



BIODIVERSITY

The Ecosystem at the Heart of Business

Citi GPS: Global Perspectives & Solutions

July 2021



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BIODIVERSITY

The Ecosystem at the Heart of Business

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An unexpected positive outcome from the COVID-19 pandemic is related to climate change — after decades of steady increases, global carbon dioxide emissions actually fell. A combination of declining manufacturing and social activities in 2020 — factory shutdowns, a fall in air travel, and work from home which eliminated many commutes — led to global carbon dioxide emissions falling by almost 7% from 2019 levels. This unexpected result brought renewed focus on efforts to lower global emissions, as it provided proof that carbon dioxide reductions could be achieved and the Earth wasn't beyond help in terms of climate change.

In 2021, governments across the globe started shifting their focus from providing COVID-19 economic life preservers to providing fiscal stimulus to drive economies out of pandemic-induced recessions. As stimulus packages are being worked out, there are renewed calls to ensure large portions support “green” initiatives. 2021 is being referred to as the “super year” for sustainability, and looks to be a crucial year for not only climate action but also the wider sustainability agenda. The year ends with two scheduled critical global summits — the UN Biodiversity Summit (COP15) in October and the UN Conference on Climate Change (COP26) in November.

We have already written a lot in 2021 on climate change in the Citi GPS report series — most recently in [Hard-to-Abate Sectors](#), [Financing a Greener Planet](#), [Natural Gas Transition](#), and [Electric Vehicle Transition](#). The report that follows takes a deeper look at the twin crises of climate change and biodiversity loss, and advocates for applying the same sense of urgency to both issues. With an objective to closing the gap between academic and policy literature and the perspective of the business and investor community, the report focuses on one question: Why should businesses and investors care about biodiversity loss?

Businesses are inherently reliant on nature for resources and ecosystems to produce their products and services. At the same time, their operations also create direct and indirect impacts on nature that could ultimately affect their business. By not analyzing dependencies and the impact on nature and biodiversity, corporates open themselves up to material risk to the profitability of their businesses and shareholders.

From an investor perspective, recent years have seen record levels of engagement in sustainability-related issues as demand for sustainable investment strategies rise. From 2016 through 2020, sustainable investment strategies saw a 50% increase in assets under management. With biodiversity loss putting over half of the world's GDP potentially at risk, integrating the protection of biodiversity into the fiduciary duties of institutional investors and assets managers increases in significance.

We hope you find this report convincing in its argument on why biodiversity matters for corporates and investors. Follow up reports will expand on recommended actions, data, and frameworks businesses and investors can use to minimize risk to their operations and investments from biodiversity loss.

Using the adage of “every dark cloud has a silver lining”, COVID-19 may have opened a window of opportunity to build a sustainable future for humanity by aligning the climate and nature agendas.

Biodiversity Loss Matters

BIODIVERSITY LOSS: AN URGENT BUT SILENT CRISIS

Source: WWF, WRI, IPBES, WEF

A mass extinction is underway, with more animal and plant species under threat than ever before in human history. Dismissing biodiversity loss is not an option, however, as biological diversity has wide ranging benefits for society, human health, business operations, supply chains, and economic growth.

Since 1970 years the **global wildlife population** has fallen by an average of

68%



0:06

In 2019 every six seconds one football pitch of primary **rainforest was lost**

1 million

animal and plant species are threatened with extinction **because of human activities**



\$44 trillion

of economic value generation is moderately or **highly dependent on nature**

TACKLING DEFORESTATION IS A GOOD PLACE TO START

Source: WWF, Pendrill et al. (2019), WRI, Forest 500

Deforestation contributes to global greenhouse emissions and degrades ecosystems resulting in ecological loss. Committing to zero deforestation can help businesses and investors both achieve climate targets and protect biodiversity.

75% of tropical deforestation is driven by 4 commodities: cattle products, soybean, palm oil, and forestry products

80% of the world's terrestrial biodiversity live in forests

43% of the top 500 most influential companies in forest-risk commodity supply chains have no commitment on deforestation

Tropical deforestation would rank 3rd in CO₂-equivalent emissions if it were a country

BUSINESS RELIANCE AND IMPACTS ON NATURE

Source: Citi Global Insights, SBTN

Most businesses have a two-way relationship with nature. On the one hand they depend on the goods and services it provides. On the other hand their operations and supply chains may have a direct or indirect impact on biodiversity and natural ecosystems. Exposure to forest-risk commodities is an example of both dependency and impact and presents a business risk for corporates.

Sector Exposure to Forest-risk Commodities and Key Impact on Nature

Operations Upstream

HIGH EXPOSURE TO FOREST-RISK COMMODITIES										HIGH IMPACT ON BIODIVERSITY & NATURE LOSS				
	Cattle Products	Timber Products	Palm Oil	Soybean	Rubber	Coffee	Cocoa	Cotton	Sugarcane	Land, water, and sea use change	Resource Exploitation	Climate Change	Pollution	Invasives and other
Energy and Utilities														
Materials														
Industrials														
Autos														
Consumer Durables & Apparel														
Consumer Services														
Retailing														
Food Retail														
Food, Beverage & Tobacco														
Household & Personal Products														
Healthcare														
Communication Services														
Information Technology														
Real Estate														
Financials														

RISKS AND OPPORTUNITIES

Source: The Nature Conservancy, WEF, KPMG, Responsible Investor

Awareness is growing around biodiversity loss and the risks it poses to businesses and investors, but the challenge also presents opportunities to innovate. Taking action now can demonstrate leadership in addressing biodiversity issues.

Risks to Corporates and Investors



Opportunities



- ✓ A financing gap of **\$598-\$824 billion** per year is needed for broad action on biodiversity
- ✓ Nature positive solutions can create \$10 trillion in business opportunities and **395 million new jobs** by 2030
- ✓ Nature-based solutions could deliver up to 37% of **CO₂ emission reductions by 2030**

- ✓ <25% of businesses exposed to **nature risks measure** and disclose them but government and industry initiatives are developing to strengthen reporting
- ✓ In a recent investor survey, **81% were very concerned about biodiversity loss** but 91% have no measurable biodiversity-linked target

Contents

Forward	7	4.8 Reputational Risk	77
Executive Summary	10	4.9 Ecological Risk from Invasive Species is Financially Material	78
Chapter 1: Introduction to Biodiversity and Ecosystem Services	13	4.10 Engagement on Biodiversity Loss and Forest-risk	79
1.1 Introduction	13	4.11 Investor Engagement questions	81
1.2 Terminology	15	An Interview with Robert-Alexandre Poujade, ESG Analyst, BNP Paribas Asset Management	83
1.3 What Is the Issue with Biodiversity Loss?	17	4.13 Summary	91
1.4 Why Does Biodiversity Loss Matter?	18	Chapter 5: The Impact of Regulation for Corporates and Investors	92
1.5. Climate Change and Biodiversity Loss: Inseparable Threats	19	5.1 EU Sustainable Finance Action Plan and EU Biodiversity Strategy	92
1.6 Staying Within the Planetary Boundaries	23	5.2 EU Sustainable Finance Disclosure Regulation (SFDR) and Biodiversity Sensitive Areas	93
1.7 What is the Current Status of Life on Earth?	26	5.3 France's Article 29 Biodiversity Disclosure	94
1.8 Growth and Prosperity and the Impact on the Natural World	30	5.4 Taskforce on Nature-related Financial Disclosures	94
1.9 Biodiversity Loss in 2021: Why Now?	32	5.5 G7 Finance Ministers and Central Bank Governors Communiqué Back TNFD	97
1.10 A Critical Decade of Action	36	5.6 The Finance for Biodiversity Pledge	97
Chapter 2: Deforestation and Forest Degradation	39	5.7 Why Data Has Become the Great ESG Enabler	97
2.1 Types of Forest	40	5.8 Why Integration of Biodiversity Loss into ESG Engagement is the Next Natural Step	98
2.2 Commodity-driven Deforestation	41	5.9 Summary	99
2.3 Net Importers and Net Exporters of Deforestation	42	Conclusions	101
2.4 Assessing Trade of Forest-risk Commodities	43		
Chapter 3: Why Corporates Should Consider Impact of Biodiversity Loss	45		
3.1 Introduction	45		
3.2 Risks to Business	46		
3.3 Sector Dependencies and Impacts on Biodiversity	49		
3.4 Sector Exposures to Forest-risk Commodities	52		
3.5 Complex and Opaque Supply Chains	57		
3.6 Commodities and Other Environmental Issues	58		
3.7 Opportunities for Business	59		
3.8 How is the Business Community Taking Action?	61		
3.9 An Interview with Eva Zabey, Executive Director, Business for Nature	65		
3.10 Summary	69		
Chapter 4: Why Should Investors Consider Biodiversity Loss?	70		
4.1 Introduction	70		
4.2 Investor Net Zero Ambition and Link to Deforestation and Biodiversity	71		
4.3 Biodiversity Loss is Financially Material	73		
4.4 Financial Stability	73		
4.5 Systemic Risk	75		
4.6 Physical Risk	77		
4.7 Transition Risk	77		



Professor Sir Charles Godfray FRS

Director, Oxford Martin School, University of Oxford

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Forward

Most people lucky enough to go to a tropical rainforest come away with indelible memories. I vividly recall climbing up to a canopy platform at dawn in Malaysian Borneo to watch a harlequin display of birds feeding on a fruiting fig tree, and then amazingly being joined on the platform by a binturong, a large mongoose that I had no idea was arboreal. Natural history programs further deepen our wonder about biodiversity, and of course for some people rainforests are their homes.

Such direct and vicarious experiences are a major motivation to protect biodiversity for its intrinsic importance and because of our duties of stewardship to future generations. Until about 25 years ago this was typically the only argument put forward to justify protection, but the last quarter century has seen a revolution in how we view the importance of biodiversity. The intrinsic arguments remain but they are joined and bolstered by a realization that our future prosperity depends on the many services provided by the natural world of which biodiversity is a key component. We no longer think of our economy as just depending on human and produced capital, but also on natural capital. The recent report for the UK Treasury on the economics of biodiversity by Sir Partha Dasgupta clearly and persuasively sets out this dependence.

The problem of course is that we are dangerously depleting our natural capital and altering climate and other aspects of the environment in ways that risk even more dangerous reductions in the future. Because we rarely pay the full costs of natural capital loss, it progresses apace as a market failure. This report focusses on biodiversity and catalogues both the numerous ways it is being depleted as well as the multitude of benefits that it provides, often for free.

The challenges are immense, but the good news is that they are increasingly being recognized and action is beginning to be taken. Companies have become used to thinking about the effect of climate change on their operations and how their operations may exacerbate the problem — double materiality. Progressive companies and investors are now asking similar questions about biodiversity, and regulators are increasingly demanding firms disclose their biodiversity impacts and risk exposures. The interview with BNP Paribas' Robert-Alexandre Poujade in the report, and indeed the report itself, well illustrates the increasing and sophisticated attention that financial institutions are paying to analyzing biodiversity risks.

But though this progress on biodiversity is to be applauded, it is still baby steps. For every company or fund manager who considers biodiversity there are many more who don't. Pledges and commitments are great, but are empty if not followed by actions. Disclosure is potentially valuable, but it must be accurate, trusted and have consequences. Battling biodiversity loss may mean sacrificing short-term for long-term gains. Business also has a critical role, along with civil society, in making it easier for politicians to do the right thing.

Analyzing climate change is hard enough but assessing biodiversity is even more difficult. Greenhouse gas emissions are relatively fungible while biodiversity is multidimensional and local. As outlined in the report we need better data and better analytics, substantially better in my view, to provide managers and investors with the granular information they need to make better suggestions. I'm optimistic that science and technology coupled with approaches such as spatial finance will provide these tools. But I completely agree with Eva Zabey from Business for Nature who in her interview in the report warns against letting the perfect be the enemy of the good. We need both to develop better tools as well as get cracking immediately with what we have.

In this spirit, the report pays particular attention to tropical rainforests. In addition to binturongs they hold a treasure trove of biodiversity as well as storing large quantities of carbon; they also have a key role in regulating regional weather. We have excellent data from remote sensing on what forest is being lost where, and increasingly good data on the complicated supply chains linking demand to deforestation, the two often on different continents. Because of its double importance for climate change and biodiversity there is an intellectual and increasingly political consensus about ending deforestation, and increasing but still inadequate action on the ground. We need to attend to multiple aspects of biodiversity, but preventing deforestation is an excellent place to start.

It is hugely encouraging to see concerns about biodiversity being recognized by the corporate world. The GPS team at Citi are to be congratulated on producing a deeply researched and highly readable overview of the consequences of biodiversity loss, why business and investors should care about it, and the rapidly changing regulatory environment. I look forward to the deep dives they plan in future reports into different aspects of this critically important topic.



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The Oxford Martin School at the University of Oxford

The Oxford Martin School is a world-leading center of pioneering research that addresses global challenges. We invest in research that cuts across disciplines to tackle a wide range of issues such as climate change, disease and inequality. We support novel, high risk and multidisciplinary projects that may not fit within conventional funding channels. We do this because breaking boundaries can produce results that could dramatically improve the wellbeing of this and future generations.

Relationship

In pursuit of our mission to collaborate across world markets and conduct ongoing multi-disciplinary global conversation, Citi has partnered with The Oxford Martin School at the University of Oxford to collaborate on the global issues that the world is facing today and develop solutions.

“ Humanity today is like a waking dreamer, caught between the fantasies of sleep and the chaos of the real world. The mind seeks but cannot find the precise place and hour. We have created a Star Wars civilization, with Stone Age emotions, medieval institutions, and godlike technology. We thrash about. We are terribly confused by the mere fact of our existence, and a danger to ourselves and to the rest of life.

– EDWARD O. WILSON, THE SOCIAL CONQUEST OF EARTH

”

“ Like it or not, we remain a biological species in a biological world, wondrously well adapted to the peculiar conditions of the planet’s former living environment, albeit tragically not this environment or the one we are creating. In body and soul we are children of the Holocene, the epoch that created us, yet far from well adapted to its successor the Anthropocene

– EDWARD O. WILSON, HALF-EARTH: OUR PLANET’S FIGHT FOR LIFE

”

Executive Summary

The UN Convention on Biological Diversity (CBD) defines biodiversity as the variability among living organisms from all sources and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems. The Dasgupta Review on The Economics of Biodiversity, published in February 2021, equates biodiversity to a financial portfolio and the economics of it to portfolio management — just as diversity within a portfolio of financial assets reduces risk and uncertainty, so does diversity within a portfolio of natural assets.

Biodiversity, the variety of living components that make up natural capital, can ensure the resilience of natural capital assets by securing them for the future. Biodiversity loss reduces the quantity, quality, and resilience of ecosystem services and can present risks to corporates and investors across multiple sectors and geographies. We are all asset managers and tackling biodiversity loss is now regarded as a portfolio management problem.

The pandemic has exposed a nature crisis as large as the climate emergency with an average decline of 68% in animal populations since 1970. Around one million animals and plant species are now threatened with extinction, more than at any other time in human history in what is often referred to as the sixth mass extinction. Scientists agree that the loss of wildlife and the natural environment is an equally urgent crisis and that human activity now rivals geological forces in influencing the trajectory of the Earth System. This has important implications for environmental and societal decision making and the global financial sector.

The headline statistic of \$44 trillion of economic value generation that is moderately or highly dependent on nature underscores the importance of nature to business operations and the global economy. There is a strong economic case for businesses and investors to take action against biodiversity loss and climate change — both of which are driven by human economic activities and are mutually reinforcing. Neither will be successfully resolved unless both are tackled with the same sense of urgency.

A 2020 survey of sustainability reporting revealed that less than a quarter of businesses exposed to nature risks are measuring and disclosing them. An annual assessment of the most influential companies in forest-risk commodity supply chains found that 43% of the 500 assessed companies and financial institutions do not have a commitment on deforestation. Deforestation risks goes beyond physical risk to encompass regulatory, liability, reputational, market, and financial risks. Even though 80% of the world's 250 largest companies report on sustainability, biodiversity-related risk remains significantly under-reported making it challenging for investors to evaluate companies and sectors most at risk.

An investor survey revealed an increasing interest in biodiversity loss with 84% of investor respondents expressing concerns. Yet, this is not fully reflected in their investment actions with 91% of respondents lacking any reported or measurable biodiversity-linked targets. The incoming regulation from the EU Sustainable Finance Action Plan has played a catalytic role within the investment sector with increasing demands for disclosures on environmental and societal issues.

There are many nature-related issues that companies and investors are trying to grasp, and deforestation is a good place to start. Almost 75% of tropical

deforestation is driven by four forest-risk commodities — cattle products, soybean, palm oil, and forestry products. Addressing these key supply chains will go a long way to tackling deforestation and corporates and investors have the ability to improve the sustainability of how commodities are produced, traded and consumed. The trade of forest-risk commodities is on the rise, and richer countries are driving deforestation in poorer economies, often where vital biodiversity hotspots are.

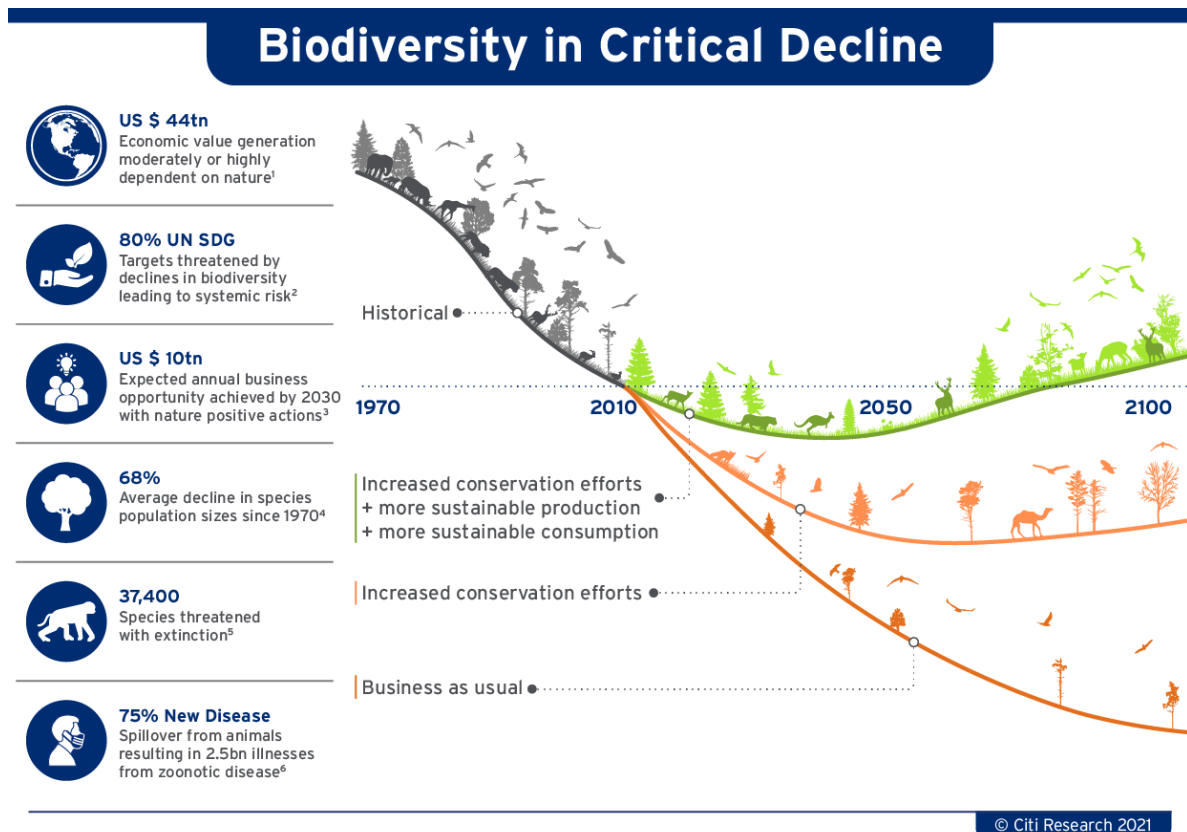
The use of forest-risk commodities are widespread across industries and supply chains, and presents a material business risk for corporates. There are

key sectors that are more highly exposed — such as consumer goods, apparel, energy and utilities, and industrials — but companies across all sectors should consider their exposure, especially for forestry products which includes printing and packaging, furniture, and paper products.

The biosphere, upon which humanity depends, is being altered across all spatial scales and poses a risk to our well-being, growth, and prosperity.

Future climate and biodiversity-related risks could be reduced by accelerating far-reaching, cross-sectoral strategies that recognize the inextricable link between biodiversity, ecosystem services, and climate change. This is a decisive decade, which will be exciting and challenging, but whatever form of wealth creation evolves by 2100, it should be restorative and regenerative to our natural environment. According to the Earth system scientists, the window is still open for us to build a sustainable future for humanity and the time to act is now.

Figure 1. Biodiversity in Critical Decline



Source: Leclère et al, Nature, 2020 (DOI: 10.1038/s41586-020-2705-y), Adam Islaam International Institute for Applied Systems Analysis (IIASA), Citi Research & Global Insights

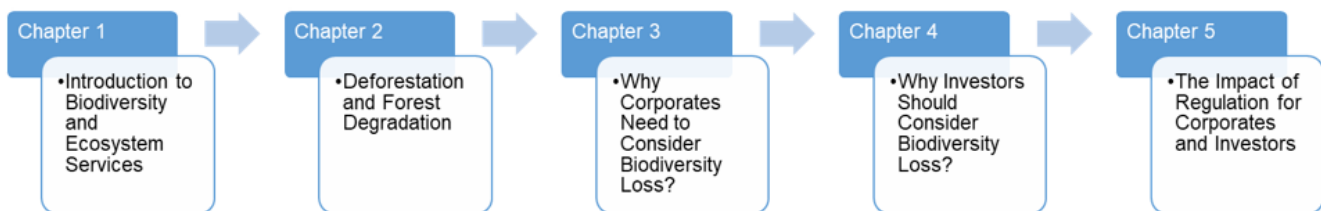
In this report, we focus on the question: Why should businesses and investors care about biodiversity loss? We set the scene for a series of reports on biodiversity loss that will go on to tackle further questions around how should businesses and investors consider the impact of biodiversity loss on operations and investments and what frameworks and data they should use.

In recent years, there has been a surge in new literature on biodiversity loss from sources outside of the academic and policy world. These reports have largely focused on tackling the issue from either a corporate or investor perspective. The objective of this Citi GPS series is to close that disconnect by producing reports that are coherent and aligned to the needs of the business and investor community.

The report starts with an introductory chapter on biodiversity and ecosystem services exploring what they are, why they matter, and what the current landscape looks like. We then take a deeper dive into biodiversity and business, and why corporates need to consider their dependencies and impacts on nature. This is then followed by a chapter addressing the reasons why investors are engaging on biodiversity loss, and includes a set of engagement questions on biodiversity loss and deforestation, which investors should be asking, and corporates should be expecting/disclosing on. Expert perspectives from the business and investment sectors help to bring real world insight to this narrative. We also summarize emerging regulation and how this affects the reporting of biodiversity loss and the current frameworks available for both reporting companies and investors.

This report also contains analysis of commodity-driven deforestation, a major driver of habitat destruction and biodiversity loss that can be linked to rising greenhouse gas emissions and climate change. We map out key forest-risk commodities from their production to sector exposure, highlighting why companies and investors have a role to play in reducing deforestation and forest degradation.

We also summarize emerging regulation and how it affects the reporting of biodiversity loss, as well as the current frameworks that are available for both reporting companies and investors. The report includes expert perspectives from the business and investment sector bringing real world insight to this narrative.



Contributions from:



Chapter 1: Introduction to Biodiversity and Ecosystem Services

1.1 Introduction

“Our imprint is now truly global. Our impact is now truly profound. Our blind assault on the planet has finally come to alter the very fundamentals of the living world.”

--David Attenborough, ‘A Life on Our Planet’

Climate change is widely recognized as the biggest challenge facing humankind, and is spurring action from all corners of the planet and across all areas of society. The Paris Agreement, adopted by consensus in December 2015, was a monumental achievement for the international community, and global leaders are coming together in their fight against climate change. While it is crucial to tackle climate change it is the growing realization that we are losing Earth’s biodiversity at an alarming rate — often termed the sixth mass extinction — that requires urgent attention.¹

The loss of biological diversity is staggering:

1. Global wildlife population sizes have fallen an average of 68% in just 46 years.²
2. In 2019, one football pitch of primary rainforest was lost every six seconds.³
3. Human activities threaten one million animal and plant species with extinction.⁴

The conclusion from the landmark 2019 global assessment of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) was clear — we cannot continue business as usual. The IPBES chair, Sir Robert Watson states, “We are eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide.”

The Stern Review on the Economics of Climate Change (2006) describes climate change as the largest-ever market failure. The Dasgupta Review on The Economics of Biodiversity (2021) regards the current biodiversity crisis as a “deep-rooted, widespread institutional failure” and defines our institutions as “unfit to manage the externalities.” The Dasgupta Review questions whether biodiversity loss is the next market failure or simply a failure of contemporary conceptions.

¹ Gerardo Ceballos, Paul R. Ehrlich, and Peter H. Raven, “Vertebrates on the brink as indicators of biological annihilation and the sixth mass extinction,” *Proceedings of the National Academy of Sciences* 117, no. 24 (June 2020): 13596-13602.

² WWF (2020) Living Planet Report 2020 - Bending the curve of biodiversity loss. Almond, R.E.A., Grooten M. and Petersen, T. (Eds). WWF, Gland, Switzerland.

³ Mikaela Weisse and Elizabeth Dow Goldman, “[We Lost a Football Pitch of Primary Rainforest Every 6 Seconds in 2019](#),” World Resources Institute, June 2, 2020.

⁴ IPBES (2019), Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Brondizio, E. S., Settele, J., Diaz, S., Ngo, H. T. (eds). IPBES secretariat, Bonn, Germany. 1144 pages. ISBN: 978-3-947851-20-1

Due to its often **mobile**, **silent** and **invisible** qualities, markets cannot adequately capture the use of goods and services provided by nature.⁵ Current economic analysis also does not account for the depreciation of natural assets, and there is now a pressing need for new measures of economic success beyond GDP.

The Dasgupta Review also calls for the inclusion of natural capital into accounting systems. Our economic development has come at the expense of the natural world, and we need to recognize and value its true worth and what it provides.

The destruction of nature is not just an environmental issue, it is an economic and developmental one. Biodiversity loss has quickly climbed up the ranks in the World Economic Forum's annual Global Risk Index and currently sits in the top five risks in terms of both likelihood and impact.⁶

Figure 2. WEF Global Risks Perception Survey 2020

	Top-Risks-by-Likelihood	Top-Risks-by-Impact
1	Extreme-weather	Infectious-diseases
2	Climate-action-failure	Climate-action-failure
3	Human-environmental-damage	Weapons-of-mass-destruction
4	Infectious-diseases	Biodiversity-loss
5	Biodiversity-loss	Natural-resource-crises
	Environmental	Societal
		Geopolitical

Source: WEF Global Risk Report 2021

In October 2021, biodiversity will take center stage as governments convene at the UN Biodiversity Conference in Kunming, China for COP15 to agree to a new set of biodiversity goals for the next decade. This summit should result in a clear roadmap on what needs to be done to tackle biodiversity loss. The private sector will have a vital role to play and it is more important than ever for the business and financial community to take an active role in tackling the nature crisis. However, unlike climate change, the private sector is still largely at the start of the journey with regards to biodiversity loss and even though awareness is growing, there is a lack of clarity on why and how businesses and investors should tackle the problem. There are some pioneers in the corporate and investor world who are advancing efforts to understand the impact of biodiversity loss on operations and investments, but these efforts remain nascent and fragmented.

Natural systems underpin our economy, society, and security, but have been taken for granted through the over-exploitation of the goods and services they provide. Scientists have been warning for decades that we cannot continue at current rates or we risk crossing irreversible tipping points that could have potentially catastrophic consequences. This next decade will define our collective future to turn the tide against two connected existential threats: biodiversity loss and climate change.

⁵ Dasgupta, P. (2021), The Economics of Biodiversity: The Dasgupta Review. (London: HM Treasury).

⁶ World Economic Forum, [The Global Risks Report 2021: 16th Edition](#), 2021

1.2 Terminology

The world has woken up in the past year to a nature crisis as large as the climate emergency and scientists broadly agree that loss of wildlife and the natural environment is an equally urgent crisis. If we do not tackle biodiversity loss, the irreversible ecological loss on land and under water could result in the breakdown of the natural systems that support life. There is broad recognition that we are at an earlier stage in the journey to tackle biodiversity loss compared to other environmental issues. There is a need to clarify the nomenclature that is used in discussion around biodiversity and how they relate to other environmental issues.

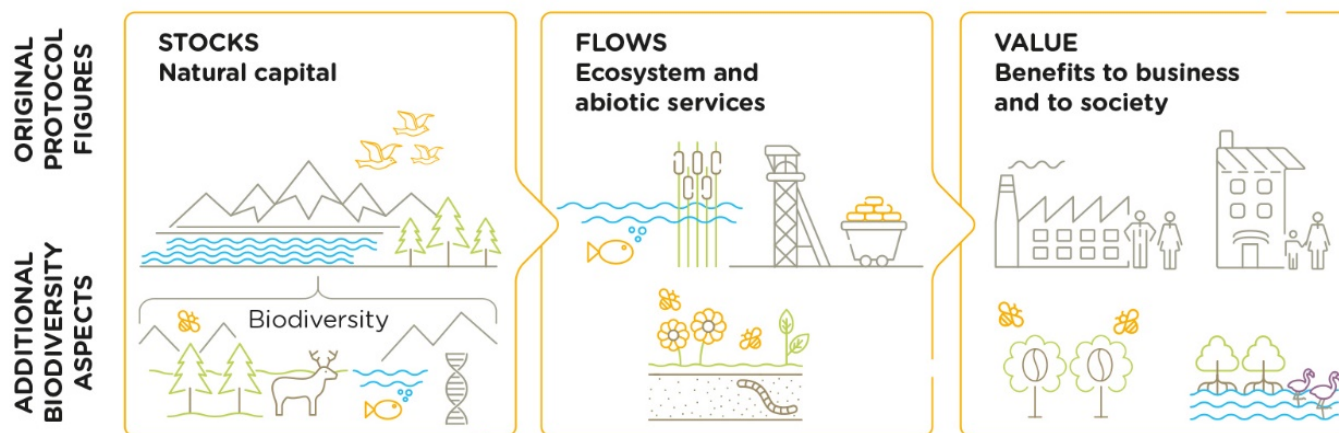
Biodiversity defined by the Convention on Biological Diversity (CBD) as “the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.”

It is essentially the diversity of life on the planet. Nature is sometimes used interchangeably with biodiversity but it is a broader term used to describe the biophysical world, as opposed to being made by humans. Nature’s productivity and resilience depends on the health and status of biodiversity.

The Capital Coalition, a global collaboration redefining values, takes a pragmatic approach to the natural world by thinking about the four capitals that form the foundation of human wellbeing and economic success: natural capital; social capital; human capital, and produced capital in terms of stocks and flows.⁷ The Dasgupta Review uses a three-way classification of capital, consisting of human, natural, and produced, with social referred to as a derived capital.

By understanding how companies impact and depend on the different types of capitals, companies can make decisions that create value for nature, people, and society alongside businesses and the economy.

Figure 3. Relationship Between Biodiversity, Natural Capital, Ecosystem Services, and Value to Society



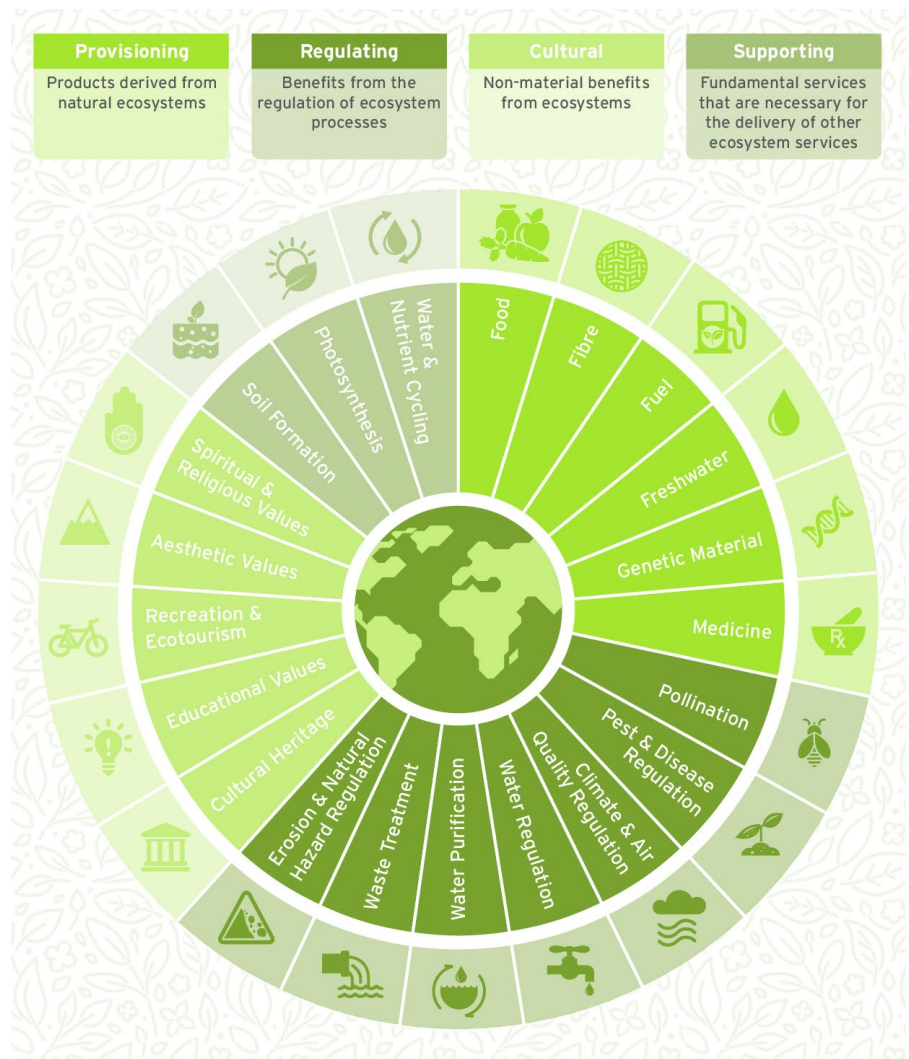
Source: Capitals Coalition and Cambridge Conservation Initiative. 2020. “Integrating biodiversity into natural capital assessments.” (Online) Available at: www.capitalscoalition.org.

⁷ Capitals Coalition [website](http://www.capitalscoalition.org), 2021.

Natural capital represents the world's stock of natural assets, which includes soil, air, water, grasslands, forests, wetlands, rocks and minerals, and all of its living things from mammals and fish to plants and microbes.

They combine to generate flows of benefits known as ecosystem services. There are different definitions and categorization of ecosystem services but the most widely used one is from the Millennium Ecosystem Assessment (MA 2005) which identified four categories of ecosystem services: Provisioning, Regulating, Cultural, and Supporting services.⁸ Figure 4 shows the diverse range of essential goods and services provided by nature which include food, clean air and water, medicine, and shelter. Some benefits, like the regulating services, are more subtle and indirect than others but they are critically important for maintaining healthy ecosystems.

Figure 4. Four Categories of Ecosystem Services and the Goods and Services They Provide



Source: Citi Research and Global Insights, Millennium Ecosystem Assessment

⁸ Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.

Biodiversity is the foundation that supports natural capital stocks and the flows of ecosystem services that deliver value to society and businesses. For example, forests provide a range of vital services from climate and water regulation to pest and disease control as well as providing essential livelihoods.

Bees and other pollinators are vital for food production. Studies have found that about 75% of agricultural crop types depend to some degree on animal pollination.⁹ Losing our pollinators could have a significant impact on agricultural production which, in turn, would impact food production and result in food insecurity.

The Dasgupta Review aptly equates biodiversity to a financial portfolio and the economics of it to portfolio management — just as diversity within a portfolio of financial assets reduces risk and uncertainty, so does diversity within a portfolio of natural assets.¹⁰ We also recognize that diversity in the workplace brings a host of benefits to employees and businesses. So why are we not applying the same perspective to nature and recognizing the importance of biological diversity for planetary, human, and economic health?

1.3 What Is the Issue with Biodiversity Loss?

Biodiversity loss is comparable to climate change in scale, but is perhaps more challenging to interpret for the business and financial community. Biodiversity, and nature more broadly, have properties that are difficult to appreciate, assess, and value and as described earlier are mobile; silent, and invisible. The potential impacts are also less clear for biodiversity loss than for climate change. Science has shown and continues to demonstrate the significant impacts climate change will have on people and the economy, but we are still missing the equivalent assessments for biodiversity loss.

Unlike efforts to fight climate change which centers on clear, measurable goals to reduce greenhouse gas emissions, there is no globally accepted metric for evaluating biodiversity making it challenging for companies and investors to price externalities.¹¹ Part of the reason why biodiversity loss is more difficult to grasp than climate change is because there are many different issues and drivers under the umbrella of biodiversity loss, and the challenges and solutions are not as clear cut as for climate change. Another difference between the two is that CO₂ emissions are fungible whereas biodiversity loss is multidimensional and spatially dependent, which makes assessments and solutions even more challenging.

⁹ Klein, A. M., Vaissiere, B. E., Cane, J. H., Steffan-Dewenter, I., Cunningham, S. A., Kremen, C., & Tscharntke, T. (2007). Importance of pollinators in changing landscapes for world crops. *Proceedings of the royal society B: biological sciences*, 274(1608), 303-313.

¹⁰ Dasgupta, P. (2021), *The Economics of Biodiversity: The Dasgupta Review*. (London: HM Treasury).

¹¹ Linda J. Bilmes, "[Putting a dollar value on nature will give governments and businesses more reasons to protect it](#)," *The Conversation*, May 11, 2021.

1.4 Why Does Biodiversity Loss Matter?

Biodiversity underpins our daily lives and matters to society, human health, business operations, supply chains, and economic growth. Various initiatives have attempted to place a value on nature and studies have found ecosystem services to be worth approximately \$125 trillion every year, and more than half (an estimated \$44 trillion) of global GDP is highly or moderately dependent on nature.¹²

It is important to note that most economists would prefer not to attribute a single figure on biodiversity as this can only truly be priced at the margin given losing all our biodiversity would be existential. Nature conservation is also important for pharmaceutical development as plant based medicines account for 25% of medicinal drugs in advanced economies, and up to 80% in developing countries.¹³

Our economic and social wellbeing depends on the health of the natural world. The 17 United Nations Sustainable Development Goals (UN SDGs), a globally recognized blueprint to achieve a more sustainable and inclusive future, has been widely adopted by countries, corporates, and investors. Goal 14: Life Under Water and Goal 15: Life on Land relate directly to biodiversity but the benefits delivered by biodiversity weaves through all the global goals.

According to IPBES, current trends in biodiversity loss are undermining progress towards 80% of the assessed targets of the UN SDGs including those related to hunger, poverty, health, cities, climate, and water.¹⁴ In the 2018 Citi GPS report [UN Sustainable Development Goals: Pathways to Success — A Systematic Framework for Aligning Investment](#), we highlighted the inter-connectivity of the global goals on aligning investments to the UN SDGs, and Figure 5 shows just how integral biodiversity SDG Goal 14 and SDG Goal 15 are to achieving a sustainable future.



Goal 14 - Conserve and sustainably use the oceans, seas and marine resources



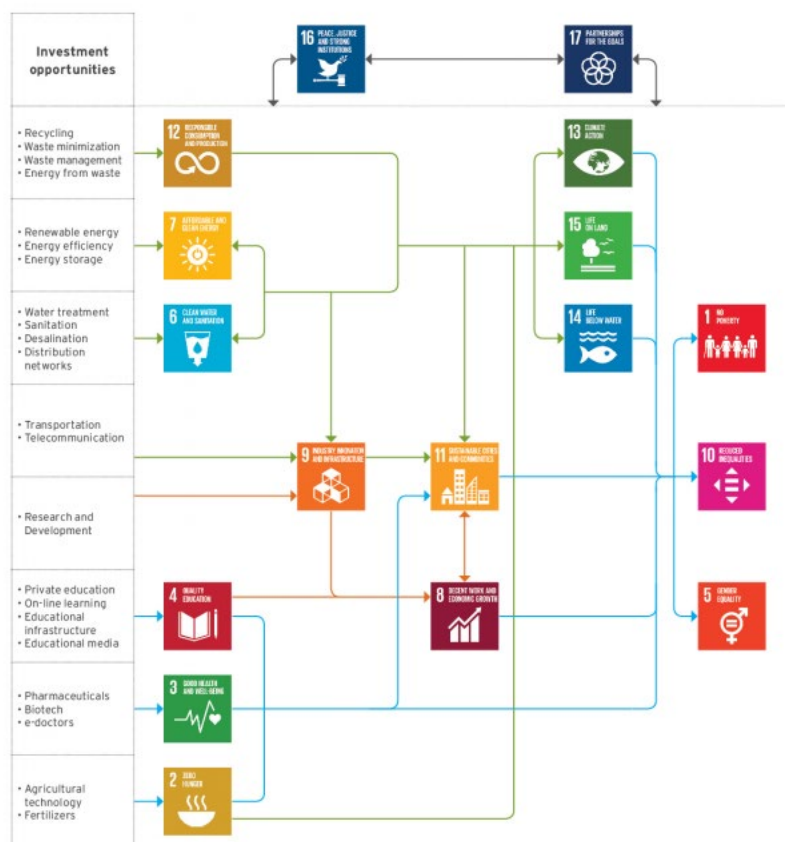
Goal 15 - Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss

¹² WWF. 2018. Living Planet Report - 2018: Aiming Higher. Grooten, M. and Almond, R.E.A. (Eds). WWF, Gland, Switzerland; World Economic Forum in collaboration with PwC, Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy, 2020.

¹³ United Nations Department of Economic and Social Affairs, United Nations Forum on Forests Secretariat (2021). The Global Forest Goals Report 2021.

¹⁴ IPBES (2019) The Global Assessment Report on Biodiversity and Ecosystem Services

Figure 5. Critical Pathways for Investing in the UN SDGs



Source: Citi GPS UN Sustainable Development Goals

1.5. Climate Change and Biodiversity Loss: Inseparable Threats

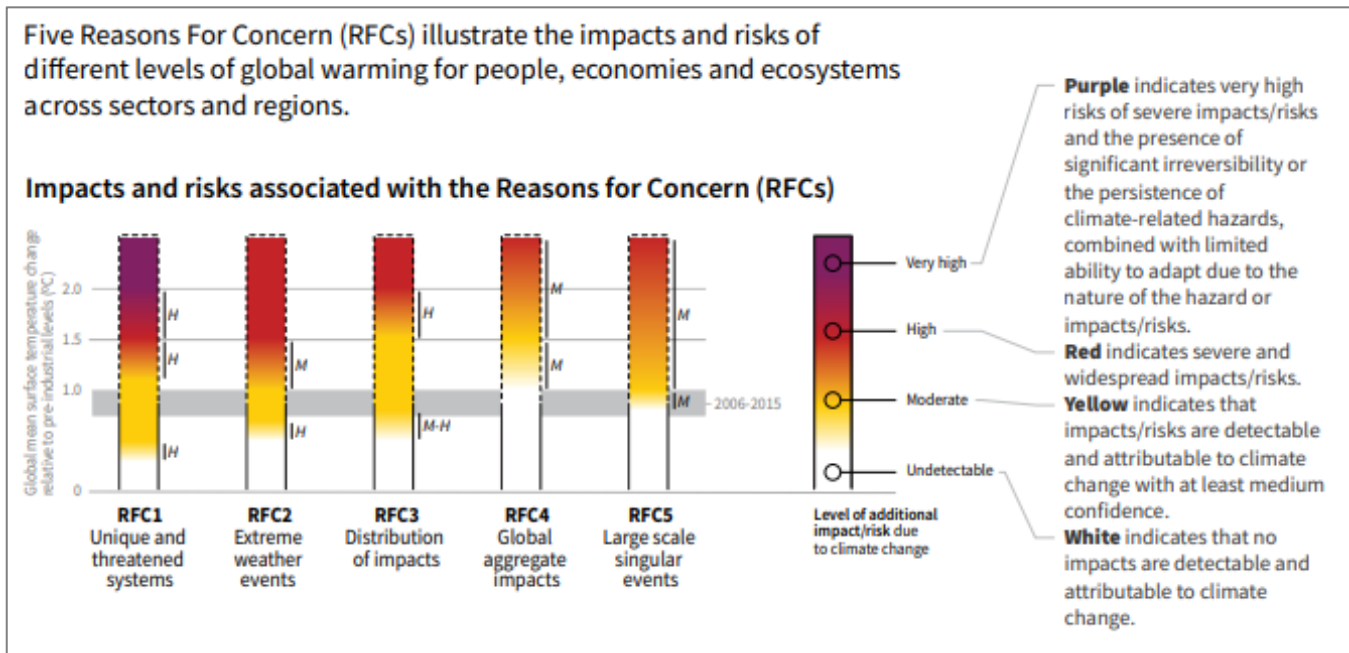
A key message from the scientists behind the Convention on Biological Diversity (CBD) is that climate change and biodiversity loss are inseparable threats to humankind and must be addressed together. Biodiversity loss and climate change are interconnected in many ways. On the one hand, biodiversity is negatively impacted by climate change; studies have found that climate change is responsible for 11-16% of biodiversity loss and is expected to become the dominant driver of biodiversity loss over the next few decades.¹⁵ On the other hand, building resilience into our ecosystems can play a role in mitigating emissions. Impacts of climate change — including extinction and migration of species, changes in ecosystem functioning, ocean acidification, an increase in wildfires, and rising temperatures are expected to threaten one in six species globally.¹⁶

¹⁵ Tim Newbold, "Future effects of climate and land-use change on terrestrial vertebrate community diversity under different scenarios," *Proceedings of the Royal Society B* 285, no. 1881 (2018).

¹⁶ IPBES (2019), *Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, Brondizio, E. S., Settele, J., Diaz, S., Ngo, H. T. (eds). IPBES secretariat, Bonn, Germany. 1144 pages. ISBN: 978-3-947851-20-1

We can also expect further global warming through feedback loops driven by deforestation and ecosystem collapse. If tropical deforestation was a country, it would rank third in terms of CO₂ emissions after China and the United States.¹⁷ This also demonstrates the importance of conserving biodiversity as part of the solution to tackle climate change. Even if we manage to limit global warming to 1.5°C, there will still be consequences for the natural world. For example, we could still lose 70-90% of coral reefs, which would have knock on effects for the 500 million people who depend on reefs for income and food, as well as coastal protection.¹⁸ However, this shouldn't stop us from pursuing 1.5°C alignment. The reduced risks at 1.5°C compared to 2°C of global warming are substantial.

Figure 6. Impacts and Risks of Different Levels of Global Warming



Source: IPCC (2018)¹⁹

¹⁷ Frances Seymour and Jonah Busch. [Why Forests? Why Now?: The Science, Economics, and Politics of Tropical Forests and Climate Change](#), Center for Global Development, 2016.

¹⁸ Hoegh-Guldberg, O., D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K.L. Ebi, F. Engelbrecht, J. Guiot, Y. Hijioka, S. Mehrotra, A. Payne, S.I. Seneviratne, A. Thomas, R. Warren, and G. Zhou, 2018: Impacts of 1.5°C Global Warming on Natural and Human Systems. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.

¹⁹ O. Hoegh-Guldberg et al., Impacts of 1.5°C global warming on natural and human systems.

The Intergovernmental Panel on Climate Change (IPCC) identifies five Reasons For Concern (RFCs) that illustrate the impacts and risks of different levels of global warming for people, economies, and ecosystems across sectors and regions (see Figure 4 Impacts and risks of different levels of global warming). The analysis indicates very high risks of severe impacts and/or risks and the presence of significant irreversibility or the persistence of climate-related hazards, combined with limited ability to adapt due to the nature of the hazard or impacts/risks.²⁰ On land, impacts on biodiversity and ecosystems, including species loss and extinction, are projected to be lower at 1.5°C of global warming compared to 2°C, strengthening the argument for urgent and rapid decarbonization to accelerate efforts to reduce global greenhouse gas (GHG) emissions and keep emissions to below 2°C.

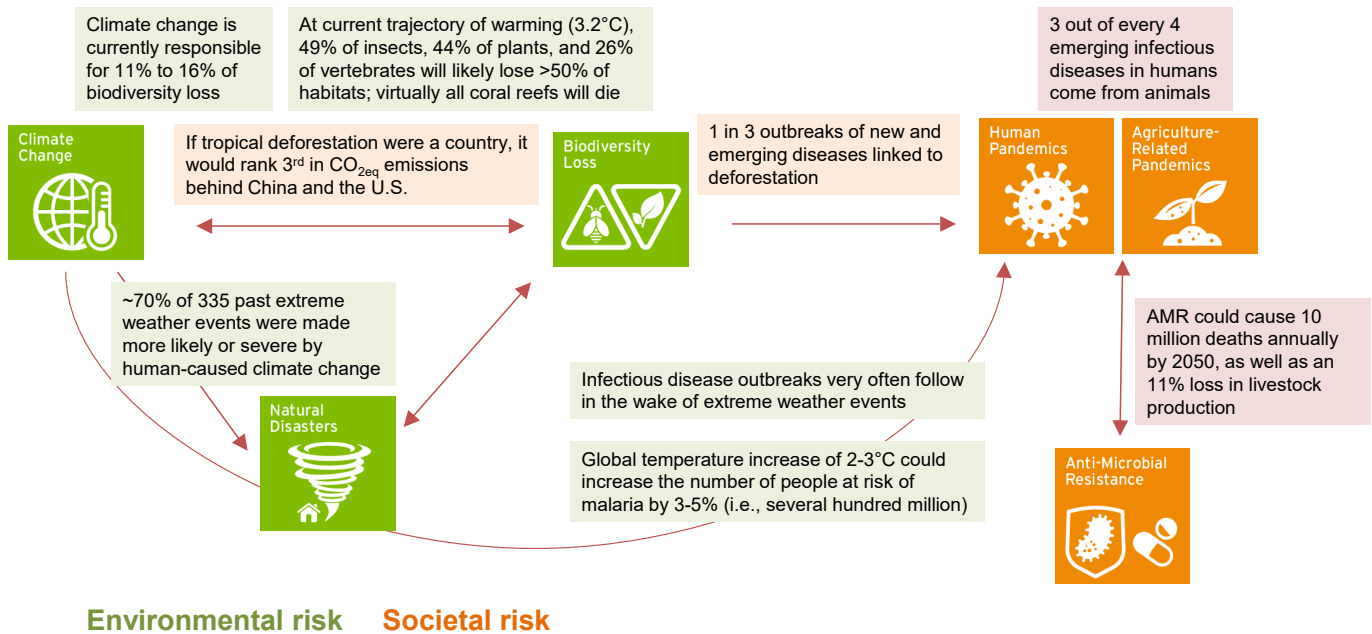
In December 2020, the secretariats of IPBES and IPCC held their first ever co-sponsored workshop spotlighting the interactions of the science of biodiversity and climate change. The findings from this important workshop, released in June 2021, stress that biodiversity loss and climate change are both driven by human economic activities and mutually reinforce each other. Neither will be successfully resolved unless both are tackled together.²¹

Earlier this year, we published the Citi GPS report [Systemic Risk; Systemic Solutions for an Increasingly Interconnected World](#), in collaboration with the Centre for Risk Studies at the University of Cambridge. This report identified a Global Risk Nexus of 10 key systemic risks including biodiversity loss, climate change, human pandemics, and antimicrobial resistance and stressing the importance of analyzing the interlinkages across systemic risks. Figure 7 pulls together some of the interdependencies at play between environmental and societal risks.

²⁰ IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty

²¹ Pörtner, H.O., Scholes, R.J., Agard, J., Archer, E., Arneth, A., Bai, X., Barnes, D., Burrows, M., Chan, L., Cheung, W.L., Diamond, S., Donatti, C., Duarte, C., Eisenhauer, N., Foden, W., Gasalla, M. A., Handa, C., Hickler, T., Hoegh-Guldberg, O., Ichii, K., Jacob, U., Insarov, G., Kiessling, W., Leadley, P., Leemans, R., Levin, L., Lim, M., Maharaj, S., Managi, S., Marquet, P. A., McElwee, P., Midgley, G., Oberdorff, T., Obura, D., Osman, E., Pandit, R., Pascual, U., Pires, A. P. F., Popp, A., ReyesGarcía, V., Sankaran, M., Settele, J., Shin, Y. J., Sintayehu, D. W., Smith, P., Steiner, N., Strassburg, B., Sukumar, R., Trisos, C., Val, A.L., Wu, J., Aldrian, E., Parmesan, C., Pichs-Madruga, R., Roberts, D.C., Rogers, A.D., Díaz, S., Fischer, M., Hashimoto, S., Lavorel, S., Wu, N., Ngo, H.T. 2021. IPBES-IPCC co-sponsored workshop report on biodiversity and climate change; IPBES and IPCC. DOI:10.5281/zenodo.4782538.

Figure 7. Inter-dependencies between Environmental and Societal Risks



Source: Citi GPS Systemic Risk: Systemic Solutions for an Increasingly Interconnected World

The COVID-19 pandemic has thrown a light on the inter-dependencies between environmental, societal, and economic risks. For years, scientists have forewarned of the spillover of viruses from animal reservoirs into abundant human hosts. The cause of the COVID-19 virus, suspected to have originated in bats, was regarded as yet another example of a virus spillover linked to unsustainable behaviors adding to the list of other zoonotic diseases such as Ebola, SARS, HIV, and the West Nile Virus. Currently there is considerable global scrutiny and debate regarding the possible origination of the COVID-19 virus; while certainty is difficult, there is a widely-held view which currently attributes it to unsustainable behaviors and animal origins.

A perspective on the impacts of biodiversity and biodiversity loss on zoonotic diseases suggests that biodiversity loss appears to increase the risk of human exposure to both new and established zoonotic pathogens.²²

²² Felicia Keesing and Richard S. Ostfeld, "Impacts of biodiversity and biodiversity loss on zoonotic diseases," Proceedings of the National Academy of Sciences 118, no. 17 (April 2021).

Quick explanation: When biodiversity is lost from ecological communities, the species most likely to disappear are large-bodied species with slower life histories, while smaller-bodied species with fast life histories tend to increase in abundance. Recent research shows that fast-lived species are more likely to transmit zoonotic pathogens. Together, these processes are likely to lead to increases in the abundance of zoonotic reservoirs when biodiversity is lost from ecological systems.

Climate change and land-use change — such as deforestation — are driving wildlife into closer contact with people which increases the potential emergence of infectious diseases that could lead to epidemics and pandemics. The Centers for Disease Control and Prevention (CDC) reports that three out of every four new or emerging human infectious diseases originate in animals.²³ Nature provides many essentials goods and services as well as health benefits, but destruction of nature can also lead to dangerous consequences for global health. The threat of negative feedback loops across environmental and societal risks is very real, and we still don't fully understand all the interactions and tipping points at play. We know enough to recognize these risks are not separate issues; fighting biodiversity loss is ultimately also about tackling climate change and global health risks, and understanding this deep interconnectivity will build resilience into our ecosystems and deliver long-term sustainable outcomes for human and economic health.

1.6 Staying Within the Planetary Boundaries

Our unsustainable use of natural resources and other human pressures are driving global environmental change, and we need to better understand the limits to which we can exploit and alter natural systems. Many experts argue that we are now in a new geological epoch called the Anthropocene in which humans are the main drivers of change on the planet's natural systems. The knowledge that human activity now rivals geological forces in influencing the trajectory of the Earth System has important implications for both Earth System science and societal decision making.

The concept of planetary boundaries, first proposed by Johan Rockström and Will Steffen in 2009, has gained traction worldwide, which identifies nine key processes related to human activity that threatens the stability of the planet. Even though it is a challenge to define a global boundary for issues with local consequences, the planetary boundaries have garnered a lot of support as an effective communication system. The Earth System is both resilient and fragile, if we push these boundaries too far and exceed them, then we risk losing resilience and crossing tipping points that could have far-reaching economic and social impacts. For each boundary, the team estimated a threshold of just how far human activities can exploit the system before we reach a tipping point that could lead to sudden and irreversible change.

²³ [“Zoonotic Diseases,”](#) Centers for Disease Control and Prevention, July 1, 2021.

Figure 8. Planetary Boundaries

Boundary	Description	Status
Biosphere Integrity	Changes to ecosystems due to human activities have been more rapid in the past 50 years than at any time in human history, increasing the risks of abrupt and irreversible changes. The main drivers are demand for food, water, and natural resources, causing severe biodiversity loss and leading to changes in ecosystem services. These drivers are either steady, showing no evidence of declining over time, or are increasing in intensity.	Crossed
Climate Change	Recent evidence suggests the planet has already transgressed the planetary boundary and is approaching several Earth System thresholds. We have reached a point at which the loss of summer polar sea ice is almost certainly irreversible. The weakening or reversal of terrestrial carbon sinks, e.g., the on-going destruction of the world's rainforests, is another potential tipping point.	Crossed
Land-system Change	Land is converted to human use all over the planet. Forests, grasslands, wetlands, and other vegetation types have primarily been converted to agricultural land. This land-use change is one driving force behind the serious reductions in biodiversity, and it has impacts on water flows and on the biogeochemical cycling of carbon, nitrogen, phosphorus, and other important elements.	Crossed
Biogeochemical Flows	The biogeochemical cycles of nitrogen and phosphorus have been radically changed by humans as a result of many industrial and agricultural processes. Nitrogen and phosphorus are both essential elements for plant growth, so fertilizer production and application is the main concern.	Crossed
Ocean Acidification	Around one-quarter of the CO ₂ humanity emits into the atmosphere is dissolved in the oceans. Compared to pre-industrial times, surface ocean acidity has already increased by 30%. Rising acidity makes it hard for organisms such as corals and some shellfish and plankton species to grow and survive, which puts the dynamics of ocean ecosystems at risk.	
Freshwater Use	Human pressure is now the dominant driving force determining the functioning and distribution of global freshwater systems.	
Atmospheric Aerosol Loading	An atmospheric aerosol planetary boundary was proposed primarily because of the influence of aerosols on Earth's climate system. Through their interaction with water vapor, aerosols play a critically important role in the hydrological cycle affecting cloud formation and global-scale and regional patterns of atmospheric circulation, such as the monsoon systems in tropical regions.	
Stratospheric Ozone Depletion	The stratospheric ozone layer in the atmosphere filters out UV radiation from the sun. If this layer decreases, increasing amounts of UV radiation will reach ground level. This can cause a higher incidence of skin cancer in humans as well as damage to terrestrial and marine biological systems.	

Note: For Biosphere Integrity, genetic diversity is assessed using extinction rates (E/MSY = extinctions per million species per year), and function biodiversity is measured during the Biodiversity Intactness Index (BII) which estimates how much of a terrestrial site's native biodiversity remains.

Source: J. Lokrantz/Azote based on Steffen et al. 2015

Figure 9. Planetary Boundaries



Note: For Biosphere Integrity, genetic diversity is assessed using extinction rates (E/MSY = extinctions per million species per year), and function biodiversity is measured during the Biodiversity Intactness Index (BII) which estimates how much of a terrestrial site's native biodiversity remains.

Source: J. Lokrantz/Azote based on Steffen et al. 2015

According to the latest update by the Stockholm Resilience Centre, we have now crossed four of nine planetary boundaries: climate change; loss of biosphere integrity (previously “loss of biodiversity”); land-system change; and altered biogeochemical cycles.²⁴ We can see from Figure 8 that along with biogeochemical flows, biosphere integrity is already at high risk, which also deteriorates the condition of other boundaries. Scientists have emphasized that the role of biodiversity in supporting a “safe operating space for humanity” may lie principally in its interactions with the other processes.²⁵ This shows that maintaining biosphere integrity is fundamental to safeguarding our economies and societies, and in order to take effective action, we need to understand the current landscape and the pressures on biodiversity.

²⁴ “Planetary Boundaries – an update,” Stockholm Resilience Centre, accessed July 28, 2021. The boundary related to biodiversity was renamed to “loss of biosphere integrity” from “loss of biodiversity” to emphasize the impact of human activity on ecosystem functioning as well as diversity.

²⁵ Georgina M. Mace et al., “Approaches to defining a planetary boundary for biodiversity,” *Global Environmental Change* 28 (September 2014): 289-297.

1.7 What is the Current Status of Life on Earth?

A unique feature of Earth is the existence of life and the most extraordinary feature of life is its diversity.²⁶ Estimates on the number of species on the planet vary from 5 million up to 100 million, with recent estimates lying in the range of 5 million to 10 million.²⁷ The issue is we really don't know for sure, and it is very difficult to count species so scientists use other methods such as looking for patterns in biodiversity.

A widely cited paper used this approach to derive an estimate of 8.7 million, and we have now scientifically identified between 1.4 and 1.8 million species.²⁸ Another way of quantifying life is by considering biomass measured in tonnes of carbon, which allows for better comparisons across taxonomic groups. Using this approach, Bar-On et al. (2018) found that plants make up 82% of biomass, followed by bacteria with 13%.²⁹ Although the world's 7.8 billion people represent only 0.01% of all living beings by weight, humanity has caused the loss of 83% of all wild mammals and half of all plants. Humans are also responsible for a substantial amount of livestock which makes up more biomass than humans and outweighs wild mammals and birds by a factor of 10.

Using biomass as a metric, most of life on Earth is terrestrial — accounting for 83% of total biomass — followed by the deep subsurface at 13%, which is largely home to bacteria and single-cell microbes (archaea).³⁰ Marine environments make up just 1% of total biomass but are home to 78% of animal biomass. This certainly should not detract from the importance of oceans, which are fundamentally the planet's life support systems, regulating climate, producing the air we breathe, and providing food and livelihoods.

²⁶ Bradley J. Cardinale et al., "Biodiversity loss and its impact on humanity," *Nature* 486, no. 7401 (June 6, 2012): 59-67.

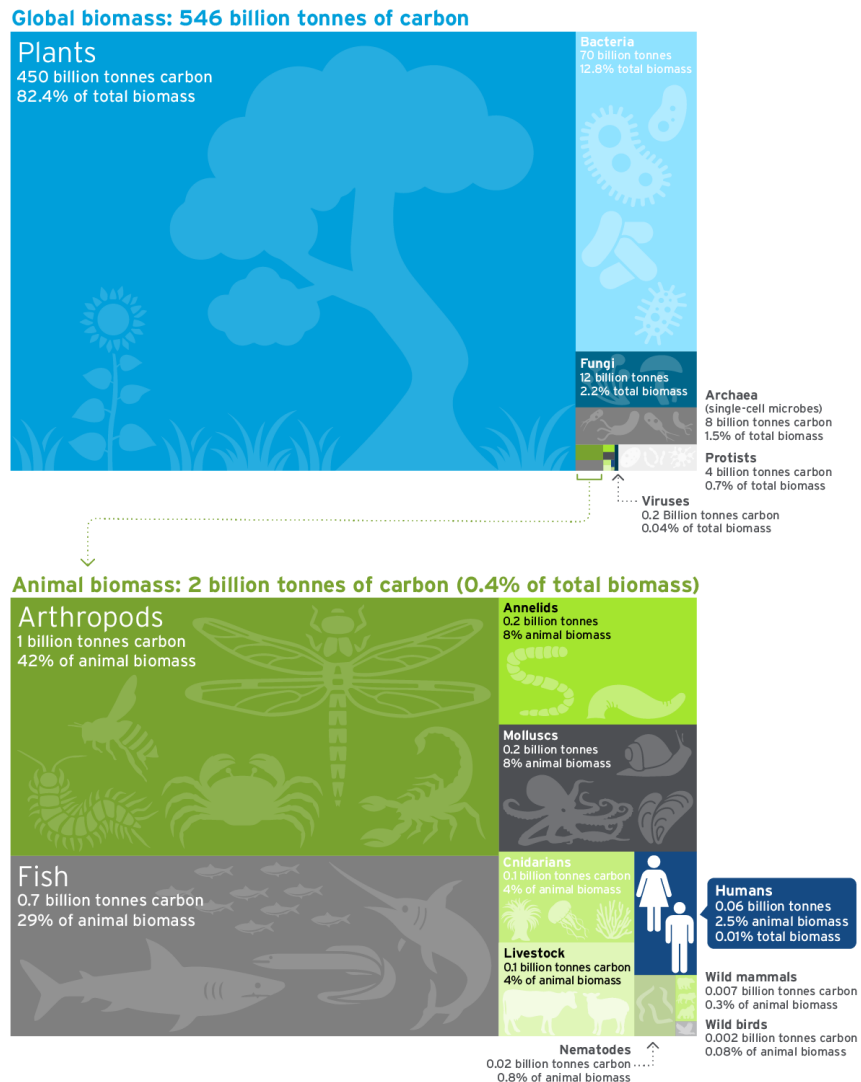
²⁷ This estimate does not include bacteria and archaea where the species concept does not really work.

²⁸ Camilo Mora et al., "How many species are there on Earth and in the ocean?" *PLOS Biology* 9, no. 8 (2011); "[How many species are we losing?](#)," WWF, 2020.

²⁹ Yinon M. Bar-On, Rob Phillips, and Ron Milo, "The biomass distribution on Earth," *Proceedings of the National Academy of Sciences* 115, no. 25 (June 2018): 6506–6511.

³⁰ Archaea are micro-organisms which are similar to bacteria in size and simplicity of structure but radically different in molecular organization. They are now believed to constitute an ancient group, which is intermediate between bacteria and eukaryotes.

Figure 10. Life on Earth: Distribution of Global Biomass



Note: Biomass is measured in tonnes of carbon. The global distribution of Earth's biomass is shown by group of organism (taxa).

Source: Citi Research and Global Insights, adapted from Our World In Data - Biodiversity

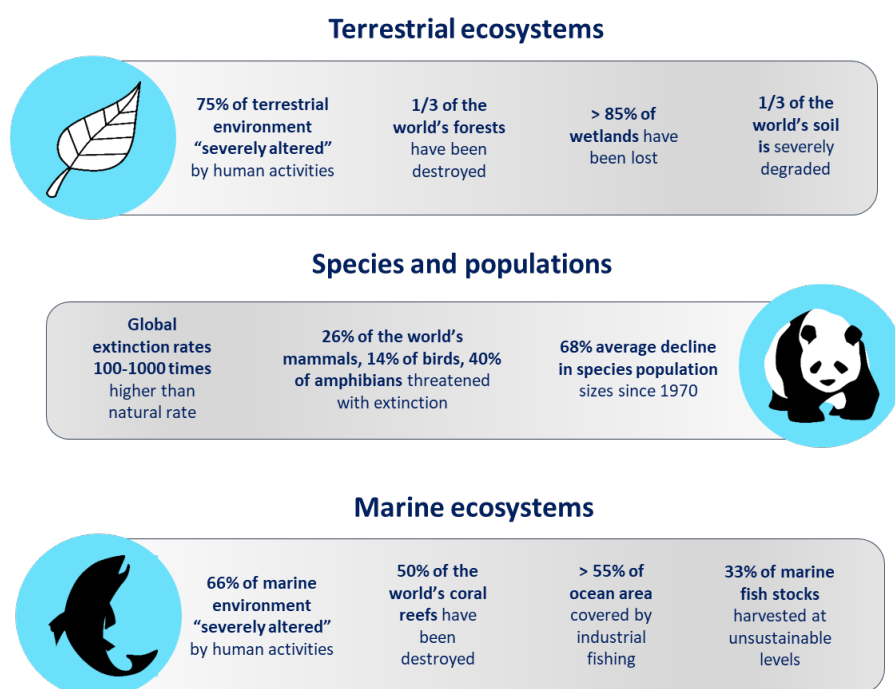
The scientific evidence is clear — biodiversity is decreasing at unprecedented rates and this downward trend is accelerating. Our anthropogenic footprints are all over biodiversity loss, which has become one of the most concerning issues to modern ecology and society. Ecosystems are now losing species at rates only seen in previous mass extinction events with rates of extinction between 100 and 1000 times higher than pre-human levels. This loss is impairing the functioning of ecosystems and their capacity to deliver goods and services.³¹ This is staggering and there is no shortage of further research and evidence that demonstrate the negative impact humans have had and continue to cause on the natural world across both terrestrial and marine ecosystems (see Figure 11).

³¹ Camilo Mora and Fernando A. Zapata, "Anthropogenic Footprints on Biodiversity," in *The Balance of Nature and Human Impact*, ed. by Klaus Rohde (Cambridge: Cambridge University Press, 2013), 239–58.

The latest Living Planet Index by the World Wildlife Fund (WWF) found that animal populations have, on average, declined in size by 68% in just 46 years,³² and IPBES reports around one million animals and plant species are now threatened with extinction, more than at any other time in human history. This is not to be confused with the International Union for Conservation of Nature's (IUCN's) Red List of Threatened Species, which has evolved to become a critical indicator of the health of global biodiversity and is the world's most comprehensive data source on conservation status of animal, fungi, and plant species. IUCN have now documented more than 37,400 species that are threatened with extinction, which was used by IPBES to estimate the overall number of around one million species that are threatened.

The conclusion from IPBES's landmark 2019 global assessment was also very clear: we cannot continue business-as-usual. We are fundamentally biting the hand that feeds us, and undermining our very own well-being, growth and prosperity. In fact, the costs of inaction are already stacking up — for example, between 1997 and 2011, an estimated \$4.3 trillion to \$20.2 trillion per year was lost in ecosystem services due to land-cover change and land degradation.³³

Figure 11. Examples of Human Impact on the Natural World



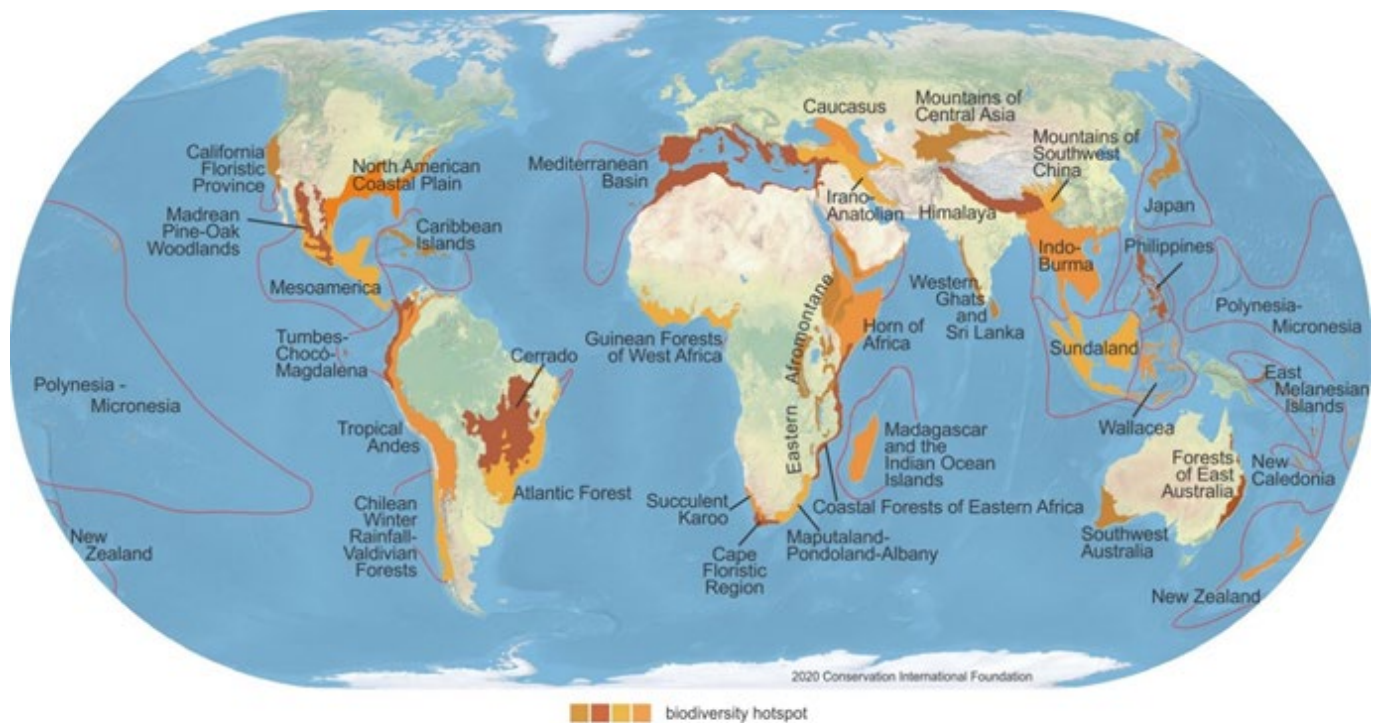
Source: Citi Research & Global Insights. Data from IPBES, WEF, WWF, Our World in Data

³² WWF (2020) Living Planet Report 2020 - Bending the curve of biodiversity loss. Almond, R.E.A., Grooten M. and Petersen, T. (Eds). WWF, Gland, Switzerland

³³ Robert Costanza et al., "Changes in the global value of ecosystem services," Global Environmental Change 26 (2014): 152-158.

It is important to note that biodiversity isn't evenly distributed around the world. Conservation efforts are particularly needed in biodiversity hotspots and can make a huge difference in protecting our global biodiversity. Conservation International has identified 36 biodiversity hotspots, which are defined as a region that has at least 1,500 species of vascular plants found nowhere else on the planet (known as "endemic" species) and has lost at least 70% of its original vegetation. These are some of the most important ecosystems in the world, even though they cover just 2.5% of the planet's land area, they are home to more than half of the world's endemic plant species and 43% of endemic land vertebrates.³⁴ These hotspots can be found all around the world but the tropics in particular are incredibly rich in unique biodiversity, and where the greatest threats to wildlife are evident. Tropical rainforests along with peatlands are also critical carbon sinks that we need to keep intact to help us tackle climate change. In order to help protect these precious hotspots and biodiversity more broadly, an understanding of what's driving their destruction and loss is vital.

Figure 12. Terrestrial Biodiversity Hotspots



Conservation International (conservation.org) defines 36 biodiversity hotspots — extraordinary places that harbor vast numbers of plant and animal species found nowhere else. All are heavily threatened by habitat loss and degradation, making their conservation crucial to protecting nature for the benefit of all life on Earth.

Source: Critical Ecosystem Partnership Fund (with permission). The colors are only used to distinguish adjacent hotspots.

³⁴ ["Biodiversity Hotspots: Targeted Investment in nature's most important places,"](#) Conservation International, 2021.

1.8 Growth and Prosperity and the Impact on the Natural World

Over time as populations, economies, urban centers and global trade have grown, we have become disconnected from nature, and have overexploited it to fuel our economic development. Increasing demands for natural resources continue to drive biodiversity loss and changes in ecosystem functioning. This is not to take away from the incredible growth and prosperity that have been achieved around the world but these have come at the price of the natural world. The Global Footprint Network estimates that humanity currently uses the equivalent of 1.6 Earths to provide the resources we use.³⁵ Our demands on the planet are exceeding its ability to supply us with goods and services, which put simply is unsustainable and is putting our very own health and prosperity at risk.

At the heart of the issue, as The Dasgupta Review points out, are market and broader institutional failures. Nature's value is not reflected in market prices and many institutions have failed to manage the use of natural assets. Governments continue to worsen the crisis by paying people more money to exploit nature than protect it, with annual harmful subsidies estimated at \$4 trillion to \$6 trillion.³⁶ We also need to change the way we measure economic success to better guide us on what is "sustainable" economic growth. Gross Domestic Product (GDP) has long been our main measure of economic success, but it does not capture nature's true worth. A more inclusive measure of wealth is needed beyond the stock of money that captures the value of the four capitals that form the foundation of human wellbeing and economic success: natural capital, social capital, human capital, and produced capital.

In terms of the actual activities which are driving changes in nature, IPBES identified five direct drivers which in descending order of relative impact are:

1. Changes in land and sea use (30%)
2. Direct exploitation (23%)
3. Climate change (14%)
4. Pollution (14%)
5. Invasive species (11%)

These five drivers have caused more than 90% of nature loss in the past 50 years, with land and sea use change and direct exploitation accounting for more than 50%. Land and sea use change is the biggest driver in terrestrial and freshwater ecosystems, whereas direct exploitation is the most important for marine ecosystems.³⁷

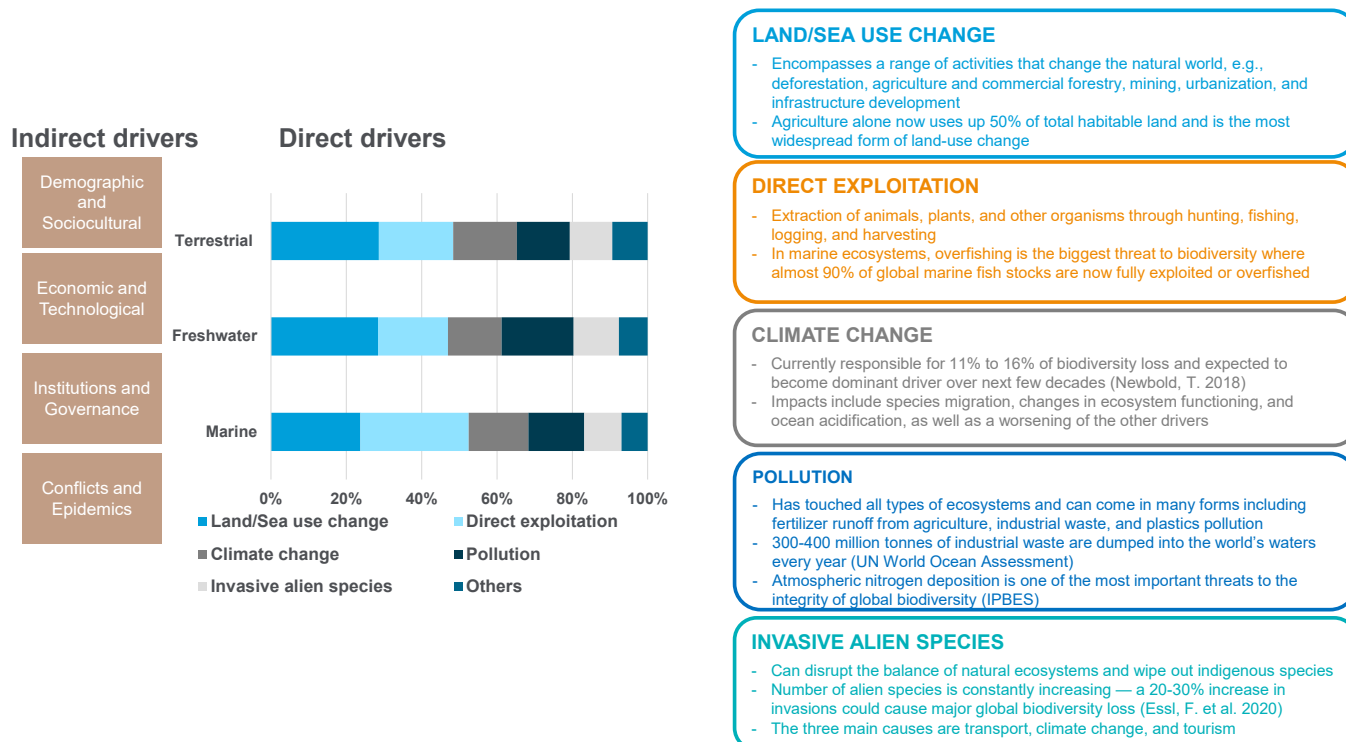
³⁵ "[Ecological Footprint](#)," Global Footprint Network, 2021.

³⁶ Dasgupta, P. (2021), *The Economics of Biodiversity: The Dasgupta Review*. (London: HM Treasury).

³⁷ IPBES (2019), *Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, Brondizio, E. S., Settele, J., Diaz, S., Ngo, H. T. (eds). IPBES secretariat, Bonn, Germany. 1144 pages. ISBN: 978-3-947851-20-1

These direct drivers themselves result from a range of underlying causes which include population dynamics, consumption and production patterns, trade and innovation, and governance structures. A seminal 2016 study which analyzed threats for the 8,688 threatened or near-threatened species on the IUCN Red List found that by far the biggest drivers of biodiversity loss are over-exploitation of species and agriculture.³⁸

Figure 13. Drivers of Biodiversity and Ecosystem Change



Source: Citi Research & Global Insights, data on drivers sourced from IPBES

Figure 13 describes some of the key features of each direct driver as well as estimates on their impacts across terrestrial, freshwater, and marine ecosystems provided in the IPBES Global Assessment.

The global food system is the world's biggest driver of biodiversity loss, and agriculture is the most widespread form of land use change. Agricultural practices alone use up 50% of total habitable land, and a staggering 77% of agricultural land is used for the production of livestock, which only supplies 18% of global calories.³⁹ If we were to continue under current industry practices, we would need a 67% increase in land area in order to meet projected 2050 food demand.⁴⁰

³⁸ Sean L. Maxwell et al., "Biodiversity: The ravages of guns, nets and bulldozers," *Nature* 536 no. 7615 (August 11, 2016): 143-145.

³⁹ Hannah Ritchie and Max Roser, "[Land Use](#)," Our World in Data, first published in September 2019.

⁴⁰ Marco Springmann et al., "Options for keeping the food system within environmental limits," *Nature* 562, no. 7728 (October 25, 2018): 519-525.

This is unsustainable and the global food industry wastes ~1.3 billion tonnes of food per year along the supply chain. Intensive farming is also extremely destructive and can lead to land degradation and desertification. The UN Global Land Outlook found that a third of the planet's land is severely degraded, largely driven by industrial farming.⁴¹ Soil is a precious resource that is often overlooked and taken for granted, studies have found that fertile soil is being lost at a rate of 24 billion tonnes a year, which has implications not just for food security, but also for biodiversity, climate change, disaster resilience and human health.

Agricultural practices are also driving substantial amounts of pollution. For example, fertilizer runoff into coastal systems have produced more than 500 ocean “dead zones” around the world where most marine life cannot survive.⁴² However, it is important to also recognize what the global agriculture and food industry has achieved and continues to deliver — it provides us with essential food, fuel, and fiber, and has helped lift millions of people out of poverty. But going forward, we need to feed a growing global population in a more sustainable and efficient way. The good news is there are plenty of solutions and technological innovations that can help get us there. Our Citi GPS report [Feeding the Future: How Innovation and Shifting Consumer Preferences Can Help Feed a Growing Planet](#), takes a deep dive into the challenges of the global food industry and explores how we can solve them from more sustainable farming, to more efficient manufacturing and distribution, and consistent delivery of nutritious food.

1.9 Biodiversity Loss in 2021: Why Now?

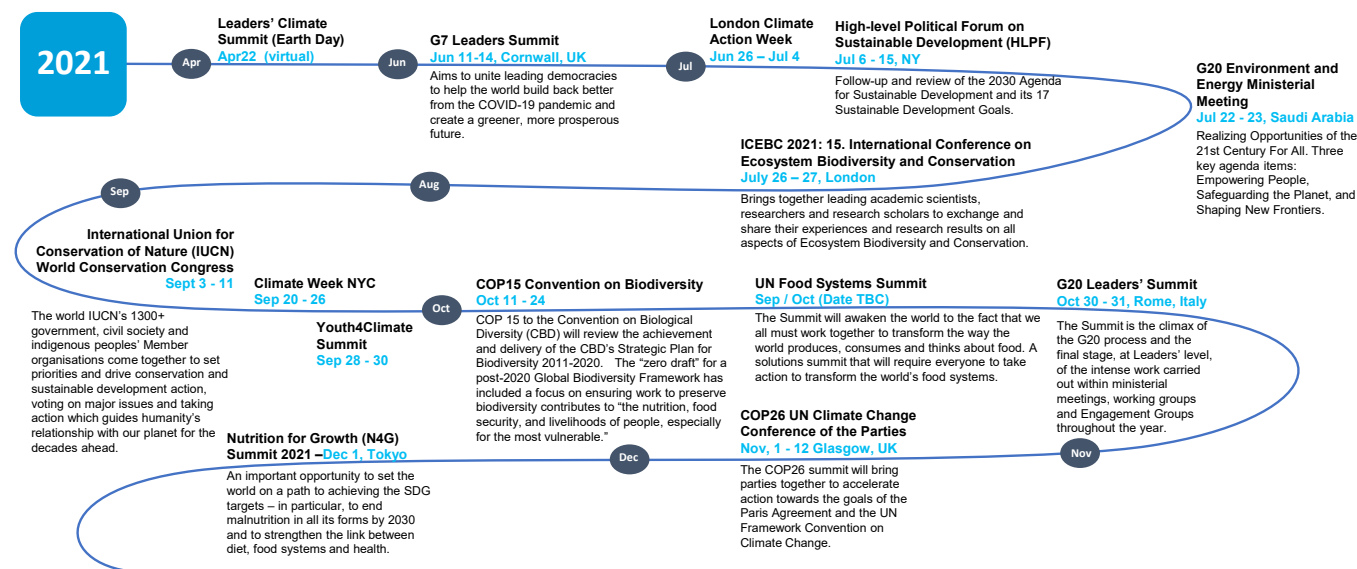
2021 is being referred to as the “super year” for sustainability, it is a crucial year for not only climate action but also the wider sustainability agenda. The COVID-19 pandemic led to the postponement of two key environmental summits in 2020 which are now planned for the second half of 2021 — the UN Biodiversity Summit (COP15) will take place in October in Kunming, China and the UN Conference on Climate Change (COP26) in November in Glasgow, Scotland.

These two summits matter with COP15 being the biggest biodiversity summit in a decade, and COP26 the most important climate summit since the Paris Agreement. Key decisions will be made at these two summits that will determine the blueprint for our collective ambition and action for this decade for sustainability.

⁴¹ “[Much of the planet's land severely degraded owing to increased consumption, UN warns](#),” UN News, September 12, 2017.

⁴² Denise Breitburg et al., “Declining oxygen in the global ocean and coastal waters,” *Science* 359, no. 6371 (January 5, 2018).

Figure 14. Timeline of Major Upcoming Biodiversity/Climate Change Conferences and Events



Source: Adapted from Chatham House, 2021. The 2nd UN Ocean Conference has been postponed to 2022.

A new set of biodiversity targets and goals will be decided at COP15, which many are calling a "Paris Agreement for Nature." This isn't the first time the world has gathered to set targets for biodiversity, the 1992 Rio Earth Summit gave rise to the following three conventions:

1. United Nations Framework Convention on Climate Change (UNFCCC)
2. United Nations Convention to Combat Desertification (UNCCD)
3. Convention on Biological Diversity (CBD)

The CBD now has 196 parties, and all UN member states have ratified the treaty with the exception of the United States.

Their three main goals, which are not always complementary, are:

1. The conservation of biodiversity
2. The sustainable use of its components
3. The fair and equitable sharing of benefits arising from genetic resources

In 2002, the Parties of the Convention committed themselves "To achieve by 2010 a significant reduction of the current rate of biodiversity loss" which failed to materialize.

In 2010, countries gathered for the tenth Conferences of the Parties (COP10) in Nagoya, Japan and produced the 2011-20 Strategic Plan, which included 20 Aichi Biodiversity Targets to stop the destruction of nature. However, studies reveal that yet again we have not succeeded in meeting any of the 20 targets, and only six have been partially achieved.⁴³

⁴³ Secretariat of the Convention on Biological Diversity (2020) Global Biodiversity Outlook 5. Montreal.

In 2014, governments, companies and financial institutions came together and pledged to halve deforestation by 2020 under the New York Declaration on Forests. This can be viewed as another slipped target that demonstrates a set of actions that failed to meet bold ambitions.

The future will be challenging and there is much learning, but this time around the ambition and action is expected to be different. There is growing awareness of biodiversity loss, its drivers and impacts, and we are starting to see a willingness to act across all sectors of society but most notably within the financial and corporate sectors. We can also learn from the Aichi Biodiversity Targets which scored highly amongst an international group of experts for being comprehensive but scored poorly on being realistic and measurable.⁴⁴

The revised targets within the post-2020 Global Biodiversity Framework should be unambiguously worded so that necessary actions are clear. It should also be scalable to allow implementation at global, national, and regional levels. The post-2020 framework aims to overcome the challenges the Aichi Biodiversity Targets posted to corporate engagement. Another positive this time round is that we have more scientific evidence, research and tools to support action and measure progress.

Preparations for COP15 are ongoing and in 2020, the UN Convention on Biological Diversity published a draft agreement that included proposals to conserve at least 30% of the world's oceans and land by 2030. More than 50 countries including the U.K., Canada, Japan, Costa Rica, and Colombia have already committed to this goal through the High Ambition Coalition (HAC) for Nature and People. According to the World Database on Protected Areas, around 8% of oceans and 16% of land are currently protected.⁴⁵

The European Union has committed to halting and reversing biodiversity loss and degradation by 2030, and has published a comprehensive Biodiversity Strategy for 2030, which will inform the EU's contribution to COP15 and negotiations on the post-2020 global framework. In the most recent G7 Leaders' Summit in Cornwall, the leaders agreed on a G7 Nature Compact that sets out commitments to halt biodiversity loss by 2030, as well as tackle deforestation, marine litter, and the illegal wildlife trade.⁴⁶

The first draft of the post-2020 Global Biodiversity Framework was published in July 2021 and presents four long-term goals which focus on nature conservation, ensuring human needs are met, equitable sharing of benefit, and means of implementation. The associated outcome for 2030 will be delivered by 21 action-oriented targets for 2030 which include:

- protection at least 30% of land and sea areas;
- eliminating plastic waste;
- reducing public subsidies that harm wildlife by \$500 billion per year;
- reducing pesticide use by two-thirds; and
- increasing financial resources from all sources to at least \$200 billion/year.

⁴⁴ Green, E. J. et al. "Relating characteristics of global biodiversity targets to reported progress," *Conservation Biology* 33, no. 6 (December 2019): 1360-1369.

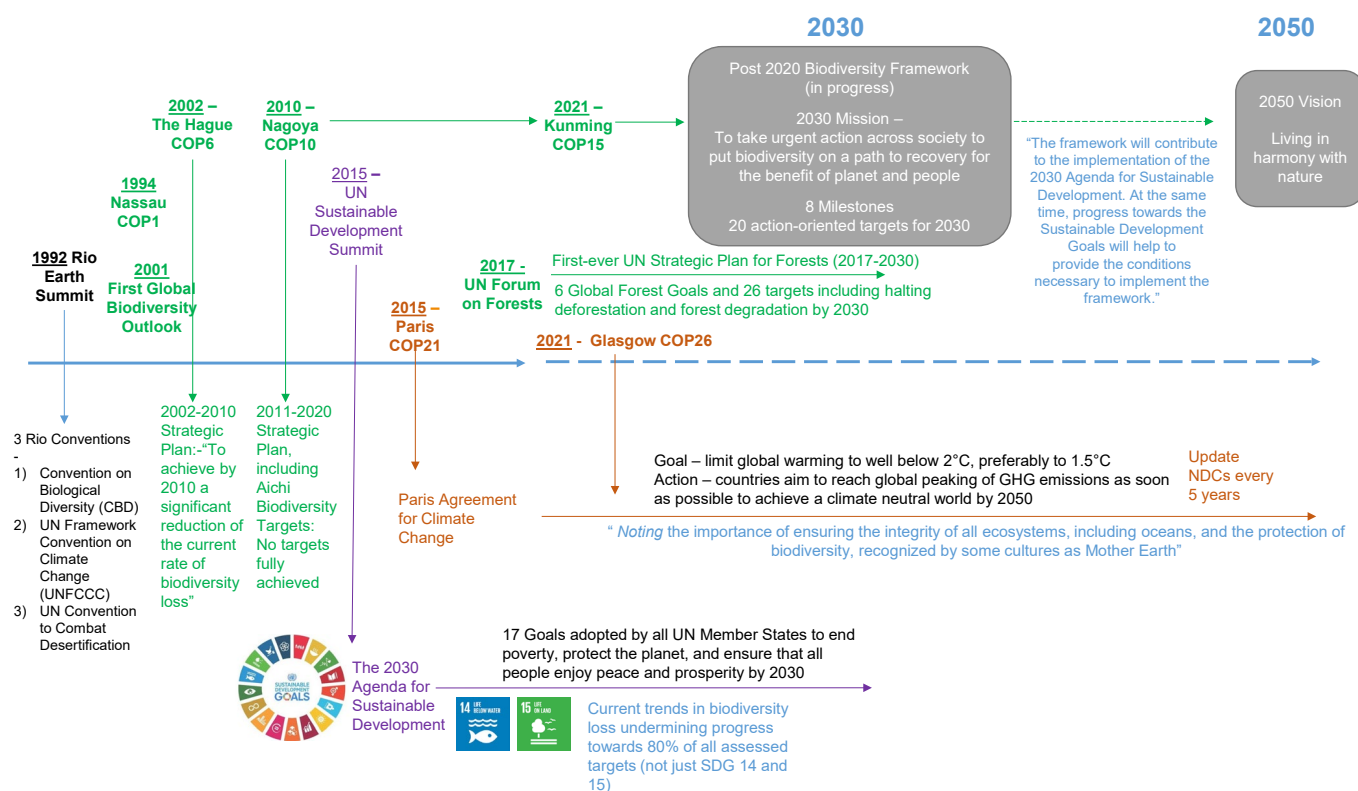
⁴⁵ Protected Planet [website](#), May 2021

⁴⁶ "[Government sets out commitments to biodiversity and sustainability in G7 Nature Compact](#)," GOV.UK, June 13, 2021.

What should result from the Biodiversity COP15 is a clearer picture and roadmap of what the international community and individual countries need to do over the next decade and beyond to achieve the Convention on Biological Diversity's 2050 vision of "living in harmony with nature."

The UN SDGs which have a 2030 target year are also flagged in the draft as being complementary to the post-2020 Global Biodiversity Framework.

Figure 15. Mapping of Major International Agreements Related to Biodiversity



Source: Citi Global Insights

As stressed earlier, climate change and biodiversity loss are inextricably linked and COP15 and COP26 should be seen as complementary events.

The Paris Agreement on Climate Change recognized the importance of ecosystem integrity and biodiversity protection, but now it is time to go further. The decisions made at the two summits should be aligned with complimentary goals and targets, supported by cross-cutting solutions and actions. The climate journey and the Paris Agreement provide an example of how to address a complex global challenge, and an advantage that biodiversity loss has is that we can take the lessons learnt from climate change and avoid the same pitfalls and accelerate the global fight against the nature crisis. The table below shows some of the lessons we can learn from the climate journey.

Figure 16. Lesson Learned on the Climate Journey

Lesson	Climate Journey and Paris Agreement	Application to Biodiversity Loss
The need for a clear universal goal that can be adopted and adapted by countries, corporates, organisations and civic society	For climate change, this was the Paris Agreement for which the outcome-oriented goal was clear — limit global temperature increases to below 2°C (ideally no more than 1.5°C) which translated into the action-oriented goal of reaching net zero by 2050. There is a clear connection between the global goal/vision and implementation mechanisms, and now we are seeing more countries and corporates announce net zero goals and Paris-aligned roadmaps and strategies.	This is more difficult to assign for biodiversity loss but we need an actionable global goal for nature that countries, corporates, and global citizens can all rally around. In a paper supported by academics, conservation, and business organizations, the authors call for a nature positive global goal with three measurable temporal objectives: (1) zero net loss of nature from 2020; (2) net positive by 2030; and (3) full recovery by 2050 ⁴⁷ .
An iterative and coordinated process for national commitments with a strong emphasis on reporting	The Paris Agreement works on a 5-year cycle of increasingly ambitious climate action. It requires countries to submit new “Nationally Determined Contributions” (NDCs) every five years, with reporting required every two years. A global stock take is carried out in line with each round of NDCs. This process will help the international community keep track of progress as well as keep climate change on government agendas.	Another criticism of the Aichi Targets was that countries failed to set effective national targets that aligned with the global goals. In learning from the past, the post-2020 Global Biodiversity Framework could take inspiration from the Paris Agreement approach to enable more effective adoption and implementation from countries.
The need to engage the private sector and financial community	COP21 in Paris was the first time non-state actors played a major role at climate summits, the private sector was more active than ever before. Productive dialogues were held between policy makers and the private sector, and importantly investors came armed with billions of dollars in financial commitments. This led to alignment between business representatives and policy makers and inclusion of the private sector in the Paris Agreement.	The private sector has the ability to act fast and at scale and we need that same level of commitment to tackle biodiversity loss. Inadequate investment was also considered another failure in delivering the Aichi Targets. This time around we need to mobilize capital beyond traditional sources, and catalyze private sector capital to support the new global goals.

Source: Citi Global Insights

1.10 A Critical Decade of Action

Put simply, we need to halt and reverse the decline of biodiversity. Scientists are calling for the need to “bend the curve” on biodiversity loss, as it is not only important to stop biodiversity loss but also to reverse and restore it.

A conservation goal of 30 x 30 (protecting 30% of global land and oceans by 2030) is certainly needed, but in order to achieve the vision set out by the Convention on Biological Diversity we need to address the drivers of biodiversity loss. This is expected to be addressed at the Biodiversity COP later this year.

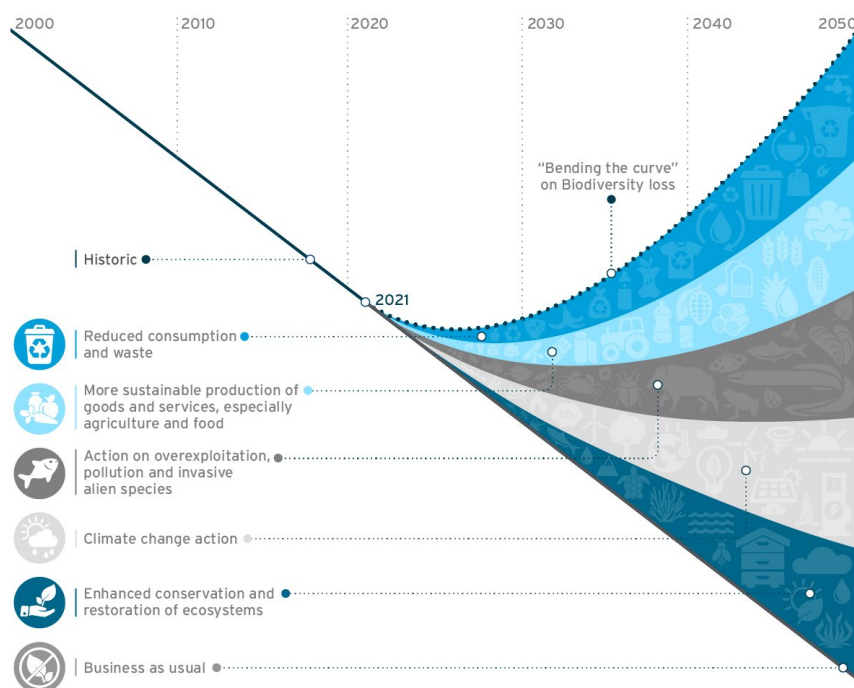
The CBD's latest Global Biodiversity Outlook identified a portfolio of actions that emphasizes that individual actions can decrease the rate of biodiversity loss, but a full set of actions are required to stop and reverse the decline. Increased conservation efforts plus more sustainable production and consumption, as well as climate action. Specific actions will have to take into consideration local conditions and contexts, and there is no single prescribed pathway, but Figure 17 shows what needs to happen simultaneously at the global level where action in one area can also help to reduce barriers in tackling other areas. Other studies have also emphasized the importance of an integrated strategy to tackling biodiversity loss, and through scenario analysis have found conservation efforts and transformational change of the food system to be integral for an effective post-2020 biodiversity strategy.⁴⁸ The IPCC highlights that sustainable land management can contribute to reducing the negative impacts of multiple stressors, including climate change, on ecosystems and societies.⁴⁹

⁴⁷ “[Embracing a Global Goal for Nature](#),” World Business Council for Sustainable Development, April 30, 2021.

⁴⁸ David Leclère et al., “Bending the curve of terrestrial biodiversity needs an integrated strategy,” *Nature* 585, no. 7826 (September 10, 2020):551-556..

⁴⁹ IPCC, 2019: Summary for Policymakers. In: *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems* [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.- O. Pörtner, D. C. Roberts,

Figure 17. Actions Needed to “Bend the Curve” on Biodiversity Loss



Source: Citi Research and Global Insights, adapted from CBD Global Biodiversity Outlook 5

A critical action that is required across stakeholders is the need to shift financing away from harmful activities responsible for driving biodiversity loss and other negative impacts. We also need to direct capital towards activities that are restorative and regenerative to nature. Annual government spending on subsidies that harm nature are up to six times higher than spending on conservation.⁵⁰

Studies have also shown that prevention is better than cure — it is less costly to conserve nature than to restore it. One study shows an estimated \$140 billion in annual investment is needed to protect 30% of the planet's land and oceans, whereas current investments in protected areas add up to just over \$24 billion.⁵¹ The same study also found that the economic benefits outweigh the costs by at least five to one. If we consider broader actions that are needed, a biodiversity financing gap of \$598 billion to \$824 billion per year has been identified.⁵² Opportunities exist for private investment to help close the funding gap, possibly through blended finance mechanisms where public entities can help reduce the risks. Investors will play a key role in redirecting global financial flows away from harmful activities to more nature-positive solutions; we explore this in more detail in Chapter 4.

P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)). In press. [Page 12]

⁵⁰ OECD (2020) A Comprehensive Overview of Global Biodiversity Finance

⁵¹ [“Economic Benefits of Protecting 30% of Planet's Land and Ocean Outweigh the Costs at Least 5-to-1,”](#) Campaign for Nature, July 8, 2020.

⁵² Deutz, A., Heal, G. M., Niu, R., Swanson, E., Townshend, T., Zhu, L., Delmar, A., Meghji, A., Sethi, S. A., and Tobin-de la Puente, J. 2020. Financing Nature: Closing the global biodiversity financing gap. The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability.

This chapter highlights that the biodiversity crisis is as urgent as the climate crisis. The awareness of biodiversity loss is at the level we were at around five years ago on climate change and will be one of the decades' immense challenges. We cannot continue to exploit the natural world without placing a value on externalities and not expect any consequences. Decreasing biodiversity is undermining the health of our societies and economies and needs to be addressed with the same immediacy as climate change.

The Dasgupta Review regards biodiversity loss as a portfolio management problem and describes us all as asset managers. The loss of biodiversity is material financially and poses a risk to companies that depend directly on nature and is also a risk to those companies that can be held responsible for the destruction of nature. Earth system scientists, studying planetary boundaries, believe the window for opportunity is still open and investing in nature-based solutions can help tackle climate change and halt biodiversity loss. This is a critical decade of action and our economic development can no longer continue at the expense of the natural world without a recognition of its true value.

The next chapter takes a closer look at deforestation, one of the biggest drivers of biodiversity loss, and the trade of forest-risk commodities.

Chapter 2: Deforestation and Forest Degradation

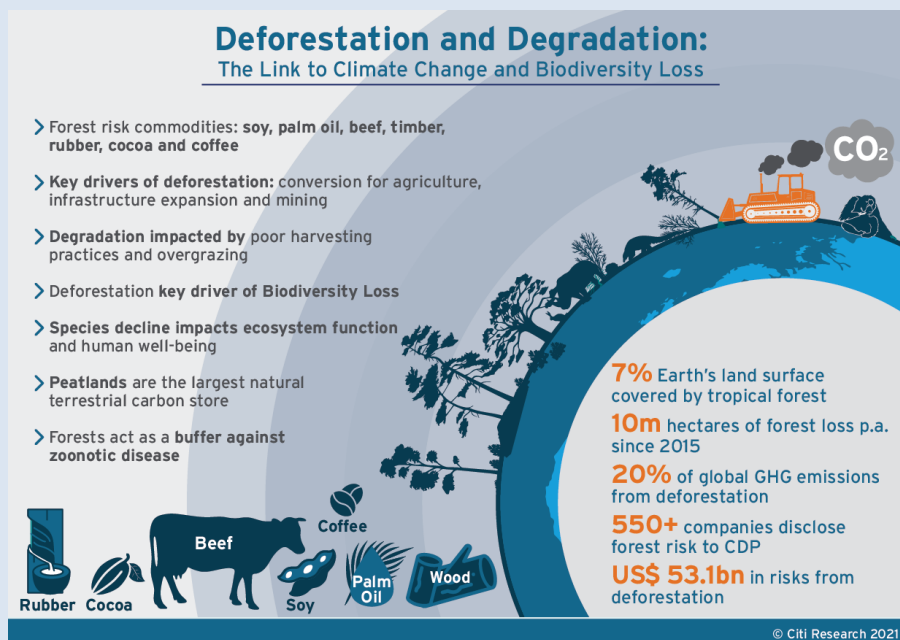
“Destroying rainforest for economic gain is like burning a Renaissance painting to cook a meal.” --E.O. Wilson

In this report, we will investigate deforestation and forest degradation, the main cause of which is unsustainable and illegal forest conversion for agriculture. Tackling deforestation is vital because the continued deforestation and degradation of the world's remaining intact tropical forests for the conversion to agricultural land is not only a significant contributor to global greenhouse emissions it is also a major cause of ecosystem degradation and resultant ecological loss.

Forests cover approximately one third of the world's land area and deliver numerous benefits to society including the purification of water and air, climate regulation, disaster resilience and disease control. They play a vital role in the global carbon cycle, and sequester and store large amounts of carbon, which makes them critical in tackling climate change. Forests also provide livelihoods to millions of people around the world, and are home to 80% of the world's terrestrial biodiversity.⁵³

Deforestation and Degradation

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) describes deforestation as human-induced conversion of forested land to non-forested land, which can be permanent.⁵⁴ Forest degradation refers to a decline in the density and health of trees, thereby reducing a forest's ability to function and support people and wildlife. The land use remains the same and changes are often temporary. Forest degradation, in terms of land area, is a bigger problem than deforestation. Most forest degradation takes place in temperate regions, and the three major drivers are forest logging, agriculture shifts, and wildfires⁵⁵. Forest loss is often used as an umbrella term for deforestation and forest degradation.



⁵³ “[Forests: Our work](#),” International Union for Conservation of Nature, 2021.

⁵⁴ “[Glossary: Deforestation](#),” Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, accessed July 27, 2021.

⁵⁵ Philip G. Curtis et al., “Classifying drivers of global forest loss,” *Science* 361, no. 6407 (September 14, 2018): 1108-1111.

Between 2015 and 2020, the rate of forest loss was estimated at 10 million hectares per year, and as we highlighted in Chapter 1, if tropical deforestation were a country it would rank third in CO₂-equivalent emissions averaging 4.8 gigatons per year.⁵⁶ Accelerating ambition by corporates and investors to tackle climate change make understanding deforestation risk pertinent to achieving goals to reduce greenhouse gas (GHG) emissions. As it is also a key driver of biodiversity loss, corporates and investors should consider deforestation risk in the context of both climate change and biodiversity loss. This means that taking action on deforestation can work towards the achievement of multiple goals at once.

2.1 Types of Forest

There are three main types of forest — temperate, boreal, and tropical. Temperate forests are found across North America, Europe, and East Asia, whereas boreal forests stretch across Siberia, Scandinavia, and North America, and play an important role in removing CO₂ from the atmosphere. For this report, we pay special attention to tropical rainforests, which are found near the equator and harbor some of the world's most diverse and important ecosystems that are also the most threatened. We are losing this highly valuable “natural asset” at alarming rates — 95% of deforestation takes place in the tropics, and in 2019, a football pitch of primary rainforest was lost every six seconds.⁵⁷ Recent studies have found that tropical forests are losing their ability to absorb carbon, and that the Brazilian Amazon has actually released more carbon over the past 10 years than it has absorbed.⁵⁸

Agriculture is the biggest driver of deforestation and degradation; estimates vary on the exact share, but range from 60-80%. It is destroying precious habitats and biodiversity, impacting local livelihoods, and contributing to climate change. According to Forest Trends, half of all global tropical deforestation is the result of illegal conversion of forests to industrial farming.⁵⁹ This is a major issue that not only drives environmental damage but can lead to significant economic losses, such as a direct loss of revenue. In addition to agriculture, other drivers of deforestation include extractive industries such as mining, as well as wildfires and infrastructure expansion.

⁵⁶ “[The State of the World's Forests 2020](#),” Food and Agricultural Organization of the United Nations, accessed July 27, 2021; David Gibbs, Nancy Harris, and Frances Seymour, “[By the Numbers: The Value of Tropical Forests in the Climate Change Equation](#),” World Resources Institute, October 4, 2018

⁵⁷ Mikaela Weisse and Elizabeth Dow Goldman, “[We Lost a Football Pitch of Primary Rainforest Every 6 Seconds in 2019](#),” World Resources Institute, June 2, 2020.

⁵⁸ Wannes Hubau et al., “Asynchronous carbon sink saturation in African and Amazonian tropical forests,” *Nature* 579, no. 7797 (March 4, 2020): 80-87; Yuanwei Qin et al., “Carbon loss from forest degradation exceeds that from deforestation in the Brazilian Amazon,” *Nature Climate Change* 11 (May 2021): 442-448.

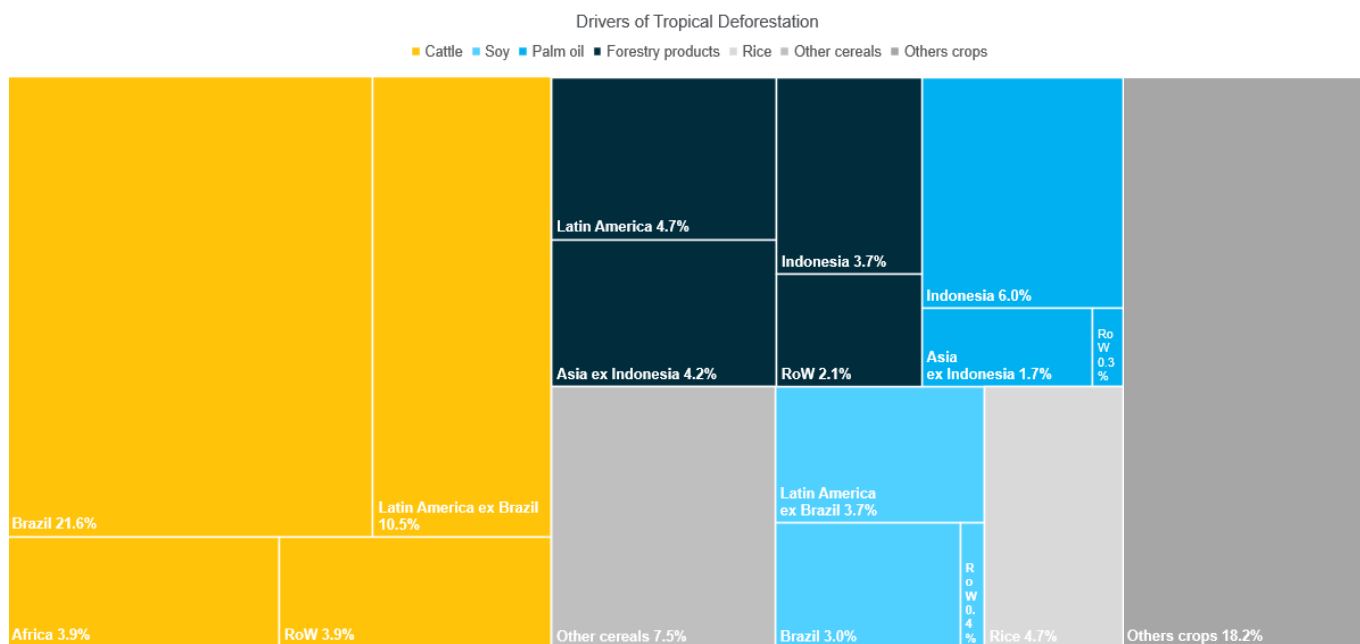
⁵⁹ Forest Trends, “[The Economic Impacts of Illegal Agro-Conversion on Tropical Forest Countries](#),” Forest Trends Information Brief, June 2018.

2.2 Commodity-driven Deforestation

We now take a deep dive into agricultural commodity driven deforestation to understand which commodities are responsible and what are the drivers. This will allow us to identify which countries and industries we need to direct our efforts in order to tackle the problem. There are a few key commodities and regions that can make a difference. Four key products drive almost three-quarters of tropical deforestation: beef, soybeans, palm oil, and forestry products, and two key countries, Brazil and Indonesia, account for almost half of all deforestation.⁶⁰

As we can see from Figure 18, in Brazil cattle ranching is the biggest driver of deforestation, and in Indonesia, it is palm oil and forestry products. However, supply chains are often complex and the link between commodity-driven deforestation and the products they end up in are difficult to track and often hidden. We explore in more detail the use of commodities across industries in the following chapter where we focus on nature and business, but for this section we unpack which countries are responsible and which countries are at risk.

Figure 18. Drivers of Tropical Deforestation



Note: For 2005-2013 where the tropics lost an average of 5 million to 6 million hectares of forest per year to agricultural production.
Source: Citi Global Insights, data from Pendrill et al. (2019)

⁶⁰ Florence Pendrill et al., "Deforestation displaced: trade in forest-risk commodities and the prospects for a global forest transition," *Environmental Research Letters* 14 055003 (2019).

2.3 Net Importers and Net Exporters of Deforestation

Similar to analysis of trade weighted carbon emissions, there are also net importers and net exporters of deforestation. Pendrill et al. (2019) found that deforestation is mainly driven by domestic demand and 26% of embodied deforestation (i.e., the deforestation associated with producing a good or commodity) is exported but there are large variations between commodities and countries.⁶¹ For example, >60% of palm oil and soybeans from forest-risk countries (i.e., countries with high deforestation) are exported. The authors also report that the bulk of embodied deforestation (87%) was exported to countries that are either increasing forest cover or decreasing their deforestation rates, especially across Europe and Asia. This could suggest that importing countries are driving tropical deforestation and reforesting domestically. Worryingly, international trade in forest-risk commodities (e.g., soybeans and palm oil) is on the rise, and likely to drive further loss of habitats and biodiversity if no action is taken.

The consumption and use of these goods in consuming countries, often thousands of miles away from where the product was grown, are rarely linked to the degradation or destruction of nature in the country of origination. However, a study by Pendrill et al. (2019) found that China, India, Russia, and the United States together account for about a third of total imported deforestation, with China alone making up 14% (Figure 17). The EU as a whole is also a leading importer of embodied deforestation, due to limited production of forest-risk commodities, high consumption levels as well as substantial food and feed industries.⁶²

Additional studies have found that richer nations are increasingly responsible for embodied biodiversity loss through trade, and argue that they should be held accountable for their impacts.⁶³ Deforestation is also a major contributor to climate change, and it has been reported that 29-39% of deforestation-related emissions were driven by international trade, and that about one-sixth of the carbon footprint of the average EU diet can be linked directly to tropical deforestation.⁶⁴ This all demonstrates the importance of assessing embodied carbon and biodiversity loss in trade, and the need to incorporate sustainability provisions in international trade agreements.

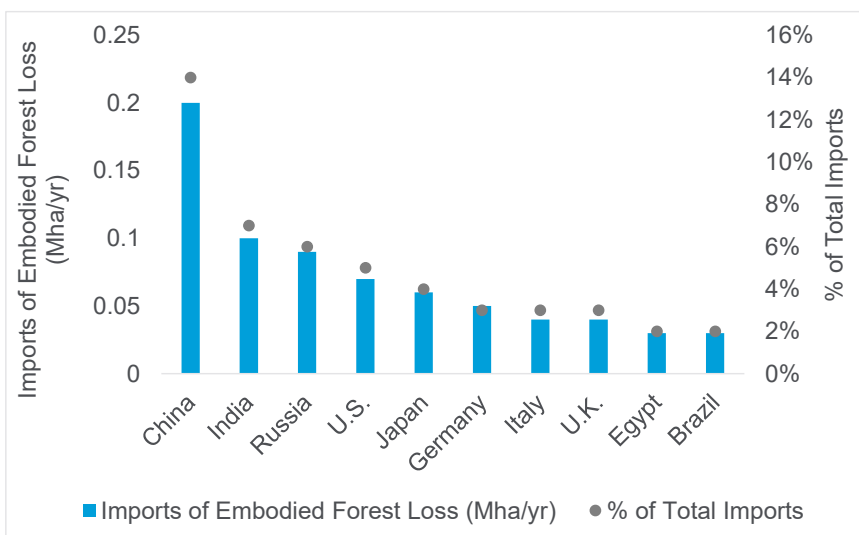
⁶¹ Pendrill et al., “Deforestation displaced.”

⁶² Simon L. Bager, S. L., U. Martin Persson, and Tiago N. P. dos Reis, “Eighty-six EU policy options for reducing imported deforestation,” *One Earth* 4, no. 2 (2021): 289-306.

⁶³ Alexandra Marques et al., “Increasing impacts of land-use on biodiversity and carbon sequestration driven by population and economic growth,” *Nature Ecology & Evolution* 3, no. 4 (April 2019): 628-637; “High time to invest in biodiversity,” *Nature Ecology & Evolution* 5, no. 263 (March 2021).

⁶⁴ Florence Pendrill et al., “Agricultural and forestry trade drives large share of tropical deforestation emissions,” *Global Environmental Change* 56 (May 2019): 1-10.

Figure 19. Top 10 Importers of Embodied Forest Loss



Source: Citi Global Insights, Data from Pendrill et al. (2019)

2.4 Assessing Trade of Forest-risk Commodities

Another way of assessing trade of forest-risk commodities is to consider the economic value of the commodities which may be at risk as awareness on the negative impacts of their production grows. Thirty-two forest-risk countries were identified by Forest 500 as having the largest remaining areas of tropical forest that are simultaneously losing high volumes of forest.⁶⁵ These identified forest-risk countries are all developing and emerging economies, who are in general more dependent on commodities than advanced economies.

The UN reports that 67% of developing countries are dependent on commodities (more than 60% of export earnings come from commodities) and urges these nations to diversify their exports.⁶⁶ However, it is important to recognize the contribution these commodities make to economic growth and development across many of these countries. For example, in 2018 soybean was the most valuable export commodity in Brazil worth \$34 billion.⁶⁷

We can see from Figure 20 that there are hotspots of trade flows of forest-risk countries — for example soybean and beef export from Brazil, Paraguay, and Argentina; palm oil from Indonesia and Malaysia; and timber and rubber from many South East Asian countries. The total export value of the 10 identified commodities from the 32 forest-risk countries comes to \$193 billion, and \$144 billion if we just consider the export value of the key drivers of deforestation identified for each country.

To put this into context, we calculated the percentage of global trade (in economic value) of each commodity that comes from the 32 forest-risk countries. We found that roughly 90% of palm oil and rubber, and 80% of sugarcane and coffee come from forest-risk countries. However, it is important to note that not all production in

⁶⁵ Global Canopy. 2021. The Forest 500: 2020 Company Assessment Methodology. Global Canopy, Oxford, UK.

⁶⁶ “[Commodity-dependent countries urged to diversify exports](#),” United Nations Conference on Trade and Development, April 16, 2019.

⁶⁷ Chatham House Resource Trade Database on resource.trade.earth.

these countries will have come from deforestation, and some of these countries are putting policies in place to protect forests. Indonesia, for example, has a permanent ban on issuing new permits to clear primary forests, and a moratorium on new oil palm plantations (although there is evidence that shows it is not working and environmentalists question the efficacy and governance of these orders).

One key issue to tackling commodity-driven deforestation is transparency but we are now seeing more tools like Trase emerge that are starting to link deforestation in specific locations to commodity production, supply chains, and consumers. These new tools and data can help increase overall transparency on agricultural supply chains and shine a light on current unsustainable practices.

Figure 20. Value of Trade Flows in 2018 for Key Commodities from Forest-risk Countries (\$mn)

Country	Region	Important FRC Drivers of Deforestation	Soy	Palm	Beef	Leather	Pulp	Timber	Rubber	Sugar-cane	Coffee	Cocoa	Deforested Area 2010-2018 (canopy cover >30%) (Million ha)
Brazil	Latin America	Timber, Cattle, Soy, Palm	41,669	38	6,198	1,740	10,429	2,716	2	5,721	4,616	3	27,239
Paraguay	Latin America	Timber, Cattle, Soy	3,749	1	1,161	92	2	78	0	42	0	0	3,292
Argentina	Latin America	Cattle, Soy	13,521	7	2,210	824	166	114	2	24	1	1	2,826
Mexico	Latin America	Timber, Cattle, Soy, Palm	31	2	1,305	383	1	197	4	469	365	2	1,956
Bolivia	Latin America	Timber, Cattle, Soy	845	1	7	20	0	56	0	3	10	1	2,894
Colombia	Latin America	Timber, Cattle, Soy, Palm	34	570	80	63	1	68	5	133	2,368	19	2,165
Honduras	Latin America	Timber, Cattle, Palm	0	398	15	1	1	41	0	58	1,091	2	660
Nicaragua	Latin America	Timber, Cattle, Palm	0	30	508	10	0	8	1	136	441	8	870
Ecuador	Latin America	Timber, Cattle, Palm	0	223	0	15	8	356	1	2	15	709	415
Guatemala	Latin America	Timber, Cattle	11	528	7	6	0	48	154	293	726	1	685
Venezuela	Latin America	Timber, Cattle	0	2	0	18	36	28	0	0	6	27	995
Peru	Latin America	Timber, Cattle, Soy, Palm	0	56	0	8	0	123	0	11	737	166	1,870
India	Asia	Timber, Cattle, Soy, Palm	1,047	19	3,121	561	7	186	23	80	567	0	1,068
Indonesia	Asia	Timber, Palm	32	19,431	1	59	3,433	3,612	4,535	0	877	98	14,805
Thailand	Asia	Timber, Soy, Palm	82	368	2	649	378	2,593	4,684	1,685	7	0	1,189
Viet Nam	Asia	Timber, Soy	70	21	4	417	1,433	1,069	1,058	8	3,050	4	1,919
Malaysia	Asia	Timber, Palm	168	10,428	10	7	49	3,003	1,134	0	3	230	4,442
Philippines	Asia	Timber, Palm	0	36	0	3	119	213	101	64	0	8	737
Myanmar	Asia	Timber, Palm	1	2	11	2	0	208	238	260	3	0	2,387
Lao PDR	Asia	Timber, Cattle, Soy	1	0	2	0	126	267	278	31	106	0	2,212
Cambodia	Asia	Timber, Cattle, Palm	22	30	0	4	0	201	270	24	0	0	1,524
Côte d'Ivoire	Sub-Saharan Africa	Timber, Cattle, Palm	1	202	0	0	0	154	1,060	0	125	3,736	1,891
South Africa	Sub-Saharan Africa	Cattle, Soy	138	40	146	172	1,135	281	1	240	7	0	644
Cameroon	Sub-Saharan Africa	Timber, Cattle, Palm	0	3	0	0	1	790	50	0	37	518	907
Nigeria	Sub-Saharan Africa	Timber, Palm	39	33	0	6	1	408	68	0	0	476	638
DR Congo	Sub-Saharan Africa	Timber, Soy, Palm	0	7	0	0	0	70	1	0	18	20	9,281
Madagascar	Sub-Saharan Africa	Timber, Cattle	0	0	0	1	0	7	0	6	1	28	2,676
Angola	Sub-Saharan Africa	Timber, Soy, Palm	0	0	0	0	2	169	0	1	1	0	1,819
Tanzania	Sub-Saharan Africa	Timber, Cattle	9	1	0	2	0	30	0	0	154	25	1,442
Liberia	Sub-Saharan Africa	Timber, Palm	1	13	0	0	0	51	124	0	1	19	1,209
Zambia	Sub-Saharan Africa	Timber, Cattle, Soy	73	0	0	1	0	65	0	68	5	0	1,099
Guinea	Sub-Saharan Africa	Timber, Palm	0	2	0	0	0	3	26	0	15	16	1,139
Total export value commodity group (Million USD)			61,545	32,491	14,791	5,065	17,329	17,212	13,821	9,358	15,353	6,117	
Total value of global trade (Million USD)			101295.734	37122.116	53304.15	19607.716	54165.444	105103.65	14857.54	11955.272	19704.68	9653.99	
% of global trade that is from "Forest risk 32"			61%	88%	28%	26%	32%	16%	93%	78%	78%	63%	

Note: Thirty-two countries accounted for 88% of tropical deforestation in 2010-18.

Source: Citi Global Insights, Chatham House Resource Trade Database, Forest500, Pendrill et al. (2019)

Committing to zero deforestation is a key step to tackling biodiversity loss, and commodity-driven deforestation is an area where companies and investors make a huge impact. They have the power and ability to improve the sustainability of how commodities are produced, traded, and consumed, and we explore this in more detail in the following chapters. Of course, deforestation is not the only issue that needs addressing. Other types of land and sea use change, as well as other drivers of biodiversity loss — direct exploitation, climate change, pollution, and invasive species — all require action. We now turn our focus to corporates in the next chapter and discuss nature-related risks for business, as well as take a closer look at sector exposure to dependencies and impacts on nature.

Chapter 3: Why Corporates Should Consider Impact of Biodiversity Loss

3.1 Introduction

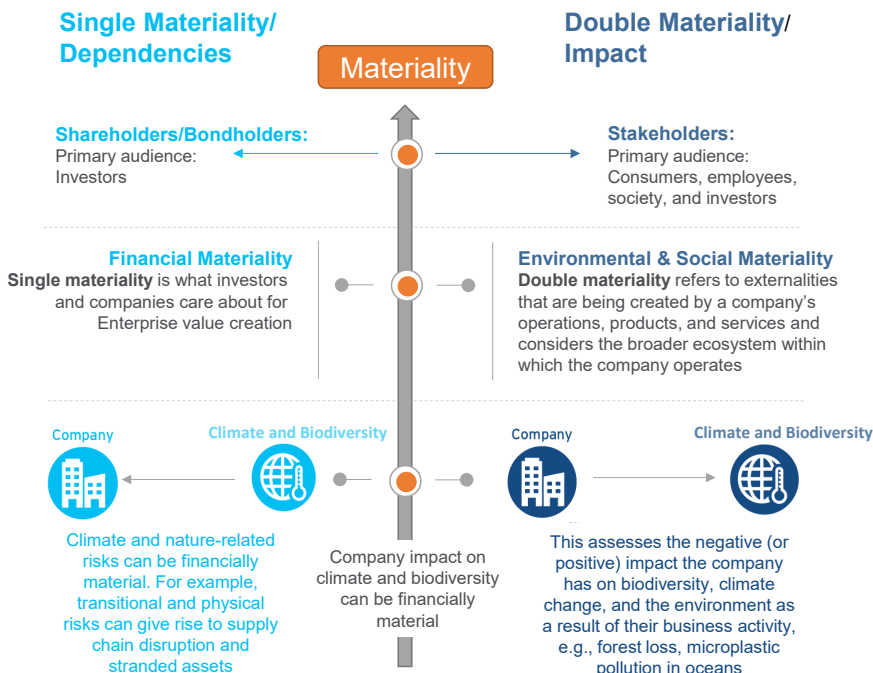
"In the last 30 years we have become increasingly estranged from the natural and wild world of our ancestors and, as a result, we are in danger of losing it. What I want is to make people bioliterate the way our ancestors were. People should be able to walk into their backyards and say, 'that's a cicada, that's a tree frog, and that's a bird.' Then, when they hear a bird scream, 'get out of my territory, get out of my territory,' I want them to recognize the cadence and remember that Beethoven put it in a symphony."

--Daniel H. Janzen, *Where the Wild Things...Must Stay*

Most businesses today have a two-way relationship with nature — on the one hand their core operations or supply chains may have direct and indirect impacts on nature and biodiversity itself, while on the other hand they might depend directly on biodiversity or on ecosystem services that nature provides as key inputs for their products.⁶⁸ In other words, businesses are inherently reliant on nature to produce their products and services; however, they also have a direct or indirect impact on nature that could in the end affect their business. There is growing acceptance of double materiality, and it is not just sustainability-related impacts on the company that can be material, but also the impacts of a company on the environment, economy and society (see Figure 21).

As we mentioned in Chapter 1, the World Economic Forum (WEF) estimates that a staggering \$44 trillion of economic value generation has some dependency on nature and its services, and is therefore exposed to the loss of nature or biodiversity in one way or another.⁶⁹ Again, it is worth emphasizing how difficult it is to put a value on nature, but these estimates can help to demonstrate our complete dependence on nature.

Figure 21. Single and Double Materiality: Reporting to Shareholders and Stakeholders



Source: Citi Research

⁶⁸ The Economics of Ecosystems and Biodiversity (TEEB), *The Economics of Ecosystems and Biodiversity in Business and Enterprise*, 2012

⁶⁹ World Economic Forum in collaboration with PwC, *Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy*, 2020.

Businesses rely on nature for many resources such as food, fiber, and minerals. They also rely on ecosystem services such as water resources, crop pollination, and climate regulation. Direct impacts from businesses on nature include changes to land use, waste generation, habitat loss and degradation, species loss, air, water, and land pollution, and the introduction of non-native species, which may occur due to business operations. Even though these impacts are complex they are easier to identify and calculate, as a business has direct control over the operations that is impacting nature. There are, however, indirect impacts resulting from the actions of others, such as suppliers, which can occur in a different place or time. These are often unpredictable and difficult to identify or manage. There could also be cumulative impacts that arise, for example, from the operations of several companies in close proximity to each other and collectively affect biodiversity and nature.⁷⁰ Drawing parallels to climate change, we could consider business impacts on nature in terms of Scope 1, 2, and 3. Scope 1 refers to direct impacts on nature from business operations; Scope 2, to cumulative impacts; and Scope 3 to the indirect impacts from suppliers and others along the supply chain.

3.2 Risks to Business

It is becoming more obvious that businesses need to start analyzing their dependencies and impacts on nature and biodiversity, as these could create a financially “material risk” to the profitability of a business and its shareholders. It is also the right thing to do, and could impact their social license to operate.

Many publications have grouped biodiversity-related risks to businesses into classifications that, each with their own categorization, however they essentially boil down into five main categories:

1. Physical risks
2. Liability risks
3. Reputational risk
4. Regulatory risks
5. Financial/Market risks

We discuss these in more detail below:

Physical Risks

Physical risks relate to the risks to businesses that are fundamentally dependent on nature for their operation. For example, habitat loss, increased use of harmful chemicals, and invasive species are driving a decline in bees and other pollinators, which has serious implications for food production and supply chains. Pollinated crops include those that provide vegetables, fruits, oils, nuts, and seed. According to IPBES, between \$235 billion and \$577 billion of annual food production relies directly on pollinators.⁷¹

⁷⁰ “[The Relationship of Business to Biodiversity](#),” International Finance Corporation, accessed July 27, 2021.

⁷¹ IPBES (2016). The assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production. S.G. Potts, V. L. Imperatriz-Fonseca, and H. T. Ngo (eds). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany

Another example is the destruction of mangroves, which is impacting coastal resilience, water quality, and fisheries worldwide. Other physical risks include the scarcity of natural resources which could increase the overall cost of resources.

For example the destruction of rainforests could lead to changing patterns of local rainfall, which could impact water availability and have an adverse impact on the production of raw materials for many industries, including cotton, food production, and mining. This could not only increase the costs of operations but can also disrupt supply chains.⁷²

Liability, Reputational, and Regulatory Risks

Businesses can also face liability risks with regards to their impacts on nature and biodiversity. A recent example is the 2010 BP Deepwater Oil Spill case that cost the company an eye-watering \$65 billion in liability-related costs. This event also had a negative impact on the reputation of the company. Policymakers are increasingly scaling up policy action on biodiversity, and if businesses do not respond in a timely manner or are caught out of compliance, then this can also lead to liability and reputational risks. If a company is associated with adverse impacts on nature and biodiversity, this could result in restrictions to its social license to operate by regulators, affecting its operations and reputation. These three risks are all interlinked; however, they can also occur independently from each other.

Financial Risks

A report on the financial materiality of biodiversity loss quantifies monetary worth in three ways: (1) by the cost to restore biodiversity once it has been degraded; (2) by the volume of biodiversity finance that is available; and (3) by identifying which industries are dependent on nature and totaling the economic output of these industries.⁷³

Financial risks to businesses include insurance risks, which are linked to increases in insurance premiums and claims as a result of biodiversity loss or its consequences. Other financially-material risks are linked to food security and scientists estimate that of the 100 crop species that provide 90% of the world's food, over 70 are pollinated by bees.⁷⁴

A recent investor survey carried out by Responsible Investor found that investors are becoming increasingly concerned about biodiversity, with 84% of respondents very concerned about biodiversity loss; however, this is not yet reflected in their actions and 91% of respondents do not have measurable biodiversity-linked targets.⁷⁵ We expect investor action to gather pace over the next few years, and corporates need to be prepared or could risk losing access to cheap capital. We discuss the role of the financial sector, and specifically investors and asset owners, in the following chapter.

⁷² OECD (2019), Biodiversity: Finance and the Economic and Business Case for Action, report prepared for the G7 Environment Ministers' Meeting, 5-6 May 2019.

⁷³ University of Cambridge Institute for Sustainability Leadership (CISL 2020).

Biodiversity Loss and Land Degradation: An Overview of the Financial Materiality.

⁷⁴ van der Slujs, J.P., Vaage, N.S. Pollinators and Global Food Security: the Need for Holistic Global Stewardship. *Food ethics* 1, 75-91.

⁷⁵ Responsible Investor and Credit Suisse, [Unearthing investor action on biodiversity](#), 2021.

Companies are waking up to the prospect that biodiversity and nature more broadly matter to their business, and are starting to understand the risks. There are certainly trail blazers in the corporate world who have been aware of the issue and have been taking action for years, but the majority of companies are still at the beginning of their biodiversity journey.

A recent KPMG survey found that less than a quarter of businesses exposed to nature risks are measuring and disclosing them.⁷⁶ However, before companies can measure, track, and disclose on the right metrics, a key first step for any business is to understand their nature-related dependencies and impact. This may not be an easy undertaking and could require companies some time and effort to collect and collate all the relevant data on their operations and supply chains.

Most companies will have had some experience mainstreaming climate action into their strategy and operations, but biodiversity-related issues and metrics present their own unique set of challenges. As we highlighted in Chapter 1, the drivers of biodiversity loss and nature loss more broadly are many and diverse, and there are no clear metrics such as energy efficiency and CO₂ emissions to focus on like for climate change. Also, while action for climate change can take place anywhere, the drivers and impacts of nature loss are very location specific.

This means that businesses need to consider spatially-explicit data — such as on the location of operations and sourcing of commodities — in their assessments, which may prove challenging for companies with complex supply chains, which is often the case. The location specificity of nature-related issues may make it more challenging for corporates, but on the flip side, it also means that they can identify key locations and activities to take action in order to make the greatest impact. This also applies more broadly at the sector level where we can evaluate which industries have the greatest dependencies and impact on nature, and where action should be prioritized.

Market Risks

Consumers are becoming more aware about biodiversity and environmental issues in general. The Union for Ethical BioTrade (UEBT) Biodiversity Barometer found that 62% of consumers it surveyed buy products from companies that they know respect biodiversity and people. Three-quarters (76%) of respondents stated that they believe that they can have a positive impact on society by buying from companies that respect biodiversity and people. Consumer preferences are changing and there is growing awareness of our impacts on biodiversity. Some regard this as the “Blue Planet effect” following the airing of a BBC program that is credited with raising global awareness of plastic pollution and galvanizing action from individuals, governments, and businesses around the world. The BBC *Blue Planet II* documentary came at a serendipitous moment to achieve maximum impact, as global awareness of sustainability and environmental issues had reached unprecedented levels. This is important for businesses as changes in consumer preferences towards products that have reduced biodiversity impacts can create a material risk to a business if it does not account for and solve its direct and indirect impacts on nature.

⁷⁶ KPMG, [The Time has Come: The KPMG Survey of Sustainability Reporting 2020](#), 2020.

3.3 Sector Dependencies and Impacts on Biodiversity

A seminal study carried out by the World Economic Forum and PwC in 2020 mapped out the dependencies of economic activities to nature. The headline statistic of \$44 trillion of economic value generation that is moderately or highly dependent on nature, referenced earlier, is now widely used to emphasize the importance of nature to business and the economy. However, we think the granular industry breakdowns are even more insightful.

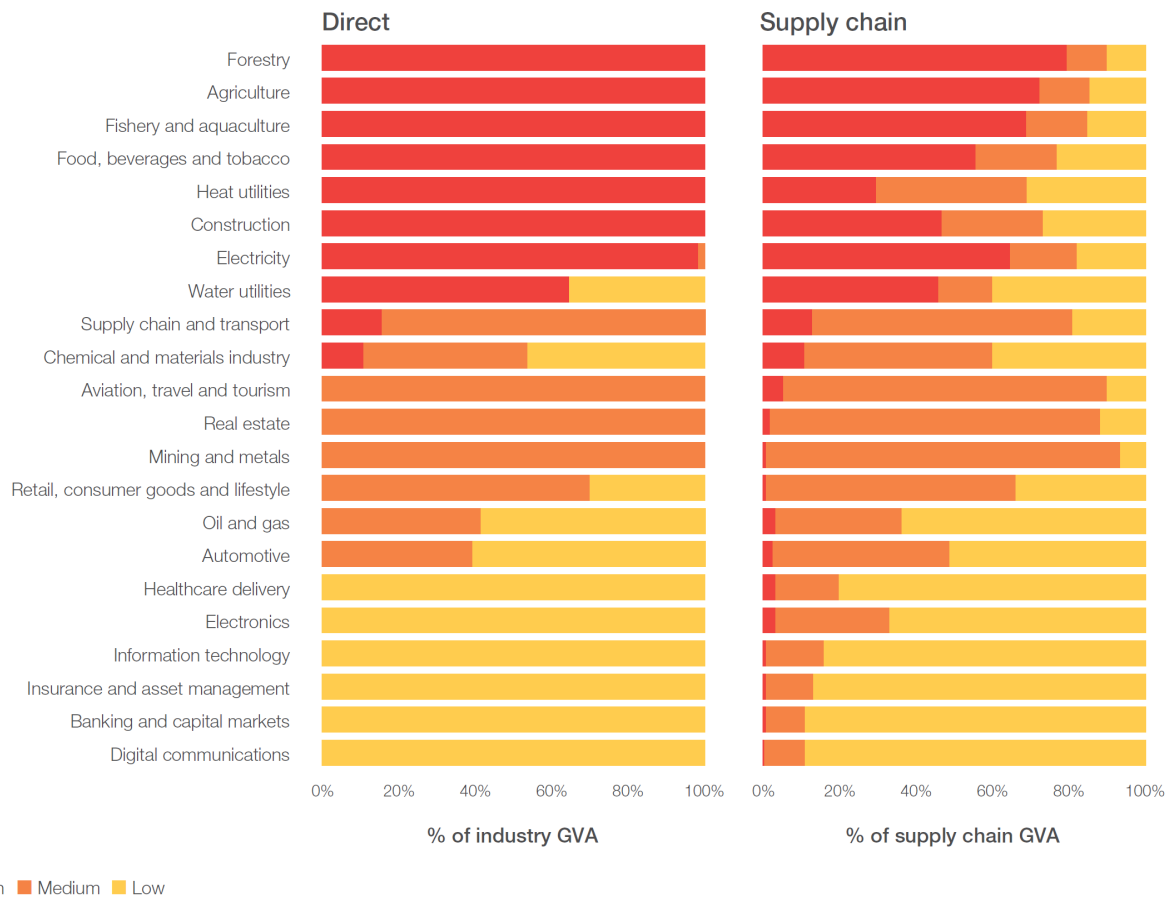
The study doesn't tag what the dependencies on nature are for each sector but it does reveal which sectors are most exposed, both as primary industries as well through their supply chains (Figure 22).

Apart from the direct dependencies on nature, the report also found that for six industries:

1. Real Estate
2. Mining and Metals
3. Chemicals and Materials
4. Supply Chain and Transport
5. Retail, Consumer Goods, and Lifestyle
6. Aviation, Travel, and Tourism

less than 15% of their direct Gross Value Added (GVA) are highly dependent on nature but more than 50% of their supply chain GVA is highly or moderately dependent on nature. This shows the importance of evaluating dependencies across supply chains as the implications of nature loss could be indirect and hidden but significant to value generation.

Figure 22. Percentage of Direct and Supply Chain CGA with High, Medium, and Low Nature Dependency, by Industry



Source: WEF

If all the ecosystem services provided by nature shown in Figure 4 in Chapter 1 are considered, then we could argue that all businesses depend on nature directly and indirectly, but benefits like the regulating services (e.g., water purification, air regulation, and flood and storm protection) are indeed difficult to capture. Production inputs from nature are more straightforward to grasp such as the use of energy, water, land, and raw materials.

Dependencies on nature can also be linked to impact on nature which can be positive or negative. For example, agribusinesses depend on inputs such as land and water, but how they use and manage their practices will have impacts on local ecosystems and beyond. The five key drivers of nature loss identified by the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) — land/sea use change, direct exploitation, climate change, pollution, and invasive species (Figure 12) — can also be applied to sectors.



The Science Based Targets Network (SBTN), a coalition of organizations that aims to develop science-based targets for nature, has mapped GICS sub-industries to these issue areas in its sector-level materiality assessment which currently considers upstream and operations.⁷⁷

⁷⁷ Science Based Targets Network, Science-Based Targets for Nature: Initial Guidance for Business, September 2020. Outputs from sector-level matrix uses data from ENCORE, which is a decision support tool from the UN Environment Programme World

The mapping is quite extensive and covers 140 sub-industries which we have summarized for the main GICS sectors and selected industry groups in Figure 23.⁷⁸ Five levels of impact are considered ranging from 1-very low to 5-very high, and the data is derived from materiality ratings of company impact from the [ENCORE](#) platform.

Figure 23. Mapping of Sector and Industry Group to Key Pressures on Nature Loss

Sector	Industry group	Land/ Water/ Sea Use Change			Resource Exploitation	Climate Change	Pollution				Invasives and Other
		Terrestrial ecosystem use	Freshwater ecosystem use	Marine ecosystem use	Water use	GHGs emissions	Non-GHG air pollutants	Water pollutants	Soil pollutants	Solid waste	Disturbance
Energy and Utilities		3 4	3 4	4	4 3	5 3	3 3	3 3	3 3	3 4	4 4
Materials		4 1	3 4	3 4	4 4	5 5	3 4	3 3	3 5	3 3	3 4
Industrials		3 3	3 4	3 2	3 3	5 4	3 4	3 4	3 3	3 4	3 4
Consumer Discretionary	Automobiles & components	3	3	3	3 4	5 4	3 5	3 5	3 5	3 4	3 4
	Consumer Durables & Apparel	3 1	3 4	3	3 4	5 4	3 4	3 4	3 4	3 4	3 4
	Consumer Services	3	3	3	3 3	5	3 3	3 3	3 2	3 4	3
	Retailing			2	3	4	3	3	2	4	2
Consumer Staples	Food & Staples Retailing	4	3	3 2	3 3	5 4	2 3	3 3	2 2	3 4	2 2
	Food, Beverage & Tobacco	4 5	3	3	3 5	5 4	2	3 3	2 2	3 4	2
	Household & Personal Products	4	3	3	3 4	5 5	2 2	3 4	2 3	3 4	2 1
Healthcare				2	4	5	3	4	3	4	2
Communication Services		3 3	3 2	3	3 3	5	3 3	3 2	3 2	3 4	3 5
Information Technology				2	4	4	3	4	4	3	2
Real Estate		2 5	1	1	2	4 5	2 4	2 1	2 1	3 4	1
Financials											

 Upstream
 Operations

There are 5 levels of impact:

1 = Very Low
 2 = Low
 3 = Medium
 4 = High
 5 = Very High

Note: Blank means No Data, impact associated with Financing are not yet covered.

Source: Citi Global Insights, SBTN Technical Annex.

Materiality is considered from a social perspective, and while location-specific data is important to factor in when assessing impacts at the company level, the matrix does provide a good overview of key nature-related issue areas by sector. From the available data, we see that greenhouse gas (GHG) emissions, pollution, and disturbance to biodiversity are key issues for Energy and Utilities, Materials, Industrials, and Consumer Discretionary (Automobiles and Consumer Durables). Almost all sectors/industry groups have high impact in terms of solid waste pollution, and medium or greater impact for water use. Also, similar to WEF's analysis on dependencies, it shows the importance of supply chain mapping. For the majority of identified sector and industry groups, upstream impacts are almost all medium or above across the key pressures on nature loss. If we consider the impact on species diversity, a WEF study found that three systems: food, land and ocean use; infrastructure and the built environment; and energy and extractives are endangering 80% of threatened and near-threatened species.⁷⁹

Conservation Monitoring Centre (UNEP-WCMC) that helps users understand the impacts and dependencies of businesses on natural capital and ecosystem services. The main aim is to help financial institutions better understand, assess and integrate natural capital risks in their activities.

⁷⁸ The GICS structure offers four levels of classification, from the most general "Sector" to "Industry Groups", followed by "Industries": and the most specialized "Sub-industry".

⁷⁹ World Economic Forum, [New Nature Economy Report II: The Future of Nature and Business](#), 2020.

The SBTN initiative directs companies to the Sustainability Accounting Standards Board (SASB) Materiality Map for a financial perspective to help build out the company level assessment. The SASB Materiality Map identifies sustainability issues that are likely to affect the financial condition or operating performance of companies within a sector or industry.⁸⁰ The Map is a useful corporate and investor resource but the current tagging of ecological impacts to sectors does not fully capture materiality across sectors. For example, “ecological impacts” is not marked as being material for any industries within the consumer goods sector, which we would argue are financially material for several industries.

3.4 Sector Exposures to Forest-risk Commodities

Building on the example of deforestation introduced earlier, we find that commodity-driven deforestation is a great example of both dependencies and impact on nature. We are dependent on agricultural commodities for food, fuel, shelter, personal products, and more, but their production is driving substantial deforestation. As mentioned earlier, agricultural commodity production is responsible for driving 60-80% of tropical deforestation globally which is destroying natural habitats and biodiversity, impacting local food supply and livelihoods, and contributing to climate change.

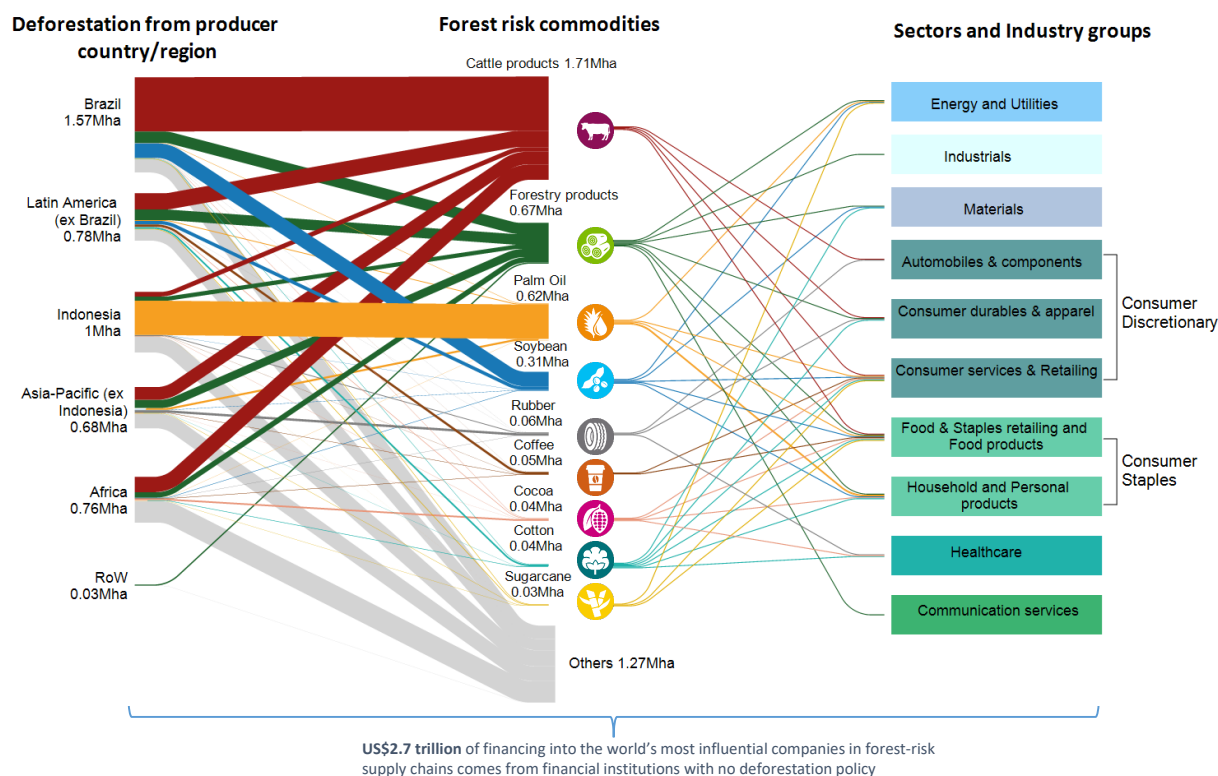
This is an issue that companies can and should take an active role in addressing as they are major sources of demand for commodities that are driving deforestation. For companies that source forest-risk commodities, there is the risk of maintaining continued supply as well as the risk of being held accountable for damaging nature and driving biodiversity loss. The business community has the power to drive more sustainable production of agricultural commodities, and awareness about deforestation risk is growing, but not enough is being done. There is a clear need for companies to step up ambition and action.

Forest 500 carries out an annual assessment of the most influential companies in forest-risk commodity supply chains, and their latest report found that 43% of the 500 assessed companies and financial institutions do not have a commitment on deforestation. Even for companies that do have zero deforestation commitments, many still lack clear definitions and targets and few report on their progress. Out of 687 companies that disclosed information to the non-profit CDP's forest program in 2020, only 4 companies were identified as having “best practice”—Essity, L'Oréal, Mars, and Tetra Pak.

Specific deforestation risk will depend on commodity, the quantity being sourced and where it is being sourced from, but in the following analysis we try to provide an overview of sector exposure to forest-risk commodities. Figure 24 shows a mapping of forest-risk commodities from source country/region to their main end use sectors.

⁸⁰ SASB Materiality Map [website](#), accessed July 27, 2021.

Figure 24. Mapping of Forest-risk Commodities from Source to Main End Use Sectors



Source: Citi Global Insights, Pendrill et al. (2020)⁸¹ Note: 2017 data used for the mapping of deforestation from producer region to commodities.

Many industries are exposed to deforestation through their sourcing of a few key commodities that are driving deforestation and biodiversity loss: cattle products, forestry products, palm oil, soybean, rubber, coffee, and cocoa. Between 2001 and 2015, more than half of the world's forest loss associated with agriculture was driven by the production of these seven commodities.⁸² In addition to these seven commodities, we consider sugarcane and cotton, which are also important commodities that are driving the destruction of natural habitats as well as other environmental issues that we discuss later on.

The most obvious sectors that are exposed to deforestation are consumer staples, which includes food products and retailing and consumer discretionary, which covers apparel, automobiles, as well as consumer services including hotels, restaurants, and leisure. Commodities such as coffee and cocoa are more easily recognized in food products but palm oil and soybean are more hidden but pervasive. Both palm oil and soybean production have increased rapidly over the past 50 years, with palm oil production now 35 times higher than in 1970.⁸³

⁸¹ Florence Pendrill, U. Martin Persson & Thomas Kastner (2020). 'Deforestation risk embodied in production and consumption of agricultural and forestry commodities 2005-2017'. Chalmers University of Technology, Senckenberg Society for Nature Research, SEI, and Ceres Inc. DOI: 10.5281/zenodo.4250532

⁸² Mikaela Weisse and Elizabeth Dow Goldman, "[Just 7 Commodities Replaced an Area of Forest Twice the Size of Germany Between 2001 and 2015](#)," World Resources Institute, February 11, 2021.

⁸³ Hannah Ritchie and Max Roser, "[Forests and Deforestation: Palm Oil](#)," Our World in Data, most recently revised in June 2021.

Palm oil is a very efficient, versatile, and affordable crop, and it is estimated that almost 50% of packaged products in supermarkets contain palm oil.⁸⁴ The majority of soybean production is used for animal feed (77%), driven by growing demand for meat and dairy.⁸⁵

These seven commodities are also used in many other industries including household and personal products, healthcare, materials, and industrials, and are embedded in thousands of products. Some commodities such as palm oil, soy, forestry products, sugarcane, and even cattle products are used in energy industries. Soybean and palm oil are increasingly used for the production of biodiesel, which if sourced from deforestation eliminates emission reduction benefits and drives more environmental harm. It has been reported that 65% of palm oil imported into the EU is used for energy production, most of which goes to biodiesel for cars and trucks, and the majority of refined biodiesel imports into the EU comes from the forest-risk countries — Argentina, Indonesia, and Malaysia.⁸⁶ It is worth noting, the EU has revised its biofuel policy to phase out palm oil based biodiesel by 2030, which has angered palm oil producers but has been criticized by environmentalists for not going far enough.










Cotton is mainly grown for its fiber that is used for textiles and apparel. Other parts of the plant are also used across industries. For example, cottonseed is crushed and used in food products and animal feed, as well as personal care products. Figure 25 provides examples of how the nine commodities are used across sectors and industries. This is not an exhaustive list but does help to demonstrate just how widespread the use of these forest-risk commodities are. If we consider the use of forestry products (e.g., paper and packaging, furniture, and lumber), then we could argue that almost all industries are exposed to some extent.

⁸⁴ “[8 Things to Know About Palm Oil](#),” WWF-UK, January 17, 2021.

⁸⁵ Hannah Ritchie and Max Roser, “[Forest and Deforestation: Soy](#),” Our World in Data, 2021.

⁸⁶ Transport & Environment, [The trend worsens: More palm oil for energy, less for food](#), June 2019

Figure 25. Sector and Industry Group Exposure to Forest-risk Commodities

	Energy and Utilities	Materials	Industrials	Consumer Discretionary				Consumer Staples			Healthcare	Communication Services/IT	Real Estate	Financials
				Automobiles & Components	Consumer Durables & Apparel	Retailing	Consumer Services	Food & Staples Retailing	Food, Beverage & Tobacco	Household & Personal Products				
		Fertilizers, pesticides, chemicals		Leather seating, interior	Furniture, clothing, footwear, buttons, bone china	Automotives, apparel	Meat, dairy, gelatin	Meat, dairy, gelatin (60%)		Cosmetics, cleaning products, personal care products i.e., toothpaste, soaps	Pharmaceuticals i.e., insulin, steroids, collagen			Financing
	Fuel	Construction materials, paper & packaging, forest products	Building products, commercial printing, packaging	Texture pulp, printing and packaging	Furniture, instruments, clothing (i.e. wood based fibres), printing and packaging	Furniture, printing and packaging	Furniture, printing and packaging, hygiene paper products	Printing and packaging		Cosmetics, cleaning products, personal care products, i.e., toilet paper, tissues, diapers, printing and packaging	Pharmaceuticals, printing and packaging	Print publishing, billboards, packaging	Construction, printing and packaging	Financing, Printing and packaging
	Fuel (10% used for biofuel)	In chemicals for industrial use					Cooking oil, ingredient for snacks and food i.e. bread, cereal, pizza, ice cream, chocolate, biscuits	Cooking oil, ingredient for snacks and food i.e., bread, cereal, pizza, ice cream, chocolate, biscuits (72%)		Cosmetics, cleaning products, personal care products i.e., toothpaste, soaps (18%)	Pharmaceuticals			Financing
	Fuel (~3% used for biofuel)	Industrial use, i.e., emulsifying agent in paints			Biocomposites used for furniture, flooring		Cooking oil, ingredient for snack and food	Cooking oil and ingredient for snack and food (19.2%), animal feed (77%)		Cosmetics, cleaning products, personal care products	Pharmaceuticals			Financing
				Tires for transport (70%), rubber for other uses	Footwear, clothing, mattresses, leisure products, cookware	Tires					Medical equipment			Financing
							Ingredient for snacks, food and beverages	Ingredient for snacks, food and beverages		Cosmetics				Financing
							Ingredient for snacks, food and beverages	Ingredient for snacks, food and beverages (80%)		Cosmetics, personal care products (~15%)	Pharmaceuticals (~5%)			Financing
		Packaging material (8% of fibre)			64% of fibre used for apparel, 28% for home furnishing.	Apparel, home furnishing	Cotton seed oil	Cotton seed - oil used for cooking, meal and husks used for animal feed		Cosmetics, personal care products	Pharmaceuticals, medical use			Financing
	Fuel (~20%)	Raw material for chemicals, packaging					Sugar, ingredient for snacks, food and beverages	Sugar, ingredient for snacks, food and beverages, animal feed (75% used for food)						Financing

Exposure to Forest-risk Commodities

High exposure Moderate exposure Low exposure

Source: Citi Global Insights, IISD, Ceres, Our World in Data, UN FAO

There are not many companies that report on the amount of forest-risk commodities that are produced, processed, used or retailed, or on quantities from specific forest-risk countries.⁸⁷ However, through CDP's data we can get a sense of the potential value at risk to companies.⁸⁸ Over the past few years, CDP has found through annual company disclosures that on average 15-24% company revenue is dependent on four forest-risk commodities: soy, palm oil, timber, and cattle products.⁸⁹ Their latest report also considers natural rubber, cocoa, and coffee, and found that on average, 31% of company revenue is dependent on forest-risk commodities.⁹⁰

These are significant exposures, but as we can see from the figures above, there are variations across sectors. In order to get a sense of potential value at risk across sectors, we used CDP data and mapped out a summary matrix of average company revenue dependence on forest-risk commodities by commodity and sector (Figure 26).

It is worth noting that there are several limitations to this exercise, which include a limited sample of 269 companies; some industries are well represented, such as Food products and Retail, whereas many others are not. Also, the question is open to interpretation from the companies themselves, for example, in how far along their supply chains they consider. However, the matrix does provide insight into the potential value at risk that is currently being considered by companies across sectors and commodities, revealing key hotspots as well as smaller dependencies.

Figure 26. Percentage of Company Revenue Dependent on Forest-risk Commodity by Sector and Commodity

	Energy and Utilities	Materials	Industrials	Consumer Discretionary				Consumer Staples			Healthcare	Communication Services	Information Technology	Real Estate	Financials
				Automobiles & Components	Consumer Durables & Apparel	Consumer Services	Retailing	Food & Staples Retailing	Food, Beverage & Tobacco	Household & Personal Products					
Cattle products	15.5	0.0	0.5	2.4	21.9	21.9	2.4	3.0	25.4	8.0	0.5				
Forestry products	75.5	72.3	40.8	1.1	24.1	11.1	13.2	3.6	55.8	76.6	1.3	45.5	0.5	1.8	
Palm oil	3.0	8.0	0.5	0.5	1.3	2.6	5.5	5.7	27.5	49.3	3.0				
Soy		0.5		0.5	0.5	17.1	8.8	13.7	25.3	19.5	3.0				
Rubber		19.3		66.9	5.5		4.3		1.8	3.0	0.5				
Coffee						23.0	3.8	2.2	5.5						
Cocoa					0.5		1.3	3.0	28.1	8.0					

Source: Citi Global Insights, data from CDP

⁸⁷ Global Canopy. 2021. The Forest 500: 2020 Company Assessment Methodology. Global Canopy, Oxford, UK.

⁸⁸ CDP is an international NGO that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts (<https://www.cdp.net/en>)

⁸⁹ CDP, *The Money Trees: The role of corporate action in the fight against deforestation*, 2019; CDP, *Revenue at risk: Why addressing deforestation is critical to business success*, 2016.

⁹⁰ CDP, *The collective effort to end deforestation: A pathway for companies to raise their ambition*, 2020.

Companies in almost all sectors have some level of exposure to commodities that are driving deforestation, and for forestry products, three sectors and industries show an average percentage company revenue at risk of more than 70% — Energy and Utilities, Materials, and Household & Personal Products. A 70%+ dependency on forestry products for Energy & Utilities might raise a few eyebrows, but in this case there was only one company that disclosed which operated in biomass power generation. The Communication Services sector also shows quite a high revenue dependency at 45.5% which can be explained by the sub-industries of publishing and advertising and their print-related revenues. There really is no sector that is not exposed in some way to forest-risk commodities. The financial sector may not be marked in Figure 26, but as we have shown earlier on, financial institutions are very much exposed through their financing of companies across the other industries.

According to Forest 500, nearly 100 financial institutions provided \$2.7 trillion in funding that risks fueling deforestation.⁹¹ Companies can no longer ignore deforestation risks, which go beyond the physical risk of supply, but also encompasses the risks highlighted at the beginning of the chapter — regulation, liability, reputational risks, and financial/market risks.

The pressure will come from all sides from regulators and investors, to consumers, who are increasingly demanding deforestation-free products. For example, a poll commissioned by the Environmental Investigation Agency found that 87% of Europeans want deforestation-free food and products.⁹² There is also a strong economic case for businesses to take action now; CDP found companies reported a total of \$53.1 billion in risks from deforestation compared to a cost of action of \$6.6 billion.⁹³

3.5 Complex and Opaque Supply Chains

Awareness and action to end deforestation needs to ripple along the entire supply chain. The complexity and opacity of commodity supply chains makes it difficult to track forest-risk commodities along the supply chain, which involves many players from producers and processors to traders, manufacturers, and retailers before reaching consumers. The supply chains of forest-risk commodities also differ, converging and diverging at different stages. For example, palm oil and soy are produced by many farmers, but are then traded worldwide by a small number of companies before splitting again to a larger number of processors, and then an even larger number of manufacturers and retailers.⁹⁴

There are four big commodity traders that dominate commodity processing and trading globally. Known as the “ABCD” Group, they hold around a 70% share of the global market of agricultural commodities. In recent years, the Chinese-owned grain company COFCO Group has caught up with the ABCD group. These companies have immense power to influence and drive change across agricultural supply chains.

⁹¹ [“Time for change: delivering deforestation-free supply chains,”](#) Forest 500, 2021.

⁹² [“Poll shows EU citizens overwhelmingly want new laws to halt deforestation,”](#) Environmental Investigation Agency, May 21, 2019. YouGov Poll commissioned by Environmental Investigation Agency, Fern, Greenpeace and WWF on deforestation.

⁹³ CDP, [“The collective effort to end deforestation: A pathway for companies to raise their ambition,”](#) 2020.

⁹⁴ Global Canopy. 2021. The Forest 500: 2020 Company Assessment Methodology. Global Canopy, Oxford, UK.

More broadly, there needs to be more collaboration between companies both vertically and horizontally to ensure that zero-deforestation commitments cascade across supply chains. However there is much work to be done in this space. There is a clear gap between downstream companies — which are overall taking more action — and upstream companies, which have more control over production but are lacking policies, commitments, and action. For example, a CDP analysis found that 77% of suppliers do not have deforestation commitments, compared to 38% of companies downstream.⁹⁵ Similar to companies setting net zero Scope 3 targets, downstream companies need to put more pressure on their suppliers in order to make a real difference to stopping deforestation.

Technologies such as remote sensing, drones, and advanced data analytics, are helping to bring transparency to supply chains, and enabling the tracking of forest-risk commodities from production to consumption. These technologies are increasingly being used by governments and NGOs to monitor deforestation fronts, and progress of companies, but they can also be leveraged by companies to help track their supply chains and identify hotspots of potential sourcing risk.

3.6 Commodities and Other Environmental Issues

These forest-risk commodities are not only responsible for driving deforestation but they also cause other environmental issues that businesses should also be aware of, such as GHG emissions, water use, and pollution. The following table assesses the forest-risk commodities across a set of indicators, in which we have also included several disclosure indicators, as well as the portion of global production area that is VSS-compliant. VSS stands for Voluntary Sustainability Standards, which are rules that help to drive environmental and social improvements along the value chain. Organizations or products have to meet a defined criteria before they can be certified, and there are now over 400 VSSs which include Fairtrade International and Forest Stewardship Council.⁹⁶

Figure 27. Assessment of Forest-risk Commodities Across Indicators

ProductionTrade			Land use	GHG emissions across supply chain	Freshwater use (withdrawals)	Scarcity-weighted water use	Eutrophication - eutrophying emissions	Biodiversity	Sustainability	Disclosure		
	% of production from top 3 producers	% of global trade from "Forest risk countries"	m2/kg	kg CO2e/kg product	l/kg product	l/kg product	kg PO4eq/ kg product	Commodity driven deforestation (2001-2015) Mha	VSS-compliant area (portion of global area)	CDP - % suppliers disclosing exposure to FRC	CDP - % of exposed suppliers disclosing data on commodity	CDP - %exposed suppliers disclosing consumption and/or production data
Beef	41%	28%	326.21	59.6	1451	34733	301.41	45.1		22%	55%	27%
Palm Oil	84%	88%	2.42	7.6	6	36	10.67	10.5	17%	30%	84%	67%
Soybean	80%	61%	10.52	6	415	14888	11.69	8.2	2%	30%	62%	40%
Pulp & Paper	45%	32%	0.96									
Timber	33%	16%						1.8	11%	68%	84%	51%
Rubber	66%	93%	8.23	4.62	361			1.9		7%	55%	21%
Coffee	57%	78%	21.62	16.5	26	337	110.52	1.9	35%	9%	28%	13%
Cocoa	67%	63%	68.96	18.7	541	2879	87.08	2.3	29%	15%	45%	25%
Sugar	65%	78%	2.04	2.6	620	16439	16.92		4%			
Cotton	61%		4.2	4.64	4900		3800		14%			

Note: Indicators are colored based on relative performance; green doesn't necessarily indicate good performance.

Source: Citi Global Insights

⁹⁵ CDP, [The Money Trees: The role of corporate action in the fight against deforestation](#), 2019.

⁹⁶ "Market Coverage," International Institute for Sustainable Development, 2020.

Some key takeaways include:

- Beef is the worst performer across almost all environmental indicators, and has caused the greatest area of deforestation from 2001-15, more than four times the area loss caused by the second-biggest driver palm oil.
- Aside from beef, coffee and cocoa have the highest land footprints as well as GHG emissions across their supply chains.
- Production of cotton uses a substantial amount of water, fertilizers, and pesticides, which leads to water scarcity issues and pollution, as well as soil erosion.
- VSS-compliant production accounts for less than 40% of global production for all of the chosen commodities. Compliant soybean and sugar cultivation accounts for less than 5%. For palm oil, there is the Roundtable on Sustainable Palm Oil (RSPO) which sets global standards for producing and sourcing palm oil, and has the buy-in from most of the industry but there are debates on whether certified production is actually sustainable.
- In terms of disclosure, rubber and coffee have the lowest percentage of suppliers disclosing exposure and data on forest-risk commodities, with less than 10% of CDP surveyed companies disclosing on their exposure. Disclosure on deforestation still lags behind that on climate change according to CDP, with only 31% of requested companies disclosing in 2020.⁹⁷

It is also worth highlighting that the production of these commodities can also have serious social impacts that companies face increasing investor pressure to address. These include poor working conditions, child and forced labor, low wages, loss of land rights of local communities, and displacement of local people. According to the International Labour Organization (ILO), the agricultural sector employs around 1.3 billion people worldwide, mostly in developing countries, and is one of the three most hazardous sectors of work in terms of fatalities, injuries and work-related ill-health.⁹⁸ Voluntary Sustainability Standards can help to drive social improvements along agricultural supply chains, for example by setting minimum standards related to health and safety for workers, or pay equal to or above minimum wage. However, as we can see from Figure 27, there is still much room for improvement in their uptake.

3.7 Opportunities for Business

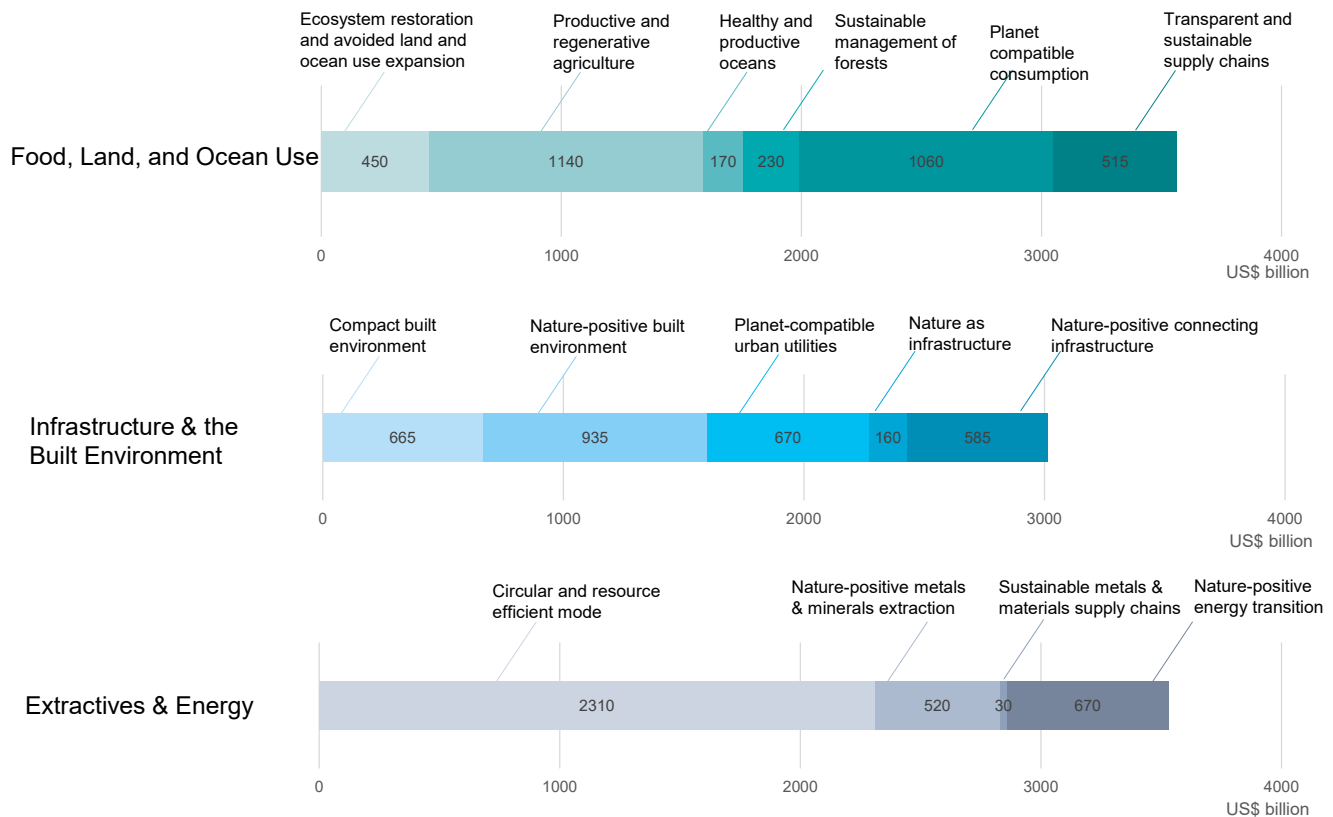
It is not all about managing nature-related risks, there are also opportunities for companies that decide to take action on nature loss. Let's continue with the parallel of climate change, the need to transition to a low carbon world has created immense opportunities for innovation and growth, and not just in carbon intensive industries like transport and energy. We are witnessing a whole range of innovations emerging to address the hard-to-abate sectors from hydrogen technologies and Carbon Capture Utilization & Storage (CCUS) to electric planes and novel cements. We discuss these innovations in detail in our Citi GPS report [Hard to Abate Sectors and Emissions: The Toughest Nuts to Crack for a Net Zero Future](#).

⁹⁷ CDP, [The collective effort to end deforestation: A pathway for companies to raise their ambition](#), 2020.

⁹⁸ "Agriculture: a hazardous work," International Labour Organization, 2021.

As discussed earlier, we are facing twin climate and nature crises that are inextricably linked. A study led by The Nature Conservancy found that nature-based solutions could deliver up to 37% of CO₂ emission reductions by 2030.⁹⁹ The global food system is a key area to address for both climate change and biodiversity loss, and is ripe for innovation and disruption, from climate-smart and regenerative farming to alternative proteins and technologies that help reduce food waste. According to the World Economic Forum, nature positive solutions can create \$10 trillion in business opportunities and 395 million new jobs by 2030.¹⁰⁰ These are substantial opportunities and Figure 28 shows a breakdown of these business opportunities across the three systems of food, land, and ocean use, infrastructure and built environment, and extractives and energy.

Figure 28. Business Opportunities in Nature Positive Solutions



Source: Data from WEF (2020) The Future of Nature and Business

Companies that take action to reduce their biodiversity impacts can also save money and build operation and supply chain resilience. For example, improving the efficiency of energy, water and raw material use can help to reduce operating costs, and increasing sustainably sourced materials can help to build resilience and longevity. The world needs nature-positive products, services and business models in a more sustainable world.

⁹⁹ Bronson W. Griscom et al., "Natural climate solutions," Proceedings of the National Academy of Sciences of the United States of America 114, no. 44 (2017): 11645-11650.

¹⁰⁰ World Economic Forum, [New Nature Economy Report II: The Future of Nature and Business](#), 2020.

Companies that take action now and are at the forefront of addressing their biodiversity-related issues stand to benefit from new business opportunities, access to new markets, ability to attract new customers, and improved reputation and standing with investors, consumers, and employees. There are also opportunities for businesses to provide the data and analytics that can help the transition to a more nature-positive world.

3.8 How is the Business Community Taking Action?

In this chapter, we have tried to lay out why businesses should care about nature and biodiversity loss, and have used commodity-driven deforestation as a key example. Nature-related issues certainly present a unique set of challenges for companies, and have more complexities than addressing climate change, but there is a strong environmental and economic case for taking action now. We intend to explore the question of how businesses should tackle biodiversity loss in future reports, but will use this opportunity to provide an overview of how resources for companies are evolving.

There are already tools and networks available to help companies assess and address nature loss in their operations and supply chains, with several global initiatives expected to mature over the next few years. We believe now is the time for businesses to take action and demonstrate leadership, before investor pressures and regulations clamp down. According to Business for Nature, a global coalition of companies and organizations that aims to create a global business movement to reverse nature loss, there are at least 1,200 businesses already taking action for nature, and at least 530 companies have made commitments. There are now many commitment platforms that businesses can sign on to or endorse, as highlighted below.

Figure 29. International Commitment Platforms Related to Nature

Category	Commitment	Description	Number of Companies (signatories / endorsements)
SDG 15: Life on Land	New York Declaration on Forests (NYDF)	Targets include: ending natural forest loss by 2030, with a 50% reduction by 2020; restoring 350 million hectares of degraded and deforested lands by 2030, supporting the private sector in eliminating deforestation from the supply chains of major agricultural commodities by 2020, and providing financial support to reduce emissions related to deforestation and forest degradation.	200 +
	Remove Deforestation from your supply chain	Led by the CDP (Climate Disclosure Project), under the "Commit to Remove Commodity Driven Deforestation from all supply chains by 2020" initiative, companies can reduce a significant source of greenhouse gas emissions while making their supply chains more sustainable and resilient.	687
	CSA 100	Launched in 2018, the CSA 100 initiative accelerates the adoption of Climate Smart Agriculture (CSA) in the food, beverage, and agriculture sector, aiming to bring together 100 influential companies to make science-based and measurable commitments to 2030, across three pillars: productivity, resilience, and mitigation.	7
SDG 14: Life below Water	New Plastics Economy Global Commitment	A vision of a circular economy for plastic in which it never becomes waste. Signatories commit to three actions to realize this vision: (1) eliminate all problematic and unnecessary plastic items; (2) innovate to ensure that the plastics we do need are reusable, recyclable, or compostable; and (3) circulate all the plastic items we use to keep them in the economy and out of the environment.	450+
SDG 6: Clean Water & Sanitation	AgWater Challenge	A collaborative effort led by Ceres and World Wildlife Fund (WWF), the challenge aims to engage some of the most influential companies with significant agricultural supply chains on water stewardship. Specifically, it spurs companies to make stronger, more transparent, time-bound and measurable commitments that better protect our limited freshwater resources.	11
	Business Alliance for Water and Climate	Launched in 2015, the long-term monitoring of companies' commitments to address the issue of sustainable management of water in the context of a changing climate is ensured through the endorsement of the "CEO Water Mandate". Endorsing companies agree to continuous improvement in six core areas of their water stewardship practice: Direct Operations, Supply Chain & Watershed Management, Collective Action, Public Policy, Community Engagement, and Transparency.	194
	Water Resilience by 2050 Pledge	The "Water Resilience Coalition", founded in 2020, is an industry-driven, CEO-led coalition of the UN Global Compact CEO Water Mandate that aims to elevate global water stress to the top of the corporate agenda and preserve the world's freshwater resources through collective action in water-stressed basins and ambitious, quantifiable commitments.	20
Cross-cutting commitments	Act4Nature	Act4nature international is a pragmatic alliance initiated to accelerate concrete business action in favor of nature. Committed businesses, which include NGOs, academic bodies, and public institutions, have signed at CEO-level 10 common commitments and SMART individual commitments.	44
Sectoral commitments	Fashion Pact (Clothing & Textiles)	A global coalition of companies in the fashion and textile industry — including their suppliers and distributors — all committed to a common core of key environmental goals in three areas: stopping global warming, restoring biodiversity, and protecting the oceans.	71
	Finance for Biodiversity Pledge	Twenty-six global financial institutions, with over € 3 trillion of assets under management, launched the pledge in September 2020. They called on global leaders and committed to protect and restore biodiversity through their finance activities and investments in the run-up to COP15 in 2021.	55

Note: It is worth mentioning "One Planet Business for Biodiversity", a coalition of agriculture-centric companies, and the World Business Council for Sustainable Development (WBCSD), which aims to protect and restore biodiversity within company supply chains and products.

Source: Citi Global Insights, Business for Nature, Platform Website

Before setting commitments, Business for Nature emphasizes the importance of companies doing the work to understand their impacts and dependencies on nature, and refers to the Natural Capital Protocol for guidance. The Natural Capital Protocol provides a standardized framework that helps businesses identify, measure, and value their direct and indirect impacts and dependencies on natural capital.

The Capitals Coalition developed the framework through an extensive design, piloting, and consultation process. They have incorporated the work and insights from several pioneering companies including Kering, which launched its own Environmental Profit and Loss Accounting methodology in 2012 and continues to evolve. Please see the section below for an interview with Eva Zabey, Executive Director of Business for Nature, who also led the development of the Natural Capital Protocol for an insightful and wide-ranging discussion on business and nature.

There are also a few other global initiatives on business and nature that are worth noting, some of which will reach important milestones over the next two years. Similar to the Task Force on Climate-related Financial Disclosures (TCFD) and the Science Based Targets initiative for climate, there are now developments for a Taskforce for Nature related Financial Disclosures (TNFD), and Science Based Targets Network (SBTN). We discuss the TNFD in more detail in Chapter 5 on the impact of regulation for corporates and investors. The SBTN builds on the work done by the Science Based Targets Initiative and is developing criteria, methodologies, and resources for companies (and cities) to set science-based targets for nature.

The Network aims to have the world's largest companies and cities adopt science-based targets for climate, biodiversity, water, land and ocean by 2025. The initiative is still in its design phase and aims to deliver a finalized method by end of 2022. Organizations are invited to join their corporate engagement program to help in the development of nature science-based targets. An initial guide for business was published in September 2020 that includes a proposed step-by-step process for setting science-based targets for nature. It encourages companies to start gathering data now on value chain impact and dependencies, especially spatial data — and where it is possible — set targets where methods have been established such as climate, land use, and water.

Figure 30. Proposed 5-step Process for Setting Science Based Targets for Nature

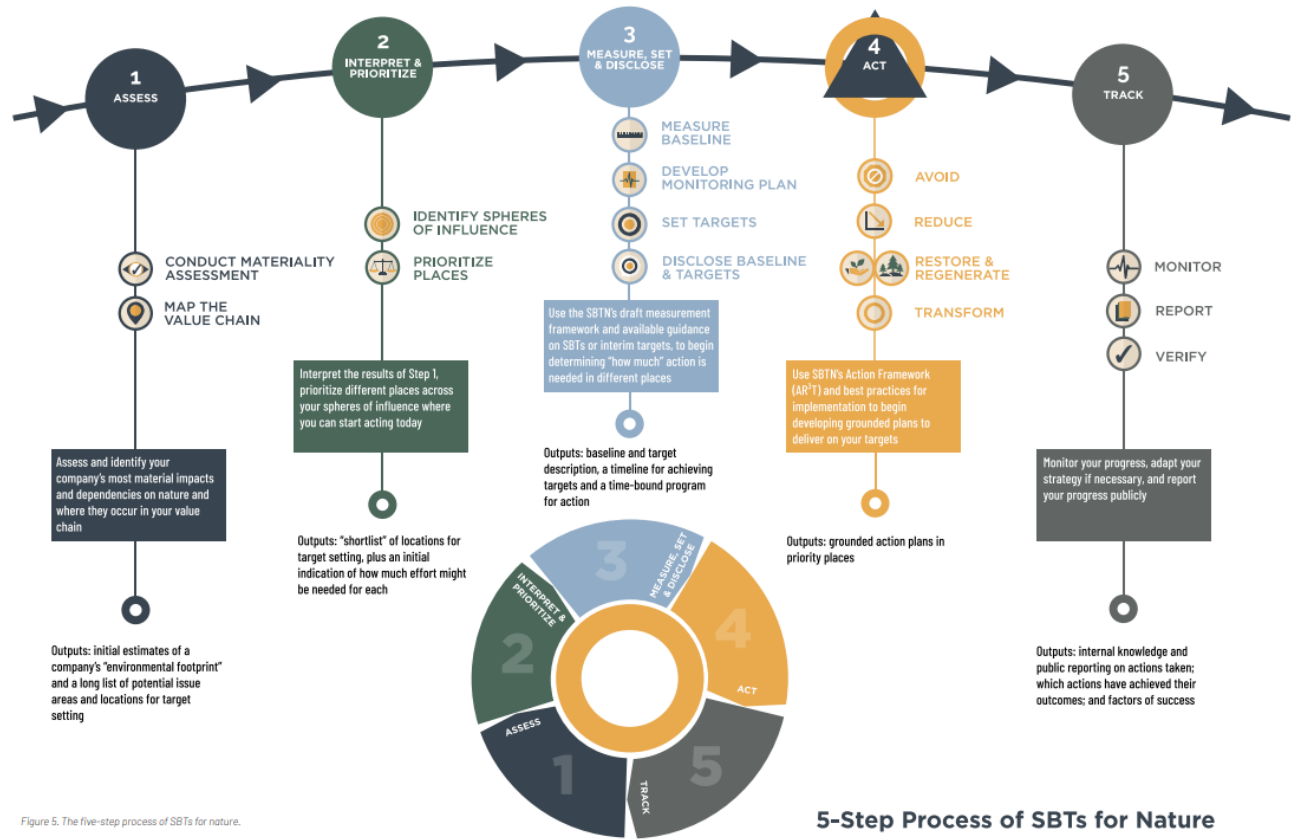


Figure 5. The five-step process of SBTs for nature.

SCIENCE BASED TARGETS NETWORK

SCIENCE BASED TARGETS NETWORK

Source: Science Based Targets Network (with permission)

3.9 An Interview with Eva Zabey, Executive Director, Business for Nature



Eva Zabey

Executive Director, Business for Nature

With a background in natural capital and environmental management, Eva is an experienced leader, facilitator, speaker, writer and media spokesperson who has led Business for Nature since 2019.

Business for Nature brings together business and conservation organizations and forward-thinking companies to amplify a powerful leading business voice calling for governments to adopt policies now to reverse nature loss this decade.

Prior to joining Business for Nature, Eva spent 15 years leading multiple projects at the World Business Council for Sustainable Development (WBCSD). This included work on natural, social and human capital measurement and valuation for business decision-making, towards integrated performance management, and ultimately reporting for investors. She led the development of the Natural Capital Protocol as well as the establishment of the Social and Human Capital Coalition, both of which now sit under the leadership of the Capitals Coalition.

Eva writes on LinkedIn, is on Twitter, @EvaZabey1 and gave this TEDx talk.

Why should businesses care about biodiversity loss and the broader nature crisis?

The answer is simple: There is no business on a dead planet. Healthy societies, resilient economies and thriving businesses rely on nature to provide a stable operating environment, healthy customers and workforces, and natural resources necessary for production.

Nature is at a tipping point. More than [1 million species are threatened by extinction](#), [75% of world's land and 66% of the marine environment](#) are significantly altered by humans. The [first report](#) of the World Economic Forum's New Nature Economy Report series highlighted that \$44 trillion of economic value generation — over half the world's total GDP — is potentially at risk due to the dependence of business on nature and its services.

The natural resources that power businesses are under massive strain and the private sector is still a major contributor to nature's depletion. We need a systemic transformation to rewire our economic system and reward sustainable, long-term performance that goes beyond financial returns. Forward-thinking businesses recognize this and are placing nature higher up their agendas.

How is Business for Nature helping companies take action?

The [Business for Nature coalition](#) aims to demonstrate and amplify a credible business voice calling for governments to adopt policies now to reverse nature loss this decade. We encourage companies to commit and act to reverse nature loss, and advocate for greater policy ambition. Ultimately, our aim is to raise the voice of business on nature and give policymakers the courage and comfort to adopt policies that provide direction and momentum to help unlock new opportunities and create a level playing field and a stable operating environment for business to act.

We are thrilled that nearly 900 companies are calling for governments to adopt policies now to reverse nature loss in this decade. Companies are making commitments and taking action. But business cannot address this global crisis on its own, governments must provide the direction, certainty, and urgency for businesses to invest in changing and adapting their business models. Policy ambition will then drive even more business action.

You have a great overview of the current business and nature landscape, how has it evolved and where do you see it in five years' time?

While business has been and is still part of the problem, it must also be part of the solution. We have seen a tremendous increase in the momentum and engagement of the business community on the nature agenda. COVID-19 has shone a light on the vulnerability of our current systems and what's at stake if we cannot mobilize ambitious action. The private sector has therefore the responsibility to co-lead the transformation needed to reverse nature loss by 2030.

In the next five years we expect to see:

- Greater recognition of the critical relationship between biodiversity loss and climate change. These are interconnected issues and must be addressed together to achieve the Sustainable Development Goals and tackle inequality.

- More clarity on how nature needs to be incorporated into decision-making and disclosure. The recently launched [Taskforce on Nature-related Financial Disclosures](#) (TNFD) will improve transparency and accountability, and help companies and financial institutions understand and — importantly account for — nature-related risks and opportunities.
- Higher investment to support measures that protect nature and biodiversity. We would want to see subsidy reform, so that harmful subsidies are redirected towards those that incentivize more sustainable behavior, as well as new revenue creation — through tax shifts and green finance.
- Increasing interest and willingness from the business community to work with governments to take action towards the achievement of the new global goals and targets that will be adopted at the UN Convention on Biological Diversity COP15.

While the risks to our global economy are daunting, nature also provides ample benefit and opportunity. For example, The World Economic Forum has [identified 15 systemic transitions](#) with annual business opportunities worth \$10 trillion that could create 395 million jobs by 2030.

There are many issues that come under the umbrella of nature loss, how and where does a company start?

Business for Nature has developed a set of [high-level and accessible steps](#) for companies to understand what they can do to help reverse nature loss:

- **Assess:** It is important that companies assess their impacts and dependencies on nature to ensure they are committing to and acting on the most material ones.
- **Commit:** Make meaningful, informed and public commitments through credible platforms, and set measurable targets across priority locations for how much the company will contribute to restore ecosystems.
- **Act:** Preventing impact from happening in the first place or eliminating the impact entirely is already a significant contribution. Actively working — in partnership with others — to restore ecosystems is one part of the solution, and investing in nature-based, inclusive and holistic solutions is another way to contribute. Ultimately, a transformation is required to become nature-positive across the value chain aiming to “give back more than you take.”
- **Advocate:** Engage in activities to advocate for ambitious government policies that will scale and speed up further positive business action.

How should companies analyze and address impacts on nature along their supply chains which they have less control over?

Businesses need to work together to create the critical mass of change that will drive markets and value chains towards nature-positive models. Multi-sectoral collaboration and partnerships can accelerate the transition needed. An example of this is the [One Planet Business for Biodiversity](#) initiative (OP2B), a unique international cross-sectoral coalition on biodiversity with a specific focus on agriculture. Among other things, the coalition partners work together to help scale up regenerative agricultural practices and eliminate deforestation.

Companies need to first identify and assess their material impacts on nature including emissions, water and land use, waste, and biodiversity, and how they can reduce, reuse, and recycle materials at every opportunity. Through this exercise, they will then be able to identify and manage priority direct and indirect impacts and dependencies within their businesses and supply chains, for example, from extraction of raw materials to post-consumer waste.

Companies can then start to work in partnership with organizations within and across their supply chains to share knowledge and experience, for example, by making sure suppliers establish long-term sustainability goals and by doing so help identify further opportunities for continuous improvement.

The [Science Based Target Network](#) (SBTN) is aiming to equip companies with the guidance to set science-based targets for nature that make business sense and at the same time reduce impacts on nature. In order to achieve real transformation though, internal business processes must change — not just procurement processes but day-to-day decision making in business must consider impacts on nature and climate.

In the report, we focus in on commodity driven deforestation, what is the business community doing/should be doing to help tackle the issue?

Business and finance have the power to alter global demand for the agricultural commodities that are the primary drivers of deforestation and forest degradation. Deforestation accounts for approximately 15% of the world's greenhouse gas emissions, so the need for action has never been more urgent.

Businesses can take action and make commitments. At least 530 forward-thinking businesses have already made commitments and are taking action by halting deforestation, reducing plastic production, replenishing water sources, protecting oceans, converting to sustainable agriculture practices, and more. For example, U.S. confectionary and pet food business Mars has delivered a [deforestation-free palm oil supply chain](#) by radically simplifying its supply chain. Unilever has committed to a [deforestation-free supply chain](#) by 2023.

Making informed commitments through credible platforms is also a tangible way for companies to start their nature-positive journey. The [Forest 500 assessment](#) found that nearly half of the 500 most influential companies and financial institutions in key forest-risk supply chains do not have a commitment on deforestation.

For example, the [New York Forest Declaration \(NYDF\)](#) is a voluntary and non-binding international declaration that aims to take action to end deforestation by 2030. There are currently over 200 endorsers, including over 50 of the world's biggest companies. These endorsers have committed to doing their part to achieve the NYDF goals and follow its accompanying action agenda.

This is a pivotal year for nature with the UN Biodiversity Conference later this year in Kunming, which will produce a new set of nature goals for the next decade. What can businesses do to support the global framework?

Indeed, the Convention on Biological Diversity (CBD)'s COP 15 provides a unique opportunity for governments to adopt a framework to set the direction for businesses to scale up and speed up action to reverse nature loss.

Businesses play a critical role beyond committing and acting within their direct sphere of influence: they are a source of investment, a driver of innovation and technological development, and a key engine of economic prosperity and employment. While parties are responsible for the implementation of the post-2020 Global Biodiversity Framework, its objectives cannot be achieved without the meaningful and constructive contribution of businesses in helping implement the framework. Business engagement is therefore essential for a successful outcome at CBD COP15.

Today, business can contribute to this process by:

- Signing up to our call to action “[Nature is Everyone's Business](#)”.
- Raising their voices for nature publicly on the need for ambitious nature policies or speaking directly with governments.
- Contributing to the negotiations to secure an ambitious post-2020 Global Biodiversity Framework.
- [Express interest](#) in supporting Business for Nature's advocacy activities.

And finally, what advice would you give companies who are just starting to develop a biodiversity/nature strategy?

There are many initiatives and tools to support businesses who are interested in nature and biodiversity. For companies that are starting to develop their strategy, I would recommend keeping in mind the following three points:

1. Make sure responsibility and accountability sits at board level. For example, a [CDP report](#) found that companies with board-level responsibility for deforestation risk identify 19% more opportunities than those that do not. This will also ensure sufficient resources are allocated to your biodiversity/nature strategy.
2. Collaborate with others and do not reinvent the wheel. Lean on the experience and expertise of others, and partner with NGOs, consultants, and other companies.
3. Do not let the perfect be the enemy of the good. Be as ambitious as possible in your plans and actions, while being transparent and honest that there will always be improvements and adjustments along the way. This journey is an iterative one, and the “perfect methodology” might not yet exist.

3.10 Summary

In this chapter, we have explored the strong inter-dependencies between business and nature starting from the wide range of nature-related risks that businesses face, to a closer look at sector and industry dependencies and impacts on nature followed by a deep dive into sector exposure to forest-risk commodities. Economic activities are not separate from nature but very much depend on nature and the goods and services that it provides.

In addition to being dependent on nature, business activities are also driving negative impacts on the natural world (e.g., pollution, over-exploitation of natural resources, and destruction of habitats), which we have summarized in a matrix by GICS sector and industry groups. Commodity-driven deforestation is one of the biggest drivers of biodiversity loss, and we show that companies in almost all sectors have some level of exposure to the seven forest-risk commodities including cattle products, forestry products, soybean, palm oil, rubber, coffee, and cocoa. For some industries — such as Household & Personal Products and Materials — the percentage of company revenue dependent on a forest-risk commodity is reported to be more than 70%.

There is a clear business risk for companies that have forest-risk commodities in their supply chain, but more awareness as well as action is needed by businesses to tackle deforestation. It is also a good first step for companies to take in helping to address the nature crisis.

It makes good business sense for companies to start addressing nature-related risks: regulation, investor, and consumer pressures are all coming but so are resources like the Science Based Targets Network and the Taskforce for Nature-Related Financial Disclosures. Now is the time for companies to get ahead of the game and demonstrate leadership.

Even though standardized tools, methodologies, and data resources for target setting are still in development, companies can already start assessing their dependencies and impacts on nature in their operations and supply chains, and take affirmative action on a few key issues such as deforestation, water use, and climate change.

It is important for corporates to not only address unsustainable procurement processes but to achieve real transformation — day to day decision making in business must consider impacts on nature. Corporates that are starting to develop a biodiversity/nature strategy should consider three points: (1) accountability should sit at the board level; (2) strategies should be ambitious in plans and actions, even though the perfect methodology may not exist yet; and (3) collaboration and learning from others experiences is crucial.

There are reasons to be optimistic for the future — the business community is coming together, becoming more aware of their reliance and impacts on nature, and starting to commit and act. We only need to look at how quickly net zero goals have proliferated across the corporate world to get a sense of how fast the private sector can take action. Just like for climate change, there are also plenty of benefits and opportunities for businesses to support nature from developing nature positive products and services, and business models, to improving existing offerings. We therefore urge businesses to apply that same urgency and drive shown to climate change to tackling its twin crisis of biodiversity loss.

Chapter 4: Why Should Investors Consider Biodiversity Loss?

4.1 Introduction

"We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely."

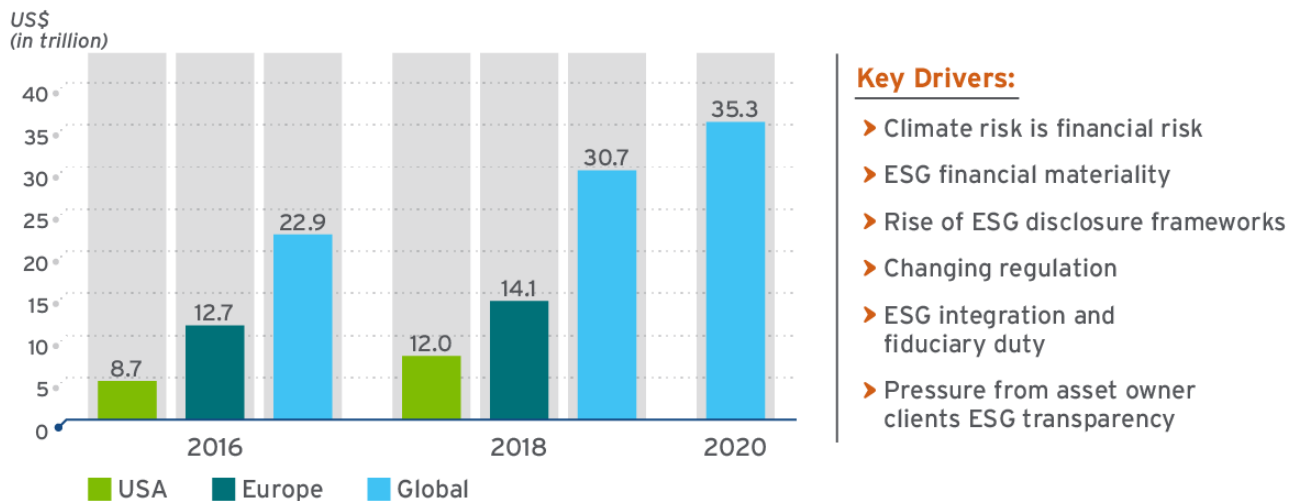
—E.O. Wilson

Growth in sustainable investment strategies has risen from \$22.9 trillion in 2016 to \$35.3 trillion in 2020, according to the Global Sustainable Investment Alliance, and signatories to the UN-supported Principles for Responsible Investment (PRI) currently represent more than \$100 trillion in assets under management.¹⁰¹

In recent years, there have been record levels of investor engagement on sustainability-related issues and the rise of environmental, social, and governance (ESG) and impact investment solutions. The rise in demand for sustainable investment strategies is reflected in capital flows and the growth of ESG-labeled funds, positive impact opportunities and green, climate, sustainability-linked, and social impact bonds.

Figure 31. Growth in Sustainable and Responsible Investing 2016-20 (US\$bn)

Growth in Sustainable and Responsible Investment Strategies



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Note: Europe and Australasia have enacted significant changes in the way sustainable investment is defined in these regions, so direct comparisons between regions and with previous versions of the data are not easily made.

Source: GSIA, Opimas

The drivers that have influenced investors to consider the integration of biodiversity loss into the investment process include: regulation; societal shifts; asset owner client engagement; reputational risk from NGO activity; and changing behaviors accelerated by finance initiatives focused on biodiversity. This chapter will consider why investors need to consider the impact of biodiversity loss and what key risks investors are facing through a new regulatory lens that requires greater disclosures, transparency, and positive societal and environmental outcomes.

¹⁰¹ Global Sustainable Investment Alliance, [Global Sustainable Investment Review 2020](#), 2021; "Enhance our global footprint," Principles for Responsible Investment, accessed July 28, 2021.

There are numerous investor initiatives that encourage collaboration and knowledge sharing that can support investors that are early on their journey with the integration of biodiversity loss into the investment process. Climate change has been catalytic in raising awareness for greenhouse gas emissions and has dominated the “E” pillar of ESG engagement; however, today there is a greater awareness that environmental issues also include biodiversity loss, and that there are direct links to a changing climate, and unsustainable consumption and production behaviors.

This chapter will also propose a nexus of sustainability issues that are deeply interconnected and will require support from the investor community in order to meet sustainability, climate, and biodiversity goals. This chapter ends with a set of questions for investor engagement and an interview with an ESG Analyst at BNP Paribas Asset Management on the recently launched Ecosystem Restoration Fund.

4.2 Investor Net Zero Ambition and Link to Deforestation and Biodiversity

Tackling climate change is a dominant investment theme, reflected by initiatives such as the UN-convened Net Zero Asset Owner Alliance representing \$6.6 trillion in assets under management (and approximately 7% of total invested asset under management),¹⁰² and Climate Action 100+. The Net Zero Asset Managers Initiative, launched in December 2020, currently has 128 signatories with \$43 trillion in assets under management.¹⁰³

The Net Zero Asset Managers initiative is globally administered by six Founding Partner investor networks: Asia Investor Group on Climate Change (AIGCC), CDP, Ceres, Investor Group on Climate Change (IGCC), Institutional Investors Group on Climate Change (IIGCC), and PRI. Further signatories are expected in the run up to the UN Conference on Climate Change (COP26) in Glasgow. Signatories have set bold commitments to transition investment portfolios to net zero greenhouse gas (GHG) emissions by 2050 and align portfolios with a 1.5°C scenario.

In 2021, an IIGCC convened group of investors, with \$11 trillion assets under management, urged banks to align financing with net zero emissions, scale up green finance, and withdraw from projects that fail to meet the Paris goals.¹⁰⁴ Notably, investors called for banks to cease activities that cause emissions through deforestation and land-use change as well as from fossil fuel financing.

The PRI, cognizant not just of the systemic risk posed by biodiversity loss but also the far-reaching potential of their knowledge platform, published a discussion paper on investor action on biodiversity.¹⁰⁵ The PRI research, designed with the goal of imbuing investor dialogue with a biodiversity narrative to halt and reverse ecological decline, could result in specific biodiversity-related disclosures in future PRI reporting cycles.

¹⁰² “[UN-convened Net-Zero Asset Owner Alliance](#),” UN Environment Programme Finance Initiative, accessed July 28, 2021.

¹⁰³ Net Zero Asset Managers Initiative [website](#), 2021.

¹⁰⁴ “[Leading investors representing \\$11 trillion call on banks to set enhanced net zero targets](#),” Institutional Investors Group on Climate Change (IIGCC), April 20, 2021. /

¹⁰⁵ Principles for Responsible Investment, [Investor Action on Biodiversity: Discussion Paper](#), 2020.

The research described investor action across a number of stages: (1) avoid negative biodiversity outcomes, (2) minimize biodiversity loss; (3) restore biodiversity and (4) seek positive outcomes. This signals that investors have a role to play not just in redirecting capital flows away from the problem but towards the solution through active management and stewardship with positive environmental outcomes.

The PRI also highlights investor initiatives that tackle biodiversity-related topics. These include: the development of investment solutions that address the pollination crisis critical to global food security; investor engagement on key forest-risk commodities linked to deforestation, such as palm oil, cattle, and soybean; negative screening of companies linked to harmful environmental practices; the development of dedicated thematic funds with sustainable investment objectives such as marine biodiversity loss including ocean pollution, and the development of tools to measure biodiversity impact.

Ceres, a Boston based non-profit organization working predominantly with U.S. investors, acted with expediency following the Brazilian Amazon fires in August 2019. Ceres brought together 230 institutional investors, representing \$16.2 trillion in assets under management, to sign an investment statement calling on companies to take urgent action to tackle commodity supply chains linked to deforestation fueled by the fires that were raging at the time in the Brazilian Amazon rainforest.

The investors that signed the statement endorsed the following language: “As investors, we see deforestation and the associated impacts on biodiversity and climate change as systemic risks to our portfolios and see the reduction of deforestation as a key solution to managing these risks and contributing to efficient and sustainable financial markets in the longer term”.¹⁰⁶

These investor networks have, in recent years, successfully galvanized signatories to become more biodiversity aware or, as Prof. Dan Janzen, one of the world’s leading ecologists puts it, “bioliterate.”¹⁰⁷ Awareness is growing on the integration of environmental and societal issues such as: (1) key forest-risk commodities linked to deforestation e.g. soybean, palm oil, timber, and beef; (2) impact of company operations on local ecology (e.g., mining); (3) responsible production and link to hazardous waste; (4) impact of toxic chemicals on local biodiversity (e.g., neonicotinoids, disposal of pharmaceutical by-products or overuse of antimicrobials); and (5) land, air and sea pollution and link to life on land and life below water (e.g., nitrogen and microplastic pollution).

Deforestation, widely recognized as a driver of greenhouse gas emissions and biodiversity loss was permanently enshrined in Article 5 of the Paris Agreement at COP21, which acknowledged that the reduction of deforestation and degradation to enhance carbon stocks could play a pivotal role in decarbonization.

¹⁰⁶ [“230 Investors with USD \\$16.2 trillion in AUM Call for Corporate Action on Deforestation, Signaling Support for the Amazon,”](#) Ceres, September 18, 2019.

¹⁰⁷ Daniel H. Janzen and Winnie Hallwachs, “Perspective: Where might be many tropical insects?” *Biological Conservation* 233 (May 2019): 102-108.

There is no solution to reaching net zero and reducing climate change that does not include a solution to tackle and reduce deforestation and deliver negative emissions, a term used by climate scientists for the removal of atmospheric CO₂. There is an emerging awareness — spearheaded by the investor networks identified above — that in order to achieve global sustainability, climate, and biodiversity goals, we need to decouple environmental degradation and unsustainable resource use from economic growth, production, and consumption patterns.

4.3 Biodiversity Loss is Financially Material

As we have discussed in Chapter 1, human activities are leading to a rapidly changing climate and dramatic species decline. There is no shortage of research and evidence that demonstrates this. For example, although the world's 7.8 billion people represent only 0.01% of all living beings by weight, unsustainable consumption and production models have resulted in the loss of 83% of all wild mammals and half of all plants.¹⁰⁸ The impacts of this loss are far reaching from nutrition and food security to the livelihoods of billions of people. It also presents significant risk to corporate and financial stability.

The loss of nature can contribute to systemic geopolitical risk and, in some cases, destabilize the environments in which businesses operate. The World Economic Forum (WEF) argues that governments and regulators should recognize the systemic risks posed by nature loss to the financial system through strategic and policy action, including consideration of extending climate risk disclosure to nature or biodiversity loss risk.

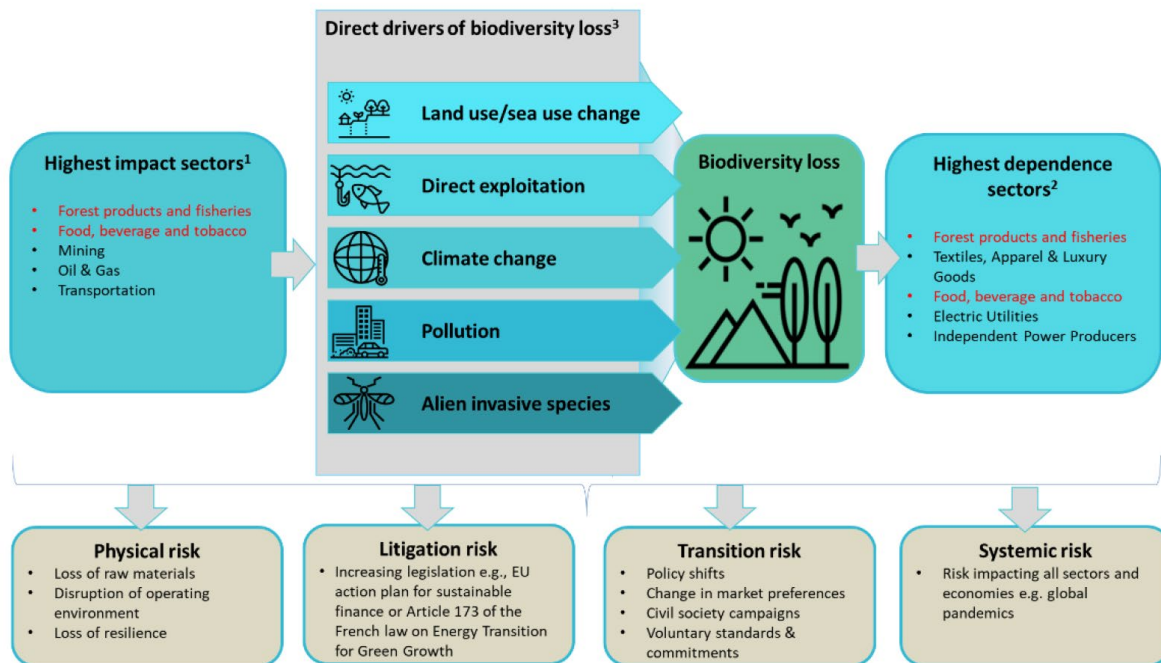
As introduced earlier, the PRI discussion paper on the relevance of biodiversity for investors outlines the risks of biodiversity loss and opportunities of biodiversity protection, trends and actions that investors and governments are taking, and makes recommendations for institutional investors.

4.4 Financial Stability

This next section looks at the risks that investors should consider when thinking about the impact to their portfolio from biodiversity loss either as a dependency or as an impact. In previous chapters, we have discussed nature-related risks to business but this section is looking at the risk through an investor lens. The PRI research paper identifies four key risks for investors: physical, litigation, transition, and systemic.

¹⁰⁸ Yinon M. Bar-On, Rob Phillips, and Ron Milo, "The biomass distribution on Earth," *Proceedings of the National Academy of Sciences* 115, no. 25 (June 2018): 6506–6511.

Figure 32. Nature Loss, Risk, and Implications for Investors



Note: (1) Calculated using IUCN Red List threat data as detailed in Maxwell et al. (2016) and UN Environment Programme, UNEP Finance Initiative and Global Canopy (2020); Sectors translated to GICS; (2) from WEF (2020) and UN Environment Programme, UNEP Finance Initiative and Global Canopy (2020); sectors translated to GICS; (3) IPBES (2019) and (4) PWC and WWF (2020).

Source: PRI

There is growing recognition that climate change presents immediate and material systemic risks to the long-term environmental health of the planet, the financial stability of the global economy, and ultimately the cohesive functioning of society. As we introduced in earlier chapters, biodiversity loss and climate change are inseparable threats to humanity that must be addressed together. They are deeply interconnected in ways that pose complex challenges to effective policy-making and investor action.

Climate change is likely to become one of the most significant drivers of biodiversity loss by the end of the century. Irrespective of human needs and interests, changes in climatic variables have led to increased frequency and outbreaks of pests and communicable disease. For example, the distribution of vector-borne diseases such as malaria and dengue fever, and food- and water-borne diseases will be further exacerbated by changes in climatic factors. The biosphere, upon which humanity depends, is being altered across all spatial scales. Future climate-related risks could be reduced by accelerating far-reaching, cross-sectoral climate mitigation strategies that recognize the inextricable link between biodiversity, ecosystem services, and climate change.

The investment community, with notable commitments to reducing greenhouse gas emissions, has accelerated efforts towards net zero climate targets. There is no solution to reaching net zero and reducing climate change that does not include a solution to tackle ecological loss in order to build resilience into the ecosystems that underpin our global systems. For many investors, understanding the interconnectivity of these issues and indivisibility of the goals at the nexus of climate change, biodiversity loss, and health and food security will be critical to unlocking the investment solutions of the future.

4.5 Systemic Risk

Impacts and dependencies across the economy can create nature-related systemic risk. Systemic risks refers to:

1. the risk that a critical natural system such as the Amazon Rainforest or a key clean water source is no longer able to function properly;
2. risks that arise at the portfolio-level (rather than an organizational or transaction level) of a financial institution; and
3. a risk to system-wide financial stability.

Biodiversity poses systemic and portfolio-level risk, and stewardship strategies are expected to consider sectoral and economy-level approaches. Biodiversity loss is inherently linked to climate change, and achieving global goals for addressing one cannot go without achieving those for the other.

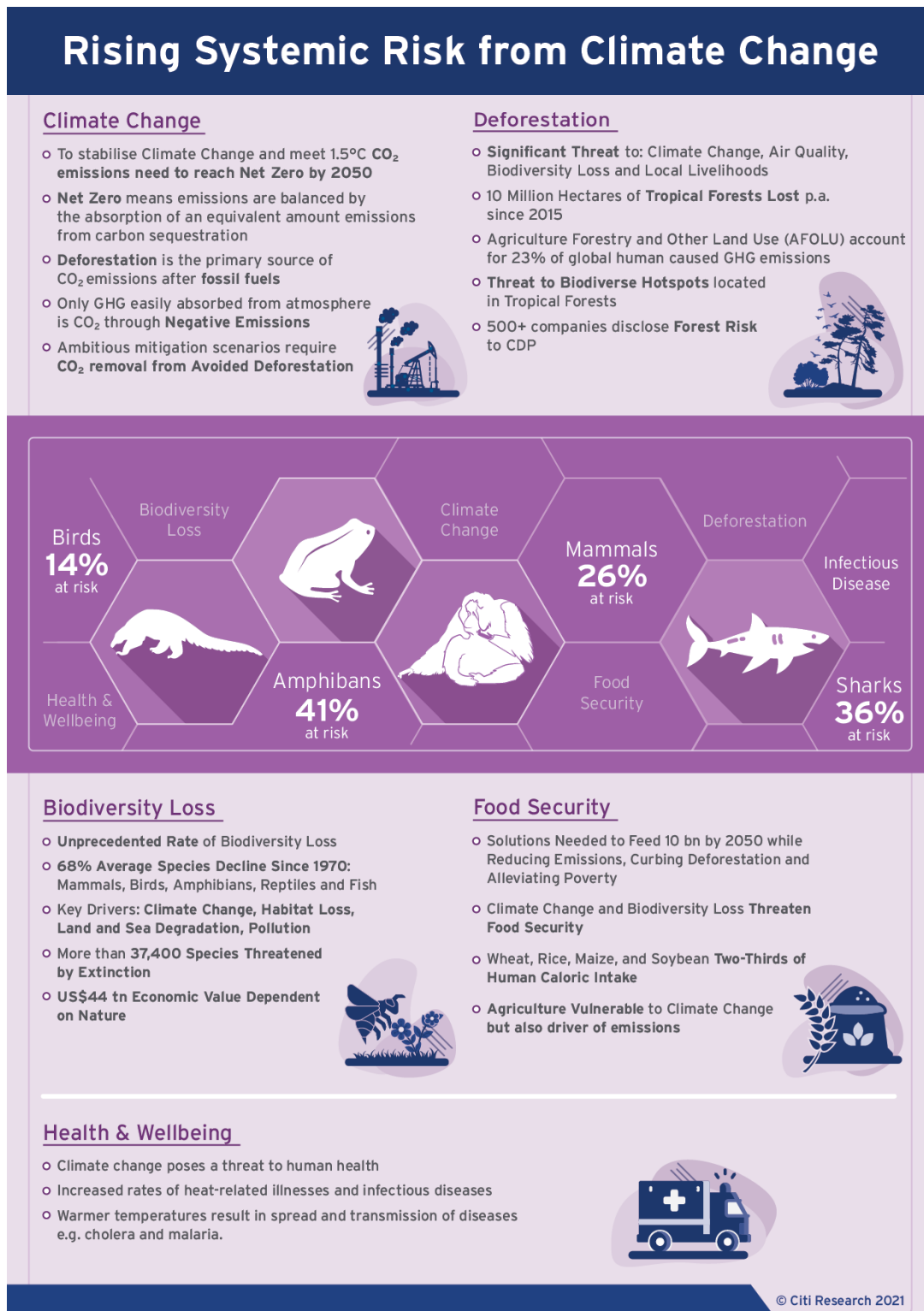
The Amazon rainforest, and other boreal forests, have been identified as tipping elements that pose potential systemic risks for the global financial system by Earth system scientists. If they fail to deliver on their ecosystem services and tip into a permanent savannah state there is a risk of a tipping cascade.¹⁰⁹

Healthy, biodiverse, and resilient ecosystems have a role in preventing disruption to society and the markets within which businesses operate. Biodiversity loss is now recognized as a systemic risk of an unknown magnitude and there is too little action to tackle both the interlinked biodiversity and climate crises.¹¹⁰

¹⁰⁹ Will Steffen et al., “Trajectories of the Earth System in the Anthropocene” Proceedings of the National Academy of Sciences of the United States of America 115, no.33 (2018): 8252–8259.

¹¹⁰ UN Environment Programme, UNEP Finance Initiative and Global Canopy 2020. Beyond ‘Business as Usual’: Biodiversity targets and finance. Managing biodiversity risks across business sectors. UNEP-WCMC, Cambridge, UK, 42 pp.

Figure 33. Rising Systemic Risk from Climate Change



Source: Citi Research

4.6 Physical Risk

Nature-related physical risks and opportunities result from nature loss and can be described as event-driven (acute), or longer-term shifts (chronic) in the way in which natural ecosystems function or cease to function.

Physical risks may have financial implications for organizations, such as direct damage to assets, the loss of local and regional ecosystem services crucial to production processes or employee well-being, and indirect impacts from supply chain disruption. These risks may also have financial and non-financial implications for other parties, such as the loss of global ecosystem services crucial to human well-being.

Examples include local and regional financial losses in the agricultural sector from reduced pollination from insects, and global financial losses in medicine. Physical opportunities may also have financial implications for organizations, such as increased resilience of business production processes or demand.

4.7 Transition Risk

Transitioning to a nature-positive economy will require extensive policy, legal, technology, and market changes. Transition risks resulting from nature may occur when businesses suffer financially due to changes that penalize the negative impact they have on nature, including reputation, compliance, and liability or litigation risks.

In some cases, this may result in an asset becoming unprofitable and stranded. Transition opportunities may occur when businesses benefit financially due to changes in market preferences and/or demands that reward the positive impact they have on nature. Economy-wide impacts on nature, commitment frameworks such as the Science-based Target Network (SBTN), and international frameworks such as the Convention on Biodiversity Post-2020 Global Biodiversity Framework will all inform credible future nature-related goals.

These goals will define the changes that may need to be made and hence, the drivers of transition risk. In this way, impacts on nature can create material financial risks for investors in the future, even if they are financially immaterial today.

4.8 Reputational Risk

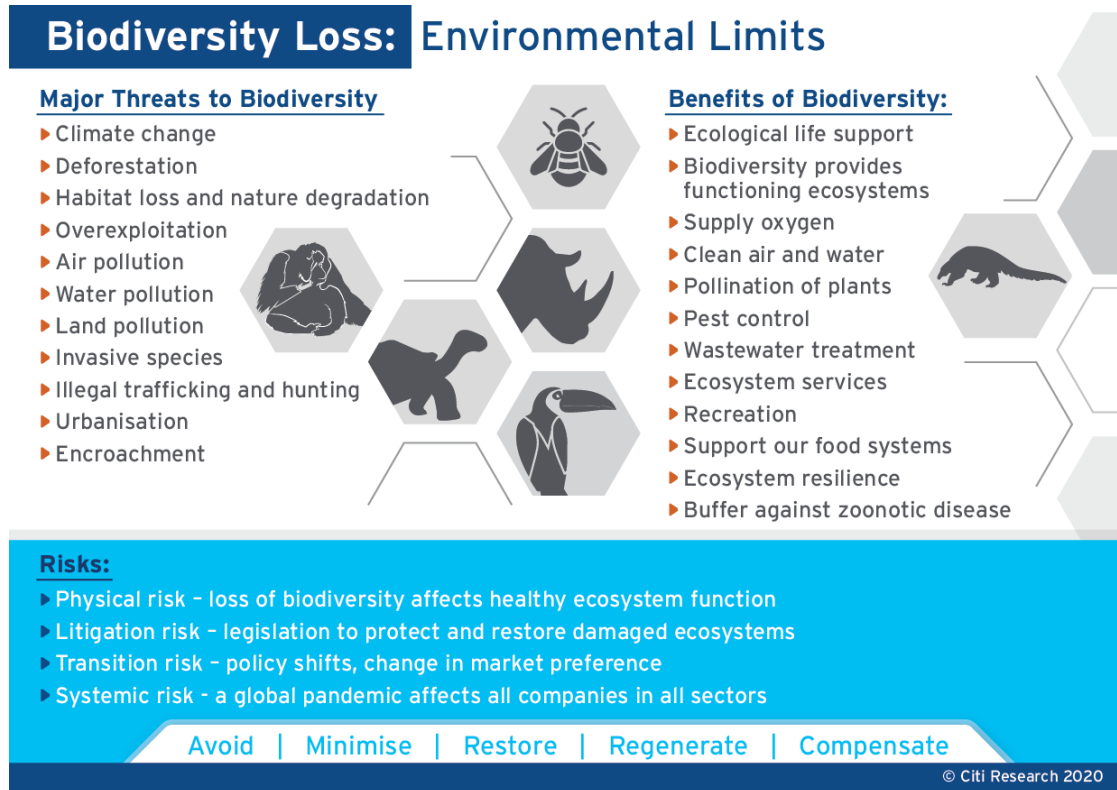
A number of NGOs and investor networks have demonstrated a sharp shift in focus away from the companies identified as drivers of deforestation to the funders of companies driving deforestation: “financial sector fueling deforestation in Brazil through investment in beef and soy supply chains;” “money managers have no formal policies to address deforestation crisis;” and “nearly 100 financial institutions risk funding deforestation with \$2.7 trillion.”¹¹¹ These headlines emphasize the link between deforestation and climate change and seek to expose unsustainable behaviors.

¹¹¹ Thin Wei Lin, “[Big investors fall short on policies to halt Amazon deforestation](#),” Reuters, October 1, 2020; “[Doubling Down on Deforestation](#),” Friends of the Earth, accessed July 28, 2021; “[Nearly 100 financial institutions risk funding deforestation with \\$2.7 trillion](#),” Forest500, January 26, 2021.

Businesses face increasing pressure from investors, consumers, shareholders, policy makers, and civil society to assess, report and manage ESG risks, including biodiversity risks.¹¹² Changing societal norms and behaviors can lead to product or natural resources boycotts (e.g., on Bluefin tuna or palm oil). NGO-led campaigns against business activities linked to unethical environmental practices can increase not only reputational risk but also financial risk.

We are also starting to see more formal agreements to secure a “license to operate” from local communities and civil society through stakeholder engagement.

Figure 34. Biodiversity Loss: Environmental Limits



Source: Citi Global Insights

4.9 Ecological Risk from Invasive Species is Financially Material

The Sustainability Accounting Standards Board (SASB), now known as the Value Reporting Foundation after it merged with the International Integrated Reporting Council (IIRC), has a sustainability reporting ecosystem to facilitate the disclosure of comparable, consistent, and reliable ESG information. Within the environmental dimension of the widely used SASB Materiality Map there is a general issue category for Ecological Impact.¹¹³ This category can be used by investors and reporting companies to assess the management of activities by the investee company on ecosystems and biodiversity.

¹¹² “Annex A. Biodiversity-related risks to businesses,” OECD iLibrary, 2021.

¹¹³ SASB Materiality Map [website](#), accessed July 27, 2021

The category includes but is not limited to land use for exploration, natural resource extraction as well as project development, the impacts include biodiversity loss, habitat destruction, and deforestation.

This is just one example of an ESG framework that investors now have to consider ecological loss as companies and investors face ecological risk either from their impact on biodiversity or their dependency on biodiversity. Ecological loss is mostly linked to operational risk from a key dependency, resource scarcity, or deteriorating yield. Extreme weather events or invasive species can have an impact on the sourcing of a key raw material and this creates risks for the agriculture and food retail sector.

The risk to agriculture from invasive species was identified as a global threat several years ago in a report that identified Sub-Saharan African countries as most vulnerable to the threat of invasive species. The U.S. and China were identified as the countries representing the greatest threat to the rest of the world, based on the invasive species they already contain, and their trade patterns.¹¹⁴

In a study published this year, the Centre for Agriculture and Biosciences International (CABI) stated that invasive species cost Africa \$3.66 trillion a year.¹¹⁵ The species found to cause the most crop losses was a moth known as *Phthorimaea absoluta*, which affects tomato plants, at an estimated cost of \$11.4 billion annually.

4.10 Engagement on Biodiversity Loss and Forest-risk

There is evidence that engagement by investors with companies on environmental, social, and governance (ESG) issues can create shareholder value. Despite the growth in demand for disclosures on engagement activity, exactly what best-in-class ESG engagement looks like and how ESG engagement creates value is still developing. Research by PRI on how ESG engagement creates value highlights three ESG engagement dynamics that create distinct types of value for companies and investors:¹¹⁶

- **Communicative dynamics:** engagement enables the exchange of information between corporations and investors, creating “communicative value.”
- **Learning dynamics:** engagement helps to produce and diffuse new ESG knowledge amongst companies and investors, creating “learning value.”
- **Political dynamics:** engagement facilitates diverse internal and external relationships for companies and investors, creating “political value.”

Using this framework, it could be argued that engaging with portfolio companies specifically on biodiversity loss could be mutually reinforcing to: (1) better communicate concerns about ecosystem degradation; (2) diffuse new knowledge and potentially upskill in a new domain within the environmental pillar; and (3) develop new and diverse relationships between investors and investees.

¹¹⁴ Dean R. Paini et al., “Global threat to agriculture from invasive species,” *Proceedings of the National Academy of Sciences* 113, no. 27 (July 2016): 7575-7579.

¹¹⁵ René Eschen et al., “Towards estimating the economic cost of invasive alien species to African crop and livestock production,” *CABI Agriculture and Bioscience* 2: no. 18 (2021).

¹¹⁶ [“How ESG Engagement Creates Value for Investors and Companies: Executive summary,”](#) Principles for Responsible Investment, April 26, 2018.

For many investors seeking to meet the ESG disclosure requirements of their asset owner clients, issues related to land use and biodiversity — and deforestation and degradation in particular — have become increasingly prominent in recent years. These ESG issues have been exacerbated by reports of widespread and destructive wildfires taking place in Indonesia to convert high carbon stock forest to palm oil plantations, and in the Brazilian Amazon for conversion to agricultural land. The reports highlighted the scale of deforestation, and the implications of biodiversity loss on global ecosystems and the global food system that affect increasing global populations, thereby catapulting the issue into the ESG domain and necessitating action from active managers with exposure to key forest-risk commodities.

The Ceres' initiative "Engage the Chain" provides an online resource for investors on agricultural supply chain risk.¹¹⁷ It highlights a number of risks specific to commodity sourcing such as: operational risk, reputational risk; regulatory risk, market risk, and litigation risk. In order to maintain growth and profitability, sectors that are exposed to supply chain risk linked to deforestation need to develop sourcing strategies that are climate resilient and fundamentally decoupled from environmental degradation and adverse human impacts.

Figure 35. Food and Agricultural Issues are Material Risks

EXHIBIT 1. TRANSLATING FOOD & AGRICULTURAL ISSUES TO MATERIAL RISKS & FINANCIAL STATEMENTS



Source: Ceres

The PRI investor working group on sustainable palm oil seeks to raise awareness of the ESG issues within the palm oil value chain, provide a unified investor voice, and engage with companies. The initiative has 50 PRI signatories and an investor expectation statement.¹¹⁸

¹¹⁷ "Drivers of Financial Risk," Engage the Chain, accessed July 28, 2021.

¹¹⁸ "PRI Investor Working Group on Sustainable Palm Oil," Principles of responsible Investment, accessed July 28, 2021.

4.11 Investor Engagement questions

For investors focused on delivering forward-looking sustainability solutions there is a growing awareness of the need to start thinking about how to integrate metrics, disclosures and targets on biodiversity loss into the investment process and understand where the impacts and dependencies lie. We intend to discuss how investors should address biodiversity loss in future notes, but will use this opportunity to provide a set of high level engagement questions that investors can start considering now. These engagement questions can be used as part of an ESG engagement strategy with targeted companies identified as either having exposure to forest-risk commodities or having complex supply chains that might be linked to biodiversity loss.

Biodiversity Loss: Investor Engagement

We recognize that companies are all on different journeys with regard to environmental degradation and biodiversity loss, but with the huge amount of focus on these issues today, we cannot ignore their importance and relevance.

- Is biodiversity a topic being considered at the board level?
- Has the company started to consider its impact on ecosystems and biodiversity through activities linked to, for example, land use for exploration, natural resource extraction and project development activities?
- Is the company thinking about its impact on the environment often described as double materiality?
- Does the company source commodities that negatively impact ecosystems and biodiversity loss through habitat destruction and deforestation?
- Does the company have policies in place for the sustainable sourcing of key forest-risk commodities?
- Which commodities are covered? Where is there more work for the company to better understand transparency and traceability?
- Has the company started to think about its impact on biodiversity and if so how far has it progressed?
- If the company has started to think about impact on biodiversity loss which organizations (scientific, non-governmental, industry, or other) does the company work with to stay informed?
- Has the company made any strategic hires or additions to the senior management team to evidence an upskilling with regard to biodiversity matters?

Deforestation: Investor Engagement

Different companies will be at varying stages with regard to their understanding and reporting of deforestation risk. When it comes to investor engagement on deforestation one of the key points is establishing a company baseline through certain questions. For example, at what point did the company start tracking progress, what targets has it set, and for which commodities? What was the rationale and what is outstanding?

- Is the company exposed to forest-risk commodities or in one of the high risk sectors identified by CDP and Ceres? Has the company mapped key forest-risk commodities through the supply chain?
- Does the company undertake any forest-related risk assessments? If so could the company disclose for what products, where they are in the value chain or supply chain and which risks are assessed (e.g. as part of an enterprise risk management framework)?
- Which key forest-risk commodities (e.g., palm oil, soybean, timber, beer, rubber, coffee, or cocoa) does the company have exposure to?
- What risks have been identified as part of the forest-related risk assessment? Risk areas may include: (1) ecosystems and biodiversity loss; (2) changing regulation; (3) climate change; (4) water security; (5) loss of market or commodity; (6) reputational risk; (7) bribery & corruption; and (8) societal impact.
- Can the company disclose how much revenue is dependent on forest-risk commodities and break this down across each commodity? Which commodities have been mapped so far and which are outstanding?
- Does the company have a No Deforestation, No Peat, No Exploitation (NDPE) commitment in place and if not why not?
- Is there a board-level executive with oversight and ownership of forest-related risks within the organization, and if so, who has the highest management-level responsibility for forest-related risk? Are there time-bound commitments with an executive sponsor related to meeting commitments, such as NDPE, to reduce supply chain deforestation?
- Does the company have commodity specific policies for key forest-risk commodities? If so, what policies are currently in place to address transparency and traceability? Which commodities are covered and which are outstanding?
- Does the company calculate Scope 3 emissions including emissions from deforestation and land use change?
- Does the company have a no-deforestation policy that is publicly available? If so, how often is it updated?
- Does the policy apply to all geographies that the company sources from and all markets where the company operates?
- Does the company consider biodiversity risks when valuing assets?

An Interview with Robert-Alexandre Poujade, ESG Analyst, BNP Paribas Asset Management



Robert-Alexandre Poujade
ESG Analyst, BNP Paribas Asset
Management

Please give us a brief description of BNP Paribas Asset Management.

BNP Paribas Asset Management (BNPP AM) is the asset management arm of BNP Paribas, one of the world's foremost financial institutions, and offers high value-added solutions to individual savers, companies, and institutional investors. It has a broad range of skills in four investment divisions: Equities, Fixed Income, Private Debt & Real Assets, and Multi-Asset, Quantitative and Solutions (MAQS). Sustainability is at the heart of BNP Paribas Asset Management's strategy and investment decision-making process, making an active contribution to energy transition, environmental protection and the promotion of equality and inclusive growth. Its aim is to achieve long-term sustainable investment returns for its clients. BNP Paribas Asset Management has assets under management (AUM) of €474 billion* (as at March 31, 2021), with more than 500 investment professionals and around 500 client servicing specialists, serving individual, corporate and institutional clients in 71 countries. *€609 billion of assets under management and advisory as at March 31, 2021

Please give us some background to your role, and how you found yourself leading on ESG and the particular focus on biodiversity.

I joined the Sustainability Centre of BNPP AM as an ESG analyst in 2015 and I cover consumer staples, retail, forest, packaging, chemicals, and agro-chemicals sectors. At BNPP AM, I'm the lead person on natural capital and biodiversity and I'm a member of the Zoological Society of London Sustainability Policy Transparency Toolkit (SPOTT) Timber and Pulp, and Palm Oil Technical Advisory Group. Prior to this role, I spent four years as a Structurer in the Structured, Guaranteed and Asymmetric Solutions team of BNPP AM. I earned a Master in Management, majoring in Finance at ESCP Europe Business School, Paris (2010).

Understanding BNPP AM's dependencies and impacts on nature has been our main objective in the past years, which is a prerequisite to drive change within BNPP AM and reduce our environmental footprint. Preserving and restoring terrestrial, aquatic and marine biodiversity is very relevant for financial institutions, especially very large ones such as BNPP AM and BNPP Group. Of course, we know that we cannot do this alone, and are grateful to the many individuals and organizations that have partnered with us to date, and with whom we will partner in the future. The biodiversity crisis presents a series of daunting challenges, but since the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) "million species" report was issued, just over two years ago, we have seen many hopeful signs of interest and activity from both investors and corporations.

In order to set the scene, could you please share with us the journey that BNP Paribas has been on to get to the launch of this new environmental focused fund?

Yes. This is our first strategy around the ecosystems restoration theme. This strategy fits perfectly into one of the three themes of our global strategy as an asset manager. We want to focus, as an investor, on what we call the three E's: Energy Transition, Environmental Protection, and Equality and Inclusive Growth. The new strategy fits very well into the Environmental Protection pillar. So far, we have had great feedbacks on the innovative character of the approach. The recent strong performance of our Environmental Strategies Group may have played a role in this, but we think the positive feedback also shows that this strategy fulfils a strong demand.

And, of course, it helps that the UN has declared this decade as the Decade of Ecosystem Restoration, which underlines its importance and its opportunities.

BNP Paribas Ecosystem Restoration invests in listed global equities across the capitalization scale that offer environmental solutions contributing to the restoration of ecosystems through their products, services or processes. Investments focus on three main themes:

- **Aquatic ecosystems:** water pollution control, water treatment and sustainable packaging, aquaculture, efficient irrigation systems, and flood control solutions.
- **Terrestrial ecosystems:** technologies relating to alternative protein, sustainable agriculture, forestry, and plantations.
- **Urban ecosystems:** environmental services, green buildings, recycling, waste management, and alternative modes of transport.

BNP Paribas Ecosystem Restoration consists of a high conviction portfolio of 40-60 holdings selected from 1,000 global companies focused on aquatic, terrestrial, and urban ecosystem restoration. The investment universe is diversified by geography, size, and sector, and contains many highly innovative companies using complex technologies to address environmental issues with technology, industrials, and materials well represented. The fund is managed using an active approach combining macro and fundamental research with proprietary quantitative screening, together with integrated ESG criteria, to identify best-in-class companies. The fund also contributes to achieving six of the United Nations Sustainable Development Goals (SDGs).

The fund is jointly managed by Edward Lees and Ulrik Fugmann, who co-head BNPP AM's Environmental Strategies Group and manage the long-only BNP Paribas Energy Transition fund and the long-short BNP Paribas Environmental Absolute Return Thematic ("EARTH") fund, launched in September 2019 and July 2020 respectively. The launch of BNP Paribas Ecosystem Restoration complements BNPP AM's existing range of funds investing in sustainable development and energy transition, offering a wide range of environmental investment solutions. BNPP AM manages assets of €26 billion in sustainable thematic funds, making it one of the leaders in Europe.

Maybe worth mentioning too is the strong collaboration between the Sustainability Centre and Edward and Ulrik. This is a key success factor for the fund and for the credibility of BNPP AM's biodiversity roadmap.

Why should investors care about biodiversity loss and the broader nature crisis?

As can be seen in most nature documentaries today, biodiversity is not only in trouble — it's in crisis. As we enter the UN Decade of Ecosystem Restoration, with a deadline of 2030 to turn around ecosystem degradation and to meet the UN's wider Sustainable Development Goals, time is of the essence. Governments failed to fully meet any of the 20 Aichi goals to prevent wildlife and plant loss set in 2010.¹¹⁹ A year delay for the UN's Convention on Biological Diversity (CBD) COP 15 biodiversity conference — originally set to occur in October last year — means it's even more important for the private sector to help address the problem.

¹¹⁹ Chloé Farand, "[World misses 2020 biodiversity goals: leaked UN draft report](#)," Climate Home News, August 9, 2020.

There is good reason to do so. Aside from the intrinsic value of biodiverse, functioning ecosystems, they also fundamentally underpin all of our activities. The U.K.'s landmark Dasgupta Review on the economics of biodiversity outlines that long-term prosperity is reliant on the rebalancing of the use of ecosystem services with the natural world's capacity to supply them.¹²⁰ As highlighted by the Natural Capital Finance Alliance's "Beyond 'Business as Usual': Biodiversity Targets and Finance" report, half the world's GDP is at least moderately dependent on some form of ecosystem service.¹²¹ The degradation of these, therefore, creates significant risk for financial institutions from lower returns to higher risk of defaults and rising insurance liabilities.

As investors in individual companies, we must also take a "bottom-up" approach and consider how nature loss translates into financial risk to companies. To do so, we first need to understand each company's relationship with biodiversity and ecosystem services. There are essentially two dimensions to this relationship — dependencies and impacts — although these categories overlap considerably:

- Companies heavily dependent upon certain ecosystem services, such as food manufacturers, face physical risk when those services are depleted or critically compromised.
- Companies having a negative impact on ecosystems may face reputational or transition risk when consumers and governments seek to reorient themselves to preserve nature, through changing consumer preferences or new regulations.
- Companies heavily dependent upon these services may also face transition risk as these services begin to be priced, or when scarcity drives up the prices of natural commodities, such as honey or timber.

But the most significant risk of biodiversity loss is not the risk to companies when they lose access to certain ecosystem services, the reputational risk to investors and financiers from financing harm to nature, or even the risk to financial stability when key ecosystem services begin to disappear. Though these are all critical and in urgent need of management, the paramount risk is the unravelling of nature itself, which is underway. Put simply, ecosystem collapse will result in economic collapse. This is an existential threat. It is difficult to overstate its magnitude.

Risk management focused solely on risks to individual issuers will not translate to a reduction of systemic risk. To manage systemic risk, investors need to bring all of their influence to bear on the problem, including more effective corporate engagement and public policy advocacy.

¹²⁰ Dasgupta, P. (2021), The Economics of Biodiversity: The Dasgupta Review. (London: HM Treasury).

¹²¹ UN Environment Programme, UNEP Finance Initiative and Global Canopy 2020. Beyond 'Business as Usual': Biodiversity targets and finance. Managing biodiversity risks across business sectors. UNEP-WCMC, Cambridge, UK, 42 pp.

The recent Sustainable by Nature Biodiversity Roadmap from BNP Paribas gave a great overview of how BNP Paribas AM is thinking about ESG integration and portfolio management. How did this report come about and where do you see the fund five years' time?

If we go back in 2015, we released our climate roadmap prior to COP21. We thought the time was right to release our biodiversity roadmap prior to CBD COP15. 2021 is the super year for nature and the private sector needs to step in as it did six years ago to make COP21 a success.

According to the world's leading scientists, the natural world is in crisis. We are losing biodiversity — the very fabric of life on Earth — at an alarming rate. What does this mean for us as a large financial institution? According to the most comprehensive scientific assessment, “the diversity of nature maintains humanity's ability to choose alternatives in the face of an uncertain future.”¹²² We would be poor investors if we did not seek to preserve our long-term ability to choose alternatives in the face of uncertainty.

In 2019, we published our roadmap for providing long-term sustainable returns — our Global Sustainability Strategy (GSS). With the release of biodiversity roadmap, we build on that framework with our position on the biodiversity crisis. We communicate our positions on key issues in order to inform our clients and prospective clients, so that they know with whom they are entrusting their funds. We also aim to influence our peers and policymakers, because we cannot solve this problem on our own. This paper is not simply a statement of our awareness of this crisis; more importantly, it details our views on the nature and urgency of the crisis and how we are actively responding to it.

Over the next decade, efforts to restore oceans, soil and urban areas will require investment of \$22 trillion and create business worth \$6 trillion a year.¹²³ Thematic investing has tended to be more focused on environmental areas such as renewable energy, rather than natural capital, yet natural capital is globally recognized as one of the most important elements of addressing climate change. The green economy offers an investment opportunity encompassing around 4,000 companies globally with a market capitalization of \$5 trillion, equating to around 5% of the total listed global equity market. Nonetheless, even with annualized growth of 8% since 2009, the size of the green economy is falling short of the levels consistent with a 2°C global warming scenario in line with the Paris Agreement. When it comes to BNP Paribas Ecosystem Restoration fund, we hope that in five years' time it will have helped catalyze change and made an impact on the ground to preserve and restore ecosystems.

¹²² IPBES (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Díaz, J. Settele, E. S. Brondízio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneeth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). IPBES secretariat, Bonn, Germany. 56 pages.
<https://doi.org/10.5281/zenodo.3553579>

¹²³ World Economic Forum, [*New Nature Economy Report II: The Future of Nature and Business*](#), 2020.

In the report we highlight the importance of tackling deforestation, could you please expand on why you decided to start with this topic and the challenges and opportunities with deforestation policies? Also, do you think the investment community is doing enough to tackle commodity-driven deforestation and what is your view on current data and frameworks?

Deforestation is one of the most significant driver of biodiversity loss. Also land-system change is one of the nine planetary boundaries, that is to say one of the processes that regulate the stability and resilience of the Earth System.

As investors, the planetary boundaries framework is a useful reminder that, alongside earnings before interest, taxes, depreciation and amortization (EBITDA), cash flow, debt, and the seemingly infinite range of factors sophisticated investors use to manage investment portfolios, we must also consider the dynamics of the planet. For all of human history, we have lived within limits. Now that we have crossed these lines, we need a map to show us where they lie, and to help us find our way back to safety. The planetary boundaries remind us that we should think about our investments in the Earth System.

Let us be reminded that if the Amazon rainforest becomes a savannah, it could lead to changes in ocean circulation in the Atlantic and to temperature increases in Asia. Also, the planetary boundaries framework implies there will always be investment trade-offs to make when you consider other dimensions than just carbon. Think about large scale hydro. It is a good way to produce low-carbon electricity, but what about its impacts on terrestrial and aquatic biodiversity? Once outside the planetary boundaries, we can no longer afford these trade-offs.

I think it's fair to say that very few investors have adopted targets to address forest loss. In 2019, we set the following forest target: "To support global efforts to halve forest loss by 2020 and end forest loss by 2030, we have set targets for relevant companies in our portfolios to comply with No Deforestation, No Peat and No Exploitation (NDPE) commitments by 2020 for agricultural commodities (palm oil, soy, paper, timber, and beef products); NDPE commitments by 2030 from non-agricultural sectors (mining, metals, infrastructure)."

We recognize that policy-based indicators are only the beginning of the story. Data that would allow us to evaluate the actual performance of our investments against deforestation goals, however, is virtually non-existent. Every year, CDP sends its forests survey to companies that they believe are exposed to deforestation. In 2020, CDP reports a 31% response rate.¹²⁴ Very few companies report land conversion in hectares or other quantitative terms. For this reason, we use a "policy-based" indicator (NDPE commitments) as an interim step towards our ultimate goal, which is to understand "compliance" with NDPE commitments. We are investigating ways to measure and estimate land use and land-use change at the issuer and portfolio level, by using and combining new data sources.

¹²⁴ CDP, [The collective effort to end deforestation: A pathway for companies to raise their ambition](#), 2020.

To report on our portfolios' exposure to deforestation, we used three overarching key performance indicators:

1. Transparency
2. Strength of the forest policy and commitments
3. Supply chain traceability practices

The indicators were chosen because of their relevance, relative data availability and simplicity. Covered commodities include timber, palm oil, cattle products, soy, and rubber, where possible. To perform the analysis below, we combined data from three key databases — CDP Forest, Forest 500, and SPOTT — to expand our coverage, but we find that these data sources use different criteria and cannot always be combined into one common dataset. These databases include companies that are the most likely to be exposed to deforestation through the agricultural commodities they produce or purchase, their size and activities, and in their operations and supply chains. We are investigating ways to integrate additional datasets in the future, such as Trase tools.

We found that an alarming number of companies that we presume to be exposed to deforestation risks do not disclose adequate information to allow us to evaluate their contribution to deforestation. Our analysis of corporate policies and traceability systems also demonstrates the need for substantial improvement, suggesting that the companies themselves are unaware of these risks. These findings are deeply concerning in light of the number of “no deforestation by 2020” commitments companies have made.

We also found that nearly 70% of our sovereign AUM is invested in countries that have endorsed the 2014 New York Declaration on Forests (NYDF). Yet, as the five-year assessment report of the NYDF demonstrated, commitments do not mean progress, and the world has failed to meet the NYDF's 2020 targets. On average, the overall forest area of the countries in which we are invested has been increasing, contrary to the world's average. Yet, this figure may hide large discrepancies between planted and natural forests, and does not mean that our investments did not contribute to total natural forest loss.

This is why investors need to continue their dialogue with companies and policy makers. BNP Paribas Asset Management has been an active member of the PRI/Ceres-led Investor Initiative for Sustainable Forests for several years, and has taken the lead with a number of companies. Through this initiative, we have engaged with key companies on their policies and procedures for sourcing commodities linked to deforestation, including soy, palm oil, cattle, and timber products.

When it comes to current frameworks that are relevant for corporates, we are working to develop investor expectations of corporates to address biodiversity loss and deforestation, in collaboration with other investors. That would include:

- **Setting science-based targets for nature:** Companies will need to develop policies and procedures to address biodiversity loss, with clear and ambitious science-based goals. We recommend that companies use the Accountability Framework Initiative and participate in the development of the Science Based Targets Network framework.

- **Disclosure:** The Taskforce for Nature-related Financial Disclosures (TNFD) has only just begun its work. Ultimately, we expect that the TNFD will provide the default corporate reporting framework for nature loss. In the meantime, we expect companies to provide thorough responses to the annual CDP survey on forests, use the Accountability Framework Initiative reporting guidance for forests, and include a discussion of their response to the biodiversity crisis in their regular sustainability reporting.

Regulation has been a notable driver for many investors when thinking about ESG integration. Could you please talk about the impact of France's Article 29 for investment funds?

Article 29 of the French Law Energy-Climate requires investors to report on their alignment strategy with long-term biodiversity objectives as defined in the Convention for Biological Diversity, their contribution to the reduction of the main pressures and impacts on biodiversity as defined by IPBES, and their use of a biodiversity footprint indicator. The biodiversity footprinting work that we started with Iceberg Data Lab will help us achieve this.

How should investors analyze and address the impacts of biodiversity loss within the supply chains of investee companies?

Supply chain data points are something we are particularly interested in to account for not just one side of the issue (direct impacts) but rather the full picture (direct and supply chain impacts). For some sectors, such as the mining sector, the direct part (land-use change, pollution) drives the majority of the impact on biodiversity. For other sectors such as food and beverage, the vast majority of the biodiversity impacts happen in the upstream part of corporate value chains. The same applies to the financial sector. As investors, we therefore rely on tools that provide us more visibility beyond the direct impacts. There are public tools, such as Trase Finance from Global Canopy, which can help. We also established a partnership with Iceberg Data Lab and iCare & Consult to develop and provide us with biodiversity data (a so-called Corporate Biodiversity Footprint) that uses life cycle assessment data to quantify the environmental pressures along the entire supply chain of a given company, using asset level data if available.

The findings of our water footprint analysis for BNPP AM AUM can further illustrate why the picture really changes when considering supply chains. The effects of water over-use and pollution vary depending on the time of the year and the vulnerability of ecosystems, local populations and businesses. In our water footprint analysis, we have chosen indicators that cannot capture the full complexity of the water theme. For example, they focus on the availability of fresh water, and help us to identify heavy corporate water use, but do not address water pollution, a key threat to ecosystems. These indicators were chosen to maximize coverage, be applied at different levels of aggregation (such as corporate, countries, and portfolios) and take into account local factors as much as possible. We found that:

- When considering only direct water withdrawals (extracted and purchased), over 60% of our corporate AUM is invested in sectors with a “low to medium” average water intensity (less than 1,000 m³ per €1 million of net sales). This is explained by our large exposure to the finance sector.

- When considering direct and indirect water withdrawals, no sector is ‘low intensity’: Water is a prevalent issue and it is essential to consider supply chains. Approximately 50% of our corporate AUM is invested in sectors with ‘high’ average water intensity (between 10,000 and 100,000 m³ per €1 million of net sales).
- When indirect withdrawals are included, the consumer discretionary and consumer staples sectors’ water intensity increases by 48x and 15x respectively, meaning that the larger proportion of its water use is within its supply chains.

Another example is our land footprint analysis. We have been investigating ways of quantifying the land occupation and deforestation footprint of our investments. For example, we experimented with Exiobase 3x, which uses environmentally extended input-output models that describe the complex relationships between sectors and countries and their environmental consequences. According to these models, on average, our corporate holdings have a land footprint from agricultural commodities of approximately 30 hectares per €1 million of net sales, 99% of which is in their supply chains. Sectors with the largest land footprint from the production and use of agricultural commodities include consumer staples and materials.

This is why the supply chain angle is always part of the discussion when we conduct company engagement — for example, when we focus in the elimination of deforestation in the Amazon and Cerrado regions of Brazil. We are engaging the major Brazilian meatpackers and are now expanding our discussions to the commodity traders, seeking full traceability of supply chains and cut-off dates for any further deforestation.

This is a pivotal year for nature with the UN Biodiversity Conference later this year in Kunming, China and we would expect to see a new set of goals to tackle ecological loss for the next decade. What can investors do to support the global framework?

Without a global policy framework that sets the right level of ambition with clear targets, we are unlikely to be able to reverse nature loss. In late 2021, governments will be meeting under the auspices of the Convention on Biological Diversity (the 15th Conference of the Parties or COP15), to negotiate a post-2020 Global Biodiversity Framework.

Scientists are warning that an outcome-oriented approach with “multiple, coordinated goals and holistic actions are critical” for success: “We highlight the need for the connectedness, partial dependence, and imperfect nesting of nature’s facets to be built right from the start in the design of outcome goals, targets, indicators, and actions. In addition to addressing different facets of nature, goals must be set across the whole gradient from ‘natural’ to ‘managed’ ecosystems, attending to the specificities of these different landscapes.”¹²⁵

More than 100 businesses, under the banner of Business for Nature, have issued a detailed call for a framework that “accelerates collective leadership on nature and shows that the transition to a nature-positive future is both necessary and achievable”.¹²⁶

¹²⁵ Sandra Diaz et al., “Set ambitious goals for biodiversity and sustainability, *Science* 370, no. 6515 (October 23 2020): 411-413.

¹²⁶ [“Business for Nature’s suggestions to deliver an ambitious global agreement on nature at CBD COP15,”](#) Business for Nature, January 22, 2021.

The framework must also include the active participation of Global South countries and indigenous peoples, with a firm commitment to a “just transition”. Wealthy nations must be prepared to compensate developing countries for land that must be set aside for nature.

We plan to work with other institutional investors ahead of the COP15 talks, to express our interest in an ambitious outcome for these critical negotiations.

And finally, what advice would you give investors who are just starting to develop a biodiversity/nature strategy?

We believe a better world is one whose economic model is underpinned by a successful “Energy transition”, more “Environmental sustainability” and more “Equality and inclusive” growth. These “3Es” serve as the focus for our global sustainability efforts. We also believe that institutional investors — both asset managers and asset owners — have the opportunity, indeed the obligation, to take action to help achieve the UN’s Sustainable Development Goals and the Paris Agreement. We still have opportunities to build the future our clients want and need, but our options are dwindling: Biodiversity loss threatens the achievement of 80% of the United Nations Sustainable Development Goals sub-targets related to poverty, hunger, health, water, cities, climate, oceans, and land (IPBES, 2019). With respect to biodiversity, we see ourselves playing a role in helping make meaningful data available to the investment community and using our leverage as a large investor to encourage stakeholders to act on issues of biodiversity.

4.13 Summary

The PRI state that biodiversity loss creates risks for society and business that can result in significant negative economic and social outcomes. Biodiversity loss is a systemic risk, and the unprecedented loss of tropical biomes such as the Amazon forest places the world’s GDP at risk. Integrating the protection of biodiversity into the fiduciary duties of institutional investors and asset managers would be a way to ensure their investment policies account for natural capital or price externalities.

For many investors pursuing sustainable investment strategies demonstrating the integration of ESG factors is now part of the day-to-day activity. Investors are increasingly viewing their investments through a range of ESG frameworks such as the SASB Materiality Map which helps them to identify which factors are financially material to the sector. With pressure to disclose how they are engaging with investee companies, issues around commodity-driven deforestation, micro-plastic pollution and hazardous waste, for example, highlight key areas for active managers to engage with investee companies to understand dual or double materiality and the increasing discussion around dependencies and impact.

There is so much normative change right now with greater demands for engagement, with support from investor-led initiatives such as Ceres and the PRI. Investors have access to engagement frameworks, working groups, and collaborative efforts which have enabled collective engagement on issues around deforestation for example. As the pressures to report ESG integration and engagement increase, we will see more focus on biodiversity metrics and targets and investor led initiatives across a broad array of biodiversity related issues.

Chapter 5: The Impact of Regulation for Corporates and Investors

"The only hope for the species still living is a human effort commensurate with the magnitude of the problem. The ongoing mass extinction of species, and with it the extinction of genes and ecosystems, ranks with pandemics, world war and climate change as among the deadliest threats that humanity has imposed on itself. To those who are steering the growth of reserves worldwide, let me make an earnest request: don't stop, just aim a lot higher."

—E.O. Wilson, *Half-Earth: Our Planet's Fight for Life*

The integration of environmental, social, and governance (ESG) factors including biodiversity loss into the investment process has been catalyzed by regulation. Europe appears to be ahead of the curve in terms of regulation. The EU Taxonomy, the Sustainable Finance Disclosure Regulation (SFDR) and France's Article 29 are all signs of requirements for biodiversity disclosure to come set against The EU Biodiversity Strategy for 2030, which aims to halt the loss of biodiversity and the degradation of ecosystem services by 2030. In this chapter, we discuss some of the key policies, regulations and initiatives that are in place or on the horizon. The section is focused primarily on Europe to start, but as the TNFD develops and more countries commit to tackling biodiversity loss (e.g., the recent G7 leaders' commitment to halt and reverse biodiversity loss by 2030), we expect more countries will start to include biodiversity and nature in disclosure regulations.

5.1 EU Sustainable Finance Action Plan and EU Biodiversity Strategy

The Sustainable Finance Action Plan (SFAP) is a major policy objective by the European Union (EU) which aims to promote sustainable investment across the 27-nation bloc. Parts of the Sustainable Finance Action Plan became effective this year in March 2021 and there is a longer timeline for new laws.¹²⁷ The plan was first set out by the European Commission (EC) in March 2018 in response to the signing of the Paris Agreement in December 2015, and to the United Nations 2030 Agenda for Sustainable Development earlier in 2015, which created the UN Sustainable Development Goals (UN SDGs).

The Sustainable Finance Action Plan is also aligned with the goals of the European Green Deal, which has set a target of 2050 for carbon neutrality across the EU. The plan is part of a wider Sustainable Finance Framework, which is backed by a broad set of new and enhanced regulations. These include the Sustainable Finance Disclosure Regulation (SFDR), which aims to improve the classification of sustainability credentials of investment funds, and a new EU Taxonomy, which aims to define what economic activities are "green" for the first time.

The Sustainable Finance Action Plan has three objectives:

1. Reorient capital flows towards sustainable investment and away from sectors contributing to global warming such as fossil fuels.
2. Manage financial risks stemming from climate change, resource depletion, and environmental degradation.
3. Foster greater transparency and long-termism in financial and economic activity to achieve sustainable and inclusive growth.

The scope of the regulation is very broad, and it applies to asset managers, pension funds, EU banks and insurers, among others

¹²⁷ ["Sustainable Investing Glossary"](#) Robeco, accessed July 28, 2021.

5.2 EU Sustainable Finance Disclosure Regulation (SFDR) and Biodiversity Sensitive Areas

The SFDR, which came into effect in March 2021, is a set of rules that aim to make the sustainability profile of funds more comparable and better understood by end-investors and came into effect in March 2021. The SFDR will focus on pre-defined metrics for assessing ESG outcomes of the investment process. There is much more emphasis on disclosure, including new rules that must identify any harmful impact made by the investee companies. The SFDR forms part of the EU wider Sustainable Finance Framework and aims to promote sustainable investment across the EU but is expected to transcend Europe's borders.

The SFDR has introduced a classification system for investment funds and mandates with three categories identified as Articles 6, 8, and 9.

Definition

Article 6: A fund that qualifies as Article 6 does not integrate any kind of sustainability credentials into the investment process and can include stocks currently excluded by ESG funds such as tobacco companies or thermal coal producers. These funds will continue to be sold in the EU, as long as they are clearly labelled as non-sustainable and may face considerable marketing difficulties when matched against more sustainable funds.

Article 8: A fund that promotes environmental and societal characteristics is described as an Article 8 fund when the fund is able to explain where a financial product promotes, among other characteristics, environmental or social characteristics, or a combination of those characteristics, provided that the companies in which the investments are made follow good governance practices.

Article 9: The most ambitious categorization is known as Article 9, also known as “products targeting sustainable investments”, and covers products targeting bespoke sustainable investments and applies “... where a financial product has sustainable investment as its objective and an index has been designated as a reference benchmark.”

Within the SFDR, the identification of principle adverse impact (PAI) will be introduced from June 2021. The identification of principle adverse impact will require an asset manager to describe its due diligence policy with a principal adverse impact statement (PAIS) and how these sustainability factors are taken into account when making investment decisions.

The PAIS is intended to show investors and prospective investors how investment decisions made by an investor have, or may have, adverse impacts on sustainability factors relating to environmental, social and employee matters, respect for human rights, anti-corruption, and anti-bribery matters.¹²⁸

Of the 18 mandatory adverse impact indicators — ranging from carbon emissions, fossil fuel exposure to employee matters — there is a specific indicator related to activities that negatively affect biodiversity sensitive areas. Investors will have to disclose their share of investments in investee companies with sites/operations located in or near to biodiversity sensitive areas where activities of those investee companies negatively affect those areas. The SFDR also has additional climate and other environment-related indicators including share of investments in companies without a policy to address deforestation.

¹²⁸ “[SFDR Factsheet: The Principle Adverse Impact Statement](#),” Matheson, January 2021.

5.3 France's Article 29 Biodiversity Disclosure

New French disclosure regulation seeks to standardize nature-related data, metrics, and methodologies. French financial institutions are now required to disclose both biodiversity and climate-related risks and impacts, per a new decree from the French financial regulator. The inclusion of biodiversity in the new disclosure regulation signals a shift in the finance sector that climate risk is no longer the only environmental risk and that the integration of biodiversity risk is now financially material.

The new decree under Article 29 of the French law on Energy and Climate provides extensive details on expected disclosures across both biodiversity and climate.¹²⁹ It requires financial institutions to publish information on the portion of their assets complying with the environmental criteria set out in the EU Taxonomy. The notable difference is that Article 29 now requires all French financial institutions — including banks, investors and insurers — to disclose biodiversity-related risks as well as climate-related risks.

The new decree adopts the concept of double materiality, aligning itself with the new EU Sustainable Finance Disclosure Regulation (SFDR). Double materiality means that financial institutions must disclose how their financial activities depend on climate and biodiversity, as well as how their financial activities impact on climate and biodiversity.

For investors the concept of double materiality will require the consideration of the investee company on the environment and biodiversity. For example, a consumer goods company that has forest-risk commodities in its supply chain will have an impact on deforestation and soil degradation. The production of agricultural commodities also relies on the pollination services of insects, which underpin global food systems. If climate change continues to drive extreme weather events and insect colonies collapse this could have a negative impact on crop production and result in lower agricultural yields.

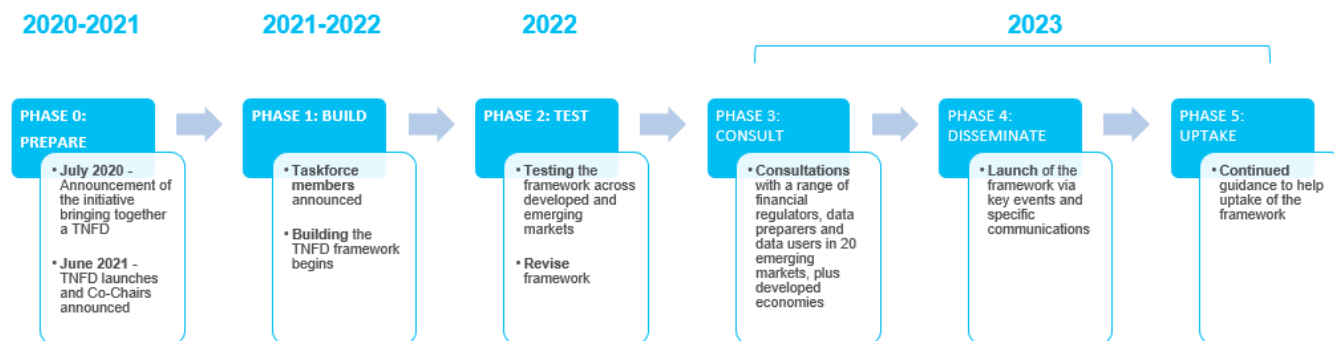
5.4 Taskforce on Nature-related Financial Disclosures

In order to halt the destruction of the natural world there is an urgent need for financial decision making and investments to take account of nature. The launch of the Taskforce for Nature-related Financial Disclosures (TNFD) marks an important milestone in the process to integrate nature-related financial disclosures into the investment process. The TNFD was initiated by a partnership between Global Canopy, The United Nations Development Programme (UNDP), the United Nations Environment Programme Finance Initiative (UNEP FI) and the World Wildlife Fund (WWF), and has started by building a framework to help lenders and investors make financially informed decisions aligned with climate and the natural environment. Similar to the Task Force on Climate-related Financial Disclosures (TCFD), compliance will be voluntary to start but mandatory disclosure requirements are expected over time.

¹²⁹ [“LOI n 2019-1147 du 8 novembre 2019 relative à l'énergie et au climat \(1\): Article 29,”](#) Légifrance, 2019.

The TNFD commits to delivering a framework by 2023 (see Figure 36 below) for organizations to report and act on evolving nature-related risks, to support a shift in global financial flows away from nature-negative outcomes and toward nature-positive outcomes. The TNFD will consist of approximately 30 members, with an equal representation of financial institutions and corporates from developed and emerging markets, as well as service providers. The focus on nature-positive ambition is supported by a new framework for organizations to report and act on evolving nature-related risks and opportunities which will be beneficial for the financial community.

Figure 36. Timeline of TNFD



Source: Adopted from TNFD (<https://tnfd.info/>)

The establishment of the TNFD, a global initiative to provide financial institutions and corporates with a comprehensive assessment of their environmental risks and opportunities and its recommendations, received major endorsement from financial institutions, corporates and governments.¹³⁰ The TNFD released a report that highlights its proposed goals and summarizes the proposed scope, governance, work plan, communication, and resourcing of the TNFD.¹³¹ The TNFD sets out seven principles (see Figure 37) that highlight the need for usable frameworks, the adoption of a science-based approach, the understanding of nature-related risks and the focus on the climate-nature nexus.

¹³⁰ "Taskforce on nature-related financial disclosures (TNFD) launched," UN Environment Programme Finance Initiative, June 4, 2021.

¹³¹ Taskforce on Nature-related Financial Disclosures, *Nature in Scope: A summary of the proposed scope, governance, work plan, communication and resourcing plan for the TNFD*, June 2021.

Figure 37. Proposed TNFD Principles

1. Market Usability	Develop frameworks directly useful and valuable to market reporters and users, notably corporations and financial institutions, as well as policy and other actors.
2. Science-based	Follow a scientifically anchored approach, incorporate well established and emerging scientific evidence, and aim to incorporate other existing science-based initiatives.
3. Nature-related risks	Address nature-related risks that include immediate, material financial risks as well as nature dependencies and impacts and related organizational and societal risks.
4. Purpose-driven	Be purpose driven and actively target reducing risks and increasing nature-positive action by using the minimum required level of granularity to ensure achievement of the TNFD goal.
5. Integrated & Adaptive	Build effective measurement and reporting frameworks that can be integrated into and enhance existing disclosures and standards. Account for and be adaptive to changes in national and international policy commitments, standards, and market conditions.
6. Climate-Nature Nexus	Employ an integrated approach to climate- and nature-related risks, scaling up finance for nature-based solutions.
7. Globally Inclusive	Ensure the framework and approach is relevant, just, valuable accessible and affordable worldwide, including emerging and developed markets.

Source: TNFD

The work of the TNFD will enable investors to make informed and robust capital allocation decisions based on clarity, confidence, and trust in natural capital and environmental opportunities and risks disclosed by a company, alongside climate change. The framework will equip financial analysts with a better understanding of how to utilize environmental and natural capital-related information in determining impacts on future cash flow and ultimately company valuations, alongside climate change. The TNFD will also provide companies with the provision of a framework to incorporate environmental and natural capital-related information into mainstream financial reports alongside data on climate-related financial disclosures. This will help companies achieve a holistic view of how climate change and natural capital can affect performance and the necessary actions they need to take to address the risks and opportunities. This will also equip investors with the necessary toolkit to drive greater engagement with investee companies which will help to unpack the dynamics of value creation.

The TNFD also aims to align with global goals as well as other related initiatives. For example, it will broadly seek to align with the two global targets in the CBD's zero-draft Global Biodiversity Framework of "no net loss by 2030 and net gain by 2050". Through its description of nature-related risks and opportunities, the initiative adopts the definition of impacts offered by the Science Based Target Network (SBTN): "positive or negative contributions of a company or other actor toward the state of nature, including pollution of air, water, soil; fragmentation or disruption of ecosystems and habitats for [human and] non-human species; alteration of ecosystem regimes."

For investors, the understanding of nature-related financial risks and opportunities will help to meet future regulatory requirements but can also help with the construction of future-oriented investment solutions that deliver a biodiversity net gain by 2050 target. Investors, already considering physical and transition risk from climate will soon be expected to consider nature-related physical and transition risks and opportunities.

5.5 G7 Finance Ministers and Central Bank Governors Communiqué Back TNFD

The need for transformative efforts to tackle climate change and biodiversity loss was a central theme of the G7 Finance Ministers and Central Bank Governors Communiqué with commitments to embed climate change and biodiversity loss considerations into economic and financial decision making. The breadth of coverage and commitment sees a confluence of efforts from the finance, scientific and economic community.¹³² This commitment was also emphasized at the G7 Leaders' Summit in Cornwall in June 2021 where a shared G7 Nature Compact was agreed, and was the first time the G7 has committed to halting and reversing biodiversity loss.

5.6 The Finance for Biodiversity Pledge

The Finance for Biodiversity Pledge was launched during the Nature for Life Hub and the Biodiversity Summit of the United Nations General Assembly in September 2020. Signatories to The Pledge called on global leaders and committed to protect and restore biodiversity through their finance activities and investments in the run-up to COP15 in October 2021. At the time of writing, the number of Pledge signatories has grown to 55, spanning 15 countries and representing over €9 trillion in assets. These 55 financial institutions commit to collaborating, engaging, assessing their own biodiversity impact, setting targets and reporting on biodiversity matters by 2024.¹³³

5.7 Why Data Has Become the Great ESG Enabler

As this chapter has highlighted, investors and corporates are facing enormous disclosure requests. We are in the midst of a major transformation and the pace of change is accelerating. There is no longer a static ESG framework that can guide investors and corporates through single and double materiality or impact and dependencies. Investors have to be innovative and flexible in how they digest and interpret ESG data by using smart digital technology.

The financial frameworks that companies and investors use are fundamentally changing as they adapt to integrate climate-related and sustainability-related financial risk. They are moving from where we used to be — static, backward, and lagged data — to something forward-looking and interactive that now includes the natural environment, climate change, biodiversity, and water.

The ESG data landscape is highly fragmented and imperfect, and current estimates suggest that there are several hundred standards and data providers which can be unsatisfactory for companies and investors. It means investors have high transaction costs to validate data only to discover that much of that data is estimated, incoherent, and based on assumptions.

Big unstructured data, natural language processing (NLP) and machine learning (ML) are not only disrupting the processes investors are used to, but are also offering solutions, enabling investors to adopt a more targeted, focused and dynamic approach to ESG engagement specifically on climate and biodiversity loss. Big data will allow investors, and corporates, to assess, for example, biodiversity hotspots, mean species abundance (MSA) and agricultural maximization models in global food systems. This will enable investors to work towards smarter,

¹³² ["Policy paper: G7 Finance Ministers and Central Bank Governors Communiqué,"](#) GOV.UK, June 5, 2021.

¹³³ ["About the Pledge,"](#) Finance for Biodiversity Pledge, 2021.

regenerative ways of producing food with higher value added, and also mitigate their environmental impact.

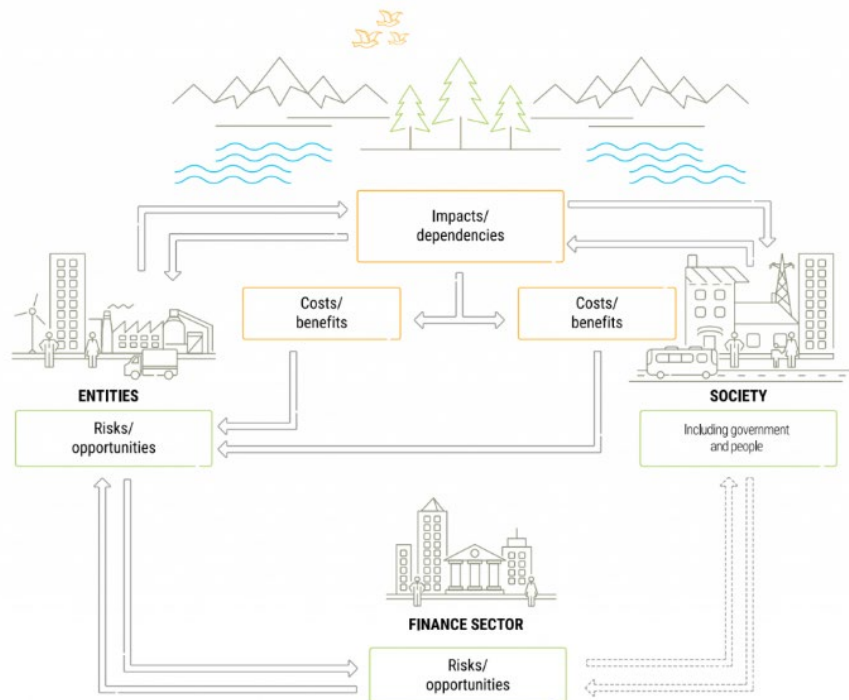
Companies that are strong on ESG performance are far more likely to be successful over long periods of time, and there is now a greater need to understand and process new data sets to understand what signals ambition and rigor through an ESG lens. ESG disclosure and performance is emerging as a necessary precondition for success and data has become the great enabler. We will address this in greater detail in a follow-up report when we address the question around how investors and corporates can tackle the biodiversity loss issue.

5.8 Why Integration of Biodiversity Loss into ESG Engagement is the Next Natural Step

As outlined earlier, the loss of biodiversity creates societal and environmental risk that affects businesses and communities, and can result in a deleterious impact on economic and social outcomes. The host of nature-related risks discussed in the chapters above highlight the very real threats to corporates and investors in the short, medium, and long-term.

KPMG research indicates that less than a quarter of large companies at risk from biodiversity loss disclose on the topic.¹³⁴ They further note that 80% of the world's 250 largest companies now report on sustainability; however, biodiversity-related risk remains significantly under-reported by the global business community, making it more challenging for investors to evaluate those companies and sectors most at risk.

Figure 38. How Business and Markets Depend and Impact on Biodiversity and Natural Capital



Source: Nature Capital Coalition

¹³⁴ "KPMG: Biodiversity-related risk remains under-reported," KPMG, December 3, 2020.

The Global Reporting Initiative (GRI) recently announced that it has received backing from a series of companies and organizations for the development of an updated and revised biodiversity standard for sustainability reporting.¹³⁵ The current GRI Biodiversity Standard (GRI 304) is used annually by at least 2,000 organizations, out of the more than 10,000 companies reporting with the GRI Standards.

As companies improve their sustainability disclosures investors will be better equipped to navigate nature-related financial disclosures and integrate these factors into the engagement and investment process.

The impact of regulation, discussed earlier, is one of the key reasons investors have started to incrementally consider biodiversity loss imposing greater demands on investee companies for biodiversity-related financial disclosures.

5.9 Summary

The integration of ESG factors including biodiversity loss into the investment process shows no signs of abating with demands from asset owner clients and new regulation. Europe appears to be ahead of the curve in terms of regulation but this is expected to eventually transcend Europe's borders.

The transition to a low-carbon economy along with climate change and biodiversity loss is expected to impact the valuation of financial assets which will present substantive financial risks for the financial system. The Taskforce for Nature-related Financial Disclosures (TNFD), and its recommendations, are being developed to help investors and market participants identify future nature-related risks.

If markets start to price in the risk from biodiversity loss either from a potential physical, litigation or reputational risk or from a dependency on a key commodity or resource, then the impact for markets with significant exposure to at-risk sectors could be financially material. There are signals that companies and investors are becoming concerned about the risks stemming from ecological loss and the degradation of natural ecosystems.

The WWF Global Futures Report suggests that damage to ecosystems could drain \$10 trillion from the global economy by 2050; these are conservative estimates, as the study only considers six ecosystem services and is not an assessment of the total costs of nature loss.¹³⁶

The incoming regulation summarized in this section is expected to have a far-reaching impact and has already helped to shift the focus on a set of clearly defined issues within the environmental and societal pillars. For the first time, investors have to disclose how they are engaging with portfolio companies on a range of environmental factors in addition to carbon footprint, carbon intensity, and supply chain emissions.

¹³⁵ ["Biodiversity crisis emphasizes need for corporate transparency,"](#) Global Reporting Initiative, June 4, 2021.

¹³⁶ Johnson, J.A., Baldos, U., Hertel, T., Liu, J., Nootenboom, C., Polasky, S., and Roxburgh, T. 2020. Global Futures: modelling the global economic impacts of environmental change to support policy-making. Technical Report, January 2020. <https://www.wwf.org.uk/globalfutures>

This has catalyzed investors into action and there are a number of ESG frameworks, sustainability standards, and rating agencies keen to help investors with these future reporting requirements and engagement strategies. This will eventually cascade down across asset classes, from equities into fixed income, developed into emerging markets, and private into public markets.

Another area that we will cover in future reports will look at the role that big data and AI technology will play to help meet these requirements. Data will also help to foster greater transparency between investors and their portfolio companies and will hopefully help us answer the next round of questions on how do we tackle this issue at scale.

Initiatives such as the UNEP FI, Finance for Biodiversity, and the TNFD are bold attempts to galvanize investors into action on biodiversity loss, and 2021 has been hailed as a critical year to tackle the sustainability, climate and biodiversity goals.

Conclusions

This report, which seeks to answer the question: “Why should corporates and investors care about biodiversity loss?” has uncovered compelling reasons not to ignore this environmental issue and to adopt the same urgency as the climate crisis. By building resilience into our ecosystems, they can play a powerful role in reducing greenhouse gas (GHG) emissions, underscoring the ecosystems upon which society and the economy depends and deliver tangible benefits to human health and wellbeing.

This report highlights that we have now crossed four out of the nine planetary boundaries identified by the Stockholm Resilience Centre, which while not perfect, are an excellent communication tool. If we push these boundaries too far, we risk losing Earth system resilience and crossing tipping points that could have far reaching economic, environmental, and societal impacts. Human activity now rivals geological forces in influencing the trajectory of the Earth System and this has important implications for societal decision making and the global economy. Biosphere integrity supports all other planetary boundaries, and we need to do better at managing our global portfolio of natural assets.

The Intergovernmental Science Policy Platform on Biodiversity and Ecosystem services (IPBES) identified five direct drivers of biodiversity loss: changes in land and sea use, direct exploitation, climate change, pollution and invasive species. A co-sponsored workshop between Intergovernmental Panel on Climate Change (IPCC) and IPBES stressed that neither the biodiversity or climate crisis will be successfully resolved unless both are tackled together. Deforestation and degradation has been identified as one of the key drivers of land-use change contributing up to 20% of global GHG emissions.

It is estimated that 95% of deforestation takes place in the tropics and in 2019, a football pitch of primary rainforest was lost every six seconds. Recent studies have found that tropical forests are losing their ability to absorb carbon, and the Brazilian Amazon has released more carbon over the past 10 years than it has absorbed. Tropical forests also harbor some of the planet’s richest and most critically endangered biodiversity. The destruction and degradation of tropical forests poses a threat to global biodiversity, climate action, as well as global health.

Businesses have a two-way relationship with nature, and corporates should start assessing both their dependencies and impacts on nature now. Exposure to forest-risk commodities is an example of both dependency and impact on nature and presents a business risk for corporates. The use of forest-risk commodities are widespread across industries; the most obvious sectors that are exposed are consumer staples and discretionary; industrials; and energy and utilities. However, if we consider forestry products — including paper and packaging, and furniture — then companies in almost all industries are exposed to some extent. The following summary chart brings together sector exposure to forest-risk commodities as well as key drivers of impact on biodiversity.

Sector	Industry group	Exposure to Forest Risk Commodities	Key pressures on biodiversity and nature loss							
			Land, water and sea use change	Resource exploitation	Climate Change	Pollution				Invasives and Other
						Non-GHG air pollutants	Water pollutants	Soil pollutants	Solid waste	
Energy and Utilities										
Materials										
Industrials										
Consumer Discretionary	Automobiles & components									
	Consumer Durables & Apparel									
	Consumer Services									
	Retailing									
Consumer Staples	Food & Staples Retailing									
	Food, Beverage & Tobacco									
	Household & Personal Products									
Healthcare										
Communication Services										
Information Technology										
Real Estate										
Financials										

High exposure
 Moderate exposure
 High to very high impact
 Medium impact
 Operations
 Upstream

It is important for corporates to address unsustainable procurement processes but to achieve real transformation, day-to-day decision making in business must consider impacts on nature. Corporates that are starting to develop a biodiversity/nature strategy should consider three points:

1. **Accountability** should sit at the board level.
2. **Ambition** should be evident within plans and actions, even though the perfect methodology may not exist yet.
3. **Collaboration** with peers is necessary to learn from the experience of others.

Richer nations, identified as having “embedded biodiversity loss”, may soon be held accountable for their negative impacts as the focus shifts to consumption patterns and demand drivers. The consumption and use of goods in consuming countries are rarely linked to the degradation or destruction of nature in the producing countries. China, India, Russia, and the United States together account for about a third of total imported deforestation, with China alone making up 14%. Yet, in 2018, soybean was the most valuable export commodity in Brazil worth \$34 billion and forest commodities make an important contribution to economic growth and development across many of developing markets. International trade in forest-risk commodities is increasing, and we identify that over 70% of global trade in palm, rubber, sugarcane, and coffee come from forest-risk commodities.

The rise of sustainable investment strategies and European regulation has accelerated environmental, social, and governance (ESG) integration across assets prioritizing disclosure on climate-risk and soon biodiversity loss. This propulsion is further supported by asset owner demands, consumer behavior patterns towards greater transparency and traceability and inter-generational wealth transfer. The risks that corporates and investors face today from a changing climate and ecosystem degradation encompass physical, transition, litigation, reputational, and systemic risk. The threat for being exposed for unethical or unsustainable practices in supply chains has incentivized many investors to engage more actively with investee companies to understand supply chain hotspots and exposures to key forest-risk commodities for example. Similar to Net Zero Clubs that are forming consisting of suppliers and counterparties with similar climate ambitions (see Citi GPS report [Sustainable Tipping Points: The 'Net Zero' Club](#)), we can this happening for biodiversity especially when it comes to sustainable sourcing.

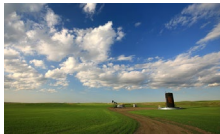
A headline World Economic Forum statistic identifies \$44 trillion of economic value generation moderately or highly dependent on nature emphasizing the importance of nature to business and the economy. Biodiversity loss creates risks for society and business that can result in significant negative economic and social outcomes. However, this global challenge also presents an opportunity to innovate; to create a sustainable future, we need nature-positive products, services, and business models.

We hope this report serves to highlight the much needed escalation of this important topic with as many stakeholders as possible in different areas: government, financial, business, and sovereign. Biodiversity loss poses systemic risk and this has to be regarded with the same level of urgency as the climate crisis. COP15 and COP26 later this year offer a crucial window of opportunity to advance the alignment of the climate and nature agenda, and to seek cross-cutting solutions. As we stated at the start of this report the window is still open for us to build a sustainable future for humanity, but time is running out and now is the time to act. We encourage our readers to engage with this content and we will follow this with a second report that addresses “How corporates and investors should tackle biodiversity loss.”

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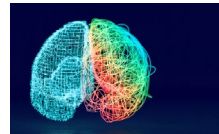


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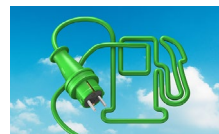
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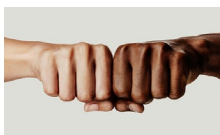
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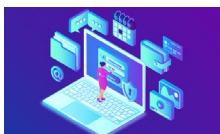
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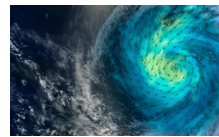
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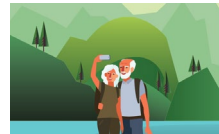
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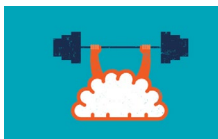
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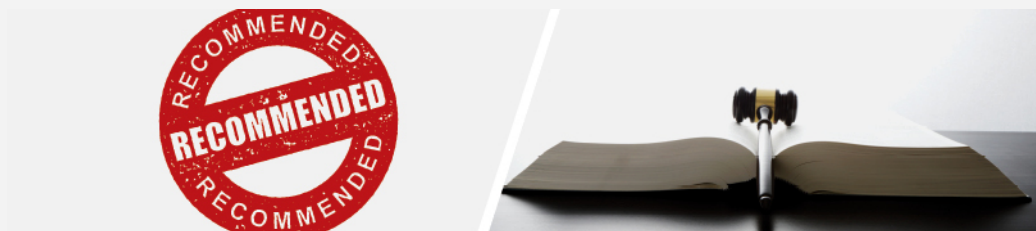
NATURAL RESOURCES

Continued deforestation and degradation of the world's remaining intact tropical forests is not only a significant contribution to GHG emissions, but also a major cause of ecosystem degradation and resultant ecological loss. / [Committing to zero deforestation is a key step to tackling biodiversity loss, and commodity-driven deforestation is something companies and investors can help to address and make an impact.](#)



REGULATION

Previous attempts by world leaders to set targets for biodiversity have failed to achieve material reductions in the rate of biodiversity loss. / [The rise of sustainable investment strategies and European regulation has accelerated ESG integration across assets, prioritizing disclosure and climate-risk and soon biodiversity risk.](#)



SUSTAINABILITY

Biodiversity is decreasing at unprecedented rates and ecosystems are now losing species at rates only seen in previous mass extinction events. The loss is impairing the functioning of ecosystems and their capacity to deliver goods and services. / [The biodiversity crisis is as urgent as the climate crisis and the window for opportunity is still open and investing in nature-based solutions can help tackle climate change and halt biodiversity loss.](#)



