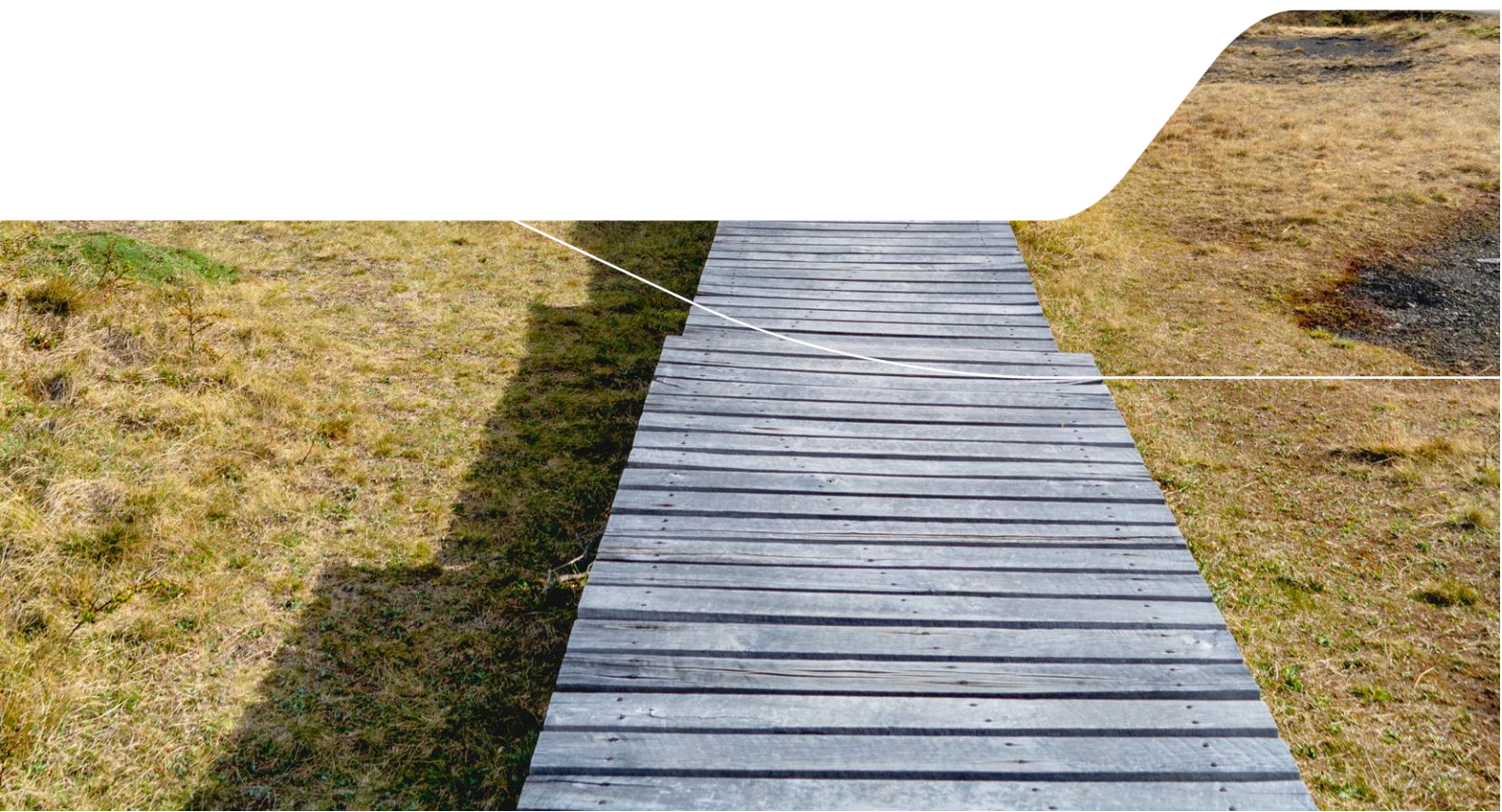




Assessing Nature-related Financial Risks

Upcoming use cases from
financial institutions



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Executive summary

Evolving financial decision-making to account for nature can start now

Our economy depends on nature. Banque de France recently estimated that 42 per cent of the value of securities held by French financial institutions are highly or very highly dependent on at least one ecosystem service.¹ With more than half of global gross domestic product (GDP) reliant on high-functioning ecosystems, we can expect to see the Banque de France analysis repeated for other parts of the financial world.²

Yet ecosystem services are on the verge of collapse in one-fifth of countries worldwide.³ There is, put simply, a disconnect between knowledge about nature loss and action to reverse it.

The possibility of such a collapse imperils humanity and creates an existential risk for our economy and financial system. One way to mitigate this risk would be for financial institutions to factor 'nature-related risks'ⁱ into investment and lending decisions.

One of the barriers to this evolution of financial decision-making is that the materiality of nature loss is often quantified at the macro level. To complement that, assessments of how specific companies are exposed to particular nature-related risks are needed, creating a tangible connection between the financiers and the natural world.

In March 2021, the University of Cambridge Institute for Sustainability Leadership (CISL) published its [*Handbook for Nature-related Financial Risks: Key concepts and a framework for identification*](#).

Following on from the publication of this Handbook, financial institutions and CISL have been co-creating 'use cases'ⁱⁱ that assess to what extent particular types of nature risk pose specific, material risks to investment and lending portfolios. These use cases will be published over the coming quarter and have already demonstrated that:

- data exists today to assess some nature-related financial risks
- tools are available to map financial portfolio exposure to nature-related risks
- some responses to nature loss (transition risks) can be modelled today with limited specialist guidance
- first assessments of nature risk promote engagement within financial institutions and between financiers and companies
- supply chain transparency is a key barrier to assessing the scale of risks.

Through these use cases, CISL and its partner financial institutions aim to show that assessing nature-related financial risks is not only possible today but fosters better internal and external engagement, improving investment and lending decisions. This has the potential to systemically change financial flows, with the financial community playing a catalytic role in the transition to a nature-positive economy.ⁱⁱⁱ

ⁱ See column A of Figure 1 below for the types of nature-related risk.

ⁱⁱ The use cases are also contributing to the [NGFS/INSPIRE Biodiversity and Financial Stability](#) Study Group.

ⁱⁱⁱ A nature-positive economy is one in which public and private sector actors, through choice and incentive, take action at scale to reduce and remove the drivers and pressures fuelling the degradation of nature, and work to actively improve the state of nature and the ecosystem services it provides.

Nature-related financial risk use cases

In a collaborative process, CISL, banks and investors chose four use cases to demonstrate the financial materiality of nature-related financial risks. Based on first-order effects only, use cases were selected to represent different, specific risk types, geographies and sectors. This selection process was driven by the intersection between data availability and relevance to the portfolio of the financial institution. This narrowing aimed to make the risk assessment method:

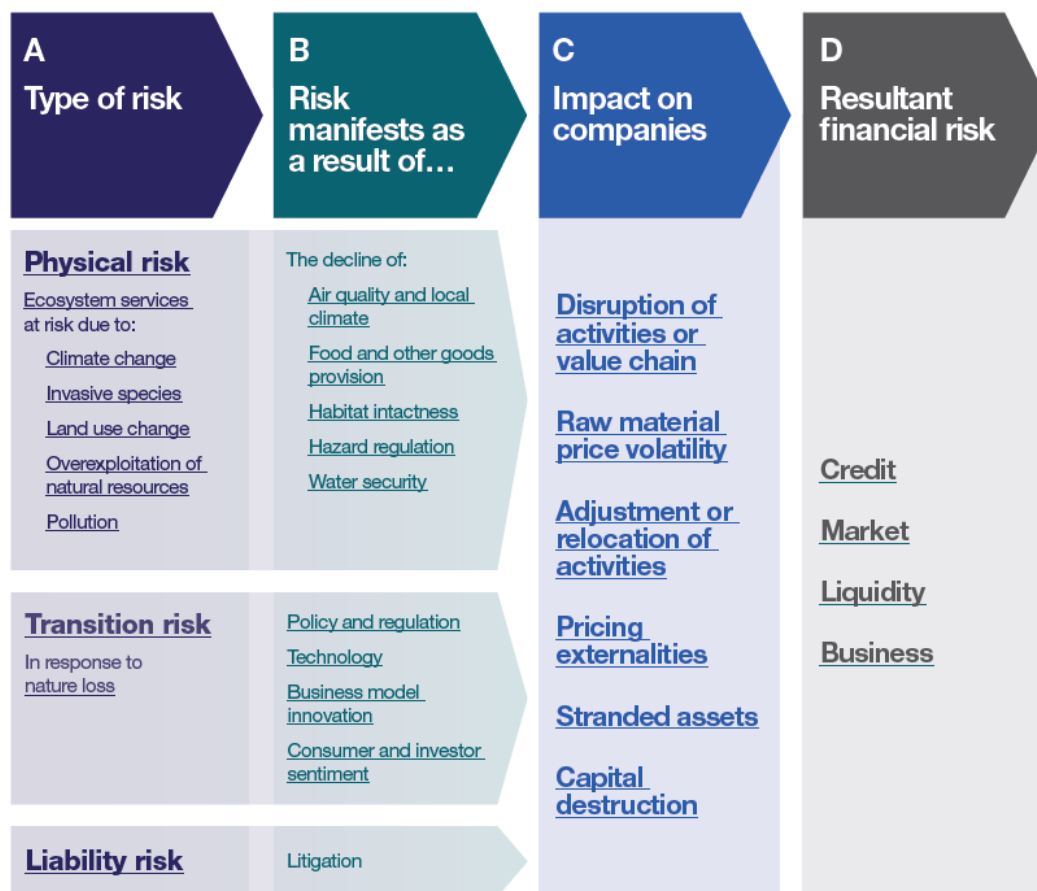
- straightforward, to enable other financial institutions to utilise the methodology for other scenarios and multiple types of risk in different regions or sectors
- specific and tangible, to motivate further action, such as engagement by the financier with companies at risk.

Table 1: Overview of nature-related financial risk use cases

Use case focus	Scenario	Type and cause of risk	Geography	Sector
1. Vulnerability of degrading land	Extreme weather events; fertiliser price spikes	Physical <i>Cause: land use change and overexploitation</i>	UK South America	Agriculture value chain
2. Water curtailment risk	Increasing levels of water stress	Physical <i>Cause: land use change, overexploitation and climate change</i>	China Thailand Indonesia	Cement Steel
3. EU Farm to Fork Strategy	Legislated reduction of fertiliser use	Transition <i>Cause: policy response to nature loss</i>	Global	Fertilisers and agricultural chemicals
4. Mapping nature risks in the portfolio	Mapping exposure of financial market indices to different types of nature-related physical risk		Global	Multisector

The above cases were chosen from a long list of viable options for which data was deemed sufficient. The use case selection process underscored the ability for financial institutions to start assessing risks arising from nature loss using available data. Alternative cases included risks emerging from habitat fragmentation, damage caused by invasive species or an increase in salinity pollution. These risk types can be seen in columns A and B of Figure 1: Framework from the CISL *Handbook for Nature-related Financial Risks*.

Figure 1: Framework for identifying nature-related financial risks



Headlines from upcoming use cases

1. Data exists today to assess some nature-related risks

The use cases combine pre-existing environmental data about nature loss with the potential impact of that loss on companies. By doing so, environmental data acquires financial meaning. For example:

- The land degradation use case (#1) combines prominent studies from PBL (Netherlands Environmental Assessment Agency)⁴ and the Intergovernmental Panel on Climate Change⁵ with other academic studies about crop yield variance⁶ to ascertain the additional financial risk that exists by farming degrading land.
- The water curtailment use case (#2) builds on the World Resources Institute Aqueduct Tool, an invaluable resource containing scenarios about water stress through 2030 and 2040 mapped geospatially. This data is easily extractable and, through combination with reference data about drought events, a likelihood of water access curtailment can be estimated.

2. Tools are available to map financial portfolio exposure to nature-related risks

The use case selected by financial institutions was partly based on risks their portfolio was considered most exposed to. Tools are available to help identify and map these exposures at the portfolio level, including:

- [Moody's Environmental Heat Map](#)
Maps the dependence of sectors upon natural capital. Scoring scale is “very high risk, high risk, moderate risk and low risk based on the credit materiality of environmental considerations to individual sectors”. To assess dependence, evaluations have been made of the connection and exposure to the carbon transition, physical climate risks, waste and pollution, water management and natural capital.
- [Sustainability Accounting Standards Board \(SASB\) Materiality Map](#)
Provides an indication of the materiality of a variety of sustainability issues for different sectors. Six environmental issues are covered, such as water and wastewater management, and the materiality of the exposure split into three tiers (high, low and immaterial).
- [Trucost and Natural Capital Coalition's Natural Capital Impact Ranking](#)
Indicates the impact on natural capital per economic unit of output from different sectors. This is based on historic environmental data disclosures.
While not focused on the dependence of companies on nature, the tool can give an indication of which sectors will be most impacted by policies to protect nature (nature-related transition risks).
- [ENCORE](#) (Exploring Natural Capital Opportunities, Risks and Exposure)
Provides qualitative assessments of the impact and dependence of different sub-sectors on nature. Scoring is done on a five-point scale. The assessments of ENCORE have been used to indicate the materiality of nature loss across sectors by, among others, Banque de France.⁷ However, there are not yet geographic nor forward-looking scenario components to ENCORE. This means the indication of which sectors are most exposed does not consider how risks stemming from nature loss are higher in some locations than others, or where the threat of future nature loss is most acute.

Use case #4 utilises ENCORE to map portfolio-level exposure to nature-related risks, analysing the extent to which different indices are dependent on ecosystem services (physical risk manifestations in column B of Figure 1). Although not geographically specific or sensitive to exposures along a supply chain,^{iv} mapping nature risks in the portfolio offers indications of how and why the index is exposed to nature loss.

^{iv} Value chain exposure is explored by Science-based Targets for Nature here: <https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf>

3. Some responses to nature loss can be modelled today with limited specialist guidance

Policy-based scenarios provide ready-made input data for a modelling exercise in a way that those driven by physical risk types, such as land use change, do not. Although the exact shape of future legislation is unknown, clear policy targets make input assumptions for modelling easier than physical risk topics, where knowledge about nature loss and its impact on companies is evolving.

We can already see policies and regulations emerging to protect and restore nature. This means policy-based scenarios can be modelled now with limited specialist guidance to understand nature-related transition risks. Examples include:

- The [EU Farm to Fork Strategy](#), which aims to reduce pesticide usage by 50 per cent and fertiliser inputs by 20 per cent by 2030. This is the focus of use case #3.
- Targets to protect and restore 30 per cent of land and marine environments by 2030.^v
- Countries banning imports of soft commodities likely to be connected with deforestation.^{vi}
- New biodiversity net gain requirements, where new construction must demonstrate an increase in biodiversity at new sites.⁸

4. First assessments of nature risk promote engagement within financial institutions and between financiers and companies

Our four use cases represent an opportunity for financiers to engage colleagues and portfolio companies about currently unquantified and unaccounted-for nature risks.

The first assessment of potential exposure to nature-related risks provides an indication of materiality. However, it will inevitably make assumptions about portfolio company exposure that cannot be proven or disproven based on the evidence available. For example, there may not yet be evidence to ascertain whether a producer is farming degrading land, or whether a cement company has strategies to mitigate water access curtailment. The exposure identified and need for more evidence can be used to engage credit risk analysts and portfolio managers internally and, in turn, catalyse conversations with financed companies to better understand their exposure.

The first assessment will also not take into account mitigation strategies or the development of more sustainable practices that companies could implement to lessen risk exposure. For example, those companies exposed to legislation that mandates fertiliser use reduction may be developing new products with a lower environmental footprint not impacted by the mandate. Again, the first assessment serves to promote an engagement process and greater transparency with the financed company.

This engagement with portfolio companies can be extremely useful for the financier, leading to:

^v Draft target for the Convention on Biological Diversity (CBD) COP15 in Kunming is to “Ensure that at least 30 per cent globally of land areas and of sea areas, especially areas of particular importance for biodiversity and its contributions to people, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area based conservation measures, and integrated into the wider landscapes and seascapes.” See: <https://www.cbd.int/article/draft-1-global-biodiversity-framework>

^{vi} The UK looks set to [introduce legislation](#) banning the import of soft commodities connected to illegally deforested areas. This has hallmarks of the Lacey Act in the US, which requires importers of wood products to take steps to ensure those products are not connected to deforestation. The [EU is also considering](#) how best to legislate to reduce the risk of importing commodities linked to deforestation.

- additional data becoming available about company operations, such as disclosure on water stress mitigation strategies, as well as their long-term exposure to nature-related financial risks
- opportunities for the financier to support risk mitigation, such as investment in soil health
- deeper understanding of the implications of nature risks on the company, such as their need for greater access to cash in the face of increasing crop price volatility.

The use case that analyses the impact of the EU Farm to Fork Strategy (#3) has already yielded such engagement. In the face of policies designed to protect nature from fertiliser pollution, agrochemical companies highlighted methods to decrease fertiliser run-off as a way to maintain sales volume.

5. Supply chain traceability is a key barrier to assessing the scale of nature-related risks

The four use cases led by CISL, in partnership with financial institutions, concentrate on the first-order effects of nature-related risks – where the risk, when it manifests, has direct impacts on companies.⁹ For example, restrictions on fertiliser use reduce market prices, harming agrochemical company profitability. There is a direct link between cause and effect. Second-order effects, meanwhile, cascade from the primary way the risk manifested – perhaps food prices increase because fertiliser prices rose to ensure operational viability at agrochemical companies.

Currently, mapping and quantification of second-order effects are difficult to establish with confidence due to a lack of transparent supply chain data, and further research will be needed. As an early example, value chain analysis of land degradation is being conducted (#1) to understand who the winners and losers are among those connected to degraded soils during extreme weather. Preliminary conclusions include that short-term price volatility benefits trading companies, while having a disproportionately negative impact on those connected with degraded land, indicating that the challenge will be to understand (1) the degree of connectivity to farmers on degraded land and (2) the extent to which this connectivity can be mitigated by liquid physical markets for soft commodities.

Improved supply chain transparency is also critical for identifying companies that will need to keep up with government policies, such as those to reverse deforestation, tackle Scope 3 emissions or increase nature conservation (types of nature-related transition risk). Previous CISL work on this topic includes [Banking Beyond Deforestation](#), which details five actions that banks can take to help halt and reverse deforestation.

Preliminary insights from each use case

Vulnerability of degrading land (Use case 1)

Scenarios: Exposure of degrading arable farmland to extreme weather and fertiliser price spikes

Type and cause of risk: Physical risk, caused by land use change and overexploitation of land

Sector and geography: Agricultural value chain in UK and South America

Preliminary insights:

- Soil degradation may cause variability of yield during extreme weather, which can disrupt grain output and reduce producer profitability. There is an inflationary impact, with implications on demand and profitability for companies along the supply chain.
- Farmers on degraded land fail to benefit fully from the crop price increases that occur after extreme weather, reducing profits.
- Size and access to capital can differentiate whether companies connected to degraded land continue to operate after extreme weather events. Small producers will have difficulty in such conditions due to chronic profitability deterioration and limited credit availability. Grain and food producers suffer the biggest value detracting, while fertiliser and trading companies are more resilient.
- Data about the percentage of degrading arable land is available globally and at a regional level, as well as including data that is 'climate-corrected', meaning that it isolates the role of land management in degradation.

Water curtailment risk (Use case 2)

Scenario: Increasing levels of water stress create water curtailment risk

Type and cause of risk: Physical risk, caused by a combination of land use change, overexploitation of freshwater and climate change

Sector and geography: Steel and cement in China, Indonesia and Thailand

Preliminary insights:

- Greater levels of water stress increase the risk that a Cape Town style Day Zero event emerges. Attempts to prevent such an event led to some industries having their access to water curtailed.
- Cost factors, such as relatively high costs of transport for cement, disincentivise production asset relocation in the face of water stress.
- Although a drought event is the trigger, the underlying water stress and management of water resources appear to be a key driver of the risk manifesting.

EU Farm to Fork Strategy (Use case 3)

Scenario: Legislated reduction of fertiliser use

Type and cause of risk: Transition risk caused by a policy response to nature loss

Sector and geography: Fertilisers and agricultural chemicals, globally

Preliminary insights:

- The EU Farm to Fork Strategy is associated with risks and financial impacts (including costs) for companies (eg fertiliser producers) if they do not pursue a sustainable long-term corporate strategy.
- The first impact is on fertiliser producers; any assessment of the impact on farmers would be complex, requiring a consideration of food price evolution and other factors such as government subsidies.
- Barometer of impact is whether policy will be exported – meaning that food imports to EU-27 also use less fertiliser and have a higher percentage of organics.
- The scenario is catalysing conversations with companies that may be impacted, revealing strategies to adapt to the policy, such as development of methods to reduce fertiliser run-off.

Mapping nature risks in the portfolio (Use case 4)

Focus: Mapping exposure of indices to different types of nature-related physical risk

Preliminary insights:

- When viewed in aggregate, the direct dependence of companies in the MSCI All-World Index on ecosystem services appears low, but nature-related risks remain unclear (and potentially much larger) for upstream and downstream supply chains. This information gap highlights the need to better assess the supply chain risk.
- The aggregate may also conceal important differences in risk across sectors, and so a comparative analysis of how dependent different indices and sectoral revenues are on nature is now being undertaken to ascertain where risks are concentrated.

Call to action

The Amazon rainforest is on the verge of becoming a savannah. Ongoing deforestation threatens to undermine the rainfall cycle that maintains the remaining forest. If the cycle is broken, a conservative estimate of the cumulative cost to GDP for the region is expected to exceed \$250 billion by 2050.¹⁰ Furthermore, avoiding catastrophe by preventing the Amazon from degrading into savannah can generate \$300 billion in additional wealth.¹¹

Hundreds of billions in additional finance are needed to avert these and other nature-related risks.^{vii} By assessing risks linked to nature loss and integrating them into investment and lending decisions, capital allocations can evolve to cover the finance gap.

Financial institutions can begin assessment of nature-related risks, using existing data and the framework suggested in the CISL [Handbook for Nature-related Financial Risks](#). Guided by CISL and driven by banks and investment managers, use cases are underway showcasing how this could be done. Already, the use cases are shining light on:

- how data and tools to perform risk assessments are already available to do many types of nature risk assessment
- the financial materiality of nature risks, producing insights to kickstart internal and external engagement with the existential threat of nature loss
- the benefits to lenders and investors of integrating nature-related risks into financial decision-making – reducing their risk exposure and generating opportunities to support client transitions to a nature-positive economy.

The integration of nature into financial decision-making can refresh the relationship between people and planet. Identifying and assessing nature-related financial risks are first steps towards an economy with nature at its heart.

^{vii} The [draft COP15 framework](#) estimates \$200 billion of new finance to conserve nature is needed to help conserve and support 30 per cent of land and sea areas by 2030, after the removal of harmful subsidies. The Paulson Institute previously [estimated](#) more than \$400 billion in new biodiversity finance is needed for similar conservation goals.

References

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- ¹ Swartzman, R., Espagne, E., Gauthey, J., Hadji-Lazaro, P., Salin, M., Allen, T., et al. (2021). A “Silent Spring” for the Financial System? Exploring Biodiversity-Related Financial Risks in France. Banque de France Working Paper #826. Retrieved from: https://publications.banque-france.fr/sites/default/files/medias/documents/wp826_0.pdf
- ² Swiss Re. (2020, September 23). A fifth of countries worldwide at risk from ecosystem collapse as biodiversity declines, reveals pioneering Swiss Re index [Press release]. Retrieved from: <https://www.swissre.com/media/news-releases/nr-20200923-biodiversity-and-ecosystems-services.html>
- ³ Ibid
- ⁴ PBL Netherlands Environmental Assessment Agency. (2017). Exploring future changes in land use and land condition and the impacts on food, water, climate change and biodiversity. Retrieved from: <https://www.pbl.nl/en/publications/exploring-future-changes-in-land-use>
- ⁵ IPCC. (2012). Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Retrieved from: <https://www.ipcc.ch/report/managing-the-risks-of-extreme-events-and-disasters-to-advance-climate-change-adaptation/>
- ⁶ For example: Hornbeck, R. (2012). The Enduring Impact of the American Dust Bowl: Short- and Long-Run Adjustments to Environmental Catastrophe. *American Economic Review*, 102(4), 1477–1507. Brás, T. A., Jägermeyr, J., & Seixas, J. (2019). Exposure of the EU-28 food imports to extreme weather disasters in exporting countries. *Food Security*, 11, 1373–1393. Liu, L., & Basso, B. (2020). Impacts of climate variability and adaptation strategies on crop yields and soil organic carbon in the US Midwest. Powell, J. P., & Reihard, S. (2016). Measuring the effects of extreme weather events on yields. *Weather and Climate Extremes*, 12, 69–79.
- ⁷ Swartzman, R., Espagne, E., Gauthey, J., Hadji-Lazaro, P., Salin, M., Allen, T., et al. (2021). A “Silent Spring” for the Financial System? Exploring Biodiversity-Related Financial Risks in France. Banque de France Working Paper #826. Retrieved from: https://publications.banque-france.fr/sites/default/files/medias/documents/wp826_0.pdf
- ⁸ See: <https://www.biodiversityinplanning.org/news/bd-net-gain/>
- ⁹ University of Cambridge Institute for Sustainability Leadership (CISL). (2021). *Handbook for Nature-related Financial Risks: Key concepts and a framework for identification*. Cambridge: University of Cambridge Institute for Sustainability Leadership. Retrieved from: <https://www.cisl.cam.ac.uk/resources/sustainable-finance-publications/handbook-nature-related-financial-risks>
- ¹⁰ Banerjee, O., Cicowiez, M., Macedo, M., Malek, Ž., Verburg, P. H., Goodwin, S., et al. (2021). *An Amazon Tipping Point: The Economic and Environmental Fallout*. IDB Working Paper Series No IDB-WP-01259. Retrieved from: <https://publications.iadb.org/publications/english/document/An-Amazon-Tipping-Point-The-Economic-and-Environmental-Fallout.pdf>
- ¹¹ Ibid