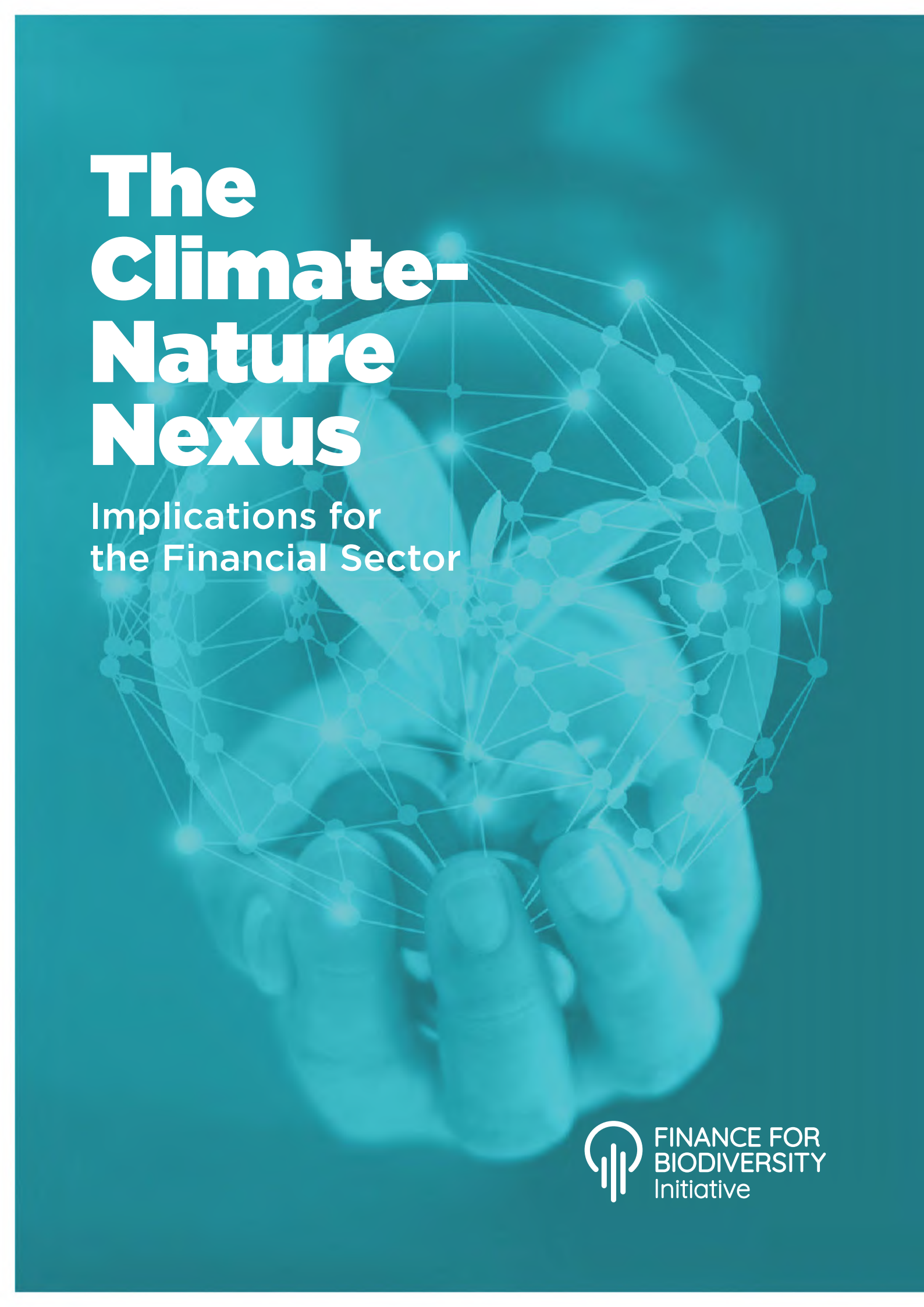
The Climate-Nature Nexus

Implications for the Financial Sector



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About this report

'The Climate-Nature Nexus' takes a practical look at where climate- and nature-related risks and opportunities do and don't overlap; what that means for the investment potential of different sectors and solutions; and how much of the nature problem financial institutions address if they cover climate well. It offers recommendations on how the private financial sector can adapt its climate approaches to address nature and be robust to nature-related risks; and on how the policy community can support the financial sector to do so.

The report is primarily intended for financial market practitioners seeking to advance their respective institutions in their handling of material risks and opportunities at the nexus of climate and nature. In addition, it seeks to synthesise evidence in an accessible way for the growing number of initiatives supporting practitioners at this nexus. Notably, this includes the two main risk disclosure platforms, the Task Force for Climate-related Financial Disclosures (TCFD) and the Taskforce for Nature-related Financial Disclosures (TNFD), as well as their counterpart at the financial system level, the Network of Central Banks for Greening the Financial System (NGFS). It also informs the growing number of policy and regulatory initiatives at the nexus, such as financial sector engagement under UNFCCC COP26 and CBD COP15, the EU taxonomy, and efforts to advance due diligence obligations that cross over nature and climate impacts. Finally, it also informs major initiatives designed to bridge the nexus such as voluntary carbon markets, sustainable data platforms, and sustainable investor networks.

Reflecting Finance for Biodiversity's (F4B) mission and theory of change, this report aims to help the growing body of work at the climate-nature-finance nexus achieve exposure and impact. As such, it synthesises and showcases evidence in the space, draws connections between different pieces of work, and presents the material within an accessible and cohesive framework.

Comments are welcomed. Please direct these to:
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THE FINANCE HUB

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Executive summary

Nature loss has fundamental implications for financial system operations that have received insufficient attention to date. The financial sector has largely been focused on the risks and opportunities associated with physical climate impacts and the zero-carbon transition, exemplified by the work of the Task Force on Climate-related Financial Disclosures (TCFD).

Climate change and nature loss intersect across four key domains: physical risks, climate adaptation opportunities, transition risk, and transition opportunities (see Figure 1).

• **The combined physical impacts of nature loss and climate change can compound business risks significantly.** The strongest examples exist for agriculture, forestry and fisheries, as well as built infrastructure and utilities. A multitude of risks threaten crop yields including lower rainfall, higher temperatures, declining natural pest control, soil degradation and loss, and pressures on pollinators (see the IPCC's special report, 2019)[1]. For example, climate variability accounts for a third of crop yield variability globally[2], while pests can reduce yields by between 18% (animal pests) to 34% (weeds).[3] These risks are additive, but also compounding, since climate change can exacerbate ecosystem imbalances in which pests flourish.

• **Some climate adaptation and mitigation measures can harm nature.** For example, the Three Gorges Dam reduced the abundance of a nitrogen recycling bacteria, lowering nitrogen levels downstream (which can harm plants and crops).[4] After the construction of the several dams along the Yangtze River, critical habitats for 46 endemic species were lost.[5] Hard engineering approaches such as structural flood defences should be implemented carefully and with mitigating measures in place. Responses that address climate change and nature loss should prioritise nature-based solutions[6] and complementary grey-green approaches.

• **A joint climate-nature transition comes with a different set of risks and opportunities, and substantial differences in expected market growth.** A joint climate-nature transition is not only consistent with net-zero carbon emissions but also has net-positive impacts on nature. By considering climate but not nature, the market values of bioenergy, large infrastructure projects and low-carbon materials in 2050 are likely to be overestimated due to their large potential negative impacts on nature.[7, 8, 9] Gross domestic product (GDP) growth in the agriculture sector alone is inflated by an estimated US$1.9 trillion, and current market expectations for new sectors like bioenergy could be overstated by a factor of 30 (see Box 3 for more detail on scenarios).[10] Risks are also severely underestimated for sectors that have relatively small climate risks but rely heavily on nature, such as pharmaceuticals.
In contrast, there will be greater demand for nature-positive carbon sequestration such as through well-designed and well-managed nature-based solutions. Increased investment in nature-based solutions in a joint transition will lead to improved resilience and health outcomes.[11] There will also be expanded investment opportunities in novel agricultural practices such as regenerative or vertical farming, with flows expected to total US$57 billion annually by 2030.

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Figure 1 | Overview of main interactions between climate- and nature-related risks and opportunities in a joint climate-nature transition compared to a climate-only transition

	PHYSICAL / ADAPTATION	TRANSITION
RISKS	**- Physical nature loss risks compound physical climate change risks** in agriculture, forestry, fisheries, utilities, built infrastructure **- New physical nature loss risks distinct from climate change** in pharmaceuticals, construction, and cross-sector (e.g. disease)	**- Unaccounted nature transition risks** in agriculture, forestry, fisheries, built infrastructure, mining **- Leading to lower than expected growth** in meat, bioenergy, conventional ag tech, large infrastructure, and materials for the zero-carbon transition
OPPORTUNITIES	**- Strong joint climate adaptation and nature transition opportunities** in nature-based solutions (NBS) **- Smaller climate adaptation opportunities due to nature transition risks** in hard engineering approaches, used to complement NBS only were necessary and with measures to mitigate nature impacts	**- Strong joint climate-nature transition opportunities** in new ag tech and business models, reducing food waste, sustainable aquaculture and fisheries, offshore mariculture, healthy diets, NBS **- Leading to stronger than expected growth** in particular in NBS, fuelled by lower demand for bioenergy

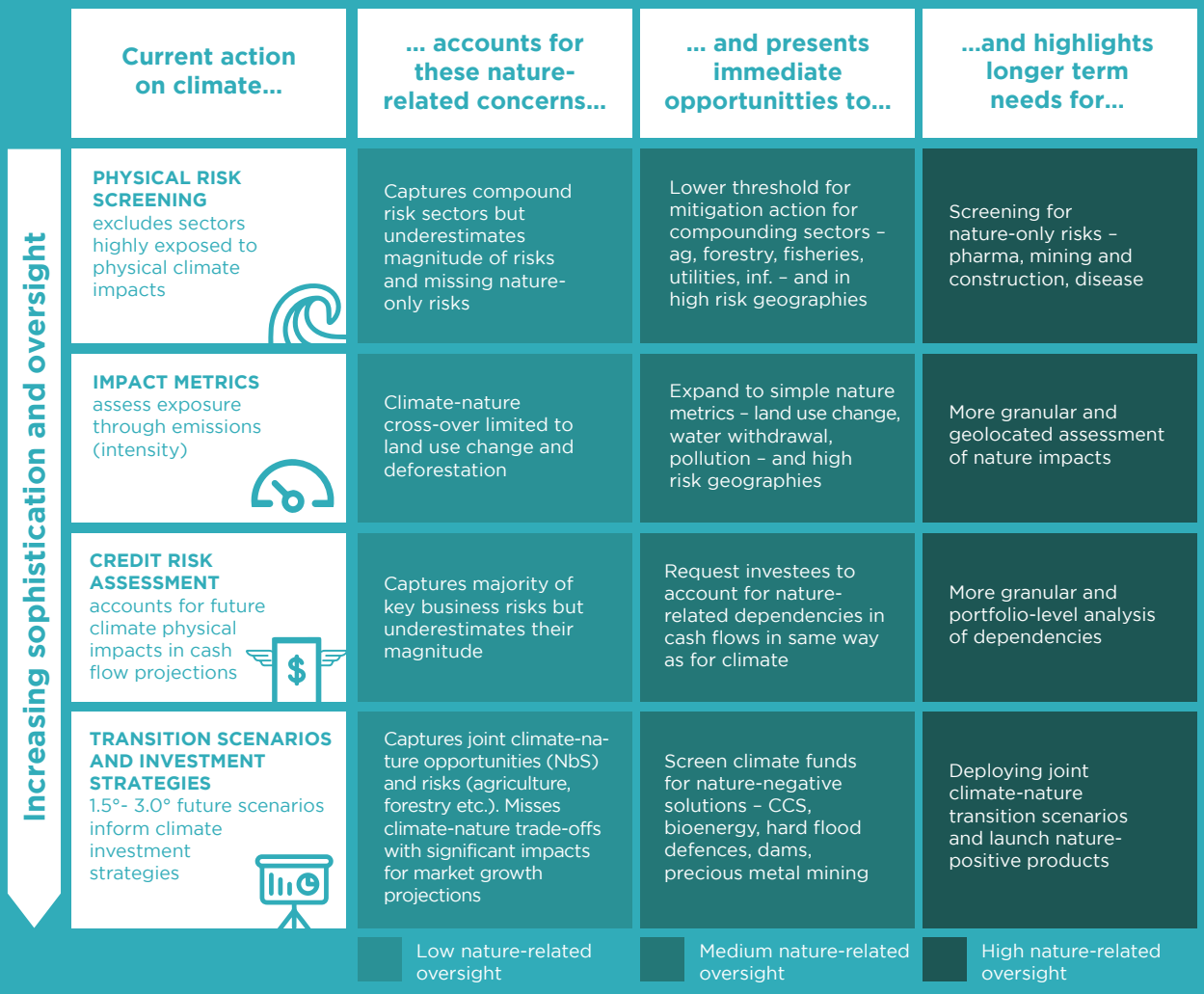
Source: Vivid Economics

A focus on nature, and how it interacts with climate, is slowly emerging across financial sector frameworks, standards, policies and regulators. The Taskforce for Nature-related Financial Disclosures (TNFD) will develop a framework for reporting and acting on evolving nature-related risks, the Science-Based Target Network (SBTN) is refining its guidance for corporate nature-related targets, and the GHG Protocol is developing specific guidance for the land use sector. In 2020, De Nederlandsche Bank (DNB) assessed the Dutch financial system's dependency on nature. In 2021, the Bank of England's remit was updated to consider the relevance of non-climate environmental risks to financial stability, and The Network of Central Banks for Greening the Financial System (NGFS) launched a working group on biodiversity. Scenarios such as UN PRI's Inevitable Policy Response (IPR) pays particular attention to some of the most critical aspects of a joint climate-nature transition such as deforestation and sustainable water use.

Private financial institutions can leverage their progress on climate to start building capacity for nature-related risk management today and prepare for a joint climate-nature transition. ESG and climate considerations have become mainstream, though strategies and the sophistication of approaches vary widely. Many of these strategies already address aspects of nature, and there are low-cost opportunities to adapt them to pick up more (see Figure 2):

- **Lower the threshold for mitigating action to account for combined nature and climate impacts:** Agriculture, forestry, fisheries, utilities and built infrastructure are all exposed to compounding physical risks from climate change and nature loss. The location of investments should be screened against areas in which natural resources are known to be under significant pressure. Additional due diligence, investee risk assessment, engagement and mitigation action should be taken to mitigate these combined risks.
- **Integrate high-quality nature impact metrics into ESG procedures:** For sectors that are known to have high impacts on nature, quantitative nature impact metrics should be added to screening procedures. Relatively good data already exist for land use change, water withdrawal, and pollution, and continue to evolve.[12] Capturing the risks associated with deforestation, which has large climate and nature impacts, should be a priority.
- **Account for nature-driven risk channels in cash flow projections:** Companies and projects operating in sectors highly dependent on nature should be asked to account for expected nature loss in their financial projections, as they do for climate change. Investors should include this disclosure in their assessment of IPOs and debt issuances.
- **Screen climate-aligned portfolios for high risk, nature-negative climate solutions:** Financial institutions should assess their exposure to bioenergy, large built infrastructure including climate adaptation solutions, and sectors dependent on mined materials for the zero carbon transition. They should strengthen environmental due diligence for these investments and align investee responses with the biodiversity mitigation hierarchy.[13]

Figure 2 | Current climate frameworks can be adapted to capture nature risks and opportunities, but there remain significant omissions



Source: Vivid Economics

Over time, a more sophisticated treatment of nature-related risks and opportunities and their interaction with climate will be needed. This will require nature-specific skills and greater use of ever more reliable tools and data, but also operational changes. To avoid unnecessary and potentially large costs, nature must ultimately be accounted for on par with climate. This necessitates that existing climate-focused dialogues across frameworks, standards, investor initiatives and think tanks are all broadened to consider the climate-nature nexus.

International policymakers too must demonstrate leadership and commitment. The financial sector needs clear policy signals, especially from CBD COP15, around the future direction of global policy on nature and its relationship to climate policy. In addition to an ambitious, clear and well-supported Post-2020 Global Biodiversity Framework, governments should implement legally binding national nature-related targets. Targets should be well-defined, time-bound, and set in a consistent manner, drawing from the experience of climate. Crucially, governments need to consider nature and climate targets together, and demonstrate how they will be cascaded into policies, plans, and regulations.

Contents

1 Introduction

Nature has fundamental implications for financial system operations that have received little attention to date. The financial sector has largely been focused on the risks and opportunities associated with physical climate impacts and the zero-carbon transition, exemplified by the work of the Task Force on Climate-related Financial Disclosures (TCFD).[14] Our understanding of nature-related risks and opportunities is now advancing rapidly, thanks to initiatives like and the World Economic Forum's New Nature Economy report series (2020-ongoing).[15] The Greenhouse Gas (GHG) Protocol Land Use Sector Initiative – developed by the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) – and the Climate Disclosure Standards Board's Biodiversity Working Group illustrate how climate tools are being adapted to account for, and report on, land use change.[16, 17] Despite this important progress, action on nature loss lags far behind climate change. Risks arising from nature loss demonstrate equivalent or greater magnitude than climate change risks for many sectors, yet there is not equivalent action to manage these risk and opportunities.[18, 19]

A joint and mutually reinforcing climate-nature transition is needed, and evidence of what this will look like continues to grow. A joint climate-nature transition refers to the transition to an economy that is not only consistent with net-zero carbon emissions but also has net-positive impacts on nature. While net-positive is not yet a well-defined concept, there is some consensus around the general principles that underpin it.[20] The leading intergovernmental scientific organisations on climate and biodiversity, the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), have together highlighted the undeniable link between climate change and nature loss, and the importance of addressing the climate and nature crises together.[21] This follows policy action on nature emerging across the globe, including the publication of the EU's 2030 Biodiversity Strategy and the UK's legally-binding species target.[22, 23] Other international actors have signalled increasing commitment to policy action that jointly addresses climate change and nature loss, including the G7 in their May 2021 Environment Ministerial Communique.[24]

The standards and regulatory community is taking the first steps toward accounting for a joint transition. The Taskforce for Nature-related Financial Disclosures (TNFD) will develop a framework for organisations to report and act on evolving nature-related risks. Nature is also picking up speed among regulators. In 2020, De Nederlandsche Bank (DNB) assessed the Dutch financial system's dependency on nature. In 2021, the Bank of England's remit was updated to consider the relevance of non-climate risks to financial stability, and The Network of Central Banks for Greening the Financial System (NGFS) launched a working group on the links between biodiversity and financial stability.[25, 26]

Private financial institutions that embrace this joint thinking have an opportunity to leverage the progress they have made on climate to incorporate nature rapidly and efficiently. Financial institutions have an opportunity to help close the biodiversity finance gap highlighted by the Paulson Institute.[27] These opportunities will expand with government action. Institutions that delay leave themselves exposed to the risks associated with nature loss and tightening global nature policy. Those that rush to cheap carbon mitigation solutions risk undermining their climate strategy by failing to account for their potentially large negative impacts on nature. Embracing the joint transition early provides room to learn from experiences with climate, highlight win-win solutions for both climate and nature, and embed robust and efficient organisational and decision-making processes from the outset.

To capitalise on these opportunities, financial institutions need to realign their thinking around a joint climate-nature transition. In turn, each section on this briefing explores the following topics:

2 **Section 2** discussed the current strategies that financial institutions employ to deal with climate change and nature loss risks, and the foundational work evolving in this area.

3 **Section 3** explores how financial risks from nature loss compound with risks from climate change, or create new risks for businesses.

4 **Section 4** details which policies, technologies and sectors will be critical to a joint climate-nature transition, and how this translates to investable opportunities.

5 **Section 5** explains why financial institutions will benefit from acting sooner rather than later.

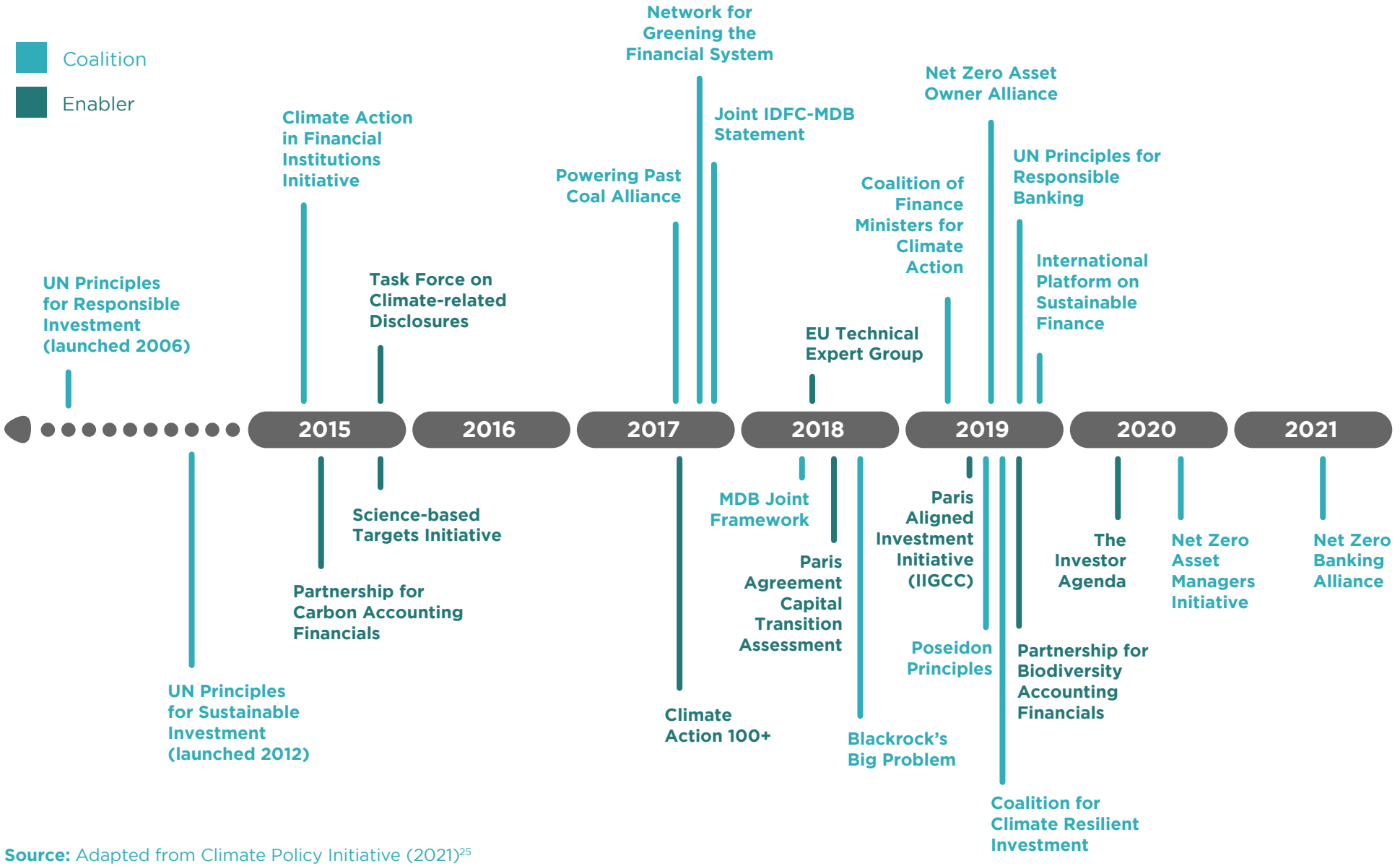
6 **Section 6** recommends actions for the private financial sector and for how international policymakers can help them.

2 The climate-nature nexus in current practice

Many initiatives work with, and within, the financial sector to achieve climate and nature goals. Financial institutions have made commitments based upon the Paris Agreement, the Sustainable Development Goals (SDGs), and net zero emissions targets. They have been supported with work from a range of organisations. The International Energy Agency's recent report on a net zero energy sector emphasises the need to protect biodiversity hotspots and to meet the UN Sustainable Development Goal 15 on biodiversity and land use.[28] Yet it also includes large levels of bioenergy production, which can lead to substantial negative impacts on nature, demonstrating the need to consider climate and nature together. In January 2020, French asset managers AXA IM, BNPP AM, Mirova, and Sycomore AM launched a joint initiative to develop a tool for measuring investment impact on biodiversity.[29] In 2020, Ceres released a guide that gives investors a framework to help them understand and engage on deforestation-driven climate risks across their portfolios, while in April 2021, the NGFS and INSPIRE announced the launch of a joint Study Group on 'Biodiversity and Financial Stability'.[30, 31] Earlier this year, Credit Suisse partnered with Responsible Investor and conducted a survey of global asset managers and owners to gauge current efforts to address biodiversity in their portfolios.[32] The Partnership for Biodiversity Accounting Financials (PBAF) brings together banks to harmonise accounting for biodiversity.[32] Other notable coalitions and enabling initiatives are illustrated in Figure 3.

The growing number of investors who want to see their money go toward stocks or funds that are both profitable and reflective of their social values has accelerated the widespread integration of environmental, social and governance (ESG) factors into investment decision-making. Increasingly, there is recognition that such considerations can go beyond virtue signalling and reputation management, and that risk-adjusted returns can be affected by material risks posed by climate change and nature loss.

Figure 3 | Climate-nature-related coalitions and enabling initiatives in the financial sector



Source: Adapted from Climate Policy Initiative (2021)[25]

Using the outputs from these initiatives as a spring-board, FIs have adopted varying strategies, with climate increasingly becoming a risk of central importance. Common terms like 'sustainable', 'responsible' and 'ESG' are used to refer to the wide diversity of strategies undertaken in service of sustainable aims. These strategies range from simple screening techniques to sophisticated integration of risk forecasts into fundamental valuations. The latter can improve risk-adjusted returns and is gaining traction after the publication of TCFD guidelines. Reports such as that by PwC Switzerland and the WWF; DNB; and Vivid Economics and Global Canopy have provided a framework to integrate nature into the traditional risk framework of financial institutions.[35, 36, 37] Environmental concerns will likely receive more and more attention as businesses and investors seek to prepare and act on the transition to a more sustainable economy. In 2020, the UN PRI made TCFD-reporting mandatory for its c.7,000 signatories, indicative of a larger shift among financial institutions to incorporate climate more explicitly as a risk factor, and to adopt more sophisticated climate risk strategies. Some of these strategies include:

• **Ethical and sectoral screens:** Financial institutions sometimes use ethical or reputational criteria to screen out companies involved in controversial activities like arms manufacturing. Similarly, many FIs apply simple tests to screen for high exposure to climate risk, flagging where additional due diligence is required. For example, many FIs exclude coal mining or coal-fired power plants from their investing and lending activities due to a mix of climate risk exposure, the emergence of competitive alternatives, and the reputational risks now posed by the sector.

• **Identifying risky assets:** More sophisticated approaches go beyond binary sector screens and involve the use of metrics that indicate exposure at the asset level to specific climate risks. This includes, for example, the amount of revenue generated from climate-sensitive crops, or local water stress levels. For particularly risky assets that are both valuable and highly exposed, such as infrastructure at significant risk of natural disasters, FIs may perform financial analysis to quantify exposure and financial risk. This includes estimating specific physical impacts, the probabilistic risk that specific climate change events occur and hence, expected damage. This is detailed and expensive, and so is typically only performed for large-scale investments in sectors suspected to be at significant risk of financial damage from natural disasters such as floods and droughts.

• **Scenario analysis:** By conducting climate scenario analyses and collecting data on climate impact drivers, FIs are improving their ability to assess borrower and deal-level credit risks, and to manage portfolio exposure. Climate risk scenarios present different views of the future that modify expectations around revenues and expenses, which filter through to scenario-adjusted expected future cash flows, credit ratings, and probability of default. An advantage of this more sophisticated approach is that it enables an examination of opportunities in addition to risks, enabling FIs to develop 'climate-positive' or 'climate-smart' investment products and strategies which aim to capture climate transition opportunities like renewable energy or adaptation investments.

These strategies could be applied to nature in addition to climate, with increasing quality, as better data and more authoritative nature scenarios are made available.[38] Few investors currently explicitly consider the role of nature within the climate transition, and therefore many may significantly underestimate total transition risk within their portfolios. Unlike for climate, there are currently limited resources available in the financial sector to assess climate- and nature-related risk together. The existing scenarios that do consider climate change and nature loss generally take existing climate scenarios and assess their biodiversity impacts, which does not allow for assessment of nature transition risk. Without forward-looking scenarios that capture both climate and nature opportunities, financial institutions will likely miss capitalising on significant growth driven by these transitions, and may unintentionally expose themselves to higher risk.

Active and indexed investing approaches both incorporate climate and nature considerations into their strategies. Active managers aim to find those risks and opportunities that have not yet been incorporated into asset prices. If most investors are failing to price in climate or nature risks and opportunities, an active investor may see an opportunity to capture value by buying undervalued shares or selling overvalued ones.

Indexed investing strategies may allow index tilts, which can be applied to shift investments away from carbon-intensive sectors while maintaining the risk-return profile of portfolios. All major asset managers and index providers now offer climate-related investment products, and such strategies are rising rapidly as a share of overall assets under management. For example, a recent study of sustainable investing in the United States found that investors were incorporating ESG factors across $17 trillion of AUM in 2020, with climate change being the largest specific ESG criteria used.[39]

Asset managers also use their shareholder power to engage with investees to address company-specific and market-wide risks and opportunities, including those related to climate.[40] This engagement ensures that investees understand what climate and nature policies or procedures they need in place to meet investor requirements. When investees lag in these procedures, investors engage with them more actively. Investor networks are key for advancing leading investment practices, corporate engagement strategies, and key policy and regulatory solutions. These investor networks ensure that policies and disclosures are increasingly standardised, so that investees can more effectively comply with climate and nature policies.[41]

Many investors already routinely collect a host of ESG data that extend beyond climate, but the different data is available to institutions with different resource levels. Larger investors have more resources to combine their own data and analytical tools with third-party data, while smaller ones may be limited to easily accessible third-party data sources from rating agencies and data providers. Ensuring metrics relevant to nature impacts are included in this set will be increasingly important for FIs in the future. The Asset Owner Platform (AoP, See Box 1) is an example of a tool that identifies products and services that promote the SDGs and facilitates investment into these products and services.

There are a handful of FIs already capturing opportunities from the joint climate-nature transition. For example, several financial institutions are developing investment strategies that generate both positive impacts on climate and nature, or focus on nature alone. The universe of 'nature-positive' investment products currently tends to focus on well-known activities such as nature-based solutions, as opposed to taking a cross-sectoral view of how current business practices can transform to better align with nature-positive outcomes. Debate on climate- and nature-linked financial instruments is also emerging, such as F4B's proposal for a Nature and Climate Sovereign Bond Facility.[42]

The proliferation of emerging sustainable taxonomies will have substantial ripple effects on the way the financial sector thinks about climate change and nature loss. Japan, Canada, Colombia, China, Malaysia, the UK and the European Union (EU) are all in the process of developing their own taxonomies for sustainable investments.[43, 44] The EU's 'Taxonomy Regulation', published in 2020, states that for an activity to be environmentally sustainable it must make a substantive contribution to at least one of the EU's six environmental objectives (of which climate mitigation, climate adaptation and biodiversity are three). Critically, activities must "do no significant harm" to any of the others. This represents a step change, forcing private financial institutions and regulators alike to consider climate change and nature loss together. This should continue to propagate across the financial sector as these taxonomies are translated into standards by the financial community, including by the newly established IFRS Sustainability Board.

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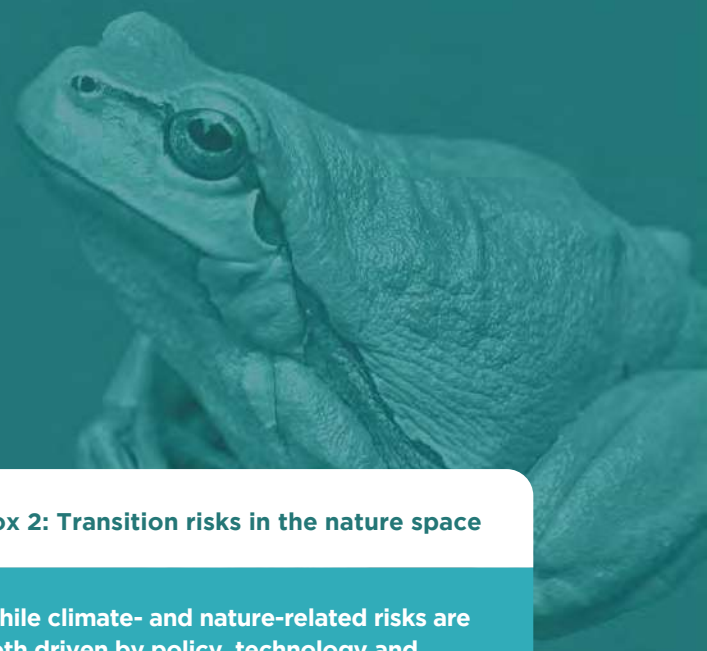
Improvements in data and metrics will build on the pioneering work of several organisations. The International Union for Conservation of Nature (IUCN)[45], Natural Capital Finance Alliance (who have developed the ENCORE tool)[46], UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)[47], United Nations Environment Programme Finance Initiative (UNEP-FI)[48] and EU Business and Biodiversity Platform (2021)[49] are helping to develop measurable, nature-related objectives, metrics and indicators. Joint initiatives, like the Impact Management Project (IMP), provide a forum for building global consensus on measuring, managing and reporting nature-related impacts.[50]

Box 1: FIs address creative strategies to promote sustainable investments

In 2020, APG in collaboration with British Columbia Investment Management Corporation (BCI), AustralianSuper and PPGM, established an Asset Owner Platform (AOP) to analyse how investment portfolios can be mapped to the UN Sustainable Development Goals (SDGs). The platform determines whether the company/asset in question has a positive contribution based on the SDI Taxonomy & Guidance, and how much a company's products or service contribute to the SDGs (company revenue generated by SDG-positive goods or services should amount to at least 10% of total revenue to be considered). The platform also assesses whether the company in question causes harm to any other SDGs, in which case a company cannot qualify as an SDI. The example set by the AOP illustrates that many sustainable and ESG strategies can be leveraged to deal with climate- and nature-related concerns. The SDGs already include climate and nature goals. Sustainable Development Goal 7, for example, aims to ensure access to sustainable energy for all, promoting wind and solar solutions. Solutions like this can be used to determine the extent to which FIs are considering climate and nature risks and opportunities already.[51]

3 Managing climate and nature risks



Climate- and nature-related risks are faced by businesses on two fronts: physical and transition.

• **Physical risks resulting from climate impacts and nature loss can be categorised as acute (event driven), or chronic – when natural ecosystems or climate systems cease to function properly.** Physical risks may have financial implications for organisations, such as direct damage to assets, the loss of ecosystem services crucial to production processes or employee well-being, and indirect impacts from supply chain disruption. Examples include property damage from hurricanes and financial losses in the agricultural sector from reduced pollination.

• **Transition risks are driven by changes in the social, economic or policy environment.** Transitioning to a nature-positive or zero-emission economy may entail extensive policy, legal, technology, and market changes. Transition risks may occur when businesses suffer financially due to changes that penalise their negative impact on nature or climate, including reputation and liability (including litigation) risks. In some cases, this may result in an asset becoming unprofitable and 'stranded'. Transitions can also be driven by changes in consumer preferences, such as increasing demand for lower carbon or nature-positive products.

Box 2: Transition risks in the nature space

While climate- and nature-related risks are both driven by policy, technology and consumer preferences, the landscape of nature-related risk assessment is evolving differently. While not yet defined, the Taskforce for Nature-related Financial Disclosures (TNFD) framework is expected to address both how nature may impact the organisation, but also how the organisation impacts nature. This is in order to not only capture risks that may be financially material in the short term, but also to capture longer term transition risks driven by impacts on nature and that may become material as global policy tightens. This approach would be consistent with the focus of the Task Force on Climate-related Financial Disclosures (TCFD) on material financial risks, but would suggest an explicit consideration of impacts from the outset.

This consideration of impacts implies a greater level of transparency and a more sophisticated treatment of long-tail (unlikely but highly damaging) transition risks. Economy-wide impacts on nature, commitment frameworks such as the Science-based Target Network (SBTN)[52], and international frameworks such as the CBD's Post-2020 Global Biodiversity Framework will all inform credible future nature-related goals. In turn, these frameworks 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 in the future, even if they are not financially material today. This suggests there may be a relatively stronger focus on impacts and long-term transition risks within the nature space relative to climate.

A business's risk profile is determined by drivers, exposure, and resilience (see Figure 4). Together, these three factors determine the likelihood and magnitude of climate- and nature-related risks. **Drivers** (sometimes called hazards) refer to changes that occur outside of the control of the business. These could be physical events such as changes in temperature or rainfall patterns, or socio-political events such as changes in consumer demand or policy. **Exposure** refers to whether an activity or asset would be affected if that external change occurred. This could be due to geographical location and sector, among other factors. Financial institutions have control over their aggregate exposure through the construction of their portfolios. **Resilience** (or vulnerability) refers to the damage that would be realised if the external change occurred. Financial institutions can improve the resilience of their investments by engaging with investees to mitigate impacts on climate change and nature loss, or put adaptation measures in place.[53, 54]

Figure 4 | The three factors that determine climate change and nature loss risk

Source: Vivid Economics, adapted from the IPCC (2012)[55]

3.1 Physical risk

Physical climate risks are well known to the financial sector. These include sea level rise, increased temperature and temperature variability, increased rainfall variability, and increased extreme weather events (including floods, hurricanes and droughts).

Sectors that cannot easily be relocated, often because they are capital intensive, tend to be the most exposed to climate risks. Capital intensive industries typically rely on large stationary infrastructure. As a result, they can be exposed to location-specific climate impacts that become more severe over time. Mines in climate-sensitive regions like Western Australia or Northern Canada, for example, face increasing water stress and more severe natural disasters.[56, 57]

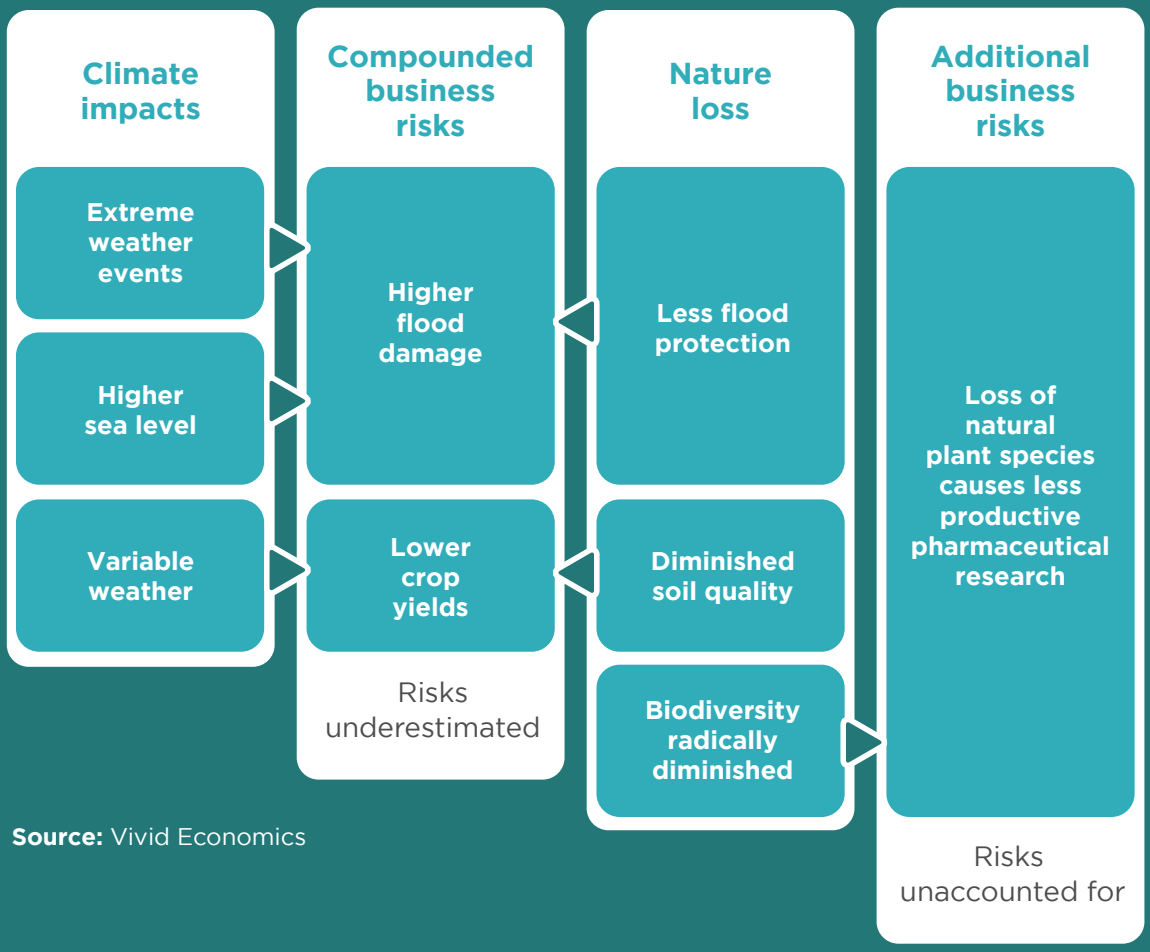
Physical risks from the loss of nature are broader and less well understood. These risks arise from the loss of ecosystem services that are vital to the global economy. Water supply and quality, biodiversity (including genetic material), flood and storm protection, soil quality, disease control, and pollination are some of the most material ecosystem services for businesses.[58, 59]

Dependency on nature drives exposure to physical nature risk. Businesses depend on nature for resources, operations, supply chain performance, real estate asset values, physical security and more. Sectors that are moderately or highly dependent on nature generate over half of global GDP. The Dutch central bank (DNB) estimates that EUR€510 billion of assets in the Dutch financial system are highly or very highly dependent on nature. [60, 61] F4B estimated that 28% of the global asset base held by development finance institutions (DFIs) is highly dependent on vulnerable forms of nature.[62]

Nature loss drives climate change, and climate change also drives nature loss. Land use change can be a significant source of carbon emissions, and the loss of forests can lead to further reductions in local climate regulation. At the same time, temperature change is threatening the survival of some plant and animal species, and increased natural disasters are contributing to habitat destruction. Yet, in addition to this dynamic relationship, there are other complex interactions between the business risks generated by climate change and nature loss.

Figure 5 illustrates how nature and climate can combine, through different mechanisms, to drive the same business risks, compounding them significantly. For example, variable weather and diminished soil quality can both cause lower crop yields, driving the same risk for agribusiness and making this risk more prevalent. In other cases, nature impacts create additional business risks, distinct from climate. A loss of biodiversity, for example, may drive risks to pharmaceutical research which climate would not directly affect. In current financial sector practice, compounding risks are likely to be underestimated, and additional risks are likely to be unaccounted for completely.

Figure 5 | Nature and climate combine to drive both compounding and distinct business risks



Source: Vivid Economics

Figure 6 illustrates that agriculture, forestry and fishery, as well as built infrastructure and utilities face the most severe compounding risks from climate change and nature loss:

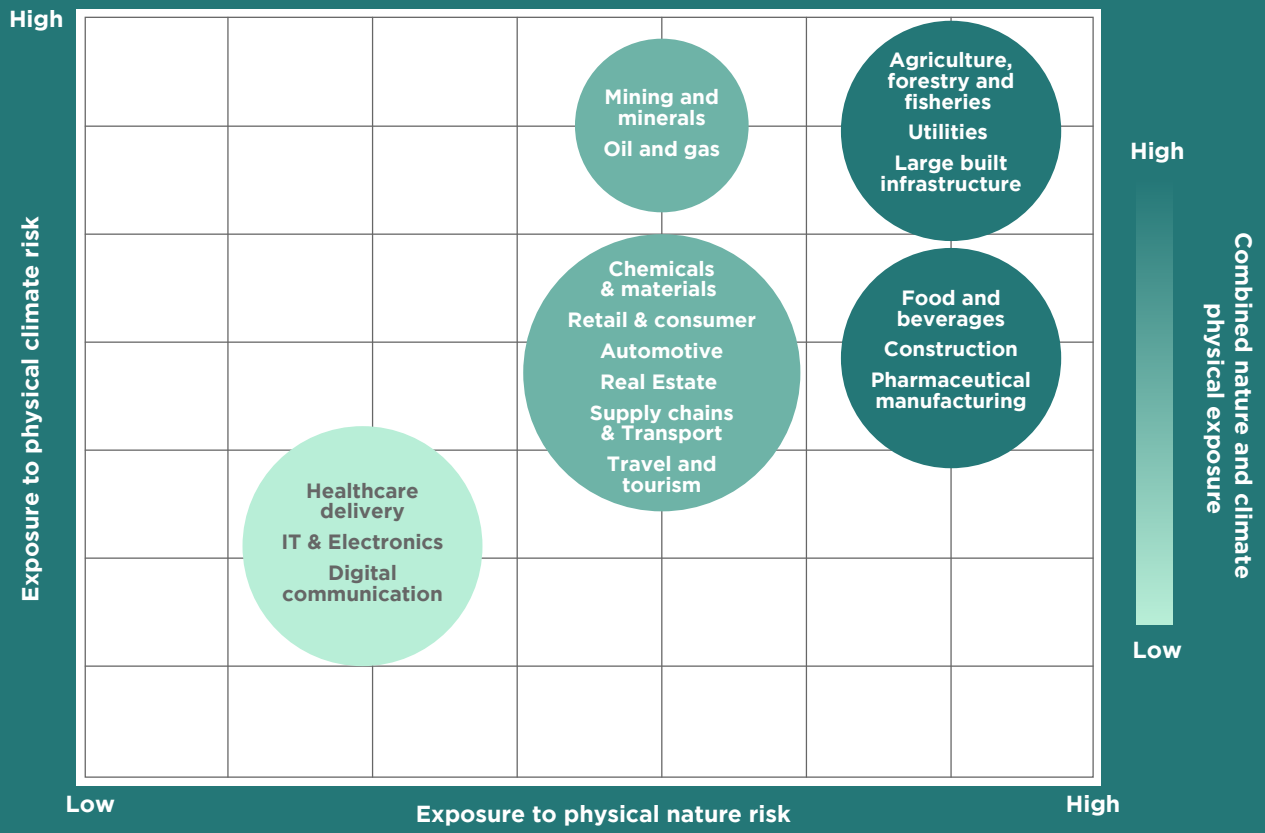
• **Crop and forest yields are threatened by a wide range of climate- and nature-related risks.** Lower rainfall, higher temperatures and drier soil conditions all reduce the growth of crops, pasture and trees. Removal of non-crop habitats can affect natural pest control as populations of natural predators decline. Overgrazing and other unsustainable farming practices can also strip topsoil and reduce soil biodiversity. The result is a depletion of organic matter belowground, worsening bioremediation, soil fertility and water storage. Soil without earthworms can be up to 90 percent less effective at soaking up water.[63] Many crop production systems rely heavily on pollinators such as bees. Pollination services can be threatened both by nature loss from excessive use of pesticides and herbicides, but also by climate from changing ambient temperatures and weather patterns which are used to track time throughout the year.[64]

• **Climate change and nature loss both drive flood and drought risks within the agriculture and forestry sectors.** Extended or repeated periods of drought could lead to water shortages and will kill crops and young trees. Forests face threats from more severe fires (in part driven by warmer weather) and from accelerated land-use changes. Increased flooding (caused by sea level rises and increased rainfall) can contribute to compaction, waterlogging and soil erosion, damaging crops and lowering yields. These risks are exacerbated as agricultural expansion reduces natural infrastructure such as hedgerows, woodland and forest which provide natural flood protection.[65]

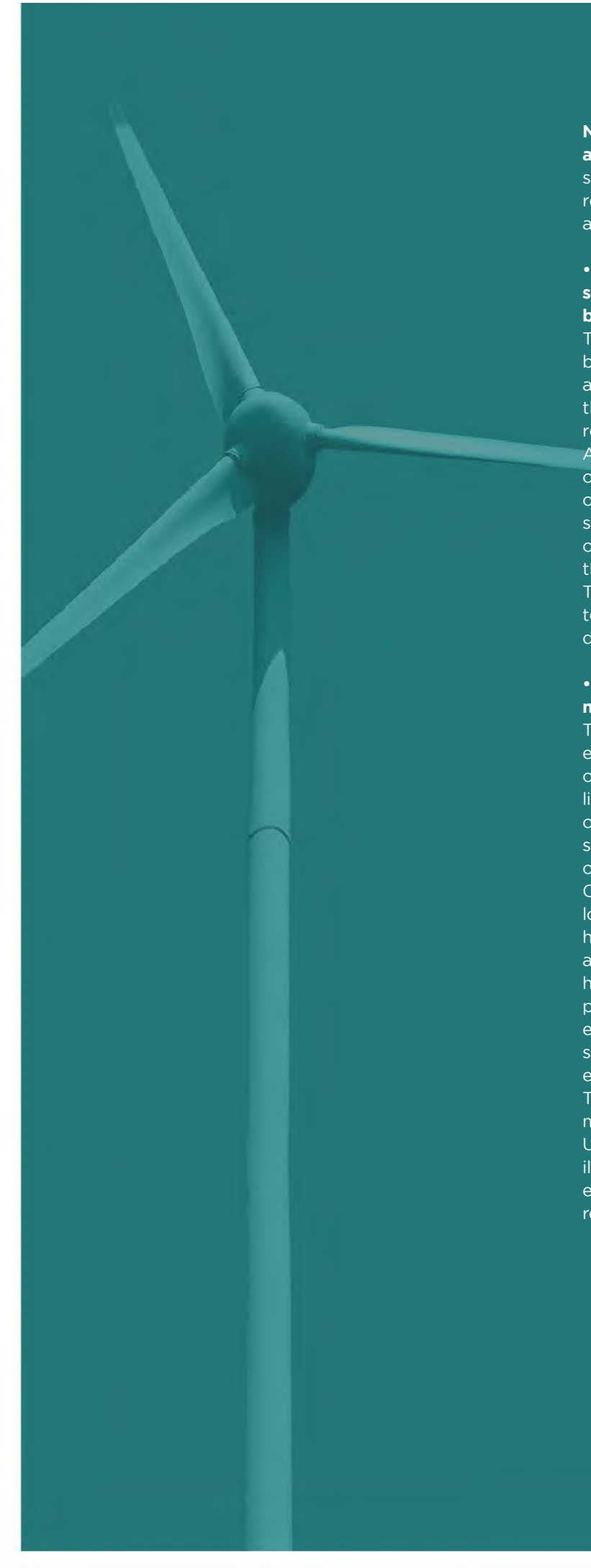
• **Climate change and nature loss both threaten catch yields in the fishing industry.** Climate changes increases ocean temperatures, acidification and deoxygenation. Changes in ocean temperature disrupt currents and migration patterns, and affect the physiology and growth of fish and invertebrates.[66] Overfishing and pollution are threatening fishing yields by damaging nursery habitats for fish and driving some fish species towards extinction. 80 percent of the world's major fisheries are depleted or are being maximally harvested today. Unsustainable fishing practices will ultimately reduce the stock of available fish for the industry, compounding climate risks and posing significant risks to their financial viability.[67]

• **Large built infrastructure including utilities are highly exposed to flood and storm risks, driven both by climate change and nature loss.** In 2017, Hurricane Irma hit the Caribbean and Florida, damaging 90 percent of the buildings on the island of Barbuda, and causing the fourth-largest blackout in US history. The total cost of damage was US$50 billion. Since 1958, the frequency and intensity of severe Atlantic hurricanes, like Irma, have risen. A large share of the US' power plants were deliberately sited near shorelines in order to have access to water. As a result, when hurricanes strike, power plants face significant flooding damage. In 2005, Hurricane Katrina forced Entergy, New Orleans into bankruptcy.[68]
The degradation of forests, mangroves, river floodplains, wetlands and coastal saltmarshes all reduce protection against floods and storms that natural ecosystems provide, increasing the vulnerability of utilities to physical damage. As with agriculture, climate-induced floods and droughts can also disrupt water supply for utilities. This can be exacerbated by built structures like dams which alter the natural water cycle, reduce potential abstraction rates, and can cause severe sedimentation.

Figure 6 | Industry exposure to nature and physical risks



Source: Vivid Economics, adapted from various authors[69]



Nature loss also generates business risks that are distinct from climate, some with sector-specific impacts such as for pharmaceutical research and manufacturing, and others affecting many sectors at once:

• **The pharmaceutical industry relies on biodiversity for its research, and the destruction of this biodiversity creates material business risks.** Tropical rainforests contain 50% of all terrestrial biodiversity, including over 2,000 plants with anti-cancer properties. The genetic material that these rainforests support forms a critical input to research into new medically active compounds. As much as half of all prescription drugs are based on naturally occurring plant molecules, while 70% of cancer drugs are natural or nature-inspired synthetic products. Approximately three quarters of approved anti-tumour pharmaceuticals in the past 70 years have been non-synthetic. The destruction of tropical forests threatens to significantly restrain future new drug development and industry growth.[70]

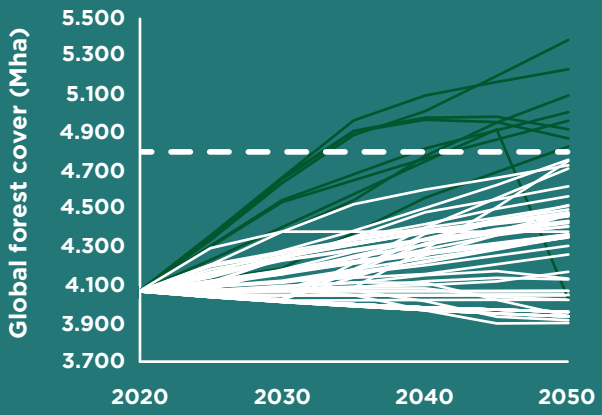
• **Diminished disease control associated with nature-loss can drive systemic business risks.** The destruction of natural habitats, through deforestation or wildlife hunting, increases the frequency of contact between wildlife and humans, raising the likelihood of pathogens passing from one to the other (zoonosis). Land use and agricultural expansion caused over a third of zoonotic disease outbreaks from 1940 to 2004. Ebola outbreaks in Central and West Africa have been linked with forest losses from the previous two years.[71] Species that have adapted well to human-dominated landscapes and therefore have more frequent contact with humans – such as rodents and bats – carry the most potential to transmit diseases.[72] The human and economic costs of COVID-19, a zoonotic disease, are significant at over 3.2 million lives lost to date and an estimated global reduction in trade of 5.3% in 2020. The World Economic Forum estimates that 114 million people lost their jobs over 2020, leading to US$3.7 trillion in lost labour income.[73, 74] This illustrates the staggering scale of risks to the real economy, and the financial sector, if systemic risks remain unchecked.[75]

3.2 Transition risk

Solely focusing on either climate or nature will leave financial institutions exposed to significant transition risk. More than 80% of 1.5-degree climate scenarios considered by the IPCC (a common source of scenarios for TCFD reporting and stress tests) continue to exceed nature-related planetary boundaries through to 2050 (see Figure 7).[76] In addition, the climate-only scenario modelled for this report (Box 3) leads to continued biodiversity losses by 2050 in some biodiverse regions such as Sub-Saharan Africa, due to the high deployment of land-based Greenhouse Gas Removal (GGRs) (see Figure 7). This is supported by recent literature which illustrates that some mitigation policies, such as the large-scale deployment of bioenergy carbon capture and storage plants, may in fact harm nature as much as climate threatens to destroy it.[77] Similarly, some nature-positive policies like environmental flow requirements can also negatively impact mitigation efforts by restricting yield improvements from irrigation, thus requiring more extensive agriculture to meet rising food demands. The differences in the policy response required for each crisis implies the existence of significantly different risks for financial institutions between a climate-only, and a climate-nature pathway.

Figure 7 | Forest cover and biodiversity outcomes in scenarios

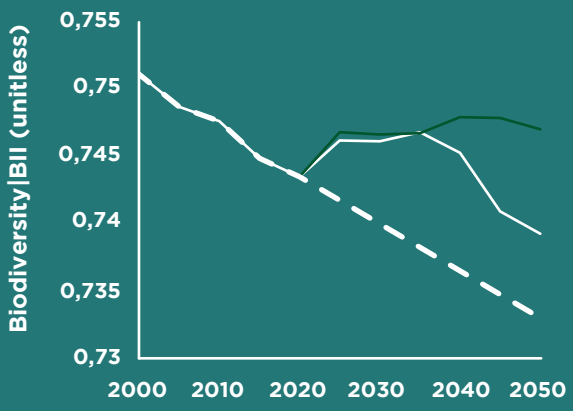
Global forest cover across 1.5C scenarios



Only a handful of the climate-only 1.5C scenarios in the IPCC database reach the global forest cover planetary boundary

Above boundary
Below boundary
Forest cover planetary boundary

BII across modelled scenarios



A climate-only scenario may lead to continued nature losses in some biodiverse regions, such as Sub-Saharan Africa.

Climate-nature
Climate-only
Historical growth

Note: BII = Biodiversity Intactness Index
Source: Left: based on data from the IIASA IAMC 1.5°C Data Explorer and Steffen et al. (2015). Right: MAgPIE.

Box 3: Archetype modelling exercise to compare a climate-only and a climate-nature pathway

To illustrate the differences between a climate-only and a climate-nature pathway for the land sector, we modelled two scenarios using MAgPIE, an internationally recognised land use model.[1]

The aim of this modelling exercise is to compare the average climate-only 1.5°C scenario from the climate policy modelling literature with the average climate-nature 1.5°C scenario in the literature. Therefore, the input assumptions used in this modelling are based on scenarios from the literature and are summarised in the table below.

	Climate-only	Climate-nature
Narrative[2]	Large demands from the energy system for bioenergy (with CCS) coupled with high carbon pricing enables early decarbonization. This results in the world limiting warming to 1.5°C. Other policies incentivizing demand shifts and protecting nature are minimal.	The climate and biodiversity crises are taken equally seriously, leading to high biodiversity prices (taxes for damaging nature) being implemented in addition to high carbon prices. Additional policies inducing demand shifts and protecting nature are strong and effective.
Key climate policy assumptions	• Carbon prices consistent with 1.5°C. • Strong incentives for afforestation. Afforestation takes place in plantations • Large demands from the energy system for bioenergy (with CCS)	• Carbon prices consistent with 1.5°C. Land use sector emissions differ in this scenario due to different bioenergy pathways • Strong incentives for afforestation. Afforestation takes place through natural regrowth • Minimal demands from the energy system for bioenergy (with CCS)
Key biodiversity policy assumptions	• No increase in the size and number of the world's protected areas • No biodiversity pricing • Agricultural intensification occurs in cheapest way possible • Shift towards more sustainable, less ruminant meat-heavy diets in high-income countries only. Historical share of food wasted is maintained	• Biodiversity price implemented to achieve no net loss • Large increase in the size and number of the world's protected areas • Agricultural intensification done in conjunction with shift towards sustainable land management practices • Shift towards more sustainable, less ruminant meat-heavy diets. Share of food wasted reduces to about half of current share in high-income countries.

This modelling exercise is meant to be illustrative of the minimum requirements for the climate and nature transitions. To adequately assess the difference between a climate-only and a climate-nature transition, a suite of models each with their own ensemble of simulations would be required, as has been done in the climate integrated assessment modelling literature already. Therefore, as with any modelling exercise that uses a single model, there are large uncertainties in these results, and so the outcomes presented throughout this report are intended to be illustrative of the 'typical' scenario.

Some recently published scenarios, such as the UN PRI's Inevitable Policy Response (IPR), make important first steps towards accounting for both the climate and nature transition.[3] The IPR scenario accounts for nature-related activities such as water consumption and deforestation and the policy tools and societal shifts that will be needed to address these. To wholly capture the joint climate-nature transition, additional features of a nature transition, such as incentives for non-forest ecosystem restoration, need to be considered.

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[1] MAgPIE was developed and is maintained by the Potsdam Institute for Climate Impact Research, a world-leading climate and nature research institute. For more details on the model see: Dietrich et al. (2019). https://gmd.copernicus.org/articles/12/1299/2019/

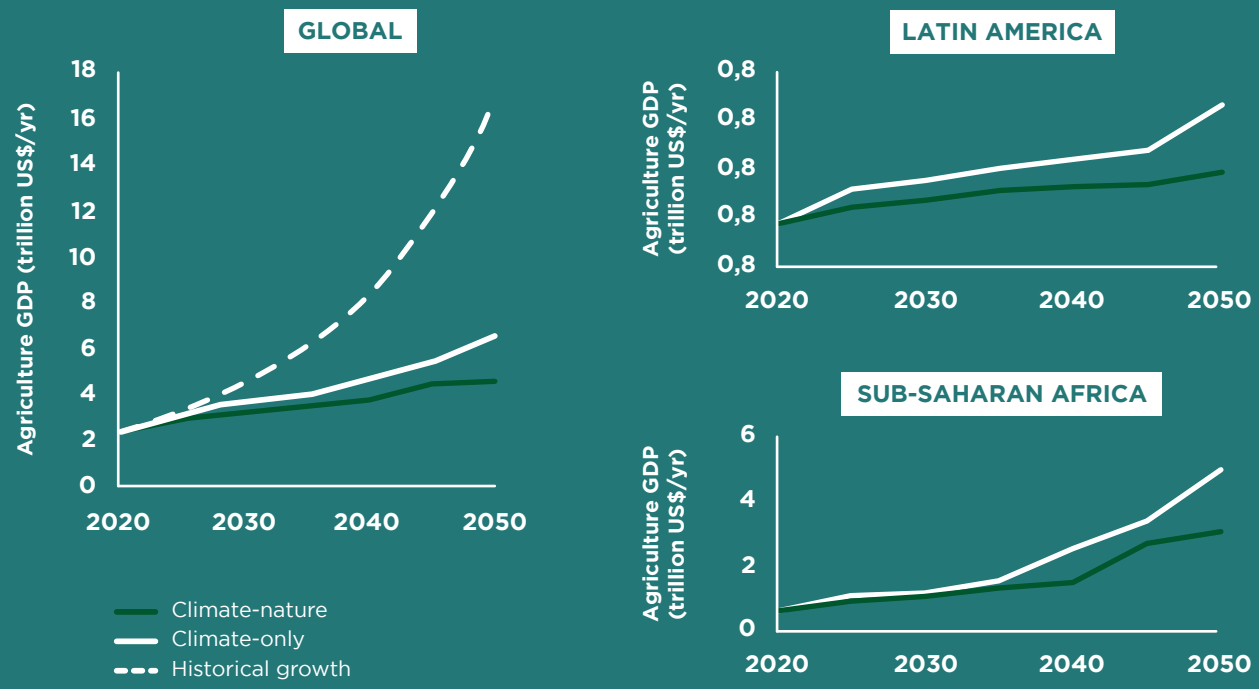
[2] We hold population growth, GDP growth and trade policy assumptions constant across these two scenarios.

[3] UN PRI. What is the Inevitable Policy Response? URL: https://www.unpri.org/inevitable-policy-response/what-is-the-inevitable-policy-response/4787.article

Today's market valuations often only account for climate risks - if they incorporate transition risk at all - implying that future expectations of value are inflated by trillions of dollars. The sectors where this inflation is most egregious include fishing, certain types of mining and agriculture, built infrastructure, and forestry. These sectors have a large and harmful impact on nature through resource extraction and pollution but a negligible climate impact. As a result, sectors involved with these activities are likely to experience more modest growth or declines than expected in projections that fail to account for nature. A few examples:

• **Agriculture:** Based on the representative modelling exercise undertaken for this report, estimates of the agriculture sector's GDP is inflated by roughly US$1.9 trillion in 2050, driven by misestimation of both demand and supply (see figure 8). On the demand side, a joint climate-nature transition will require reducing food waste and shifting diets to decrease pressure on land systems. The diet transition required will result in a third less beef production by 2050 than one that only factors in climate. More dramatic transition scenarios call for larger diet changes, such as the proposed EAT Lancet diet that decreases the 2050 market size by an order of magnitude. This is particularly important in China, Europe and the USA, where beef production in a climate-nature scenario is expected to fall even relative to today's production. On the supply side, less competition from bioenergy and forest plantations will require only half the investment in yield improvements relative to a climate-only scenario, implying smaller markets for agrochemicals and irrigation suppliers.

Figure 8 | Growth in agriculture gross domestic product (GDP) for a climate-only and climate-nature scenario



Source: Vivid Economics

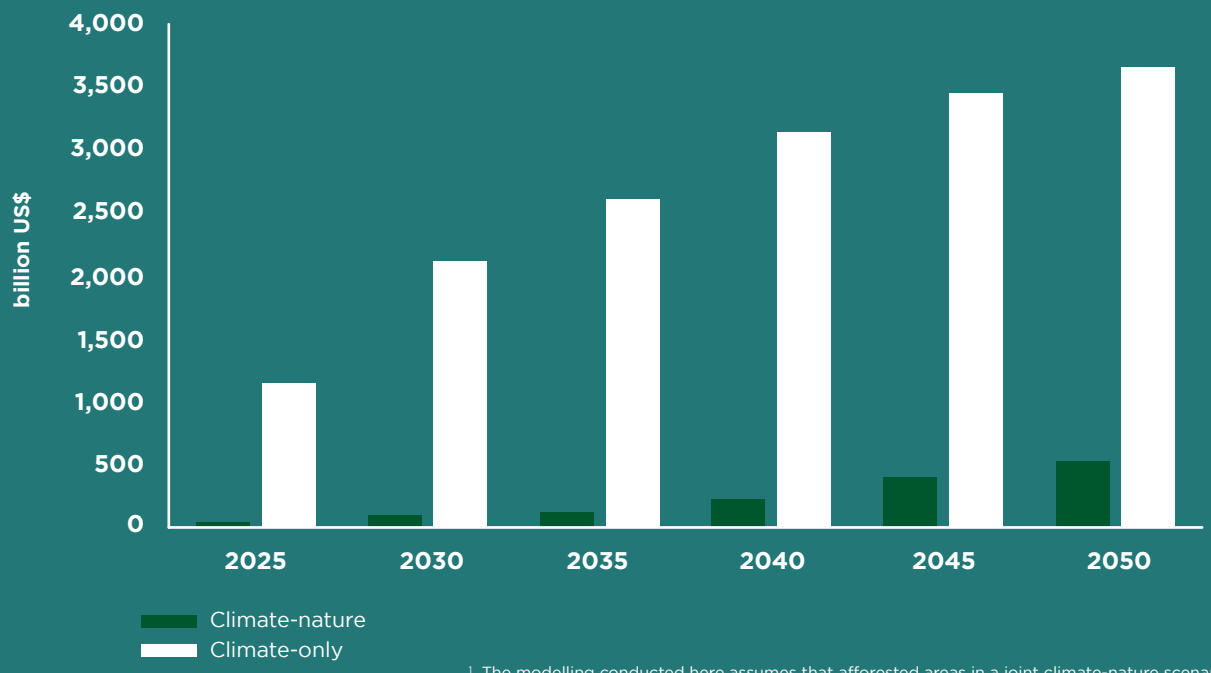
• **Built infrastructure:** Buildings and transport infrastructure contribute to a large share of today's emissions. However, abatement will be largely achieved through electrification, whereas the nature transition will require reconsideration of the placement of new infrastructure to minimise habitat fragmentation. This could create stranded assets, as real estate bought for development may become restricted in its use due to nature policies.

• **Fishing:** Greenhouse gas (GHG) emissions associated with fishing are minimal, at 0.5% of global emissions.[78] Fishing is the largest driver of marine biodiversity loss, however, both due to extraction and plastic pollution.[79, 80] In a climate-only transition, the fishing sector will only be moderately affected. In a climate-nature transition, however, marine protected areas and tighter regulations of fish stocks will likely require geographic shifts in where fishing takes place, what species can be caught, and when stocks can be harvested. These changes will hurt some fishing subsectors, although will also create opportunities as discussed below.

• **Forestry:** The nature transition will require a focus on planting native species over monocrop plantations of exotic trees, which could result in tens of billions of dollars of misallocated capital. Monocrop plantations of exotic trees grow quickly, sequestering lots of carbon in their lifetime. They can, however, also cause serious biodiversity loss. Preliminary modelling suggests that in 2030, payments for afforestation will be over US$40 billion/year under a climate-only scenario (Figure 9). Under a climate-nature joint transition this reduces to about US$7 billion/year because of the slower, but nature-positive regrowth of natural species. In addition, this market will be for a different type of afforestation, potentially leaving tens of billions of dollars' worth of investments stranded in plantations if the climate and nature transitions are not considered jointly. The large market expected for plantation-based afforestation in Sub-Saharan Africa is essentially non-existent once nature is accounted for.[81]

• **Mining:** Mining is a significant source of emissions and has a large biodiversity impact, but solutions to these two problems differ greatly.[82, 83] A large amount of abatement in the mining sector can occur through electrification, however the worst nature impacts of the sector occur through land use change and chemical pollution, and so require restrictions on where mining can take place or stricter regulation of mining practices. For example, some businesses and governments are already committed to excluding World Heritage Sites from their activities.[84] In a nature-compatible scenario, these initiatives will continue to grow. Therefore, nature policy could shift which mines are profitable, posing a significant risk to financial institutions involved in the mining sector.

Figure 9 | Cumulative payments to afforestation by scenario

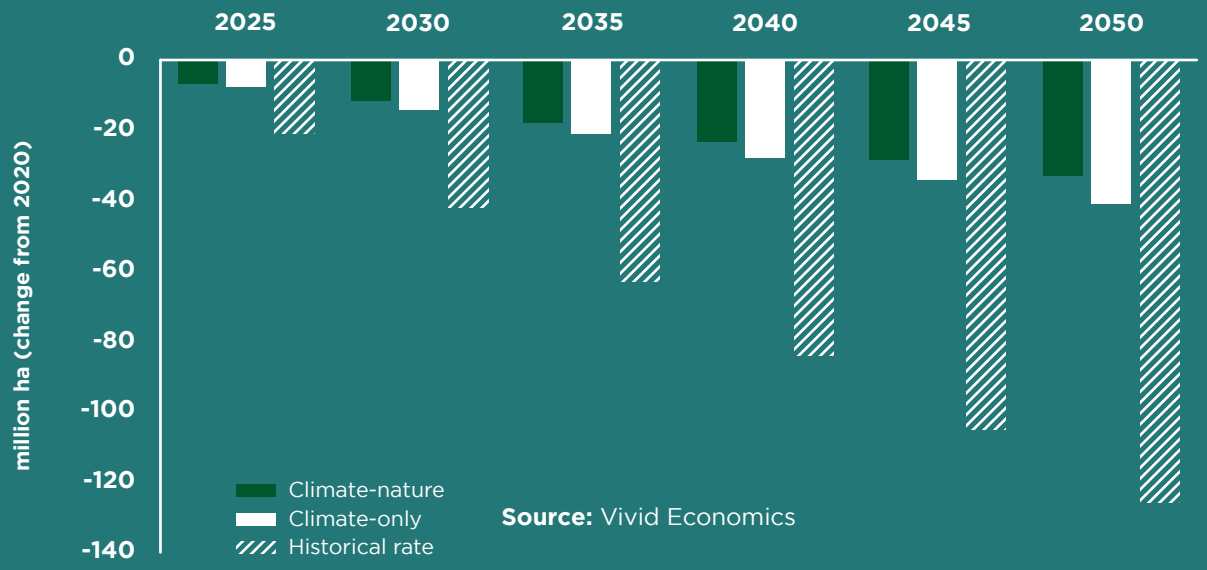


Source: Vivid Economics

[1] The modelling conducted here assumes that afforested areas in a joint climate-nature scenario grow back at the rate of natural growth, whereas in plantations they grow back at rates consistent with active management. In reality, afforested areas in a climate-nature scenario likely would be actively managed as well and so, although the native species used would still grow slower than exotic species, the rate of growth would be faster than natural regrowth. Consequently, the gap between the magnitude of the afforestation market in a climate and climate-nature scenario is likely somewhat overstated here.

While climate and nature transitions come with distinct risks, managing the climate transition will also mitigate the nature risk associated with some business activities such as those linked to deforestation. Many activities that emit large amounts of carbon emissions also destroy habitats and generate nature-harming pollutants. Therefore, policies, consumer shifts and technologies associated with the climate transition will also largely drive the nature transition in these sectors. For example, beef production, soy and palm oil cultivation, and logging all lead to high levels of deforestation in tropical countries. Since this leads to large GHG emissions, decisive climate action will also curb habitat loss, as illustrated in Figure 10.

Figure 10 | Primary forest loss between a climate-only and climate-nature scenario, compared to continued historical rate



Source: Vivid Economics

Box 4: Nature-related litigation and broader liability risks

Liability risks have the potential to be one of the most sudden, material sources of nature-related risk to the financial sector. Liability risk refers to the potential for an organisation to bear the consequences of damage or the breaching of standards due to operations, a product, an act or neglect.[85] In 2020, F4B released a taxonomy of nature-related liability risks demonstrating the broad range of claims that can be brought against the financial institutions themselves, the organisations they finance, and the organisations they indirectly depend upon.[86] Policy or legislative change, new court rulings and new evidence can all significantly increase liability risk. This broad array of entry points provides the potential for nature-related liability risks to increase rapidly.

There is live political debate concerning whether and how direct legislative liability could be introduced in some jurisdictions. The UK and the European Union (EU) are introducing supply chain due diligence obligations that would require businesses to prove their products and services are deforestation-free. In the case of the EU, this explicitly includes the financiers of those supply chains. There is already precedence for this globally; in Brazil, the legal system regards provision of credit to environmentally harmful projects as sufficient to constitute causation of damages.[87]

The potential for nature-related litigation might far exceed that for climate. Global cases of climate litigation increased from an average of 80 per year in 2010-2015 to roughly 140 per year in 2015-2019.[88] Proving causation of damages is one of the biggest obstacles to climate litigation due to the wide range of drivers of climate change all around the world. In the case of nature, the drivers and impacts typically occur in proximity, making the link between them much easier to prove. Emerging disclosure frameworks such as the Taskforce for Nature-related Financial Disclosures (TNFD) and the EU Taxonomy will increasingly require businesses and their investors to understand and report the geolocation of their physical assets. This increasing transparency could be a turning point for the feasibility of nature-related liability claims.

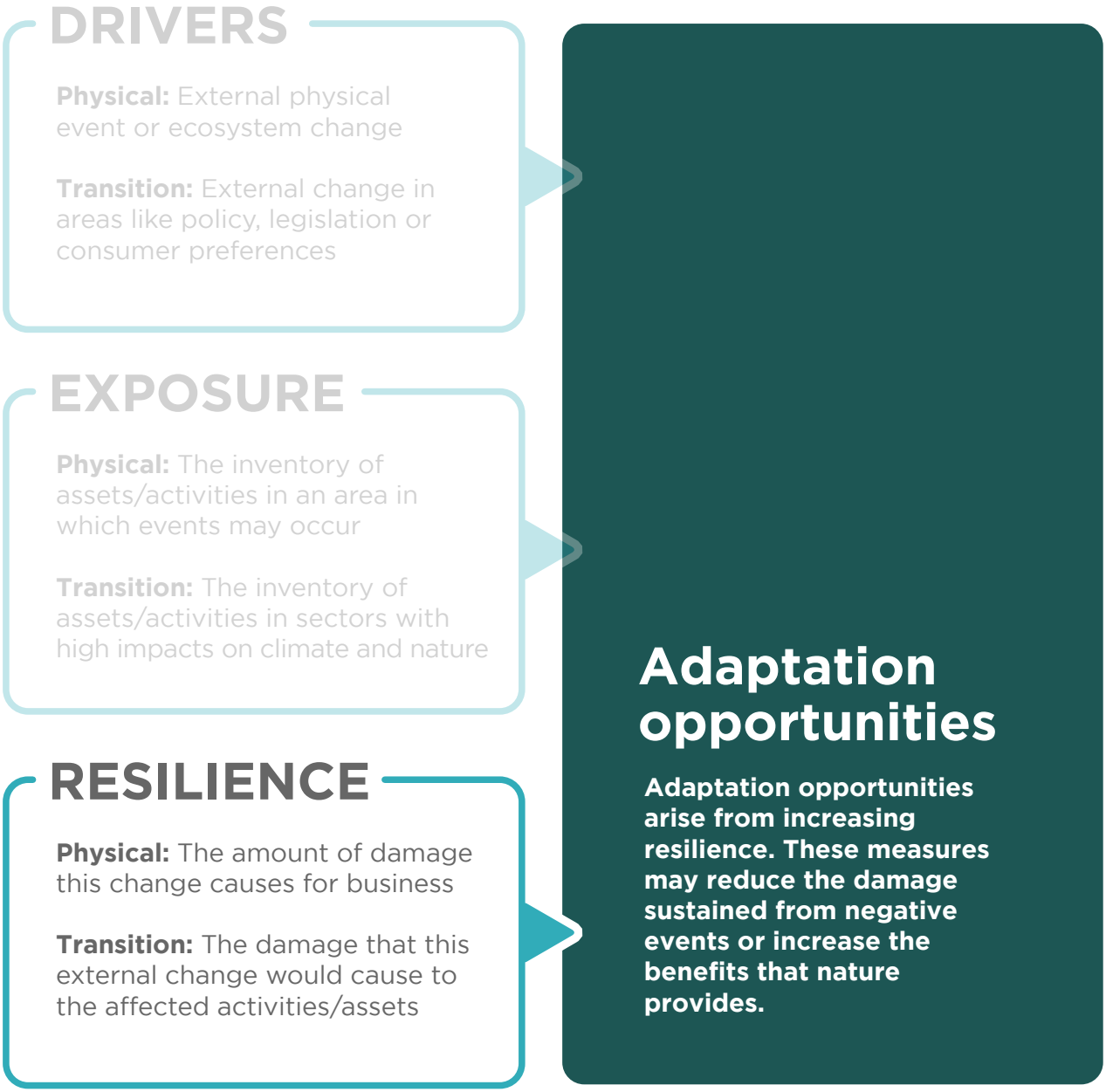
4 Accessing climate and nature opportunities

Nature's importance in decision-making is much broader than risk; a joint climate-nature transition comes with a different set of opportunities than either transition alone. Financial institutions are increasingly targeting climate-related opportunities through dedicated investment strategies and their stewardship activities. Realigning these strategies to incorporate nature will better align portfolios with the sectors expected to play a significant role in the future from a joint climate-nature perspective, and hence, stronger investment returns.

4.1 Adaptation opportunities

Climate adaptation measures generate financial opportunities by increasing resilience and reducing physical risk (see Figure 11). Adaptation opportunities neither affect the external drivers of climate change and nature loss, nor a business' exposure to those risks. They improve a business' resilience, reducing the financial loss to the business if the climate or nature impact occurred. Some climate adaptation measures for climate strengthen nature, often called 'green infrastructure' or 'nature-based solutions', while other 'hard engineering' approaches can harm nature if implemented without sufficient mitigating measures.

Figure 11 | Adaptation opportunities increase the resilience of business to nature loss and climate change



Source: Vivid Economics, adapted from the IPCC (2018)[89]

Nature-based solutions (NBS) leverage biodiversity and ecosystem services to help people and businesses adapt to adverse climate and nature impacts. Coastal wetlands like mangroves or salt marshes trap sediment with dense vegetation and reduce wave height and velocity, in some cases by nearly three quarters. Sandy beaches and dunes can prevent waves from reaching inland areas in storm surges. NBS often cost less than hard engineered approaches.[90] It can be up to five times cheaper to restore coastal wetlands than to construct submerged breakwaters. Investment in NBS must be patient, however, since it can take years for natural solutions to grow large enough to be effective.

NBS also generate significant co-benefits, some of which can be monetised. These include providing wood fuel, non-timber forest products (NTFPs), biodiversity conservation, tourism, carbon sequestration and storage. Social co-benefits include improved health and recreation options.[91] In addition, interventions are more easily reversible than built infrastructure, and NBS are naturally responsive to environmental change.[92] The following section explores how significant NBS are in mitigating the effects of climate change through sequestration.

If used strategically, hard engineering solutions can help overcome some of the limitations of NBS. In areas where ecosystems are badly degraded, NBS are likely to develop slowly, and built infrastructure may be needed for more immediate protection. Differences in ecosystems make it difficult to accurately estimate the effectiveness of NBS in each context. High-risk areas could benefit from a combination of NBS and hard engineering approaches. This is particularly the case for areas exposed to high magnitude disasters such as hurricanes or tsunamis.[93]

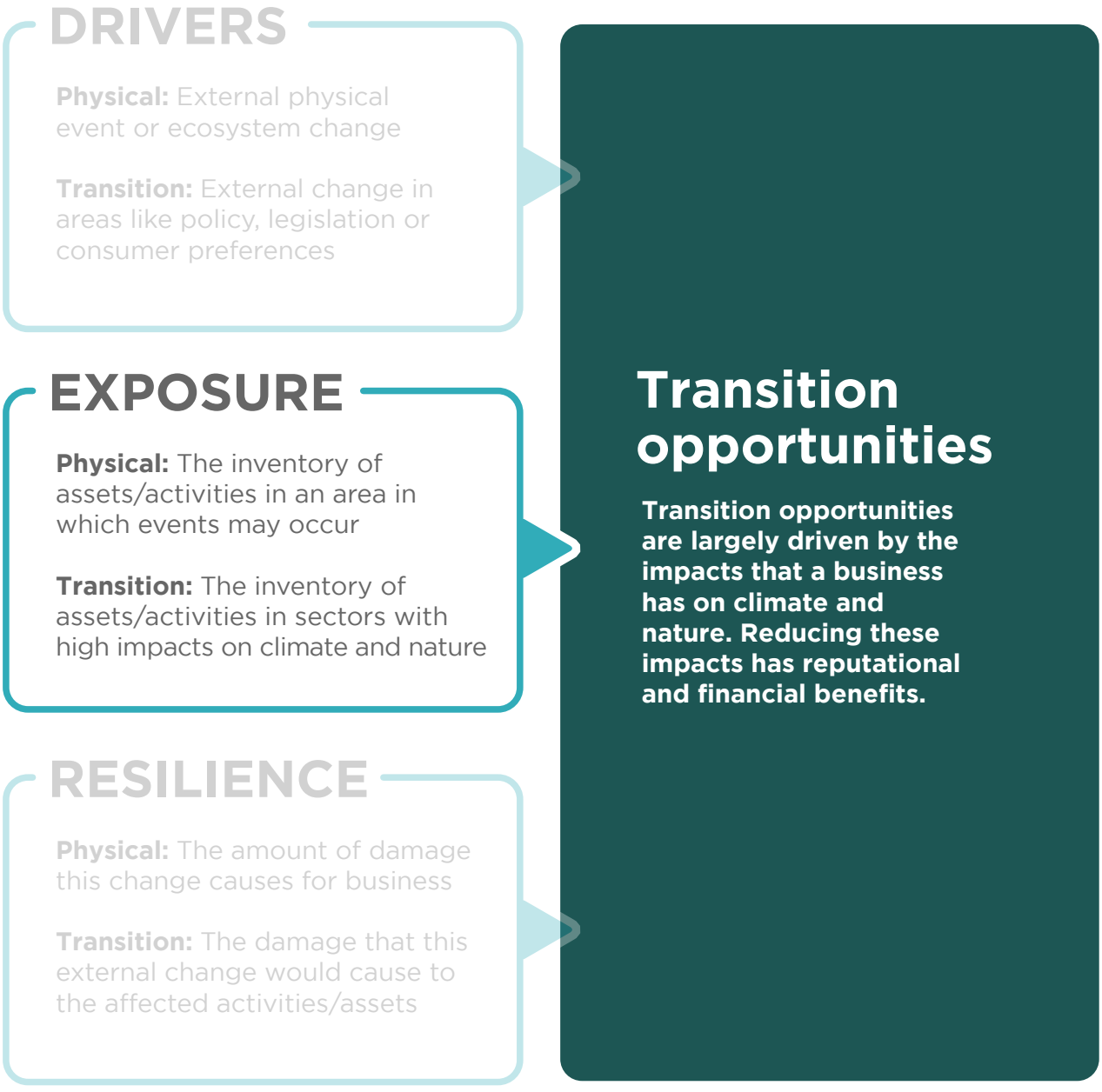
As hard engineering solutions can cause significant harm to nature, they should be implemented carefully and with mitigating measures in place. Large structural flood defences like dams, storage reservoirs and embankments fall into this category. Rivers link surface and groundwater flows; are important corridors for the flows of energy, matter and species; and are critical for water supply and to support biodiversity as a result. Dams can obstruct river systems and hamper their ability to deploy nutrients and support biodiversity in a number of ways. Dams can significantly decrease peak flows, and alter water temperatures with releases from the deep cold layer of reservoirs. Water chemistry and sedimentation patterns can also be disrupted with knock-on effects for the health of the diverse aquatic habitats that rivers provide. Other negative unintended consequences can also arise, and these should be assessed thoroughly.[94]

4.2 Transition opportunities

Transition opportunities are driven by exposure – assets and activities in the sectors whose goods and services will be in higher demand due to climate and nature policy, shifting consumer demands and new technologies (see Figure 12). We discuss transition opportunities in three categories:

1. Opportunities which are present in a climate-only transition, but which will not materialise in a climate-nature transition;
2. Opportunities which are present in both transitions and potentially strengthened by a climate-nature transition; and
3. Opportunities which do not exist in a climate-only transition but are present in a climate-nature transition.

Figure 12 | Climate adaptation opportunities increase the resilience of business to nature loss and climate change



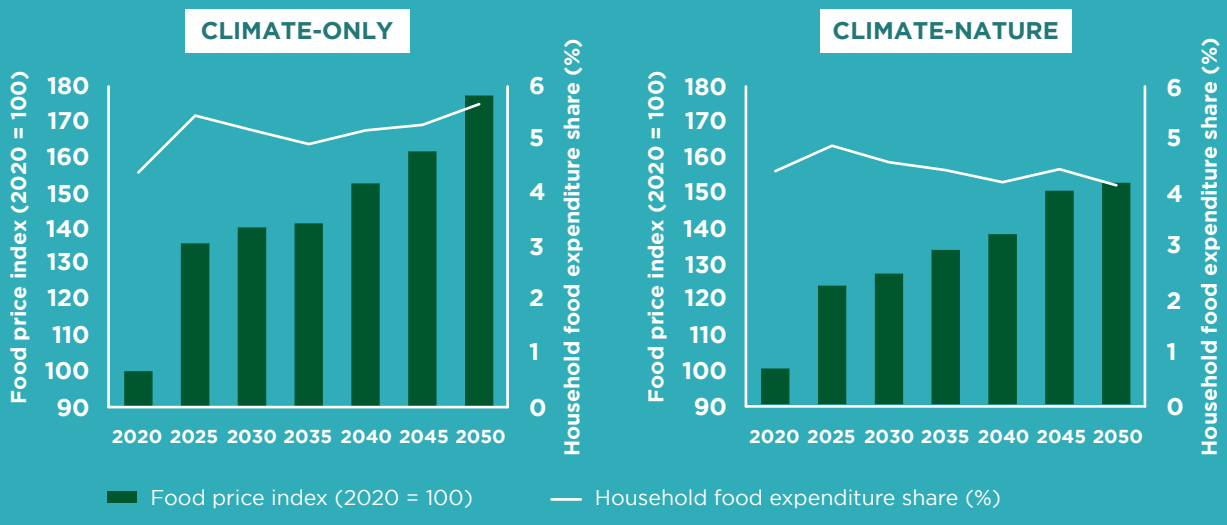
Source: Vivid Economics, adapted from the IPCC (2018)[95]

Opportunities which feature prominently in climate-only scenarios such as bioenergy, large infrastructure projects and materials for the zero carbon transition, may experience a small fraction of this growth in a climate-nature scenario. These opportunities help mitigate carbon emissions but also generate considerable harm to nature. In a climate-only scenario, the global market for second generation bioenergy is expected to nearly reach nearly US$700 billion by 2050, but accounting for the nature transition, the market will grow to only around US$25 billion. Similarly, large power and transportation projects, and the mining of certain minerals such as lithium and nickel for use in batteries will aid in the climate transition, but at the expense of nature. Consequently, the nature transition will likely lead to a reduction in potential profits from these climate opportunities as nature considerations increase cost of production and/or a geographic redistribution of where these projects take place. Without taking nature into account, scenarios will overestimate the future role these activities, and misinform long-term investment strategies.

Box 5: Implications of a minimal bioenergy future

While the nature transition will restrict bioenergy growth, it also presents a solution to the high food prices that BECCS deployment will likely result in. In the climate-only scenario modelled here, food prices grow by approximately 50% more by 2050 than in the climate-nature scenario. In Latin America this difference is much larger, with food prices growing nearly 80% more in the climate-only scenario than in the climate-nature scenario by 2050. The large increase in land needed to produce bioenergy under the climate-only scenario leads to greater land competition and higher land values, resulting in significantly higher food prices in the climate-only pathway (Figure 13). Since politicians are generally sensitive to food price increases, the difference in food prices between scenarios suggests that a climate-only scenario with such a large increase in bioenergy would be politically challenging. This is because such a food price increase would likely lead to politicians dialling back climate policy ambition. In this light, the climate-nature pathway can be seen as a solution to this problem, guiding the world to a more efficient solution.

Figure 13 | Food price index and food expenditure share over time in each of the scenarios

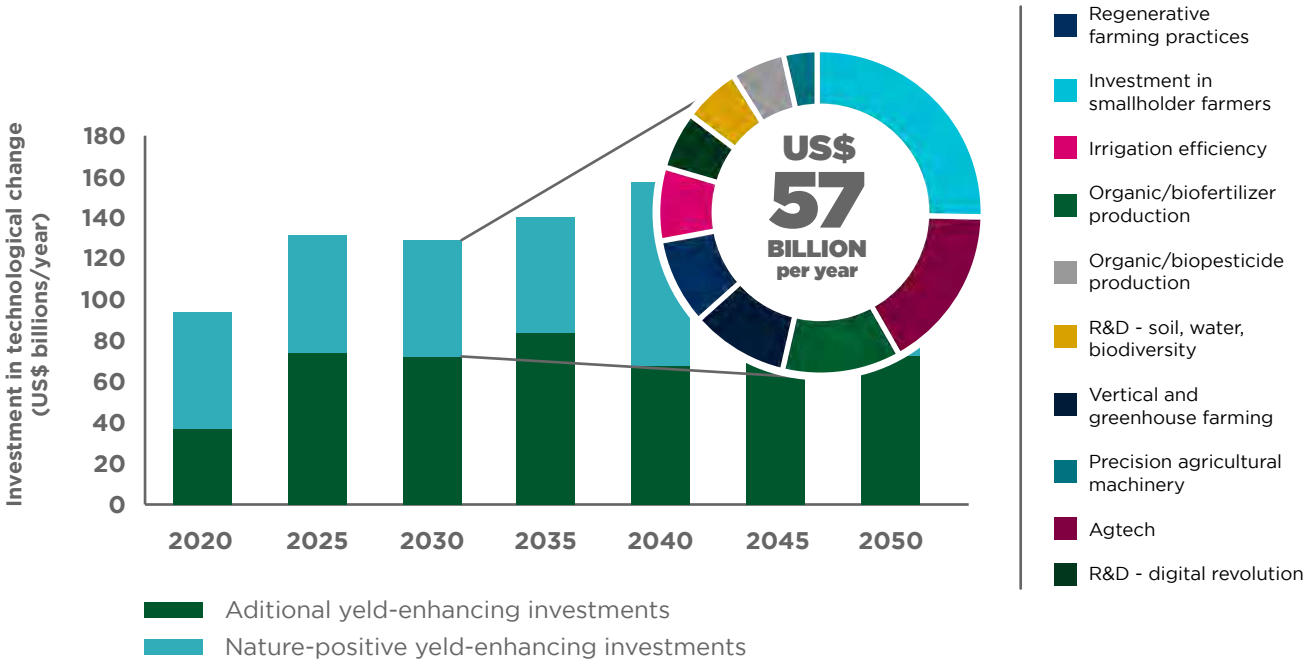


Source: Vivid Economics

The nature transition's impact on BECCS and afforestation will also reduce the availability of negative emissions, which will have a clear impact on transition risk in hard-to-abate sectors. The reduced availability of such negative emissions will result in more mitigation being needed from the energy and land use systems, or from emerging direct air capture technologies. This has important implications for investments into hard-to-abate sectors as many of these sectors', such as aviation's, current climate strategies involve significant offsetting. Therefore, without considering how the nature transition impacts opportunities, financial institutions may misallocate capital into hard-to-abate sectors on the basis of relatively cheaper carbon offsetting strategies incompatible with a joint climate-nature transition.

However, some opportunities that are present in a climate-only transition, such as investment in certain types of nature-based solutions (NBS), are present in equal, or even greater magnitudes in a joint climate-nature transition. When implemented correctly, nature-based solutions generate climate mitigation, climate adaptation and nature benefits, and will become a critical part of the future transition. In a climate-nature transition, nature-based solutions that have positive biodiversity impacts will be deployed in greater quantity than in a climate-only transition. While only native species forest restoration is modelled here, this will also be true of peatland, mangrove and salt marsh restoration. This increase in NBS will be at least partially driven by the reduced availability of carbon sequestration from BECCS and monoculture afforestation, which will place additional importance on sequestration from NBS, and significantly increase the NBS share of total negative emissions available in a climate-nature transition.

Figure 14 | Share of yield enhancing investments that could be met through nature-positive interventions



Source: Vivid Economics, based of modelling results and data from FOLU (2019). Note that FOLU only provide estimates for required nature-positive yield-enhancing investments out to 2030. We assume this required investment stays the same out to 2050, which is likely an underestimate.

The nature transition will generate trillions of dollars' worth of new opportunities that are not present in a climate-only future. Innovations in technology or business models that enable greater uptake of vertical farming, agroforestry and regenerative agriculture that can reduce agriculture's environmental footprint, will expand rapidly. All three currently make up less than 1% of our food system, but the market penetration of these sectors will grow by many multiples over the next 30 years. For example, the market for products from vertical farming and regenerative agriculture will increase by over seven times by 2030 and could constitute US$57 billion/year of yield-enhancing investments, making up nearly half of the yield enhancing investments needed in a climate-nature scenario (Figure 14).[96] The diet shifts required under a climate-nature transition will also lead to large business opportunities in sustainable food production and alternative protein sources. The business opportunity by 2030 of the shift to healthy diets has been estimated to be US$2trillion/year by 2030.[97] In addition, modelling for this report suggests the poultry market will be nearly US$150 billion larger in 2050 in the climate-nature transition than in a climate-only scenario, due to a transition away from beef. In addition, marine interventions such as marine protected areas, eliminating over-exploitation, reducing plastic pollution, and relocation and restoration of reef systems are all assessed to have a very small global mitigation benefit, so are unlikely to occur in a climate-only scenario.[98] The business opportunity in shifting to the sustainable use of our oceans has been estimated to be in excess of US$300 billion/year by 2030.[99]

5 Why act now?

Those private financial institutions that act early stand to benefit the most. In many ways, the financial sector is in a stronger position to integrate nature today than it was for climate five years ago. The experience of climate shows how environmental risks can interface with existing processes, which tools and data are needed in which contexts, and the long-term operational changes that are needed. Private financial institutions have the opportunity to approach nature more systematically, efficiently and cost-effectively than was possible for climate.

There is evidence that FIs and businesses that incorporated ESG factors have created significant short- and long-term value. Moving early on nature may be analogous to this experience. The financial impact of nature-positive programmes is likely to increase as expectations and scrutiny from investors, consumers, employees, and other stakeholders continue to grow. There is good evidence that strong performance on ESG issues is associated with higher top-line growth, can reduce costs, minimise regulatory and legal interventions, improve employee productivity, and focus investment and capital expenditures. Investors and executives are also willing to pay a premium for businesses that have strong ESG performance.[100]

Moving first on nature will allow FIs to capture value in lending and investing activities. Lenders and primary investors that adopt strong nature frameworks will increase their capacity to identify disruptive, lucrative opportunities like plant-based meat. Strengthening screening procedures, encouraging the adoption of sustainability standards, and providing capital to early market entrants has been shown to improve firm performance. In Malaysia, for example, adoption of sustainable palm oil standards was positively correlated with returns on invested capital.[101] Financial institutions that adopt best-in-class nature frameworks can encourage uptake in these kinds of policies for lenders, increasing their credit ratings and cash flows. FIs have an opportunity to help counterparties implement stronger sustainable practices and provide value over and above supplying capital.

Asset managers and asset owners can also benefit from adopting robust nature frameworks. Businesses that harm nature can have higher costs of equity and debt due to their greater exposure to regulatory and liability risks, which drive down returns. Stricter screening requirements can eliminate these businesses from the portfolio of asset managers. Investing in companies that are recognised by the market as 'good' may not increase financial returns, since this goodness is already priced in. However, investing in companies that are 'good', but currently unrecognised, has significant upsides once it is priced in by the market. Recent studies show that ESG screening can be applied to passive investment strategies without deteriorating risk-return performances for most regions and for most ESG criteria. If future funds flow to firms with high nature scores as they have with high-scoring ESG firms, they could offer market-beating returns.[102] Finding these companies and investing in them will be aided by a robust, developed nature framework that understands and evaluates nature-related risks.[103]

FIs that can manage nature risks ahead of regulatory deadlines can more effectively protect against large, rapidly evolving liability risks. To date, over 1,200 climate change cases have been filed in more than 30 jurisdictions.[104] Climate litigation cases that aim to have an impact beyond the courtroom are on the rise, and decisions in one country can shape outcomes in others. Companies in sectors beyond oil may be increasingly exposed to damages claims, but also to the costs of defending litigation, and the reputational harm of being associated with such litigation. Getting a head start on building out robust nature frameworks will make a strong case against potential future claims.[105]

Acting first and collaboratively presents significant reputational advantages. Maintaining a good corporate reputation and strong brand equity is an important consideration for FIs and businesses. Developing strong nature frameworks and distributing these throughout the financial and other sectors could boost the reputation of first movers, who are therefore more likely to be seen as well-managed businesses.[106, 107]

6 Recommendations

6.1 Private financial sector

The launch of the Taskforce for Nature-related Financial Disclosures (TNFD) has the potential to accelerate the pace of change on nature-related risk management and spearhead joint consideration of climate and nature. In its preparatory phase, the TNFD gathered the support of 74 financial institutions, regulators and corporates, as well as a range of standard setting bodies, NGOs and data providers. The Task Force on Climate-related Financial Disclosures (TCFD) helped galvanise thousands of organisations into reporting on climate-related risks and opportunities in a standardised way. The TCFD and TNFD should work closely together to maximise compatibility and uptake and trigger the development of other joint climate-nature vehicles in the space.

By managing their climate risks, financial institutions are already managing some aspects of nature (see Figure 15), but with some important gaps. Screening procedures for physical climate risks will flag many of the sectors most exposed to the physical risks of nature loss. Financial projections are already starting to account for some of the business risks these generate. Deforestation metrics provide a good first sight of impact on nature, but this is only one of many dimensions. Climate transition scenarios will help align portfolios with those activities that benefit both climate and nature such as nature-based solutions, but miss important trade-offs between climate and nature that are present in a number of other sectors.

Figure 15 | Current climate frameworks can be adapted to capture more nature risks and opportunities, but there are still longer-term improvements to be made

Increasing sophistication and oversight

Current action on climate...	... accounts for these nature-related concerns...	... and presents immediate opportunitties to...	...and highlights longer term needs for...
PHYSICAL RISK SCREENING excludes sectors highly exposed to physical climate impacts	Captures compound risk sectors but underestimates magnitude of risks and missing nature-only risks	Lower threshold for mitigation action for compounding sectors – ag, forestry, fisheries, utilities, inf. – and in high risk geographies	Screening for nature-only risks – pharma, mining and construction, disease
IMPACT METRICS assess exposure through emissions (intensity)	Climate-nature cross-over limited to land use change and deforestation	Expand to simple nature metrics – land use change, water withdrawal, pollution – and high risk geographies	More granular and geolocated assessment of nature impacts
CREDIT RISK ASSESSMENT accounts for future climate physical impacts in cash flow projections	Captures majority of key business risks but underestimates their magnitude	Request investees to account for nature-related dependencies in cash flows in same way as for climate	More granular and portfolio-level analysis of dependencies
TRANSITION SCENARIOS AND INVESTMENT STRATEGIES 1.5°- 3.0° future scenarios inform climate investment strategies	Captures joint climate-nature opportunities (NbS) and risks (agriculture, forestry etc.). Misses climate-nature trade-offs with significant impacts for market growth projections	Screen climate funds for nature-negative solutions – CCS, bioenergy, hard flood defences, dams, precious metal mining	Deploying joint climate-nature transition scenarios and launch nature-positive products

Low nature-related oversight | Medium nature-related oversight | High nature-related oversight

Source: Vivid Economics

We recommend four low-cost actions for how financial institutions can leverage their progress on climate for nature and start preparing for a joint climate-nature transition:

• **Lower the threshold for mitigating action in sectors with highly compounding climate change and nature loss risks:** Agriculture, forestry, fisheries, utilities and built infrastructure are all heavily exposed to business risks that are driven by both climate change and nature loss. If financial institutions have screening procedures for physical climate risk, these sectors are likely already flagged, but the threshold for mitigating action should be lower. The location of investments should be screened against areas in which natural resources are known to be under significant pressure. Appropriate mitigating actions will vary across financial institution type and size but include cross-referencing with additional data, requesting investee risk assessment and investee engagement.

• **Work readily-available nature impact metrics into procedures that already assess climate impact:** Many financial institutions already collect data on the GHG emissions associated with their investments, particularly in carbon-intensive sectors. For sectors that are known to have high impacts on nature, financial institutions should seek to integrate a set of simple and readily available nature impact metrics into these procedures. Relatively good data exists concerning land use change, water withdrawal, and some forms of pollution. Importantly, this available data allows financial institutions a good initial understanding of the risks from deforestation which has large climate and nature impacts. Again, the location of investments should be screened against areas in which significant nature damage is expected to occur. This is particularly the case for investments in commodities known to cause damage through deforestation such as palm oil, soy and beef. Disclosure frameworks and tools around climate change, biodiversity and land use have progressed significantly and continue to evolve, so they should be reviewed periodically.

• **Request investees to account for nature-driven risk channels within cash flow projections:** Companies and projects operating in sectors highly exposed to the physical impacts of climate change such as agriculture are often expected to account for climate variability within future financial projections. Financial institutions should be asking investees to do the same for the best understood channels of nature-related physical risk. There is already a large body of evidence detailing the ways in which businesses depend on nature to draw from.[109, 110, 111, 112]

• **Screen climate-aligned portfolios for high risk, nature-negative climate solutions:** Financial institutions with dedicated climate funds (mitigation or adaptation) should screen for their exposure to activities that have substantive negative impacts on nature. These include some forms of bioenergy, large infrastructure projects, and sectors dependent on mined materials for the zero carbon transition such as electric cars. Where investments are made in these areas, environmental due diligence should be strengthened and financial institutions may ask investees to disclose how they have adhered to the biodiversity mitigation hierarchy.[113] Financial institutions should apply the same test – avoiding mitigation and adaptation solutions that harm nature – to the actions they are requesting of investees within their stewardship activities.

Over time, a more sophisticated treatment of nature-related risks and opportunities and their interaction with climate will be needed. This will require nature-specific skills and greater use of (more reliable) tools and data, but also operational changes. Financial institutions could establish new dedicated nature teams or expand the remit of climate teams to include nature-related risk management or tackle it in a more transversal way. Reflecting on the process of building out climate risk management will shine a light on the merits and drawbacks of different approaches.

Nature-related capacity will be required in a broad sense across a financial institution to achieve effective risk management. Data teams will need to manage a broader, more complex and often geolocated set of data types relevant to nature. This will strengthen the already emerging demand for joint climate-nature product offerings from both the ratings community and data providers. Compliance teams will need nature expertise to assess relevant regulatory and liability risk. Nature will need to enter strategic discussions at a senior level including product development. To avoid unnecessary and potentially high costs, nature must ultimately be assigned the same priority as climate.

6.2 International policy makers

International policy makers too must demonstrate leadership and commitment in order to support the financial sector in building this capacity. The financial sector needs clear policy signals, especially from CBD COP15, around the future direction of global policy on nature and its relationship to climate policy. Aligned with F4B's framework for systemic change[114], action is needed through:

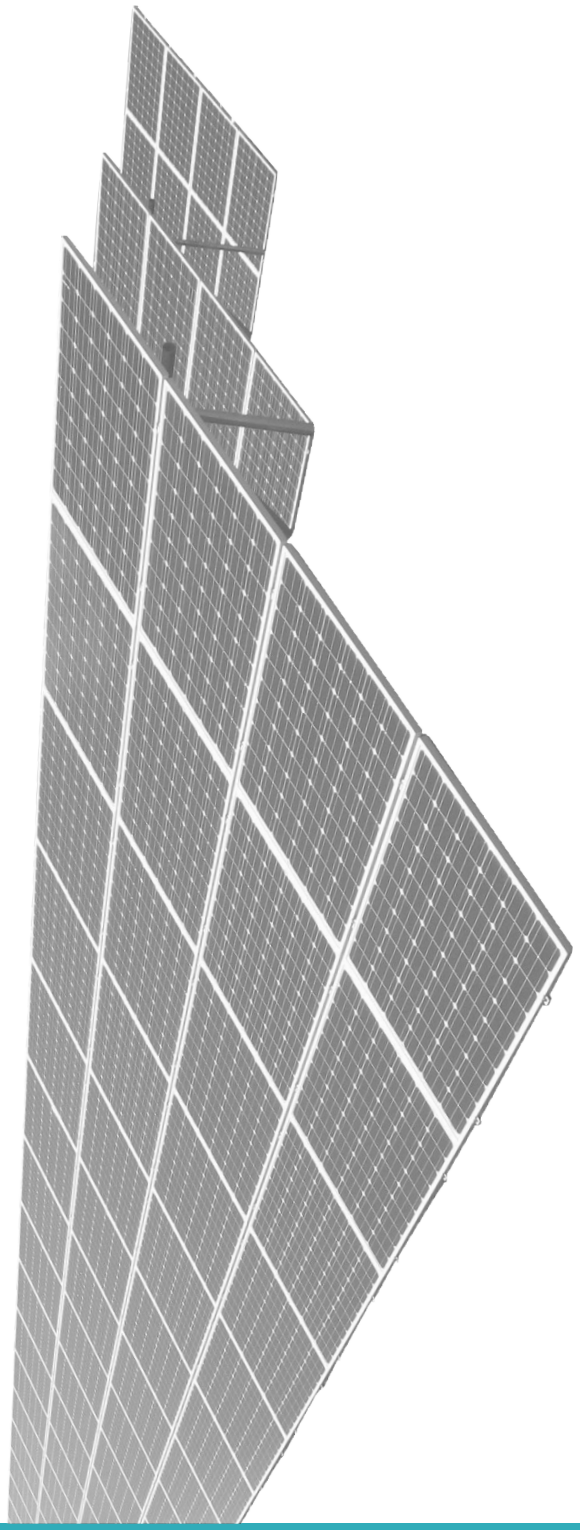
• An ambitious, clear and well-supported Post-2020 Global Biodiversity Framework, that provides measurable global goals to align the international community.

• Legally binding national nature-related targets, recognised in legislation. Targets should be well-defined, time-bound, and set in a consistent manner, such as climate targets under Nationally Determined Contributions (NDCs).

• A joint consideration of nature and climate targets, and a clear public-facing communication of how these will be cascaded into plans, policies and regulations. As part of this, governments should support finance sector initiatives to develop, implement and share best practice on climate- and nature-related risk management.

Focusing directly on the key drivers of biodiversity loss across national contexts could help clarify the goals of policy responses to nature loss. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) identifies five major drivers of biodiversity loss - land use change, direct exploitation of natural resources, pollution, climate change and invasive species. Policies that focus on the specific sectors and activities making the largest contributions to these drivers in the national context would send clear signals to financial institutions.

A constructive two-way dialogue between the financial sector and international policy makers is needed. In turn, the financial sector must also communicate what is required to align with global policy and support the joint climate and nature transition. An open dialogue would help policy makers to understand what financial sector action is productive yet feasible in the short- to medium-term, how emerging frameworks like the TNFD and SBTN can be aligned with forward-looking policy, and what company-level targets would be consistent and meaningful. Having these asks explicitly recognised in global policy provides confidence that they are the right actions to take, and strengthens the internal case for action.



About Finance for Biodiversity

Finance for Biodiversity (F4B) aims to increase the materiality of biodiversity in financial decision-making, and so better align global finance with nature conservation and restoration. F4B is advancing five workstreams that create and amplify the feedback signals that increase the value of biodiversity in private and public financing decisions:

- **Market efficiency and innovation:** including a leadership role in the Taskforce on Nature-related Financial Disclosures (TNFD), and support to a number of data and fintech-linked initiatives.
- **Biodiversity-related liability:** with a particular focus on the place of extended environmental legal liabilities for financial institutions, as well as financial policy and regulatory initiatives.
- **Citizen engagement and public campaigns:** advancing data and fintech-led instruments to catalyse shifts in citizen behaviour as consumers, savers, pension holders, insurers and capital owners.
- **Responses to the COVID-19 crisis:** advancing measures and advocacy linked to stimulus and recovery spending, and the place of nature in sovereign debt markets.
- **Nature markets:** catalysing nature markets by developing new revenue streams and robust governance innovations.

F4B has been established with support from the MAVA Foundation, which has a mission to conserve biodiversity for the benefit of people and nature. Its work is also supported by the Gordon and Betty Moore Foundation through The Finance Hub.

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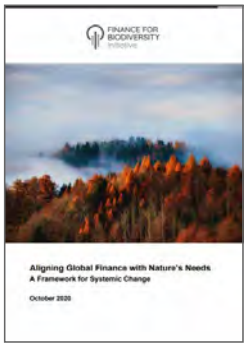

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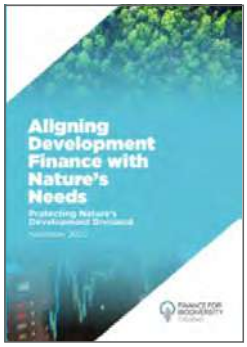

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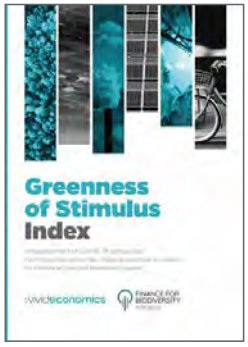

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The Climate-Nature Nexus

Implications for the Financial Sector

FINANCE FOR BIODIVERSITY Initiative