based on respect for the regenerative capacity of natural systems, in order to maintain environmental functions intact.

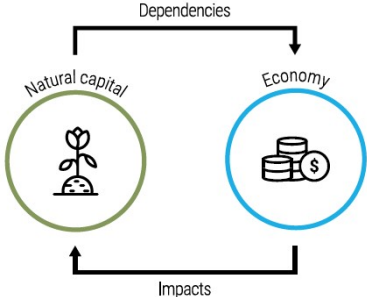
1.2 Financial institutions’ role and nature : taking stock of the mobilisation on climate change

During the last 15 years, financial institutions have gradually been made accountable for and exposed to the impact of the climate-related activities they finance via various stakeholders. Similarly, the considerable pressures that influence nature will affect the economy and the investors and financial institutions, which, globally, are plugged into every economic activity. Financial institutions have played a key role in the global mobilisation on climate via different initiatives (individual or broad-based coalition), some of which have contributed to make significant progress. Because linking financial institutions and nature is both urgent and complex, it is necessary to leverage on lessons learned from the way financial institutions have been gradually mobilised for climate.

1.2.1 Linking financial institutions and nature

The financial industry is a complex web of organizations offering a wide variety of services including retail, commercial, investment and development banking and insurance to inter-national markets. The sheer size and complexity of the business makes it inevitable that the activities of financial institutions will affect or be affected by nature.

These impacts and dependencies deliver both costs and benefits to the entities serviced by the finance sector, to society and to the finance sector itself. These costs and benefits are likely to differ depending on whether the link between the financial institution and nature is approached through an impact perspective or through a dependency one.



Source: Integrating Natural Capital in Risk Assessments: A step-by-step guide for banks

Financial institutions’ role on nature protection

In recent years, finance has been heavily criticized for being the source of various dysfunctions, the most dramatic example of which was the financial crisis of 2008-2012. Companies do not only produce returns and employ labour, they also generate both positive and negative externalities, commonly referred to as extra-financial performance. However, these externalities should be taken into account in ESG criteria, from the standpoint of the general interest, in issues of portfolio allocations and real investment in the economy.

As of today, companies have little incentive to take into account these externalities and reduce their impacts on nature. These incentives can come through different channels; one of these being the way these companies are financed by financial institutions.

Even though the finance sector has very little direct impact on nature, it has an indirect impact through the investments it makes, the credits it grants and the insurances it provides. The primary responsibility for the degradation of nature of course lies within non-financial companies and activities, which have a direct impact on nature. But as these companies and activities depend on the financial facilities that the financial sector provides, the latter is also involved in the issue. As concerns over degradations to nature grow, the roles and responsibilities of financial institutions increasingly being scrutinized as a lever to mobilize companies on this crucial issue and to shift financial flows from highly environmental-adverse activities to more friendly ones.

Building on this observation, more and more companies and financial institutions are engaged by their responsibility for nature-adverse activities and the associated damages. Linking financial institutions and nature through the responsibility angle is unveiling some new risks and opportunities.

Box 1 : Example of a financial institution that has been held liable for the activities of entities it financed

A UK-based international bank has recently been held liable by an international NGO for allegedly funding palm oil companies in Indonesia that it says have illegally cleared forests, planted oil palm on carbon-rich peat soil and grabbed community lands.

Despite detailed policies on forestry and agricultural commodities (including specific sections on palm oil), the NGO showed evidence that the bank had been involved in arranging loans and other credit facilities totalling US\$16.3 billion between 2012 and 2017 for six companies, which were in breach with these policies.

In response the UK bank announced a stricter lending policy based on a “no deforestation, no peat, no exploitation” commitment. The bank CEO admitted “the financial sector can play a greater role”. Coming from the world’s sixth-largest bank, the new policy provides impetus for the rest of the banking sector to stop financing destructive palm oil companies.

Box 2 : Example of a company that has been held liable for its impact on nature and human health and its implications on the company’s stock price

A Germany-based pharmaceutical firm bought a famous US-based seed and agricultural chemicals maker a few years ago, closing the acquisition at US\$63 billion. This firm has notably been a leader in the production of glyphosate-based herbicides.

For decades, such herbicides have been associated with various health concerns. In 2015, the World Health Organization’s International Agency for Research on Cancer classified glyphosate as “probably carcinogenic to humans”.

Further, these suspicions recently translated into numerous cancer lawsuits, in some of which the US firm was directly involved.

In March 2019, the German pharmaceutical, now the owner of the US company, had to pay out \$81 million in damages to a man who claims the weedkiller caused his cancer. In a similar ruling in 2018, the sum was \$289 million, reduced to \$78 million on appeal. Since that first verdict, the German pharmaceutical shares have lost over 40% of their value—and there are still around 11,300 such cases waiting in the wings – causing billions in losses for the stock holders.

Conversely, financial institutions are exposed to the degradation of nature that affects the real economy

The ecosystem services that businesses depend on are provided by natural assets such as water or species. For example, nature’s ability to provide filtration of pollutants depends on a complex web of micro-organisms and plants working together, and the quality of the habitats that supports them. Identifying the natural assets underpinning each ecosystem service and the potential drivers of

environmental change that could affect them therefore enables financial institutions to understand the sources of a disruption risk that materially affects their investee's performance.

It follows that a financial institution can be exposed to financial risk stemming from potential disruption of its investee's operations as a result of environmental problems. This underlines that the need to have a robust risk management process, relying on quantitative analysis related to mitigation and transition activities, is key for financial institutions.

The dependency chain that ties the environment to financial institutions conveys risks for the latter: depleted ecosystem services will in turn affect financial returns as activities which rely on these services become less profitable. The risks that arise for financial institutions range from operational risks to market risks.

Box 3 : Example of the materialization of a nature-related risk on a company's activities

Due to climate stress and agricultural water consumption the River Rhine experiences persistently low levels. Rather than recover from low flow during a dry summer, river levels have continued to drop. The low water is affecting many German chemical companies dotting the Rhine as well as firms further upriver in Switzerland.

One of these, a German-based chemical company, has publicly admitted facing some severe challenge in shipping all the necessary materials to one of its major production sites. Despite maximum shift to alternative means of transport (pipeline, trucks and rail), it was not able to convey all raw materials to the site. In November 2018, the company announced that it will have to stop the production in its near shore site. Restart of production depends on improved Rhine water level.

According to some estimations, the low water level of the River Rhine in the fourth quarter of 2018 was expected to lead to negative earnings impacts of up to €200 million, higher than previous forecast (in the third quarter of 2018, the negative earnings impact from the low water level of the Rhine could be limited to around €50 million).

Box 4: Example of the materialization of a nature-related risk on a company's activities

In 2018, a major US-based electric and gas company was bankrupted by the environment. Following numerous wildfires, stemming from a decade-long drought, that some have traced to the company's power lines, the company admitted it faced claims rising up to \$30 billion. It claimed that bankruptcy was its "only viable option".

According to some analysts, the problem was that the company viewed risk in ways that are out of touch with the nature of the problem. In recent financial disclosure, the company detailed its exposure to pending lawsuits and its efforts to fix fire risks from its equipment. It did not project its ongoing exposure to future environmental risks — the physical cause of its underlying liability. Instead, its plan for reducing the nature-related risks to its bottom line was to lobby to change the rules that hold the company accountable. It is notable that, for the company, regulatory risks still trumped physical ones.

1.2.2 The precedent of climate change: a rising concern for financial institutions

Taking into consideration impacts and dependencies is still very new for financial institutions, but in doing so they can benefit from the path that has already been walked for climate and the lessons learned. During recent decades, it has been widely recognized that continued emission of greenhouse gases will cause further warming of the Earth, which could have catastrophic economic and social consequences. As evidence of the growing recognition of the risks posed by climate change, in December 2015, during COP21, nearly 200 governments agreed to limit "the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels." This was referred to as the Paris Agreement.

Despite the understanding of the financial risks posed by climate change—to companies, investors, and the financial system as a whole— still being at an early stage, there is a growing demand for decision-useful, climate-related information from a range of participants in the financial markets. Creditors and investors are increasingly demanding access to risk information that is consistent, comparable, reliable, and clear. There has also been increased focus on the negative impact that weak corporate governance can have on shareholder value, resulting in increased demand for transparency from organizations on their risks and risk management practices, including those related to climate change.

The fast-growing demand for decision-useful, climate-related information has resulted in the development of several climate-related disclosure standards.

While some of the initiatives that have been developed around financial institutions and climate change have proved to be useful both for financial institution and companies from the real economy, others have not been successful. In order to avoid engaging with directions, tools, methodologies and targets which might not be properly fitted to nature-related issues, financial institutions should take stock of the lessons learned from climate change: judge what has worked, what has not, and identify the ideas which could be replicated in imagining nature-related issues as opposed to those specific to climate which would not apply.

The Task Force on Climate-related Financial Disclosures

Recognizing these concerns, the G20 Finance Ministers and Central Bank Governors requested that the Financial Stability Board (FSB) “convene public- and private-sector participants to review how the financial sector can take account of climate-related issues.” In most G20 jurisdictions, companies with public debt or equity have a legal obligation to disclose material risks in their financial reports—including material climate-related risks. However, the absence of a standardized framework for disclosing climate-related financial risks makes it difficult for organizations to determine what information should be included in their filings and how it should be presented. Furthermore, because financial-sector organizations’ disclosures depend, in part, on those from the companies in which they invest or lend, regulators face challenges in using financial-sector organizations’ existing disclosures to determine system-wide exposures to climate-related risks.

In response, the FSB established the industry-led Task Force on Climate-related Financial Disclosures (TCFD) in December 2015 to design a set of recommendations for consistent “disclosures that will help financial market participants understand their climate-related risks” and entrusted the initiative to Michael Bloomberg and Marc Carney, the Chair of the FSB. Of note, AXA co-chaired this taskforce. These recommendations were published in June 2017 and have gained more and more traction: in less than one year, the number of companies that support the recommendations of the TCFD has grown to 513 companies, including 287 financial and 170 non-financial companies, with a combined market capitalization of US\$7.9 trillion (€7 trillion). The supporting financial firms are responsible for assets of nearly US\$100 trillion (€87,000 billion).

Article 173 in France

In August 2015, France took a ground-breaking step by imposing ESG and climate reporting requirements on asset owners and managers.

Article 173 of the French Energy Transition for Green Growth Act, which took effect in July 2017, requires French institutional investors, including insurance companies, to disclose information related to climate-related risks and opportunities. More specifically, Article 173 sets three requirements: (i) providing a general description of the investor’s ESG policy, (ii) disclosing the resources allocated to ESG analysis, and (iii) explaining the methodology and the results of the climate risk analysis. Through a flexible approach, emphasising pilot testing, investors are required to comply with these new requirements or explain why they do not apply to them (approach called “comply or explain”), yet without the law imposing a prescriptive method.

With Article 173, France became the first country in the world requiring by law that institutional investors incorporate climate risk and environmental and social factors into their public communications. After two years of reporting, the French government has reviewed institutional investors’ implementation of these new reporting requirements and plans to publish its findings S1 2019.

It is worth noting that before engaging in the law-making process, the French government went around the main French financial institutions to get a sense of their appetite for a new reporting requirement of this kind. It is an understatement to say that few of them answered positively. AXA was part of the latter: its then-CEO Henri de Castries declared that “a world 4 degrees warmer wouldn’t be insurable any more”. Today, almost four years after that episode, nearly every large French financial institution acknowledges that Article 173 has been a useful catalyzer for unveiling the risks they face regarding climate change. This illustrates two interesting points: first that a regulatory reporting requirement can help tip the market towards new practices and second that such an evolution doesn’t require a global consensus prior to its initiation - a single champion can make the difference.

The EU action plan on sustainable finance

Following recommendations from the EU High-Level Expert Group on Sustainable Finance, the European Commission published in March 2018 an action plan on sustainable finance, which sets out a comprehensive strategy to further connect finance with sustainability. Its key actions include:

- Establishing a clear and detailed classification system – or taxonomy – for sustainable activities;
- Establishing EU labels for green financial products;
- Introducing measures to clarify asset managers' and institutional investors' duties regarding sustainability;
- Introducing a 'green supporting factor' in the EU prudential rules for banks and insurance companies;
- Enhancing non-financial information disclosure

Concerning disclosure, the Commission’s work contains recommendations that will allow her to update its non-binding guidelines on non-financial reporting with specific reference to climate-related information, in line with the recommendations of the TCFD established by the FSB, and with the Commission proposal on a 'taxonomy' of sustainable economic activities. It contains proposals for disclosing not just how climate change might influence the performance of a company, but also the impact of the company itself on climate change.

Interestingly enough, the legislative text on disclosure not only focuses on climate-related information but also aims to address other environment-related adverse impacts. It also specifies that “a sustainability risk should mean an uncertain environmental, social or governance event or condition that, if it occurs, could cause a negative material impact on the value of the investment”.

Exploratory tools for portfolio alignment analysis

Among other recommendations, the TCFD has elevated the need for financial institutions to assess and disclose their climate-related risks and opportunities based on forward-looking climate scenario analysis. The primary objective of such analyses is to provide a framework for investors and policy makers to translate high-level climate policy goals (e.g. limiting global warming to 1.5°C) into a benchmark that can inform portfolio allocation targets.

A handful of NGOs and consultancy firms have recently developed tools and methodologies that enable the translation of high-level and political goals into portfolio allocation recommendations, for example via “warming potential-type” KPIs.

In performing this translation, these analyses generate a set of key, sector-specific performance metrics that measure the exposure of a given portfolio to the energy and technologies that represent climate problems and solutions. These performance metrics allow for the first time portfolio-level benchmarking of climate policy alignment. They act as benchmarks for both asset managers and companies on how their business model today aligns with decarbonization trends and quantify the necessary steps to close the 1.5°C exposure gap.

Today, more and more financial institutions integrate a forward-looking approach into their investment decisions to respect their fiduciary duty and safeguard the pensions and assets of current and future generations.

II. DE-RISKING NATURE

The economic integration of nature into financial institutions: Risks and opportunities

From a global perspective, the degradation brought to nature by human economic activities has implications for the financial sector. To link this global evidence to financial institutions is nevertheless hugely challenging. Making such a collective challenge is however critical for the preservation of nature and the economic and social wellbeing which derive from it.

A first step on identifying economic issues associated with nature degradation is to understand where the economy most relies on natural resources. Following scientifically-based findings, some economic sectors and geographic areas are more highly dependent on natural resources than others. This is typically the case for intensive agriculture in developed countries and change in land use in developing ones. Tools already exist to carry out these first round analyses and help financial institutions to screen their portfolios to ensure inclusion of biodiversity considerations.

The main challenge is to develop a framework for investors to use in analyzing biodiversity risks. Three obstacles seem today to hinder an accurate management: (i), appropriate nature-impact disclosures (ii) scalable metrics to monitor the risks and (iii) reliable and consistent data fueling the risks management metrics. In the short term, extra-financial rating agencies can help overcoming these obstacles although their practices need to be harmonized.

As a consequence of the integration of biodiversity considerations within ESG criteria and rating methodologies, new opportunities for financial institutions arise as well. Beyond the straightforward avoidance of nature-related risks, which could have pro-cyclical effects, financial institutions have an important role to play to finance the transition efforts from companies. They should also consider that the shift toward a more nature-friendly economy will create new markets and investment opportunities on new technological solutions, differentiation market capturing for early movers and demands for new financial products. Most of these opportunities are tightly conditional to public decisions to facilitate the transition towards an economic and social model that takes better into account of its natural limits.

2.1. Identifying how nature degradation can impact financial institutions

Nature-related concerns are not yet being taken into account by the vast majority of financial institutions. However, there are risks connected to the activities of the companies they invest in or lend to that finance-sector organisations should identify and monitor. These risks stem both from the economy's dependencies and its impacts on nature, which could have an effect on the performance of financial institutions' portfolios. Therefore, it is important for finance-sector organisations to understand the sources for and the impact that nature related issues can have on them.

Adding onto the classification by the TCFD⁴, a categorization of nature-related risks for financial institutions going beyond climate was established by the Natural Capital Coalition in 2018⁵. This framework identifies five natural capital related risks: operational, legal and regulatory, markets, reputational and societal.

As put forward in section 1.2., the identified nature-related risks for financial institutions derive from the dependencies and impacts of companies on nature. While operational risk shows a clear connection to nature-related dependencies, reputational risk is closely tied to nature-related impacts. The remaining risk categories, however, can be based on both underlying links of the economy to nature. Even though the motivation for passing nature-related laws and regulations is grounded on companies' impacts on nature, the reason why they are affected can also be their dependency on nature - for instance, a law that limits companies' use of a natural resource that is important for their production. For market risk, it depends on the circumstances whether the risk stems from companies' impacts or dependencies on nature, most notably concerning the hesitation of investors due to uncertainties with regard to nature-related risks.

2.2. Managing nature-related risks

Financial institutions have basically two ways to take nature into account in their investment strategies: ESG analysis and active engagement. These two strategies need accurate criteria, which can be done through multiple tools that are currently being developed by the market, but they also require harmonised metrics in order to allow comparability and investment decisions. The problem is that financial institutions face a critical lack of data to set up and monitor such metrics. The underlying companies in their portfolios should be able to provide accurate, comprehensive and tailored data. In the meantime, external data-providers and rating agencies can help too.

2.2.1. ESG strategies: paving the way to de-risking nature

Taking into account nature-related issues can be significant for an ESG mapping analysis: some investment decisions would probably be taken differently depending on the degree of integration and the granularity of the ESG analyses. ESG grids can have different levels: from macro trends, such as climate change and resource scarcity, to the materiality for a specific sector and company, for example in the fishing or agri-food sectors. The relevance of these criteria can thus vary widely between different portfolios. It is therefore important for financial institutions to assess their relevance for their specific portfolio.

⁴ Cf paragraph on TCFD in section 1.2.2.

⁵ <https://naturalcapitalcoalition.org/wp-content/uploads/2018/05/Connecting-Finance-and-Natural-Capital-Supplement-to-the-Natural-Capital-Protocol-1.pdf>

Combining sectoral and geographic approaches

Financial institutions should identify the impacts of the activities they finance have on nature and the dependencies that these activities are subject to vis-à-vis natural ecoservices. To do so, both the sectoral and geographic approach are relevant. On the one hand, some sectors are likely to have a much higher impact on nature than others and some geographic areas to have much more fragile ecosystems than others do, and on the other hand some economic activities are much more dependent on ecoservices than others, and that might well vary very much from one area to another.

Sectoral approach

On the impact side, there is growing evidence⁶ that by far the biggest drivers of biodiversity decline are overexploitation (the harvesting of species from the wild at rates that cannot be compensated for by reproduction or regrowth) and agriculture (the production of food, fodder, fibre and fuel crops; livestock farming; aquaculture; and the cultivation of trees). Additionally, the WWF *Living Planet Report*, lists six pressures stemming from economic activities (legal and illegal) that endanger nature: agriculture, forestry, fishing and hunting, energy and transportation, mining and infrastructure.

Most of the sectors mentioned above appear to also be the source of the main dependencies of the financial sector towards nature: fisheries, forestry, agribusiness and hydropower are sectors that are intensive in capital and pressured by the degradation of nature.

Some tools are currently emerging to help financial institutions map which sectors are particularly at risk, both on the impact and dependency sides – see for instance Box 6 presenting the ENCORE tool, which can help give financial institutions to have a first understanding of their exposures to natural capital risks. Box 6 briefly presents a handful of useful tools that can be mobilised in order to carry out an assessment of environmental risks.

⁶ Maxwell et Al, *Biodiversity: The ravages of guns, nets and bulldozers*, 2016

Box 5 : WWF India report⁷ on water and the Indian banking sector

Set in the context of the Indian banking system, this report provides evidence for why water presents a material risk for businesses - and hence for banks - in India. It highlights several instances of water risks materializing into tangible financial impacts for businesses while establishing water related factors as key contributors to possible 'asset stranding' in the power and agriculture sectors – two sectors which account for the highest lending exposure of Indian banks.

The report shows the exposure of the Indian banking sector to highly water dependent sectors. Based on an initial assessment, it is estimated that more than 39% of the portfolio of Indian banks is exposed to sectors that face high levels of operational water risk. The extent, magnitude and nature of the water risks faced do vary by the type and distribution of the industry. Water risks, for instance, can materialize from the discharge of untreated effluents or from regular conflict with communities for rights and access to water. However, the basin context dictates whether operational water risk exposure constitutes a material concern or not. Although different sectors face unique set of water related risks, water risks such as those arising from the siting of businesses and water pollution from industrial operations are common to multiple sectors.

The report further shows that while the banks consider water to be critical to the operations of the companies in their portfolios, it is not yet widely integrated into various operational and strategic elements in the banks' day-to-day functioning. The depth of water risk assessment also varies by the type of lending, with banks reporting an enhanced due-diligence of non-financial risks for project finance compared to corporate lending. Absence of a regulatory mandate to integrate water related risks, lack of robust data and a framework to analyze water related risks, low internal capacity within banks to understand and manage water related risks and the challenging dynamics of engaging with the government were some of the barriers listed by banks in enabling integration of water related risks.

⁷ Hidden risks and Untapped opportunities: Water and the Indian banking sector, 2019, available here: http://www.indiaenvironmentportal.org.in/files/file/hidden_risks_and_untapped_opportunities.pdf

Box 6 : Presenting the ENCORE tool

The *Exploring Natural Capital Opportunities, Risks and Exposure* (ENCORE) web-based tool seeks to provide financial institutions with systematic information for assessing their exposure to these risks exploring businesses' dependencies on natural capital as well as the effects of environmental change on the natural capital assets businesses rely on. It was launched in 2018 by the Natural Capital Finance Alliance in partnership with UNEP-WCMC and was financed by the Swiss State Secretariat for Economic Affairs and the MAVA Foundation.

ENCORE looks at the effects of drivers of environmental change on natural capital assets and the ecosystem services these assets supply. Potential disruptions in the provision of ecosystem services are linked sector production processes per sector by means of an ecosystem service materiality assessment. This evaluation determines the extent of the loss of functionality in production processes and the resulting financial losses.

In order to create the online tool, dependencies of economic sectors on ecosystem services were identified based on relevant literature and expert interviews. Factsheets were compiled for each ecosystem service containing its relationships with natural capital assets, the main drivers of environmental change affecting these relationships, and the underlying mechanisms of the drivers' impacts. However, the factsheets were not created and assessed based on spatial, contextual or temporal data even though ecosystem service-natural capital asset systems and the manner through which they are influenced by drivers of environmental change may diverge significantly in different locations. Correspondingly, the materiality of ecosystem services to production processes may vary in distinctive contexts and time frames. Thus, in light of its generality, the tool can only serve as a general guideline for risk assessment and can be used as an initial input for financial institutions aiming to understand their exposure to natural capital risks.

Geographic approach

This sector-by-sector approach should also be complemented with a geographical approach. An economic activity's impact on nature and the impact of nature on financial returns depends heavily on the geographic area where the economic activity is being carried out. For instance, in intertropical areas, the main pressures on biodiversity are illegal hunting and changes in land use (e.g. from forest to agriculture) whereas in outertropical areas the main driver is pollution deriving from intensive agriculture (which leads to plummeting insects and birds populations).

The magnitude of impacts and dependencies on nature to which financial institutions are exposed depends on the location of the business, the source of its raw materials, the supply chain and (in some cases) the location of its customers. Corporates that have activities in areas with fragile ecosystems may be more at risk than the same type of corporate and activities in a less stressed area. Checking whether the region in which the economic activities are taking place is under significant environmental pressure, or is experiencing shortages in natural resources, is a filter that financial institutions should be looking to apply.

Box 7 : Examples of tools and methodologies for assessing environmental risks⁸

Issue addressed	Name	Organization	Description
Climate change	PACTA	2DII	Uses asset-level data with known capital expenditure plans to assess investor portfolio alignment with IEA technology/fuel mixes associated with different climate scenarios.
	SBTi	WWF, CDP, WRI, UN	Helps corporations identify pathways and set targets for decarbonization that are aligned with emissions reductions required to achieve a well below 2°C warming scenario. Methodology is under development for financial institutions.
Deforestation	Global Forest Watch	WRI	Assesses and monitors deforestation and fire risk based on user uploaded locations of concessions and other physical assets.
Protected areas	SIGHT	WWF	Offers overlays of protected areas such as World Heritage sites and key biodiversity areas with user uploaded locations of concessions and other physical assets.
Water	Aqueduct	WRI	Assesses exposures to different types of water risk based on user uploaded asset location data.
	Water risk filter	WWF	Assesses exposures to different types of water risk based on user uploaded asset location data.
	Corporate bonds water credit risk tool	NCFA, Global Canopy, UN	Assesses impact of water stress on corporate credit ratings.
	Drought stress testing tool	NCFA, Global Canopy, UN	Shows impacts of different drought scenarios on banks' loan portfolios.
Multiple	ENCORE	NCFA, Global Canopy, UN	Identifies business risks arising from economic dependencies on natural capital.
	SCRIPT	Global Canopy	Benchmarks companies on the strength of their soft commodity production and assesses portfolio exposure to deforestation, biodiversity loss and other soft commodity sector risks.
	E-RISK	UN	Quantifies natural resource and environmental risks, in order for these to be incorporated into sovereign credit risk assessments.
	Certifications	Multi-stakeholder	Multi-stakeholder, independent third-party assured certification standards that indicate sustainability best practices.

Integrating nature into investment strategies

Beyond the understanding of the geographical and sectorial issues, adapting investment strategies remains a major challenge. The way this can be done widely varies according to the type of strategies followed by the financial institutions and for the asset classes it concerns.

⁸ Source: WWF Singapore, Resilient and sustainable portfolios: a framework for responsible investment, April 2019

Following passive strategies implies that the financial institution has identified an index to follow for allocating its portfolio. Today, the market still does not provide enough sustainability trackers to enable financial institution to develop diversified sustainable passive strategies. The DJSI (Dow Jones Sustainability Index), computed by S&P and Robeco, is a well known example of such sustainability indexes. Taking the largest 2,500 companies, it identifies the leading 10% in global sustainability performance based on long-term economic, environmental and social criteria. Alongside from providing some information to investors, these indexes are also a useful tool used by companies to monitor internally their management of nature-related issues.

Another nature-driven investment policy is active qualitative strategy. Most of today's leading financial institutions in the area of nature-related risk integration follow this kind of approach. They have developed in house expertise and research capacities, although this does not also prevent many of them from being huge buyers of data and scorecards from ESG data providers. They do not yet have the ability to quantify the extent to which they are exposed to nature-related risks but they are nonetheless able to make investment decisions which integrate environmental considerations. For the moment, this kind of strategy is restricted to impact investments niche and dedicated funds, rather than the whole range of portfolio investment strategies.

The last - and maybe most effective - way to integrate nature-related issues into investment decisions would be to quantify nature-related risks. In this strategy there is an even greater reliance on data and metrics, since they will be necessary brick of the investment decision (and not the qualitative data anymore). One way of doing so is to determine a monetary value of the impact of a company on nature and then to determine for which share of this amount the financial institution is responsible for or depending on. This is the aim of the proposed methodology presented in Box 8.

But one of the challenges with which financial institutions are often confronted is that stand alone metrics do not usually provide sufficient insight to cover all the dimensions of the interdependencies between the asset and the ecosystem. The complexity of such interdependencies is too much for condensed metrics; additional contextual information seems to be always necessary.

Box 8 : A methodological proposal for measuring in monetary terms the natural capital impacts of listed companies

The proposed methodology is based on public data and provide a monetary evaluation of the natural capital impacts of listed companies following a “solution and potentially avoided costs” approach. In doing so it provides investors with an evaluation tool for investment potentials in light of the trade-offs resulting from the implementations of future solutions for a sustainable economy. Its authors - Damien Friot (Ecometrics), Samuel Vionnet (Valuing Nature), Anne Verniquet (Sofies), Vincent Kaufmann (Ethos) - suggest a list of valuation factors which convert environmental values into monetary values which can then be translated in terms of risks.

A three steps approach is used to derive natural capital costs from corporate information. First, a description of corporate activities and environmental impacts is formulated on the basis of financial and sustainability reports. Second, this description is enhanced with data from life cycle databases and models extracted from a global environmental-energy-economic model. Lastly, natural capital costs are computed in monetary terms based on valuation factors, which determine the monetary costs per environmental impact. They are provided as societal costs, solution costs, and potentially avoided costs. Complementing this information on costs with the likelihood of their occurrence provides a perspective in terms of risks.

The proposed global average valuation factors for the study’s nine indicators (e.g., climate change, land use, and water pollution) are either derived from existing literature or calculated for the purposes of the report. With regards to solution costs, the suggested values represent only rough estimates since solutions can be plentiful with vastly differing costs. Concerning potentially avoided costs, both direct and indirect costs are examined. While the proposed valuation factors are a first step towards widely recognized factors, at this stage they lack robustness due to several methodological weaknesses.

2.2.2. Engaging companies

The Dutch Association of Investors for Sustainable Development (VBDO) and CREM⁹ produced in 2016 a guide to addressing nature-related issues through engagement with companies can be done through different angles, such as materiality or transparency. The financial institution should firstly identify which are the nature-related issue it want to engage into with the company. These issues are likely to be the activities from which the company face the highest materiality risk. Influencing a company is more likely to be effective when the asks from the financial institution are specific to a given sector or environmental issue (mining, deforestation...).

Among engagement initiatives at annual shareholders meeting, the most commonly used is to put it on the agenda set by the company itself. The box below shows an example of a controversial shareholder resolution.

⁹ <https://crem.nl/en/1282/>

Box 9 : Example of the use that can be done of a shareholder resolution

A world leading US-based oil major has faced a bevy of shareholder resolutions about climate change and other environmental issues. In 2017, shareholders, led by the New York State Common Retirement Fund, and the Church Commissioners of England, asked the major to disclose, for the first time, short, medium and long-term targets to reduce greenhouse gas emissions from both its operations and the use of its products.

In January 2019, the oil company asked the Securities and Exchange Commission for permission to bar the resolution. The permission was granted early April 2019. An SEC lawyer says the measure would “micromanage” the company and supplant the judgment of managers and directors.

The New York State Common Retirement Fund argued that a low-carbon global economy is a significant risk for the oil company and that it isn’t prepared. It called the SEC ruling “a bump in the road” but vowed to keep pressing the oil major on the issue.

Internal monitoring and first ideas for future reporting

There is a lack of consensual metric for financial institutions to assess comprehensively natural related issues or related mitigation strategies.

As a first step to support quantitative self-evaluation, some high-level key performance indicators can be mobilized, such as:

- The share of the total portfolio which has been invested according to a comprehensive ESG risk mapping;
- The share of the portfolio that is contributing positively to the preservation of natural ecosystems¹⁰;
- The amounts that have been divested from a company or a sector identified as doing too much harm to nature¹¹;
- The number of companies with which the financial institution has been actively engaging on nature-related issues;
- The number of nature-related items that have been pinned on general assemblies’ agendas;
- The number of nature-related shareholder resolution submitted and adopted;
- The proportion of staff that have been trained on nature-related risks and more generally environmental risks;
- The share of top-management executives’ remuneration which depend upon a sound management of nature-related risks;

¹⁰ for instance the amount of assets in funds which would have been awarded a label relying on methodologies allowing to identify a pool of activities which contribute positively to the preservation of natural ecosystems (mitigation or transition activities)

¹¹ For instance in companies where active engagement do not work or sustainable alternatives (certified actors) are not available. For sectors, it would be at the crossroads of economic activities that put the most pressure on nature (agriculture, forestry...) and geographic areas under nature-stress (desertification, species extinction or wide deforestation).

2.2.3 Bridging the data gap

Challenges to efficient risk monitoring and reporting processes

For financial institutions to get to a systematic screening of all their portfolios through the nature-related risks filter, enabling them to invest, divest or engage, two main challenges have still to be addressed:

1. For the assets and activities that can be successfully mapped, financial institutions usually do not know what metrics to look at in order to understand whether these assets are at risk vis-à-vis nature ;
2. For the assets and activities that have been located and for which key indicators have been identified, financial institutions widely lack accurate, comprehensive and tailored data.

The critical role of extra financial and financial rating agencies

Finding accurate, comprehensive and tailored data on impacts and dependencies is still quite a challenge for most financial institutions. Classical financial rating agencies give for the moment to less importance to ESG information in their scoring grids.

However, there is an increasing amount of data and analytical tools available in the market provided by ESG-specialists such as Sustainalytics, ISS-Oekom, Trucost, Vigeo Eiris (recently acquired by Moody's), RobecoSAM... These ESG-data providers offer corporate and country research and ratings that enable financial institutions to identify material social and environmental risks and opportunities. The research they do, through compiling companies' annual reports and sending in questionnaires (see Box 10), enables investors to develop and integrate responsible investing policies and practices, engage on responsible investment issues, and monitor portfolio company practices.

These rating agencies provide critical information to the market. However, practices vary considerably between them: nothing appears harmonised in the issues they cover, the attention they give to different ESG issues, their scoring methodology, the depth of their analyses (life cycle approach, external providers, final clients, asset location etc), or their geographical coverage... For instance, questions on biodiversity vary widely from one questionnaire to another: one of the above-mentioned data providers only asks one questions on it to agri-food actors while another one dedicates two entire pages to the issue.

For the sake of clarity and efficiency (corporates often have many questionnaires to fill, on similar yet different questions, asking for different metrics or other information), the activities of ESG data providers should be watched more closely by regulators in order to harmonise their practices. This would help financial institutions to get more standardised and comparable information on the impact of the companies they invest in whatever the data provider they select.

Box 10 : Example of questions from an ESG data-provider questionnaire send to an agri-food company

Environmental Reporting

- ➔ *Is the coverage of your company's publicly available environmental reporting clearly indicated in the report or in the online domain?*
- ➔ *Please specify for the three environmental indicators where you have the highest available coverage.*
- ➔ *Please indicate below the extent to which your company reports on environmental KPIs in the public domain and provide the targets linked to these indicators.*

Environmental Policy & Management Systems

- ➔ *Is your company's environmental management policy publicly available?*
- ➔ *Please indicate how your Environmental Management System is certified / audited / verified and indicate the coverage of this verification for the selected standard.*

Operational Eco-Efficiency

- ➔ *Please provide your company's direct (scope 1) and indirect (scope 2) greenhouse gas emissions.*
- ➔ *Please complete the following table about total energy consumption.*
- ➔ *Please provide your company's total net fresh water consumption, including data for fresh water extraction and consumption.*
- ➔ *Please provide your company's total solid waste disposed (i.e. not recycled, reused or incinerated waste for energy recovery) for the part of your company's operations for which you have a reliable and auditable data acquisition and aggregation system.*
- ➔ *Does your company have a public commitment on the topic of GMO?*

Raw Material Sourcing

- ➔ *Please indicate the specific information related to your environmental guidelines or standards for agricultural raw materials and explain whether they apply to your own agricultural production, direct procurement and/or procurement over wider trade channels.*
- ➔ *Are your company's agricultural raw materials certified to one or more third-party standards or do you demand or monitor such certificates from your suppliers?*
- ➔ *Please indicate the share of food and beverage revenues from products marketed as organic or containing a significant share (over 50%) of organically-produced content in the last fiscal year.*

Besides, it is important for extra financial ratings agencies to integrate a forward looking view in their analysis so they capture not only the current positions of corporates vis à vis biodiversity, but also their strategies to preserve nature.

In the coming years it is also key that this kind of analysis are mainstreamed – and in a harmonised way – to and by financial rating agencies. They are the one which are the most likely to reach out to the entire financial sector (and not only to ESG leaders which can afford the higher price of ESG-dedicated extra-financial rating agencies).

2.3. Seizing new opportunities

As new ways of working and living take hold, innovation is intensifying. Organizations are using new technologies, engaging with customers in new ways and making faster decisions with sophisticated digital intelligence. With the proper risk management procedures in place, financial institutions can identify threats, avoid surprises and manage risk effectively. In time, they will discover that those risk-mitigation strategies can be turned into competitive advantage.

According to the above-mentioned VBDO & CREM guide, opportunities for the financial sector to take better into account of nature-related risks are three fold:

1. Differentiation and opportunities for branding;
2. Opportunities for new financial products;
3. New investment opportunities.

2.3.1. Differentiation and opportunities for branding

As retail investors and institutional investors (such as pension funds) are paying more and more attention to nature-related issues, demand is rising for financial solutions and products with a do-less or do-no harm environmental approach. As a consequence, a growing number of financial institutions wish to position their brand and their products as responsible towards nature. Early movers who can demonstrate their awareness or integration of nature in their decision processes and investment policies can bolster their organisation's reputation and create marketing value: this can often be achieved through comprehensive reporting on nature-related risks.

2.3.2. Opportunities for new financial products

Green bonds are the most well known example of a new financial product driven by the positive impact it has on the environment. The cornerstone of a green bond is the utilisation of the proceeds of the bond for green projects, which should be appropriately described in the legal documentation for the security. All designated green projects should provide clear environmental benefits, which will be assessed and, where feasible, quantified by the issuer. In 2018, global green bond issuance reached US\$ 167.3billion, according to the Climate Bond Initiative¹², surpassing the 2017 volume of US\$162.1billion by 3%.

However, green bonds are not the only new financial products that are emerging in response to rising demand from retail and institutional investors. Environment-dedicated funds are also a good example

¹²

https://www.climatebonds.net/system/tdf/reports/2018_green_bond_market_highlights.pdf?file=1&type=node&id=35684&force=1

of the kind of distribution opportunities that financial institutions can seize by scaling-up their capacities in nature-related investments.

2.3.3. Bringing opportunities to the market

For opportunities for new financial products to become attractive to financial institutions, public bodies have an important role to play. Primarily they can do this by rising awareness around environmental issues and their links with economic activities, in which the financial industry is involved.

This new demand for nature-friendly financial products could also be enhanced by public bodies by setting up labels for financial products with a positive impact on one or multiple environmental pressures. In this way, investors will have better visibility of what exactly their money can do, or avoid doing, on nature-related issues.

Governments can also provide some incentives for investing into such products, for instance through tax exemptions for products with a positive environmental impact. Public bodies themselves can also invest into these products, particularly the riskier tranches. So called “blended finance” is gaining traction too: stakeholders see it as an effective way of getting private financial institutions to invest into innovative products and projects they wouldn’t have gone into alone given the level of uncertainty involved and the accompanying risks.

The Land Degradation Neutrality Fund, as presented in Box 11, is a good example of an innovative financial product dedicated to environmental issues and yet providing financial returns.

2.3.4. New investment opportunities

The Biodiversity Finance Initiative (BIOFIN) estimates that funds needed to protect nature run up to US\$440billion, whereas estimated current investments barely reach US\$52billion¹³. Each year, closing this gap becomes more critical. Enhanced public financing is essential, but private financial institutions also have an important role to play.

For financial institutions, the gap means that new markets are developing along with huge demands for capital. Bringing capital to meet these emerging demands could translate into new revenue streams from new environmental markets and products (e.g., carbon offsets, sale of surplus water rights, habitat credits, renewable energy, electric vehicles etc).

¹³ BIOFIN, The biodiversity Finance Initiative. “What is Biodiversity Finance?” : <https://www.biodiversityfinance.net/about-biofin/what-biodiversity-finance>

Box 11 : The Land Degradation Neutrality (LDN) Fund¹⁴

The LDN Fund is an impact investment fund blending resources from the public, private and philanthropic sectors to support achieving LDN through sustainable land management and land restoration projects implemented by the private sector. It was launched in 2017 at the 13th Conference of the Parties (COP13) to the United Nations Convention to Combat Desertification in Ordos, China. A French private sector investment management firm, an affiliate of a large private bank, dedicated to responsible investing, was selected competitively to manage the LDN Fund.

The LDN Fund is the first investment vehicle of its kind leveraging public money to raise private capital for sustainable land projects. While many private investors have subscribed to senior shares, the initiative is also backed by de-risking partners. In total, investors have announced commitments of over US\$100 million toward a target of US\$300 million. By leveraging long-term non-grant financing, the LDN Fund will invest in financially viable private projects on land rehabilitation and sustainable land management worldwide, including sustainable agriculture, sustainable livestock management, agro-forestry and sustainable forestry.

In addition to restoring degraded lands, the Fund will generate revenues from sustainable use of natural resources, creating green job opportunities for local communities, increasing food and water security and sequestering CO₂. The LDN Fund will provide evidence of impacts it achieves through a rigorous monitoring and evaluation framework. The LDN Fund will offer financing for the rehabilitation of degraded land and for sustainable business models used on land affected or at risk of degradation. In addition to direct investments into larger scale projects, the Fund is also expected to work with financial intermediaries (in most land use sectors the access to finance for smallholders and small businesses is a big challenge).

¹⁴ <https://www.unccd.int/news-events/ldn-fund-officially-launched>

III - ALIGNING WITH NATURE

The ecological integration of nature into financial institutions

The previous section explored how to understand the impacts (or potential impacts) that nature (its dynamics, evolutions, or related socio-economic changes) has on financial institutions. In certain circumstances, it may lead financial institutions to reduce their ecological pressures, or to invest in the preservation or restoration of ecosystems. In the following section, we will present two ways of understanding and trying to assess the ecological impact of portfolios. The first one is described in section 3.1, and it is mostly initiated by the companies financial institutions invest in, from all economic sectors, who assess their own impact on nature, and share these informations with financial institutions. The second approach is described in section 3.2, whereby financial institutions use methodologies to assess themselves the impact of their portfolio, based on a number of variables and models.

These methodologies are only emerging and are currently experimental, lacking robustness or being difficult to scale. In an exploratory effort, this section intends to make an inventory of these methodologies.

3.1 Transitioning towards portfolios integrating ecological limits: the case of companies financial institutions invest in

Companies in many sectors have started taking initiatives to take ecological limits into account, usually per the following steps: i) measuring their pressures and impacts on ecosystems, ii) defining legitimate ecological limits that apply to their activity and the measurement of their level of sustainability (i.e. the comparison between their impacts and these limits), and iii) communicating this information so that financial institutions can access it.

When this information is available, financial institutions can use the disclosed data to measure the sustainability of their portfolios and make informed decisions.

3.1.1 Measuring corporates' pressures and impacts on nature: footprinting methodologies

The availability of natural capital metrics and robust methodologies is a crucial issue. For some environmental aspects, such as greenhouse gases (GHG) emissions and water consumption, these metrics are relatively straightforward and already familiar to businesses. However, understanding impacts on biodiversity is a more complex and wider topic. There is currently a lack of generally-accepted and adopted methodologies on how businesses and financial institutions can measure and value their impacts and dependencies on biodiversity, but many initiatives are under development.

Carbon footprinting

Carbon footprint methodologies are the most widely-adopted footprint methodologies, since they are used as a way to measure whether an activity's impact on climate change. They aim to measure the total quantities of GHG emitted by an organization (company, subsidiary, production unit, portfolio, territory, economic sector, administration, households, individuals, etc.), a product or a service (Galli et al., 2012). While methodological choices may vary between the different approaches (GHGs considered, avoidance of double counting, etc.), a central element of the carbon footprint (and more generally of all environmental footprint methodologies) is to take into account both direct (internal, on-site, etc.) and indirect (external, upstream, downstream, etc.) emissions. For example, a territory's carbon footprint corresponds to that of its consumption, including imports and excluding exports. The emissions of a product includes emissions related to the extraction of raw materials, manufacturing, transport, distribution, use and end-of-life. The carbon footprint is expressed only in mass units (kg, t, etc.), without any relation to a unit of space. When only CO₂ emissions are counted, the unit used is the mass of CO₂, but the majority of carbon footprints count different types of GHGs (CO₂, CH₄, N₂O, HFC, PFC, etc.). In the latter cases, the unit used is the ton of CO₂ equivalent (CO₂-eq), calculated by multiplying the mass of each gas by its global warming potential factor, which makes it possible to make the different GHGs comparable and addable.

Water footprinting

The water footprint is another footprint methodology widely used by companies and public administrations. It is calculated either from the point of view of the producer or from the point of view of the consumer. The production water footprint is the volume of fresh water used to manufacture the product in all phases of its production. This volume is comprised of water consumed, evaporated or polluted: i) the green water footprint, i.e. the volume of rainwater stored in the ground as moisture; ii) the blue water footprint, which represents the volume of fresh water captured in surface and groundwater; and iii) the grey water footprint, which corresponds to the volume of water required to dilute pollutants in proportions that comply with water quality standards. The consumption water footprint is equal to the volume of fresh water required to produce goods and services for a given population. At the scale of a territory, the consumption water footprint is broken down into: i) internal water footprint, i.e. the volume of water required to provide the goods and services produced and consumed; and ii) external water footprint, i.e. the volume of water required to produce the imported goods.

Ecological footprinting

The ecological footprint (Wackernagel et al., 1999) is also popular, although it is not widely used by companies because it is exclusively oriented towards consumption. It measures the biologically productive area required to produce the renewable resources consumed by a given population, and to absorb the waste it produces.

As the assessment combines the impacts of several ecological pressures, it provides an understanding of the environmental consequences of human activities on the biosphere or on particular ecosystems. Six key ecosystem services are monitored in the methodology: the consumption of plant products (food or other products), the consumption of animal products (food or other products), the consumption of marine products, the consumption of forest products, the carbon storage, and the consumption of physical surfaces for human construction.

This calculated biologically productive area is then compared to the productive area actually available (biocapacity), which makes it possible to estimate whether or not the ecological limits are exceeded (WWF, 2016).

Biodiversity footprinting

With regard to biodiversity, the need for footprint methodologies has mainly come from both proactive companies, which want pragmatic and relevant approaches to measure their impacts on biodiversity, and proactive financial institutions interested in knowing the biodiversity performance of their portfolios.

While this need is not new, the methodologies for calculating the biodiversity footprint are recent and the vast majority of them are under development at the time of writing this report. This is because there are many difficulties in creating generally accepted approaches to measuring biodiversity performance, including the complexity of biodiversity itself, and the complexity of the cause-and-effect relationships between the activities of organizations and natural environments.

Several initiatives have emerged in recent years (Lamerant et al., 2018). These tools propose to evaluate the impact generated by an activity (product, company, value chain, equity portfolio) on biodiversity, with a view to reporting and/or strategic management. The specificity of these recent tools, most of which are still under development, is to allow the representation of direct and indirect impacts caused by several types of pressures on different components of ecosystems, and using common unit - usually a biodiversity indicator linked to a surface unit.

The Global Biodiversity Score

The Global Biodiversity Score (GBS), developed by the CDC Biodiversité, is one of the most interesting approaches (CDC Biodiversité, 2017 ; CDC Biodiversité, 2019). It aims to represent all of a company's impacts on biodiversity across its value chain, through the use of a common unit: the MSA or Mean Species Abundance and its spatialized version, the MSA.km2. The MSA is a metric expressed in percentages, characterizing the integrity of ecosystems: MSA values vary from 0% to 100%, with 100% representing a virgin ecosystem not modified by humans.

Calculating a company's biodiversity footprint via GBS is a two-step process. The first is to link the company's activity to pressures affecting biodiversity, using LCA data where available, or input-output matrix models. The second step is to analyse the impact of these pressures on biodiversity. This second step is carried out using the GLOBIO model, based on pressure-impact relationships and spatialized on a global scale with a resolution of 50 km x 50 km. The pressures considered for terrestrial biodiversity are land use, fragmentation of natural areas, nitrogenous air deposition, infrastructure, encroachment

on natural areas and climate change. GBS allows several types of use, such as assessing a company's biodiversity footprint along its value chain, assessing the biodiversity footprint of a financial portfolio (cf. section 3.2.1), or assessing a territory's biodiversity footprint.

The GBS is being developed in close collaboration with the "Businesses for Positive Biodiversity" club (Club B4B+), which has more than 30 members (including both companies and non-economic actors). A first finalized version of the tool should be available by the end of 2019, but already at the time of writing the report, several companies in the real economy have carried out experimental implementations (in particular Solvay and Michelin, cf. CDC Biodiversité, 2019), as well as some financial institutions (cf. section 3.2.1).

The Biodiversity Impact Metric

The Biodiversity Impact Metric (BIM) is developed by the Cambridge Institute for Sustainability Leadership (CISL), in association with members of the Natural Capital Impact Group, The Biodiversity Consultancy, UNEP World Conservation Monitoring Centre, and other academics (Di Fonzo et Cranston, 2017; Lamerant et al., 2018). It aims to measure the impact on biodiversity caused by the production of raw materials for the supply chains of globalized companies. Footprint measurement combines information on the areas required to produce each raw material with a series of coefficients that quantify the impact on biodiversity. More precisely, it makes it possible to characterize the impact of a company by weighting the land areas necessary for its production by, on the one hand, the proportion of biodiversity lost through the production process (quantity) and, on the other hand, by the relative importance of the biodiversity lost (quality).

BIM is particularly suitable for companies that market products or services derived directly from raw materials, with globalized supply chains. The sectors most particularly concerned are the agriculture and agri-food sector, the cosmetics and pharmaceuticals sector, the forestry and forest products sector, and other sectors sourcing agricultural raw materials. BIM helps to inform company-wide decision-making by assessing of biodiversity impacts in raw material supply chains, and by indicating where and how the company can reduce its impact. The methodology provides a basis for comparing different raw material supply options, and allows companies to compare different investment options.

Other biodiversity footprint tools

Several other tools for companies are available or under development, such as simpler and faster biodiversity footprint assessment tools (including the Biodiversity Footprint Calculator, developed by Plansup, and Bioscope developed by PRé Sustainability, Arcadis, and CODE), or tools focused on the product scope (the Product Biodiversity Footprint, designed by I Care & Consult and Sayari). In 2018, the EU Business@Biodiversity Platform published a complete guide to these methodologies (Lamerant et al., 2018).

3.1.2 Establishing ecological limits and aligning the business activity

Establishing single ecological limits for activities and making sure that they fit into this sustainability framework is a fundamental step. It is intended to answer the question "Is the environmental pressure

of this activity sufficiently low for it to be considered environmentally sustainable, and if not, how much lower should the pressure be?" (Bjorn et al., 2018). Answering this question means comparing the environmental pressures generated by the activity with the ecological limits of ecosystems, understood as the maximum anthropogenic pressure that can be supported. These limits make it possible to guide the protection of natural capital considered "critical" to human well-being, with a view to achieving strong sustainability (cf. section 1.1.4). An activity that does not exceed the ecological limits attributable to it (according to the allocation principles chosen) can thus be considered environmentally sustainable. While approaches to meeting single ecological limits still only represent a small proportion of the considerable number of environmental assessment tools available to economic actors, their number has increased considerably in recent years, and with it the interest of public and private decision-makers. This growth has been associated with the development of robust theoretical frameworks, often complementary, that have made it possible to characterize ecological boundaries at the level of the biosphere and/or local ecosystems. Anders Bjorn and his colleagues propose a review of these different initiatives – both frameworks and tools – in a 2018 publication on the topic (Bjorn et al., 2018):

- Ecological footprint (Wackernagel et al., 1999)
- Water footprint (Hoekstra et al., 2011)
- Science-based targets (SBTi, 2019)
- Planetary boundaries (Steffen et al. 2015)
- Methods originating in LCA community (Bjorn et Hauschild, 2015)
- Context-based sustainability (McElroy et van Engelen, 2012)
- Human appropriation of net primary production (Haberl et al. 2004)

Some of these initiatives focus on specific ecological aspects, whereas others adopt an integrated point of view, comprising several complementary ecological aspects.

Establishing single ecological limits

Among the initiatives listed by Bjorn et al. (2018), it is interesting to note the representation of environmental footprint methodologies, some of which intrinsically integrate the definition of sustainability limits.

Limits for water

This is the case for the water footprint, described in the previous section, the calculation of which is associated with an ecological limit through the measurement of available freshwater resources, leading the user to measure the absolute sustainability of the use of this natural capital (WWF France, 2010).

Limits for climate

With regard to carbon footprint, methodologies for determining ecological limits have also been developed, but later on and separately from other footprint tools. The Science Based Targets initiative is currently the most advanced approach in this area. It is a joint project of the Carbon Disclosure Project, the United Nations Global Compact, the World Resources Institute and WWF aiming to support

companies in setting GHG reduction targets consistent with the best scientific knowledge. This means achieving a level of decarbonation compatible with a global temperature increase limited to 2°C or even 1.5°C compared to pre-industrial temperatures. To address this challenge, the SBT initiative identifies and promotes methodologies that enable companies to set significant GHG emission reduction targets that are consistent with their sector of activity, and calls on companies to commit to these targets by submitting them for validation (SBTi, 2019).

The SBT initiative's methods initially propose allocating this budget over time in order to define global GHG emission scenarios, based on a global carbon budget aligned at least on the 2°C trajectory. These scenarios are then disaggregated according to a regional and/or sectoral distribution, based on equity criteria, thus distributing emissions (and therefore reduction efforts) among different subsets. Within these disaggregation subsets, specific targets must be assigned to each of the actors according to different criteria, for example according to their level of production or their projected growth (Global Compact France et Compta Durable, 2017).

At the time of writing, more than 550 companies worldwide have committed to defining scientifically consistent environmental limits for their GHG emissions and associated carbon targets, of which more than 200 have had their targets validated by the SBT initiative¹⁵.

Limits for biodiversity

In the field of biodiversity footprint methodologies, this issue of ecological boundaries has also emerged. This is particularly the case for the GBS, which has benefited from the translation of the planetary boundary "integrity of the biosphere" - initially expressed in Biodiversity Intactness Index (BII) – into Mean Species Abundance (MSA), the metric used by the GBS. This has been achieved by the developers of the GLOBIO model – on which the GBS is based, cf. section 3.1.1 – (Lucas & Wilting, 2018). Their results place the biodiversity planetary boundary at a minimum of 72% of MSA (where 100% of MSA would correspond to a biosphere composed entirely of intact ecosystems with populations of native species). This work also made it possible to assess the global biodiversity situation in 2018 at 63% of MSA, and to evaluate the projected results of different biodiversity conservation strategies (see Figure 4).

This data, which must then be transcribed into regional biodiversity conservation boundaries (at the most relevant ecological level), could thus help to set overall biodiversity conservation objectives (the equivalents of the 1.5°C and 2°C climate change objectives). From there, biodiversity footprint tools could be used to define single targets for economic actors, and to manage and monitor their achievement. However, the allocation methodology for such single targets definition is still to be developed.

¹⁵ <https://sciencebasedtargets.org/>

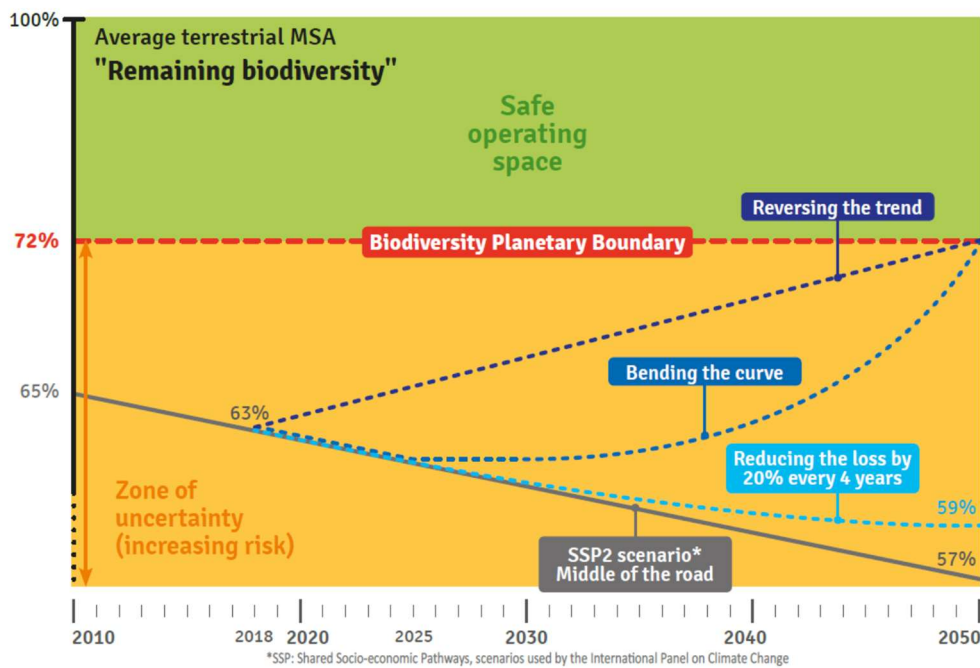


Figure 4. Scenarios to get back into the biosphere integrity planetary boundary (CDC Biodiversité, 2019)

Establishing integrated ecological limits

Ecological footprinting

The ecological footprint, described in the previous section, intrinsically integrates the calculation of an ecological limit: the biologically productive area calculation is associated with the Earth's biocapacity and makes it possible to determine whether the biosphere's capacities on several environmental aspects have been respected or exceeded, and to measure a possible "sustainability gap".

Approaches based on the planetary boundaries framework

Approaches to defining ecological boundaries based on the conceptual framework of planetary boundaries are also well represented and particularly interesting, as they allow for an integrative approach to ecological issues.

The One Planet Thinking initiative is currently well advanced in this regard. It aims to help companies define sustainability targets aligned with planetary boundaries, avoiding transferring impacts from one environmental aspect to another. A first study, the results of which were published in 2017 (Sabag Munoz and Gladek, 2017), identified and mapped a complete range of tools, methodologies, frameworks, programmes and action plans consistent with the concept of planetary boundaries. This review defined an 8-step process to describe all the measures necessary to effectively transcribe planetary boundaries at a level relevant to decision-makers. This work can thus help companies to define significant and relevant sustainability objectives for different environmental aspects. The first implementation of this methodological framework was carried out by Alpro, whose results were published in 2019 (Metabolic et al., 2019; see below).

Box 12: The Alpro and One Planet Thinking case study

As part of the One Planet Thinking programme, Alpro (a subsidiary of the Danone group, which produces vegetable food and beverages) carried out an assessment of the impacts of its value chain in order to set environmental objectives aligned with planetary boundaries and establish significant measures to reduce its impacts (Metabolic et al., 2019). The study was conducted on a production perimeter deemed representative of the company's supply chain (several farms). The planetary boundaries taken into account in the analysis are those directly affected by agricultural production: land use, water consumption and pollution, disruption of the nitrogen cycle, and loss of biodiversity. The control variables and references for identifying relevant ecological limits are given in Table 1. The results obtained for each environmental dimension are presented in the Table 2.





Boundary	Aspect	Indicator	References and Data Sources
 FRESHWATER BALANCE BOUNDARY	Blue water impacts	Environmental Flow (EF) requirement for local waterways	<ul style="list-style-type: none"> Preliminary technical proxy EF calculations for the Rio Canaleta River (Confederación Hidrográfica del Ebro, 2016a) Formal EF values for the main Ebro river downstream (Confederación Hidrográfica del Ebro, 2016)
	Green water impacts	Natural vegetation cover (green water)	<ul style="list-style-type: none"> Half-Earth approach (E.O. Wilson, 2016)
 NITROGEN BOUNDARY	Terrestrial ecosystem impacts	Critical load level of nitrogen for terrestrial ecosystems	<ul style="list-style-type: none"> Critical load level of nitrogen for terrestrial ecosystems in regions similar to Ebro river basin (Bobbink et al., 2011)
	Aquatic ecosystem impacts	Critical load level of nitrogen for aquatic ecosystems	<ul style="list-style-type: none"> Maximum total nitrogen (TN) concentrations for aquatic ecosystems (Laane et al., 2005; Liu et al., 2013)
 LAND-USE BOUNDARY	Natural habitat loss	Habitat availability for key species and significant biophysical parameters	<ul style="list-style-type: none"> Tipping points for Natural Intact Vegetation (Sloan et al., 2014) Framework developed for landscape-level land-use allocation, which requires further testing
 BIODIVERSITY BOUNDARY	Biodiversity footprint	Mean Species Abundance of original species (MSA)	<ul style="list-style-type: none"> GLOBIO framework (Alkemade et al., 2009)

Table 1. High level overview of the impact areas: freshwater, nitrogen cycle, land-use, and biodiversity (Metabolic et al., 2019)

	Freshwater: Environmental Flow (EF)	Freshwater: Green Water Balance	Nitrogen: Terrestrial Deposition	Nitrogen: Aquatic	Land-Use: Global and Regional	Land-Use: Landscape and Farm	Biodiversity
Almond Farm 1	Green	Green	Green	Green	Red	Grey	Red
Almond Farm 2	Green	Green	Yellow	Yellow	Red	Grey	Red
Almond Farm 3	Green	Green	Green	Green	Red	Grey	Red
Soy Farms	Grey	Grey	Grey	Grey	Yellow	Grey	Yellow

■ Likely Within Boundary
 ■ Likely Crossed
 ■ Likely Severely Crossed
 ■ Not Evaluated

Table 2. High-level overview of boundary evaluation results based on methodologies developed and tested in this pilot process (Metabolic et al., 2019)

Other methodologies for defining ecological limits for companies based on the planetary boundaries framework have emerged in recent years and are currently under development. These include the work initiated by the World Resources Institute with Mars Incorporated (Putt del Pino et al., 2016), and the Science Based Targets Network initiative developed by the Global Commons Alliance.

Leading actors in environmental reporting have also begun to encourage this type of approach. One example is the Global Reporting Initiative (GRI), which recommends that companies communicate their impacts "in relation to the capacity of the regional ecosystem to absorb the pollutant" (GRI 2016), and

the UN Global Compact in its guide on the appropriation of Sustainable Development Goals by companies, which calls for basing corporate levels of performance on scientific knowledge and the needs of the planet (UN Global Compact, GRI, WBCSD, 2015).

National governments have also begun to implement the planetary boundaries framework in a governance perspective (Nykvist et al. 2013; Cole et al. 2014; Dao et al. 2018).

3.1.3 Communicating absolute sustainability: methodologies for non-financial disclosure, integrated reporting, and integrated accounting

The disclosure of information by financial institutions on ecological impact, the way in which they are presented, and the channels of communication would all represent a significant lever to advance on biodiversity issues.

Extra-financial disclosure

A first way for companies may be to publish information on compliance with ecological thresholds in standard non-financial communication documents: annual reports on CSR, reports on absolute sustainability issues (such as the report published by Alpro, cf. Metabolic et al., 2019), or reports required by regulation (management report in European countries subject to the non-financial performance declaration). These will be accessible to ESG analysts of financial institutions who have in-house expertise. Another possible form of non-financial disclosure for this information, which can work in parallel with the latter, is to complete the questionnaires sent by non-financial rating agencies. Such an approach will allow the dissemination of this data to a wider audience of financial institutions: in particular those with no ESG expertise (these represent a significant proportion of the rating agencies' clients), and those that seek data of a higher quality than is available publicly.

In both cases, these non-financial reporting procedures should enable portfolio managers within financial institutions to use this data on compliance with ecological thresholds to inform their decision-making. First, as long as absolute sustainability practices do not represent the norm among real economy actors, they will allow asset managers to identify the most advanced actors on these issues and build sustainable asset portfolios (or at least portfolios explicitly directed towards an objective ecological transition). In the longer term, when companies' alignment with ecological thresholds is widespread, an assessment of the absolute sustainability of existing portfolios, and the management of these portfolios, may also be considered.

Extra-financial communication practices are progressing rapidly and concern an ever-increasing proportion of economic actors. However, the reference frameworks used are not harmonised and their heterogeneity is increasing. While some information is communicated on a routine basis and through different channels (data on water, GHGs, pollution, etc.), the modalities of disclosure may differ according to the stakeholders (metrics requested, perimeters required, etc.): such limited data comparability does not facilitate either the work of companies or that of observers. In addition, some aspects, including those relating to biodiversity, escape the prism of non-financial communication or are under-represented in relation to the ecological issues they represent.

Moreover, as long as non-financial information is not more widely mobilised, i.e. beyond the relatively small circle of responsible finance actors, these practices will not become widespread within financial institutions.

Integrated reporting and integrated accounting

Other research on communicating information related to the absolute sustainability of companies focuses on so-called integrated accounting approaches, assimilating financial and non-financial data.

Such an integration of financial and non-financial data raises major conceptual issues: on the need for an accounting system to rely on an univocal valuation system, as well as operational issues due to the high risk of disturbance of the financial system in case of the use of non-univocal valuations.

Initiatives in this area have multiplied over the past decade, as reflected by the work of the IIRC (IIRC, 2011). However, the vast majority of approaches are not oriented towards a real integration of financial and non-financial data (i.e. integration into general accounting documents), nor towards a strong sustainability conception.

Another example is the « CARE-TDL model » (Rambaud et Richard, 2015a; Rambaud et Richard, 2015b; Rambaud et Richard, 2017). The CARE-TDL model (Comprehensive Accounting in Respect of Ecology - Triple Depreciation Line) consists of effective integration 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.

However, such an evolution presupposes a standardization of CSR practices (sectoral standards), a harmonization of environmental monitoring (metrics, perimeters, etc.), and the definition of institutional standards for defining ecological limits – conditions that are not met yet.

3.2 Transitioning towards portfolios integrating ecological limits: the case of financial institutions

Another approach requires financial institutions to be able to assess the absolute sustainability of their financial portfolios, through the assets that constitute them, and the implementation of actions that may lead to alignment with ecological limits.

This recent dynamic must follow two main phases: i) a measurement of the pressures and impacts on ecosystems caused by their portfolios, and ii) the definition of the legitimate limits that apply to these portfolios and the measurement of their level of sustainability (i.e. the comparison between the impacts and these limits).

3.2.1 Measuring portfolios' impacts on nature

Among the biodiversity footprint methodologies currently available or under development, two tools are intended partly or exclusively for financial institutions: the Biodiversity Footprint for Financial Institutions (BFFI, developed by ASN Bank) and the Global Biodiversity Score (GBS, developed by CDC Biodiversité). These have been discussed in the previous section (cf. section 3.1.1).

The BFFI (ASN Bank et al., 2018) was specifically designed to provide a global assessment of the biodiversity footprint of the economic activities in which a financial institution invests. The first methodological step in its implementation is quantitative and is based on three stages:

- (1) The first of these aims to produce an overview of the economic activities in which the institution invests.
- (2) In the second stage, the ecological pressure of the investments considered is measured using an input-output matrix model to assess water consumption, GHG emissions, terrestrial ecotoxicity and acidification, land use and transformation, marine ecotoxicity, eutrophication and aquatic ecotoxicity, at the global level, by country and by economic sector.
- (3) The third stage involves calculating the ecological footprint of the investments, using the ReCiPe methodology, which provides scientifically determined dose-response (pressure-impact) relationships. The unit used to express impacts on biodiversity is the PDF.ha.yr for "Potentially Disappeared Fraction of species per hectare/cubic meter per year", and is used to determine the biodiversity footprint in m2 per euro invested for each investment category, and the total footprint in m2 for all investments.

Following these stages, the second step in the process is a qualitative analysis to guide the interpretation and use of the results: limitations of the evaluation, potential influence of the results on investment decisions, etc. For example, the BFFI can be used to calculate the biodiversity footprint of a portfolio of financial assets, to support investment decisions for the financial sector, to develop investment criteria based on the estimation of the main causes of the impacts of different asset classes and sectors, or to identify the main "hotspots" (the richest and most biodiversity-sensitive areas) at the portfolio level, and to develop a strategy for zero net biodiversity loss.

ASN Bank carried out the first experiments with the BFFI tool in 2016. A second version of the tool was released in 2017 and led to a second series of evaluations over the full fiscal years 2014, 2015 and 2016.

Despite distinct technical approaches on a number of points, GBS and BFFI are two tools that are relatively similar from a methodological point of view. CDC Biodiversité and ASN Bank have also worked on a joint publication (ASN Bank et al., 2018) presenting their shared view of the fundamentals associated with biodiversity footprints: taking biodiversity into account as a whole, proposing a cross-sectoral and transnational methodology, taking into account all value chains, defining a consensus methodology, integrating a quantitative link between pressures and impacts, and ensuring compatibility between approaches.

Box 13: The BNP Paribas Asset Management and CDC Biodiversité case study

CDC Biodiversité worked with the French financial institution BNP Paribas Asset Management to calculate the biodiversity footprint of one of its listed equity portfolios, comprising 10 companies in the agri-food sector (CDC Biodiversité, 2019). As GBS was still under development, only terrestrial pressures were considered, and the assessment of four of the five terrestrial pressures was limited to impacts caused by agricultural products. The evaluation focused on the impacts of scopes 1, 2 and 3 (static and dynamic) of the portfolio companies, with scope 3 limited to the upstream part of the value chain of direct suppliers. The results obtained show that the static impact of the portfolio under consideration amounts to 4.8 MSA.km², and that the dynamic impact covers an area of 0.06 MSA.km². Since the static impact is caused by the occupation of cultivated land required for corporate purchases, it is logical that it is much higher than the dynamic impact, which only takes into account induced land conversions. The results also show that the impact of activities directly under the control of companies represents only a fraction of their actual footprint.

The case study enabled developers to improve the methodology for using GBS for financial institutions, particularly on the issue of processing pressure input data. The study also allowed BNP Paribas AM to experiment with what future biodiversity disclosure processes might look like and to take a lead in thinking about how biodiversity impact information could be useful in the future.

These methodological fundamentals guarantee a certain robustness to GBS and BFFI. However, these tools, and biodiversity footprints more generally, suffer from a number of weaknesses. The most important are the inaccuracy of economic modelling approaches that determine business pressures, the limitations associated with biodiversity modelling tools based on fragmented scientific data, and the lack of representation of certain types of pressures (including overexploitation of resources and invasive species) and certain ecosystems (e.g. marine biodiversity). To overcome these limitations, the implementation of spatially explicit ecosystem accounting models, as the ENCA model (Weber, 2019), could be useful. Furthermore, corporates' disclosure of ecological pressures' information on their whole value chain seems to be an important prerequisite.

3.2.2 Establishing ecological limits and aligning portfolios

Initiatives to align portfolios with environmental sustainability issues are currently being developed in a limited number of areas. The Aligning Portfolios for One Planet (AP1P) project, currently in progress and led by WWF Sweden and the consulting firm Quantis, is now at the forefront on these issues (WWF et Quantis, 2019).

AP1P project objectives

The project aims to establish concrete links between absolute sustainability frameworks – defining the ecological boundaries associated with the biosphere and ecosystems – and methodologies for evaluating financial portfolios. The aim is to broaden the reasoning over absolute sustainability beyond the climate field alone (for which several initiatives already exist), and to adopt an integrative perspective.

In the longer-term, the objective is to characterize, measure, and represent the absolute sustainability performance of a financial portfolio. Different types of representations could be considered, such as a

temporal representation through trajectories (cf. Figure 5), which would make it possible to visualize the projected evolution of impacts and estimate the sustainability of investments, or a representation in the form of a dashboard (cf. Figure 6), highlighting the current and expected performance of the assets in question.

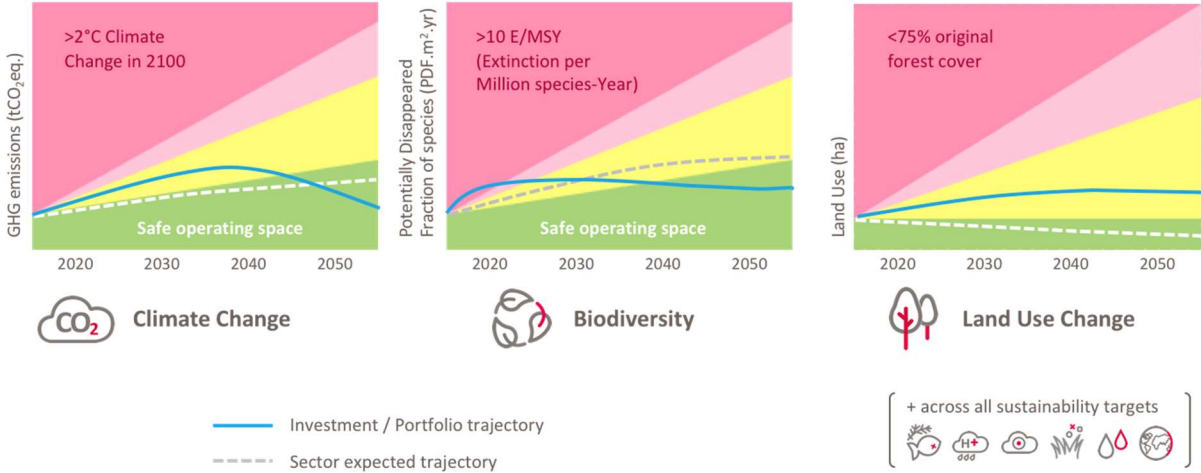


Figure 5. The trajectories representation of absolute sustainability performance (WWF et Quantis, 2019)

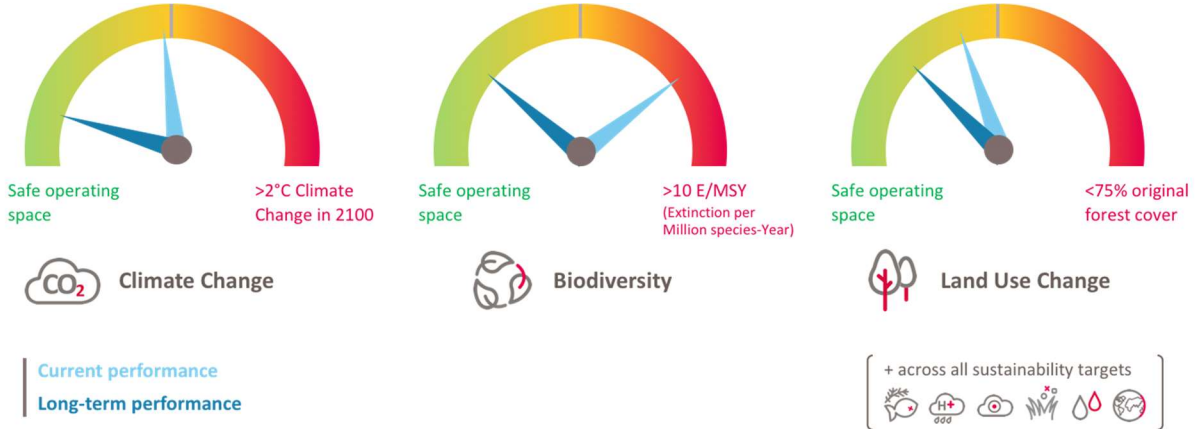


Figure 6. The dashboard representation of absolute sustainability performance (WWF et Quantis, 2019)

However, such detailed and exhaustive representations of the alignment of portfolios with ecological limits would require appropriate scientific and methodological approaches and the existence of relevant data. From this perspective, a focus on identifying and filling gaps in existing approaches is needed.

Study of existing approaches to science-based investment assessment

A study of the initiatives available to assess the environmental performance of portfolios against absolute sustainability objectives was carried out by the AP1P initiative, with a view to i) listing relevant tools and methodologies, ii) providing an analysis of these tools against the project objectives, and iii) identifying key elements that remain unexplored by these approaches and that would require future development.

The preliminary results of this study made it possible to highlight the existence of different types of tools (cf. table 3):

- Tools aiming to measure environmental impacts on financial portfolios: risk assessment methodologies (cf. Chapter 2) ;
- Tools aiming to measure financial portfolios' impacts on the ecosystems: "relative" assessment methodologies, allowing the assessment of "contributions" or "reductions", and performance assessment methodologies ("absolute"), in relation to science-based scenarios.

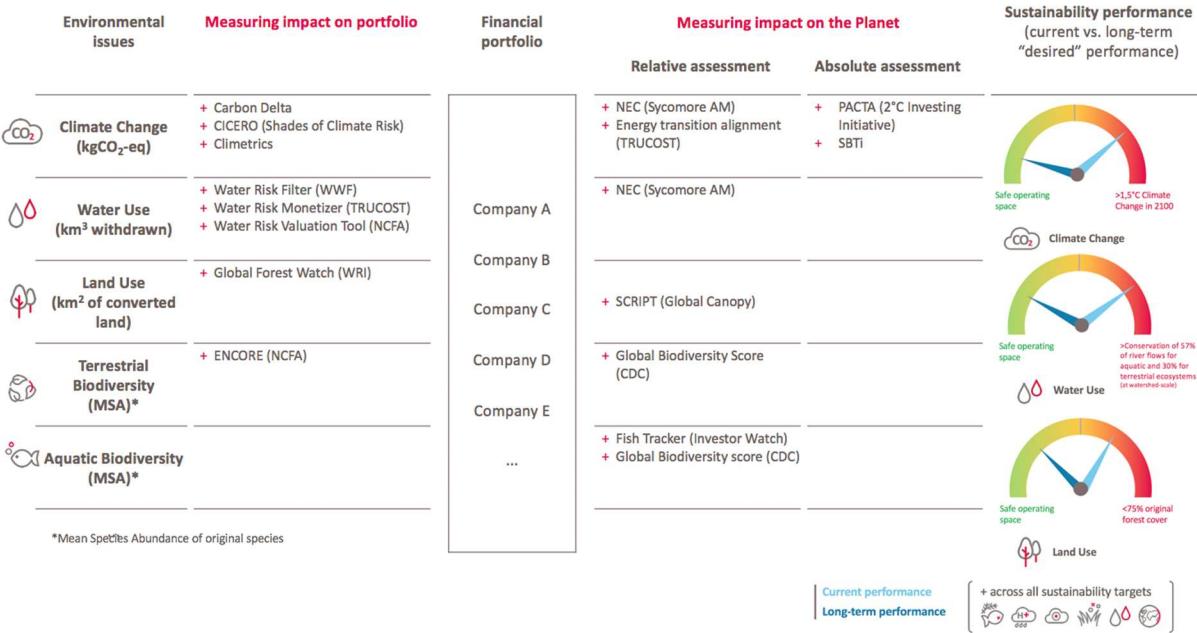


Table 3. AP1P Conceptual Framework – opportunities for assessing financial portfolios' sustainability performance in relation to science-based sustainability target (WWF et Quantis, 2019)

These results show there are several limitations to such an exercise. The main types of tools available are for measuring the impacts on financial portfolios, and the relative ecological impacts of portfolios. Climate change remains the only environmental theme for which a set of approaches is available to measure absolute sustainability performance remains climate change, although the authors note the many development initiatives aimed at creating links between the concept of global boundaries and the financial sector (on the theme of water in particular).

Further perspectives and development needs

This lack of tools is attributable to a number of underlying limitations, shown in Table 4. For each, ways of adapting the theoretical framework of the project are identified in order to carry out concrete short-term actions.

Identified limitations	Potential adaptation of the framework
Environmental issues coverage: some targets in the SDGs and Planetary Boundaries frameworks are not yet completely defined (e.g. chemical pollution)	Limit the analysis to environmental indicators that are both methodologically mature and relevant for the assessed activities / sectors
Data availability and granularity: for instance, some environmental issues need to be assessed at local scale (e.g. freshwater use)	Rely on a coarser model, based on global data
Company data availability: information directly reported by companies may not be sufficient to evaluate their current environmental performance, across all analyzed indicators	Define a classification of activities, products, etc. and search for complementary sources of data such as industry associations and satellite imaging, in order to evaluate the company's performance on the basis of the global contributions of each type of activity. For a long-term adaptation it is certain that there is a need to develop methodologies which do not depend on corporate reporting
Company future performance: a long-term strategy covering all relevant environmental indicators may not have been defined by the company	Limit the analysis to the company's current environmental performance
Defining the fair share: several ways of assessing a company's emission or consumption 'budget' exist. However, defining which fair share should be applied to a given company or activity raises many ethical and political questions, that go beyond the scope of the present conceptual framework	Determining what should be the possible approach(es) to define the fair share remains an open topic.

Table 4. Current limitations for portfolios' sustainable performance assessment and proposed adaptation of the AP1P framework for short-term action (WWF et Quantis, 2019)

However, in the long term, a comprehensive portfolio assessment framework must enable decision-making that integrate the conditions of the ecosystems which provide the fundamental elements for economic and societal stability. To that end, all strengths are needed and even small steps matter. This is why involving various stakeholders is a necessity:

- Academics and scientific community: develop and refine a comprehensive "science-based" targets framework;
- Certification bodies, rating agencies, data providers and other third parties: develop robust and harmonized assessment methodologies and tools, data to feed such methodologies, and ensure reliability;

- Financial institutions: help develop, test and ultimately integrate such framework in their daily activities.
- Governments: bridging the data gap e.g. on the locations as well as nature-related impacts and dependencies of assets and activities of the companies that financial institutions invest in.

CONCLUSION

Biodiversity loss and environmental changes are accelerating rapidly. As a result, considerable risks arise for companies due to their impacts and dependencies on nature. These risks may in turn also affect the financial institutions that invest in these companies. At the same time, considerable nature-related opportunities can emerge for financial institutions. Therefore, including nature in investment decision-making processes is an urgent need, for human societies as well as for financial institutions themselves. The integration of environmental concerns is a recent enterprise for financial institutions. However, the financial sector, policy makers as well as other stakeholders can benefit from the progress that has already been achieved in the climate context. While it may not be optimal to replicate the methodologies, tools, metrics, and policy measures designed for climate change, they can provide valuable foundations for the inclusion of nature-related aspects.

As an immediate first step, financial institutions should reflect on nature-related issues can affect them, where are the opportunities related to nature protection - and potential methods to identify both. They should also actively expand their knowledge about the possibilities for aligning their portfolios with ecological limits.

As things stand, it is still too early to require that financial institutions to report their integration efforts for nature-related risks as the necessary data is not yet available. Governments have a key role to play in bridging this data gap and enabling financial institutions to obtain information about the locations as well as the nature-related impacts and dependencies of assets and activities of the companies they invest in.

In addition, governments are central actors for scaling up investments in nature-related opportunities. They should create incentives for financial institutions to develop an investment strategy oriented towards positive impacts on nature, for instance through tax incentives, the creation of labels, and private-public financing solutions.

Finally, in order for financial institutions to take nature-related risks and opportunities into account and ultimately align their portfolios with environmental boundaries, concrete and measurable targets need to be formulated. International science-based biodiversity targets should be defined by governments in a New Deal for Nature and People by 2020.

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ANNEX

Organizations interviewed for the purpose of this report:

Agence Française de Développement (AFD)

AgroParisTech

Autorité des marchés financiers (AMF)

AXA

Biotope

BNP Paribas Asset Management

Carrefour

CDC Biodiversité

Crédit Agricole

Ecometrics

Electricité de France (EDF)

Entreprises pour l'Environnement (EPE)

Ethifinance

EU Business @ Biodiversity Platform

European Environment Agency

Finance for Tomorrow

Finance Watch

HSBC

Mirova

Moringa

Organisation for Economic Co-operation and Development (OECD)

Trucost

Veolia

