

# Assessing the Materiality of Nature-Related Financial Risks for the UK



**USER GUIDE and SYNOPSIS**

April 2024

## About this Guide and Synopsis

This document is a synopsis and guide to the [full report](#), summarising the methodology and building blocks of the analysis and highlighting their key findings. It acts as a complement to the full report's [Executive Summary](#) and [Key Takeaways](#) and provides an abridged version of each chapter. It is designed to help a wide range of stakeholders navigate the report's depth of information and to point them to key takeaways and sections of the analysis (and annexes and supplementary material) most relevant to their sector.

The final GDP impact analysis presented in the report is crucial in establishing understanding that nature degradation is an economic risk - both on its own, and even more so when combined with climate risk. Beyond the GDP and financial sector results, however, the full report contains many useful outputs, insights and new methodological approaches for central banks, regulators, the corporate and financial sectors, policy makers, and environmental NGOs.

## About the Analysis

The project was developed by the Green Finance Institute (GFI), with analysis undertaken by the Environmental Change Institute at the University of Oxford, the University of Reading, the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and the National Institute of Economic and Social Research (NIESR). The underlying dataset used was public data from the Bank of England and public Pillar 3 reporting from the largest seven UK banks.

The analysis benefited from the direction of an Advisory Committee that included representatives from the Department for Environment, Food and Rural Affairs (DEFRA), the Financial Conduct Authority (FCA), HM Treasury, and the Taskforce for Nature-related Financial Disclosures (TNFD). Full acknowledgements can be found in the [full report](#).

These individuals helped identify the most critical evidence gaps to address and guide the focus of the analysis over its 12-month period.

***The analysis presented and the views expressed in the report and this synopsis, however, are those of the authors and do not necessarily reflect the views or positions of the organisations listed above.***

# Overview of the Full Report

This report presents the first quantitative evidence of the economic risk posed by nature degradation and the erosion of ecosystem services, both domestically and internationally, to the UK economy. In addition, it considers how this economic risk to GDP could translate to risk for the financial sector, as an indication of the potential impact of nature-related risk on financial stability.

Today, these risks are not captured within UK prudential policies or wider risk management, including fiscal risk assessment. In the private sector, financial institutions neither account for nature-related risks in their decision-making nor routinely quantify them for the purpose of risk management, and companies do not routinely disclose or report on their nature-related risks.

Underpinned by the development of a UK Nature-related Risk Inventory and sectoral risk analysis, a set of three nature-related risk scenarios were produced, and their impact on GDP estimated, as well as preliminary indications for their impact on UK banks' domestic loan portfolios.

The scenarios explore different ways in which these risks could occur over time, combining:

- chronic risks that are ongoing risks, such as soil health decline and biodiversity loss, with
- acute risks, or 'shocks', that are event-driven, such as a wildfire, or disease outbreak.

The impact of chronic risks builds over time and for the purposes of this analysis is taken to commence in 2023 to capture the fact that these risks are already occurring. The acute shocks within these scenarios are taken as occurring in 2030 through 2035 - though based on the latest scientific evidence, such events could plausibly occur sooner (or later).

The scenarios comprise:

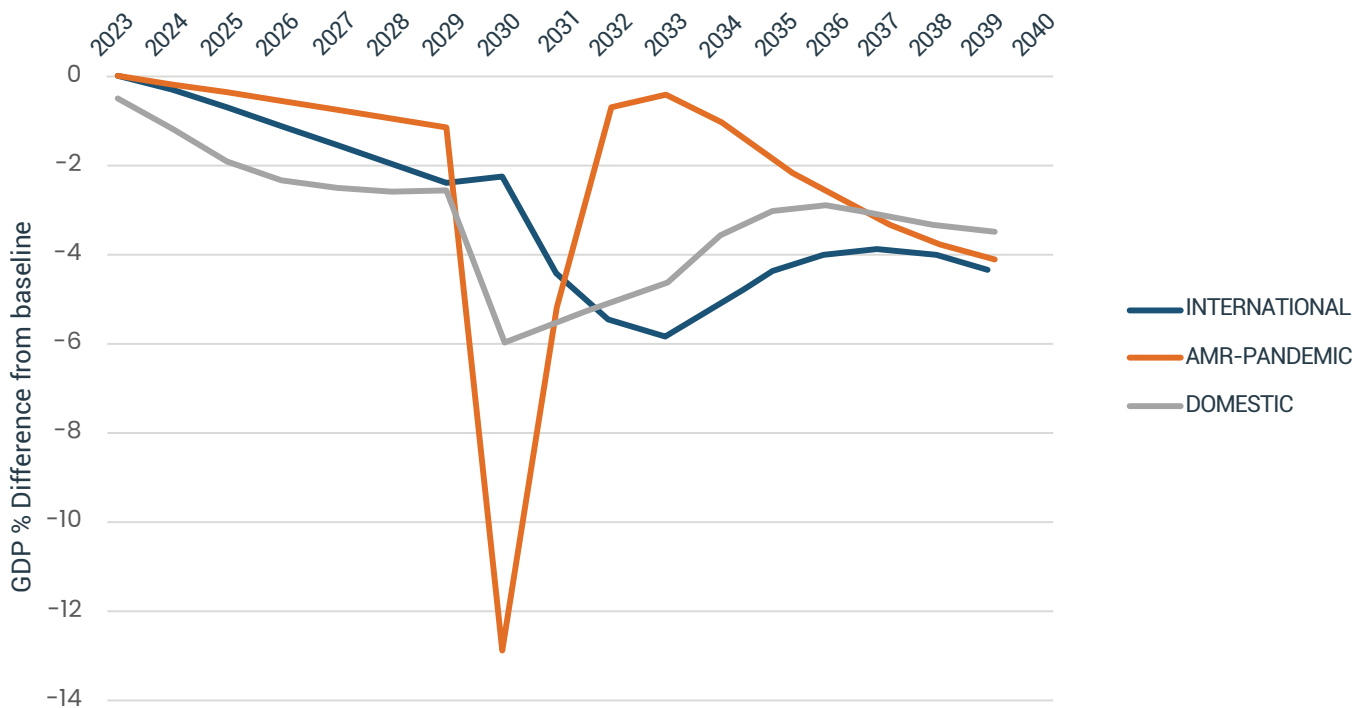
- a UK domestic scenario that captures continued chronic risks, such as soil health decline, water pollution, water scarcity, air pollution and biodiversity loss, combined with an acute shock of heatwave, drought and wildfires.
- an international supply chain scenario that explores how increased pressure on the global food system can have significant repercussions for the UK economy, driven by chronic risks of water quality and scarcity, soil health, pollinator decline, fishery overexploitation, and biofuel-land use tensions and fiscal issues, alongside the failure of multiple global breadbasket countries (key staple food exporters), geopolitical instability, and trade wars.
- an anti-microbial resistance pandemic scenario (health scenario) that explores how increased anti-microbial resistance and outbreaks of major livestock and poultry disease could result in a global pandemic and lockdown.

The impact of these scenarios on UK GDP was quantified using NiGEM, a macro-economic model used by a wide range of central banks and supervisors globally, including the Network for Greening the Financial System (NGFS).

Across the three scenarios, **chronic nature-related risks** are resulting in a slowdown in economic growth, equivalent to **an erosion of 1.5% to 3% of GDP (or £35bn to £70bn)** compared to what it would have been otherwise by the late 2020s.

When **acute risks**, starting in 2030, are **added to chronic nature-related risks**, this loss to GDP increases to **6% (for the domestic and international scenarios) and 12% for the health scenario, equivalent to wiping out £140bn to £300bn of GDP.**

As a result, the combination of chronic and acute risks could lead to an impact on GDP greater than that experienced in the Global Financial Crisis, in which UK GDP fell by around 5% to 6%, and (for the AMR-Pandemic scenario) greater than the GDP impact of the COVID-19 pandemic in which lockdown measures caused GDP to fall 11% over 2020.



**Figure 1:** Scenario impacts on GDP (chronic and acute combined for each scenario)

The results were then overlaid with results from climate-related risk scenarios (chronic only) published by the NGFS to examine the joint impact of nature- and climate-related risks. Care was taken not to double count any risks. When the domestic and international scenarios are run alongside these **climate-related risk scenarios**, we see a potential increase in the total erosion to GDP from 6% to in excess of 8%.

**These estimates are likely to be conservative.** For example, the acute scenarios do not assume any semi-permanent ecological regime shifts (e.g. tipping points that lead to long lasting impacts on food and other commodities); and human health impacts may also persist longer than expected, with longer-term suppression of economic recovery (as is being demonstrated with Long Covid), plus complex, cumulative interactions between physical and mental health. Several risks were also not able to be captured within the model.

What this tells us is that biodiversity loss and environmental degradation create demonstrably material risks for the UK economy and financial sector, in addition to their wider social impacts. The impact of these nature-related risks is also commensurate with those caused by climate-related risks. These impacts are near and present, reflecting the significant decline in the functioning of critical ecosystem services in the UK and around the world. While the analysis presented in this report is preliminary, this conclusion is clear.

These results may seem daunting, but early recognition of risk, if acted on, offers an opportunity to the UK. Ultimately, if we want a resilient society and a healthy and competitive economy, it serves us to protect and restore nature, and to assess and mitigate risks.

In order to gauge the extent to which nature-related risk may also be material for the UK's financial stability, **two scenarios were applied to the portfolios of the seven largest UK banks as a preliminary stress-test.**

The results show that the value of domestic lending portfolios (excluding finance and services) held by the largest UK banks could fall by as much as 4% to 5% by 2030 for the international and domestic scenarios in the coming decade. These risks will continue to increase over time.

The broad and correlated nature of these risks indicate that, in the long-term, nature-related risks could present a threat to financial stability in the UK, on a par with (and even greater than) direct climate change impacts.

A further output of the analysis is **a quantification of sector-specific nature-related value at risk (nVaR).** This represents the probable loss to sector production at a national-scale and shows the sectors with the highest nature-related risk. This is an essential step forward in the assessment of nature-related risk which, up to this point, has focused predominantly on capturing exposure to risk, rather than material risk itself.

It reveals that the greatest financial risks for the UK, in monetary terms, are to the services sector, followed by the manufacturing sector. The highest risks as a proportion of economic output are to the agricultural sector, with the greatest risks associated with water, nature's ability to regulate climate, soil quality, pollution, and pests.

Beyond these results and outputs, however, the methodological approach taken provides several ground-breaking advances in nature-related risk assessment of interest to both private financial institutions and financial supervisors, as well as policy makers and environmental NGOs. These are detailed in the introduction and in Figure 2 on page 9.

The final section of the full report (and this synopsis) provides a **conclusion, recommendations** and **next steps** that could be taken to collectively improve on capturing nature-related risk.

The full report with all final outputs, as well as detail on the methodological building blocks listed above, their findings, and evidence bases can be found [here](#).

# Contents

This synopsis follows the same structure as the full report. It summarises the content and provides key findings, as well as a readers' guide to the corresponding chapter in the full report.

Both this guide and the full report answer the following questions under each chapter.

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# Introduction

## About the Analysis

In early 2023, the Green Finance Institute (GFI), in collaboration with the Environmental Change Institute at the University of Oxford, the University of Reading, the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and the National Institute of Economic and Social Research (NIESR), set out to develop the first analysis of the economic and financial risks posed by nature degradation and the erosion of ecosystem services, both domestically and globally, to the real economy and financial sector in the UK. Publicly available Bank of England data was used as the basis for the analysis in addition to publicly available Pillar 3 reporting from the seven largest UK banks.

The analysis aimed to investigate whether nature degradation and the erosion of ecosystem services poses a material risk to the UK economy and UK financial stability, and, where possible, to also capture transition risk in addition to physical risk.

Characteristics	Climate-related physical financial risks	Nature-related physical financial risks
Driver	Global. Increasing GHG emissions and changes in natural sinks directly attributable to human activities	Local (albeit could occur as a global trend). Wide range of drivers directly attributable to human activities
Examples	Financial risks driven by GHG emission increases and changes in sinks causing temperature change, precipitation intensity, sea level rise etc. (drought, flood, heatwaves, ocean warming)	Financial risks driven by biodiversity loss, soil health decline, loss of pollinators, livestock disease outbreak, water pollution, fisheries exploitation, water provisioning, zoonotic disease outbreaks, crop disease
Acute and chronic	Both acute (shocks) and chronic (gradual) impacts	Both acute (shocks) and chronic (gradual) impacts
Diversity of impacts	Wide range of potential impacts on natural and human systems	Range of potential impacts on natural and human systems is arguably even wider and more direct than for climate change, including changes in genetic materials for medicines etc.
Timescales	Immediate but time delay before the physical impacts of GHG emissions fully manifest	Impacts of nature degradation can be immediate or can build up over time
Spatial scales and localisation	The impacts of rising GHG concentrations are global, albeit are spatially heterogenous and determined by a combination of local nature and socioeconomic factors (including nature loss)	Impacts of nature degradation are local, and determined by local natural and socioeconomic factors, however can also have a global impact, due to connections across natural and social systems

**Table 1:** Excerpt from climate and nature-related financial risks.

**Source:** Ranger et al (2023) See Introduction in the final report for full table.

The erosion of the UK's natural capital generates significant and long-term risks to society, our economy, and therefore, potentially to financial institutions and our financial stability or resilience. These nature-related risks are multiple: be that an increased likelihood and impact of pandemics, floods and droughts; the undermining of water quality and supplies; or damage to agricultural productivity through soil health, pollution and pollinator decline with adverse implications for food security and greater exposure to imported inflation.

Nor is it solely the erosion of the UK's natural capital that is presenting systemic risk. The degradation of the natural environment in the countries from which we import goods and services (and to which we are exposed to additional 'transboundary' risks, such as disease) is conceivably a larger risk than that born of domestic erosion.

Today, however, these risks are not fully or explicitly captured within UK prudential policies or UK fiscal risk management frameworks. **Recent research by the Global Association of Risk Professionals (GARP)** showed that less than 20% of firms surveyed were using scenario analysis to assess nature-related risks, and only around one third of firms have performed any materiality assessment at all.

While several central banks have now begun to assess nature-related financial risks, collectively the maturity of nature-related risk assessment and management appears to be in line with that for climate risks around five to ten years ago, noting that rapid progress was made on climate risks between 2015-2018.

The UK's economy and financial sector is, therefore, potentially exposed to unassessed and unmitigated systemic risks, while finance continues to flow to activities that damage nature and compound the risk.

**Evidencing this material risk is, therefore, a vital step towards transitioning our economic and financial system to one that values and invests in the natural environment.**

As with climate change, acting early to mitigate nature-related risks is vital. Continued degradation of nature can lock-in future risks and if ecological tipping points are breached either globally or locally, the implications could be severe and irreversible.

**However, whereas for climate change, we are already committed to further damages for the next decades from past emissions due to lags in the climate system; for nature, reducing pressures now should produce signs of recovery and measurable benefits for people, planet and prosperity within a few years.**

## **Methodologies**

The approach to the analysis contained several steps which produced insightful outputs and informed the remainder of the analysis:

Figure 2 and the section below summarises the building blocks of this approach, and how they fit together.

### **A UK Nature-related Risk Inventory (NRI) (1)**

An inventory that identifies the long list of UK nature-related risks (including physical risk, transition risk and litigation risk) and a table capturing the cascading effects from the interconnection of the risks.



### Part A: Risk-Based Analysis (2-3)

This part of the analysis uses a risk-based approach to assess value at risk for specific sectors. This analysis is not contingent on any specific scenario, but instead represents the probability of a given level of loss to sector production based on what we know about the likelihood of impacts and sectoral exposures and vulnerabilities.

### Part B: Scenario-Based Analysis (4-6)

This part of the analysis takes a scenario-based approach, generating estimates of losses contingent on a specific series of events that are defined through the narrative scenarios, combining chronic and acute elements. Through its narrative approach and use of the macroeconomic model, this part attempts to include second-order effects, such as changes in labour productivity, prices, trade, investment risk premia and public expenditures, alongside sector-specific impacts.

## Overview of Analysis and Building Blocks

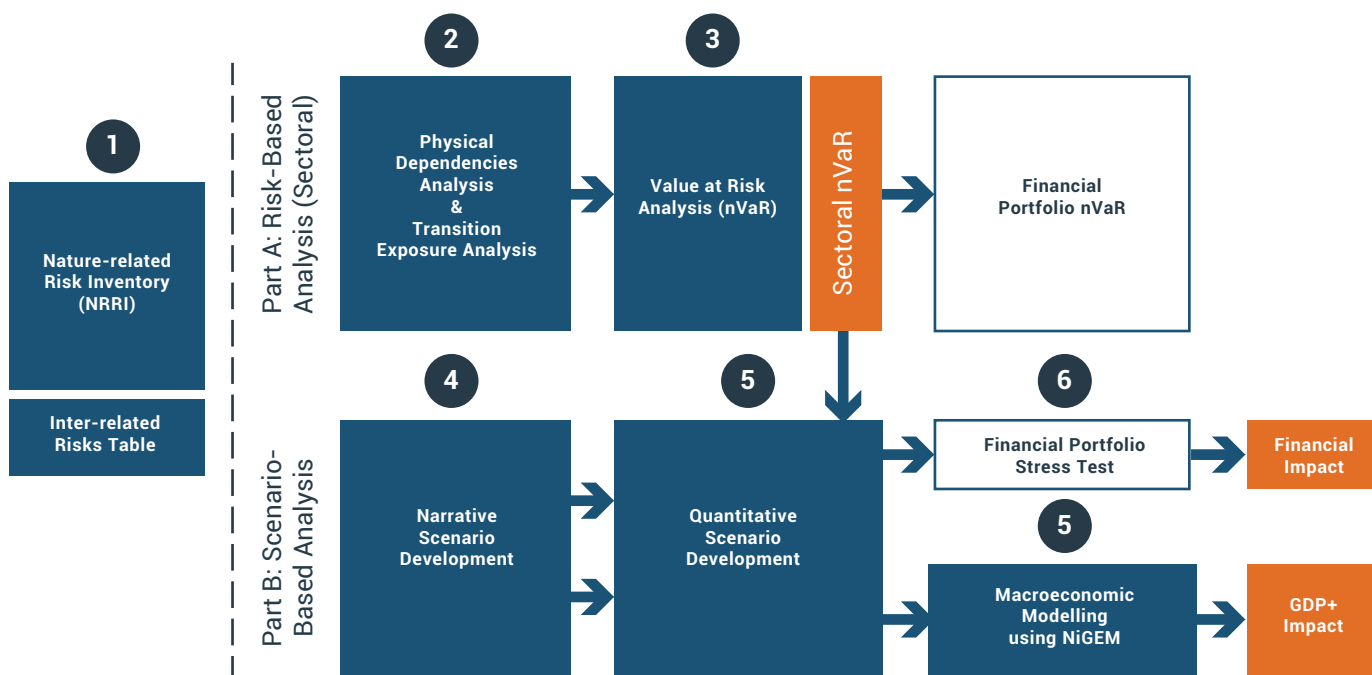


Figure 2: Methodological building blocks for analysis

The building blocks and outputs within the analysis are:

1. A Nature-Related Risk Inventory (UK-NRI).
2. Dependency analyses incorporating supply chains and overlaying risk hotspots, and transition risk exposure.
3. Sectoral nature-related value at risk modelling (nVaR).
4. Scenario development; from storylines to quantitative scenarios.
5. Macroeconomic modelling using NiGEM.
6. Financial risk assessment



## Guide for readers

We recommend reading the introductory chapter of the full report for more background detail on the broader topic of nature-related risk assessments, and the methodologies used within this UK analysis.

In the **Introduction** you will find detail on:

- Central bank nature-related risk assessments to date
- Summaries of the NGFS' work on nature-related risk
- Detail on the TNFD's approach to scenario development
- An overview of the methodologies that were developed within this analysis and the approach taken.

# 1. UK Nature-related Risk Inventory

## What is it?

A Nature-related Risk Inventory (NRRI) is complementary to the UK National Security Risk Assessment (NSRA) and the UK Climate Change Risk Assessment (CCRA) in that it offers an expanded set of nature-related Risks that includes chronic, long-term risks as well as acute event-driven risks. The UK NRRI is the first of its kind in that it focuses specifically on risks arising from nature degradation, including several risks missing from previous assessments. [See Box 1: Nature Risks and the National Risk Register]

The NRRI captures not only economic risks resulting from nature degradation and the erosion of ecosystem services in the UK, but also economic risks to the UK derived from nature degradation and the erosion of ecosystem services beyond our borders. In addition to these physical risks, it also captures transition risks, such as an acceleration of the stringency of nature protection policies, and litigation risks, such as legal cases filed against businesses or governments. The Inventory ranks these 29 risks based on both their likelihood, and the impact they would have on the economy.

### BOX 1: Nature Risks and the National Risk Register

The UK [National Security Risk Assessment](#) (NSRA; corresponding to the publicly available [National Risk register](#)) highlights acute threats to the UK, such as terrorist attacks, flooding and livestock and zoonotic diseases. Work led by the Cabinet Office is [currently ongoing](#) to appraise longer-term 'chronic risks', - i.e. challenges which build incrementally that, if left unchecked, can erode our economy, community, way of life and/or national security.

The NRRI in this current report could be incorporated into these 'live' risk registers. For example, physical risks detailed in the NRRI, such as soil health decline, aquaculture pest/disease outbreak and North Sea fishery collapse are not included in the NSRA, nor are transition and litigation risks.

## Why is it important?

A Nature-related Risk Inventory can play an important role within decision-making for a wide range of stakeholders by identifying risks derived from nature degradation and the erosion of ecosystem services, as well as transition and litigation risks, thereby enhancing understanding and informing responses. It could help inform policy makers to develop regulation and define public spending priorities, private companies to prioritise risks for further assessment and management, and central banks to consider potential risks to financial stability.

In this way, an inventory can prevent unanticipated negative impacts on citizens, businesses, and UK security and prosperity.

It can also support corporates and financial institutions to develop scenario-based analysis of nature-related risks by understanding which risks are most material to their operations and portfolios, and how these might interact.

## How was the Inventory developed?

The NRRRI was developed as part of the INCAF Project of the NERC Integrating Finance and Biodiversity for a Nature Positive Future programme as a collaboration between the University of Reading, the University of Oxford and the UK Centre for Ecology and Hydrology (CEH).

The team developed a long list of risks mapped to each category within the IPBES Nature's **Contributions to People**.

The project team then developed plausible worst-case scenarios for how each risk might impact the UK economy and threaten financial stability. This was accompanied by an evidence statement based on a literature review pertaining to the likelihood and potential impact of this scenario. All evidence statements are published in **Annex 1** of the full report.

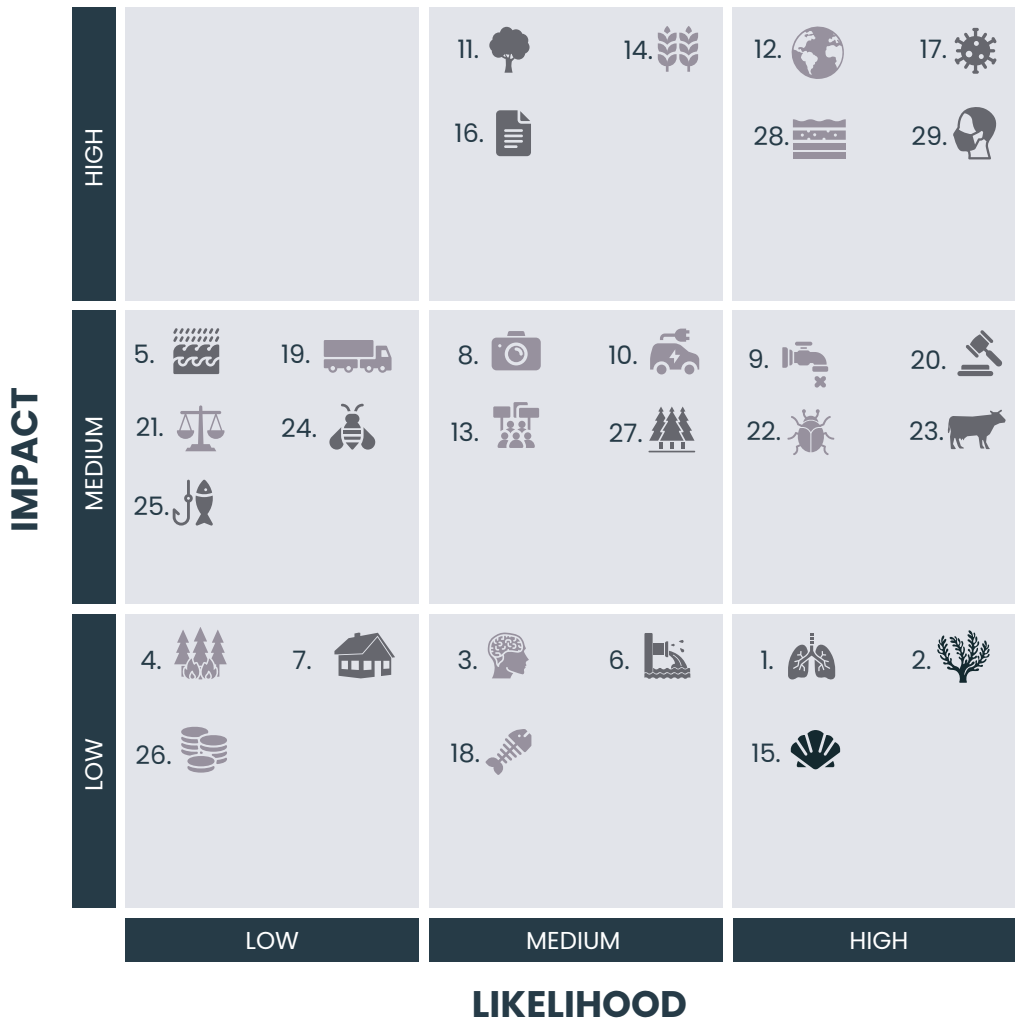
The team consulted 25 experts spanning both environmental science and climate-environment risk analysts at various financial institutions. These experts were each allocated several risks, asked to review the evidence statements, and then produce a score (high, low, medium) across likelihood and impact. They were also asked to provide a confidence rating.

## What does the UK NRRRI tell us?

Figure 3 below presents the economic nature-related risks that were identified. They include both chronic and acute nature-related risks. These risks will incorporate direct risks, such as damage from wildfires with indirect risks such as air pollution.

The horizontal axis captures low, medium or high likelihood – an estimate of the probability that the risk will materialise over the next three decades.

The vertical axis captures low, medium or high impact - an assessment of the potential materiality of the risk to the UK economy and financial system (i.e. it could cause major economic disruption and financial instability, such as bank defaults).



**Mainly Domestic**

- 1. Air pollution from wildfires
- 2. Algal blooms in water ecosystems
- 3. Biodiversity access and mental health
- 4. Direct damage from wildfire
- 5. Flooding due to deforestation and soil damage
- 6. Freshwater pollution
- 7. Housing asset risks due to policy and legal changes
- 8. Risks to tourism from nature damage
- 9. Water shortages impact energy and agriculture

**Mainly International**

- 10. Critical resource supply chain disruption
- 11. Deforestation and ecosystem tipping points
- 12. Global food security repercussions
- 13. Global food supply chain interruption from biodiversity and climate policy misalignment
- 14. Multiple breadbasket failure
- 15. Ocean acidification

**Domestic and International**

- 16. Acceleration of strict net zero and nature protection policies
- 17. Anti-microbial resistance
- 18. Aquaculture major pest or pathogen outbreak
- 19. Business impacts due to UK-only biodiversity policies
- 20. Corporate litigation cases
- 21. Government litigation cases
- 22. Grain crops pest / pathogen outbreak
- 23. Livestock disease
- 24. Loss of pollination service
- 25. North Sea fishery collapse
- 26. Reputational risk, stranded assets and fund withdrawal
- 27. Sitka spruce pest outbreak
- 28. Soil health decline
- 29. Zoonotic disease

Figure 3: UK NRRl

Figure 3 demonstrates that the nature-related economic risks to the UK with the **highest likelihood** of occurring up to 2050 (with chronic impacts occurring already and worsening, and acute impacts possible within the next decade), and that would likely cause the **highest impact** in terms of level of disruption to the UK economy and financial stability are:

- Soil health decline (both domestic and international)
- Anti-microbial resistance (AMR)
- Zoonotic disease
- Global food security repercussions

Confidence in the scoring is indicated by the colour of the risk symbol, with darker shading indicating higher confidence.



### Guide for readers

We recommend reading **Chapter 1**, Annex 1 of the report, and Supplementary Materials 1 and 2 for more detail on the NRRI, including evidence statements and the interaction between each risk and their cascading effects.

In these documents, you will find detail on:

- Evidence statements for each risk
- A table demonstrating how these physical, transition and litigation risks interact creating a cascading effect
- The role of hotspots analysis to estimate risk
- UK environmental degradation and whether it is improving or worsening
- An overview of UK environmental policy
- Next steps for the Inventory

## 2. Exposures to Nature-related Risk

### What is it?

Two analyses were carried out that sought to quantify sectoral exposure to nature-related risk for the UK's financial sector.

The first part, the exposure analysis, was completed by UNEP-WCMC. This estimated the dependency of UK banks and insurers' financial assets on ecosystem services, using the [ENCORE \(Exploring Natural Capital Opportunities, Risks and Exposure\) knowledge base](#). The output is a sector and ecosystem-specific assessment of exposure.

Where data was available, the UNEP-WCMC team also estimated the geographical spread of underlying sectors using the [EXIOBASE MRIO](#), and mapped those to hotspots of natural capital depletion. Hotspots of natural capital depletion are defined as areas within the top 20% of relative depletion values for natural capital assets globally. This brought the analysis closer to understanding potential physical risk exposure.

The second part of this exposure analysis was completed by the University of Oxford and explores the exposure to transition risks of the seven largest UK banks. The impacts it envisions within transition risk included: increases in the price of deforestation-linked commodities; changes in demand for meat; shifting bioenergy; changes in soft commodity supply chains in response to changing policies and reputational and liability risks; and growing opportunities related to nature-related foods, services and assets.

### Why is it important?

Identifying exposure to dependencies on ecosystem services is an initial step to calculating material risk.

Dependency analysis can provide a useful barometer as to where there is exposure to potential physical risks. However, as discussed in the following chapter, it cannot tell us what the material risk, or Value at Risk, is.

To estimate Value at Risk, we need to understand indirect (or upstream) dependencies, as well as, importantly, the health of the ecosystems those assets depend upon, and the financial risk that the degradation of those ecosystems may pose. This is aligned with the LEAP process to assess nature-related risks and opportunities detailed within the [TNFD Framework – Locate, Evaluate, Assess, Prepare](#).

We also need to capture risks beyond physical risks. Within nature-related risks there are physical risks, transition risks and also litigation risks – some of these are captured within the NRRI. These risks are difficult to value, and while were captured in this part of the analysis, were not integrated into the latest scenarios.

### How were the analyses developed?

The UNEP-WCMC team used the latest publicly-available dataset published by the Bank of England in 2023, which includes around 90% of the UK banking and insurance system's total assets for the fourth quarter of 2021. It did not contain spatial (geographically disaggregated) data or pension or asset management data.

The dataset includes the NACE sector codes for the underlying bonds, equities and loans, which indicate to which sectors the portfolio of assets has exposure. From this, using the associations in the ENCORE knowledge base, it is possible to assess which ecosystem services these sectors are dependent on.

Using the dataset, the UNEP-WCMC team first applied the ENCORE knowledge base to the underlying NACE sectors to calculate nature dependency by sector and by £ amount.

The team then applied a spatial dimension to the data by working with SEI York to combine:

- The original data on assets of the UK's banking and insurance system.
- EXIOBASE multi-regional input-output model (MRIO) to look at which upstream sectors contribute to the financial exposure of sectors within the UK's financial investment portfolio.



**Figure 4:** Approach taken by UNEP-WCMC to understand material risk.

Further detail on this can be found in the [full UNEP-WCMC report](#), including on the decision to exclude the 52% of assets that were invested or lent to financial institutions (where it is therefore impossible to track upstream or indirect exposure without further data) when analysing direct dependencies.

To provide preliminary insights on the potential exposure to **transition risks and opportunities** in the UK, the University of Oxford collected data on the sectoral and geographical exposures of the top seven banks in the UK and conducted a preliminary risk screening, using the methodology of the WWF's Biodiversity Risk Filter (See Annex 3 of the full report). Combined assets with a value totalling more than £1 trillion were analysed.

## What does it tell us?

The UNEP-WCMC work offers several helpful insights.

### 1. There is significant exposure of UK banks and insurers to ecosystem services in areas of the world with a high rate of natural capital depletion.

It is estimated that the £3.8 trillion in assets from UK banks and insurers are dependent on a wider set of assets through supply chains, which may represent approximately £5.8 trillion of assets. Of this upstream £5.8 trillion, financial exposure associated with NACE Divisions with a High or Very High dependency on nature in areas of the world that have a fast rate of natural capital depletion was found to be £2.5 trillion or **44%** of the portfolio.

### 2. The regulation of surface water quantity is the ecosystem service to which our financial sector is most exposed through its sectoral lending and investments.



This is followed by the provision of flood and storm protection, and then mass stabilisation and erosion control.

**3. Some 75% of the UK is covered by at least one hotspot of natural capital depletion, and 25% is covered by up to two hotspots of natural capital depletion.**

The hotspots of natural capital depletion layers are not a new data source but they were applied across the entire portfolio, and it is interesting to note the UK's own standing when it comes to natural capital depletion. These figures are due to high depletion rates for biodiversity and soil and sediments in the UK.

The Oxford University transition risk exposure analysis also offers us useful insights:

**4. Between 8% and 53% of the portfolios of the seven largest banks are exposed to transition risks and this would include the value at risk.**

In particular this exposure is through media scrutiny, pollution and their impacts on protected/conserved areas.

**5. Banks are not homogeneously exposed, with the holdings of some banks significantly more exposed to transition risks.**

Banks with large international portfolios are most exposed to transition risk. Banks with exposure to the following sectors are also most likely to be exposed to transition risk: agriculture, forestry and fishing; manufacturing; construction; mining and quarrying; and transport and storage.

**6. Transition poses both a risk and opportunity.**

UK firms in some sectors could see higher costs and reduced demand as part of the transition towards nature-positive outcomes. On the flip side, there are also opportunities due to transitions that companies can capture. Opportunities could outweigh the costs if governments, corporates and financial institutions act early. Actions for banks can include engaging with their clients to support their transition to nature-positive operations, and ensuring risks are assessed and priced appropriately.



### Guide for readers

We recommend reading **Chapter 2** of the report for more detail on these two parts of the exposure analysis, in addition to Annexes 2 and 3 and the full UNEP-WCMC report.

These documents will provide insights on:

- The ENCORE tool (also see Chapter 3 for challenges with using ENCORE to assess risk)
- UK financial sector ecosystem service dependencies
- How to tackle a lack of location/spatial specific data when assessing nature-related risk
- Location specific guidance for the top ten NACE sectors
- Recommendations for action based on dependency and hotspot analysis
- Calculating transition risk using the WWF Biodiversity Risk Filter tool
- The transition risk exposure at the UK's seven largest banks

## 3. Nature-related Value at Risk (nVaR)

### What is it?

While the ENCORE-based dependency analysis provides us with helpful information about the exposure of sector output and financial portfolios to ecosystem service depletion and therefore potential exposure to risk, it does not tell us about the actual risk. As described, it does not take into account the state the ecosystem service is in, nor what the financial or economic impact would be if its state were to decline.

We therefore need to translate dependencies into economic risks to sectors in order to arrive at the Value at Risk.

For this part of the analysis, the team at the Oxford University Environmental Change Institute took eighteen ecosystem services and applied a methodology to translate those services into economic risks to sectors, looking both at direct risks and supply chain risks.

This Value at Risk (VaR) is naturally much lower than the total value exposed because the methodology takes into account the likelihood that the ecosystem service will be materially disrupted in a given year, the severity of this impact, and the potential scale of the impact on firms and the sector overall.

Moving from dependencies to VaR may also highlight a different set of ecosystem services as being key. For example, in the dependencies analysis surface water, flood and storm protection and mass stabilisation were the ecosystem services to which the financial data analysed was exposed. Yet within VaR analysis we see water, nature's ability to regulate climate, and mediation of sensory impacts to be the key ecosystem services at risk. [See box 2]

Ultimately, VaR will give a more accurate picture of nature-related risk.

### **BOX 2: What is Mediation of Sensory Impacts?**

Our natural environment interacts with our human senses. We can be negatively impacted if there is man-made noise or light pollution, for example, or if our surroundings are unsanitary or lacking natural elements. Essentially, our bodies and minds tend to perform better when we have access to green natural spaces, with fresh air, clean water and the sounds of nature.

As such, when this ecosystem service that nature provides is reduced due to air pollution, water pollution and reduced sanitation, destruction of habitats and land use change, our economy may experience lower productivity and labour shortages, and increased mental and physical health costs for our public health sector.

## Why is it important?

As stated, this part of the analysis shows the importance of moving beyond dependencies to assessing material risk.

The analysis also provides evidence that nature does represent a financial risk to the UK economy.

While the VaR methodology is useful, it is worth noting that many important risk transmission channels are missing and the potential cascading and macroeconomic implications are not captured. These limitations are detailed further in Chapter 3 of the full report.

## How was nVaR developed?

We recommend referring to Chapter 3 of the final report for the full methodology and equations used to translate dependencies into nVaR.

The VaR metric presented in the full report is a forward-looking metric that quantifies the extent of possible financial losses across the sector within one year, with a defined probability level. This is subtly different to VaR as calculated for other types of risk, which is generally backward looking and defined for a specific firm or portfolio. Given nature-related risks are changing over time, just looking backward does not give an adequate picture of the risks. Note that (unless otherwise stated) we look at the 1-in-100 year likelihood level. This level was selected given its relevance to financial regulation on the advice of firms.

It should also be noted that this analysis captures only physical nature-related risks and not transition risks.

## What does it tell us?

### **1. The most significant risks relate to the ecosystem services of water and nature's ability to regulate climate.**

The Value at Risk analysis suggests the most significant risk relates to water with nearly £300 billion at risk due to water scarcity alone (ground water and surface water).

Reduced capacity for nature to regulate climate emerges as the second highest risk. For example, the benefits of vegetation in reducing heat stress and flood risk in local urban environments.

Mediation of sensory impacts emerges as the third most significant risk. This risk can be interpreted as a risk to labour productivity across sectors, and other costs, related to the impacts of biodiversity loss and environmental damage on human wellbeing. {see Box 2}

### **2. The greatest financial risks are to the services sector, followed by the manufacturing sector.**

In terms of value of assets at risk, the most significant financial risks are to the services sector, followed by the manufacturing sector. However, the highest risks as a proportion of economic output are to the agricultural sector (Figure 5), with the greatest risks associated with soil quality, pollution, pests and water.

	Agriculture	Construction	Electricity and Utilities	Manufacturing	Mining	Services	Transport
Climate regulation	15.6	6.6	7.7	6.4	9.8	4.7	14.7
Dilution by atmosphere and ecosystems	6.3	1.4	0.8	5.8	1.1	1.0	1.2
Disease control	6.9	0.0	0.0	0.2	0.1	0.1	0.0
Fibres and other materials	8.0	0.1	0.1	0.5	0.1	0.3	0.1
Flood and storm protection	1.8	0.8	1.2	1.4	0.7	6.7	1.5
Genetic materials	9.6	0.2	0.2	1.3	0.3	0.3	0.1
Ground water	12.0	4.3	6.5	11.0	6.5	5.0	7.2
Mass stabilisation and erosion control	3.7	1.8	3.3	2.5	2.3	3.4	2.6
Mediation of sensory impacts	5.0	5.0	2.4	8.7	1.5	3.0	4.3
Pest control	14.6	2.0	1.4	0.5	0.3	0.3	2.0
Pollination	4.9	0.0	0.0	0.1	0.1	0.1	0.0
Soil quality	12.8	2.2	1.5	1.4	0.5	0.6	1.2
Surface water	13.8	4.9	10.0	12.5	7.1	6.2	8.4
Ventilation	2.1	0.8	0.2	1.3	0.3	0.3	0.9
Water quality	6.4	1.0	2.9	4.0	1.9	1.2	2.2

**Fig 5:** Percentage Value at Risk by sector and ecosystem service (grouped)

**3. The Value at Risk is in the £hundreds of billions.**

The Value at Risk to the UK economy related to water and nature's regulation of climate is equivalent to around 3% and 2.4% of UK GDP respectively. Much of this risk transmits through global supply chains to the UK manufacturing and services sectors.

The largest risks to sectoral output in percentage terms are to agriculture, which is impacted by several ecosystem services with VaR up to 7.5% for disruption of any one service. These risks are domestic and chiefly related to soil quality, water and climate regulation.

These direct risks to sectors stack up with indirect and second-order effects covered in Chapters 4-5



## Guide for readers

We recommend reading **Chapter 3** of the report for more detail on measuring Nature-related Value at Risk.

In particular, Chapter 3 will provide insights on:

- Translating dependencies into Value at Risk including a methodology
- Risk transmission channels between nature and finance
- Challenges with using the ENCORE model to calculate VaR
- List of ecosystem services that pose the greatest risk to UK GDP and the financial sector
- List of sectors that hold the greatest nature-related risk
- Limitations and next steps

## 4. Nature-related Risk Scenarios

### What is it?

Scenario analysis and stress testing are commonly used as tools to assess and manage a wide range of risks, predominantly macroeconomic risks, and more recently long-term stresses and shocks like climate change and pandemics.

Scenario analysis is the process of estimating the expected value of, in this case, impact on GDP, after a given change in the values of key factors occur (in this case, chronic risks born of environmental degradation building in the system, and acute risks).

For this UK analysis, the team at the Environmental Change Institute at the University of Oxford, and the University of Reading developed three 'narrative' scenarios to apply to UK GDP - a domestic scenario, an international supply chain scenario and an AMR pandemic scenario. They each contain chronic risks (ongoing) and acute risks or 'shocks' (event-driven). Scenarios were co-developed with financial institutions and experts through a series of workshops.

In order to best demonstrate financial or economic risk, scenarios need to be plausible (likely to occur), but also severe or extreme (recognised as being of high impact).

### Why is it important?

The rationale for forward-looking scenarios for nature is the same as for climate change; the past is no longer a good guide to the future, and so scenarios are called for to explore potential future outcomes based on a set of assumptions.

These scenarios, when applied to GDP through the National Institute Global Econometric Model (NiGEM) (see Chapter 5) enable us to quantify the impact of nature-related risk on the UK economy.

### How were the scenarios developed?

The technical team first revisited the literature on scenario design for other forms of risk to the financial sector. For example, the team looked at recommendations on stress testing from the IMF and the ECB; those within standards such as Basel III and IFRS 9; as well as the climate scenarios developed by the NGFS used by central banks.

As a result of the review, the team concluded that the best approach would be to develop a framework for scenarios to capture the 'bigger picture' of risk transmission, to understand the plausible but severe potential risks that could emerge related to the loss of biodiversity and ecosystem services. This is a qualitative approach, and what is referred to as a 'narrative scenario approach'. Several key aspects and criteria were identified for scenario development which are detailed in Chapter 4 of the full report.

The team used the UK Nature-related Risk Inventory, and the analysis on concurrent risks to identify clusters of interrelated risks. Compounding narrative scenarios were then developed that met the criteria.

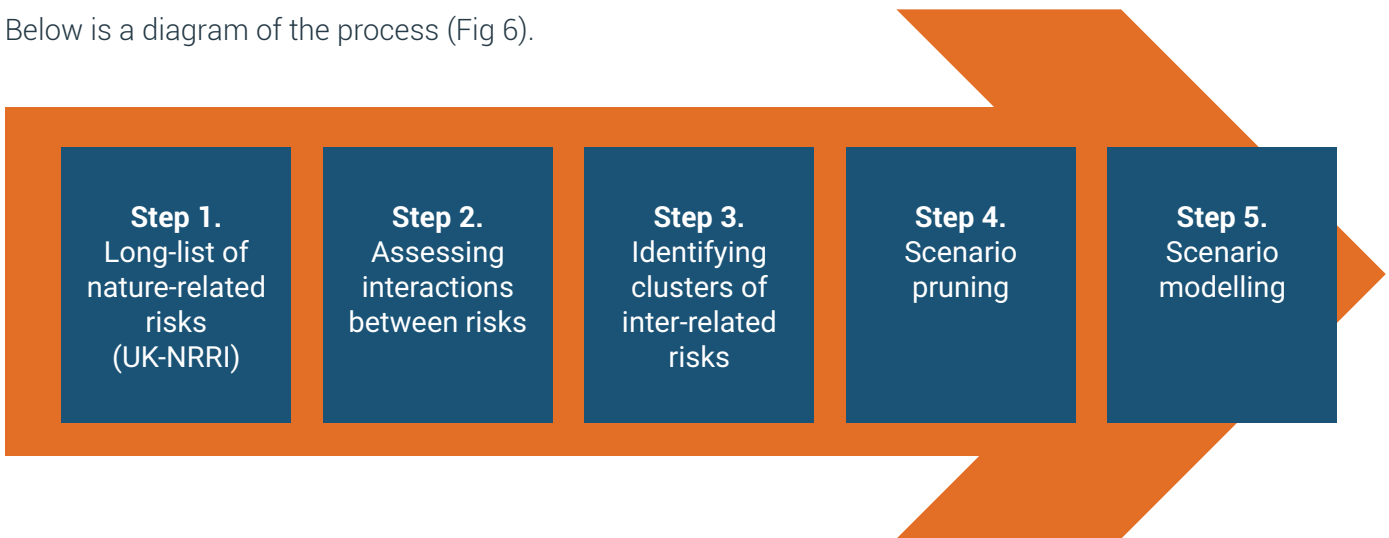
In collaboration with the NIESR team (which uses NiGEM to model the GDP impact), these clusters were then simplified ('scenario pruning') to include:

- up to four chronic impacts that run continuously from 2023-2050,
- two acute impacts that occur in Years 2 & 3 during a five-year window of interest (2030-35), that could be modelled in NiGEM.

The 2030 to 2035 period was selected as a plausible period within which acute shocks could occur (recognising that they could occur sooner or later).

For transmission pathways that could not be captured in NiGEM, the team conducted a qualitative analysis of these 'systemic risk dimensions' that are detailed in Chapter 4 of the full report. [See Box 3] This is important to note, as it implies that the full impact of risk may not have been captured in the tested scenarios.

Below is a diagram of the process (Fig 6).



**Figure 6:** Scenario development process

### **What does it tell us?**

The scenario development tells us what collection of chronic and acute nature-related risks will plausibly impact the UK economy and financial sector in the coming years.

For example, the UK domestic scenario shows chronic risks to include water scarcity and pollution, soil health decline, air pollution and biodiversity loss driven by the state of environmental degradation in the UK.

It also shows the impact of extended heatwaves and droughts should they occur with the period 2030 to 2035, which further exacerbates health impacts from air pollution, reduces agricultural productivity and water availability in the UK.

Under this scenario, there is plausible risk of an acute event of major wildfires occurring in the UK in the year following a drought, leading to major impacts on air pollution, disruption of transport and capital damage.

The three scenarios, including evidence bases can be found in Chapter 4 and the corresponding Annex, but here is an overview:

## DOMESTIC SCENARIO

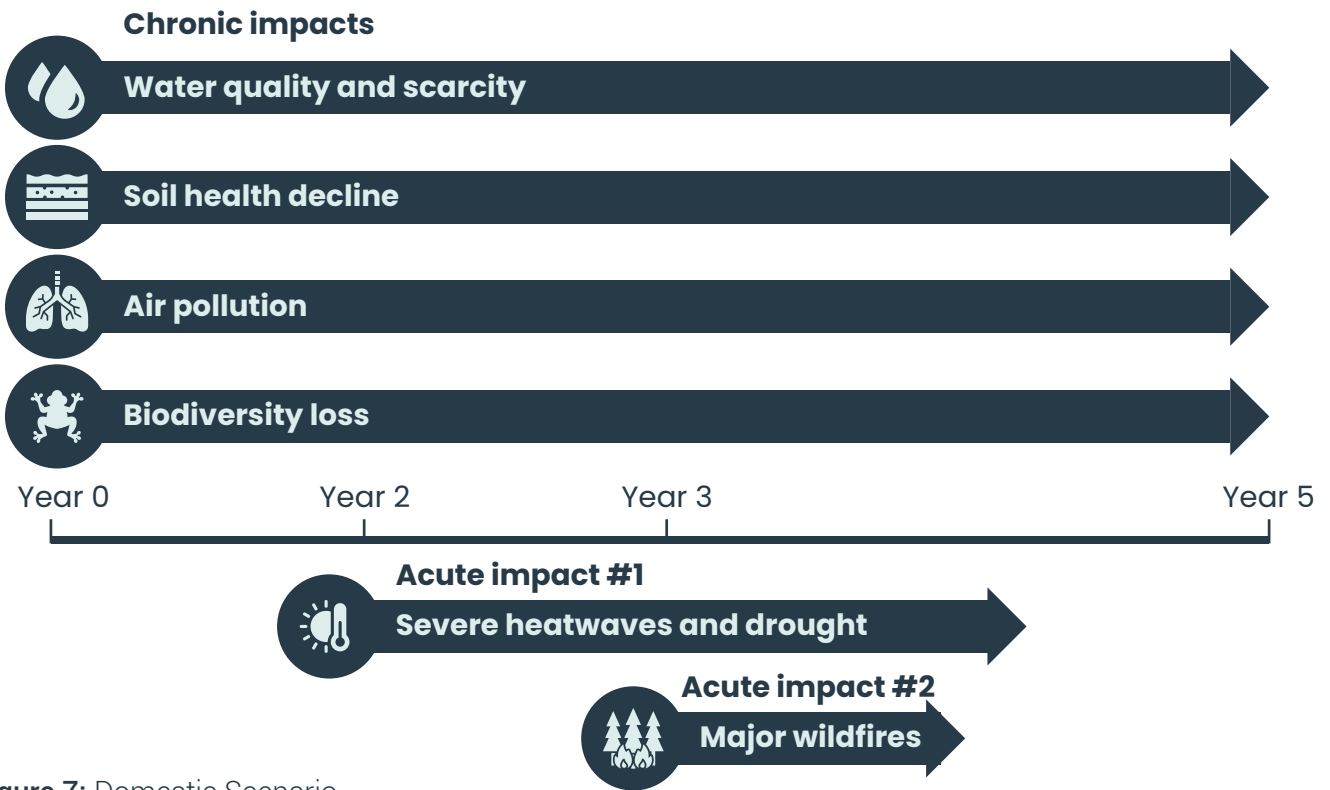


Figure 7: Domestic Scenario

## INTERNATIONAL (SUPPLY CHAIN) SCENARIO

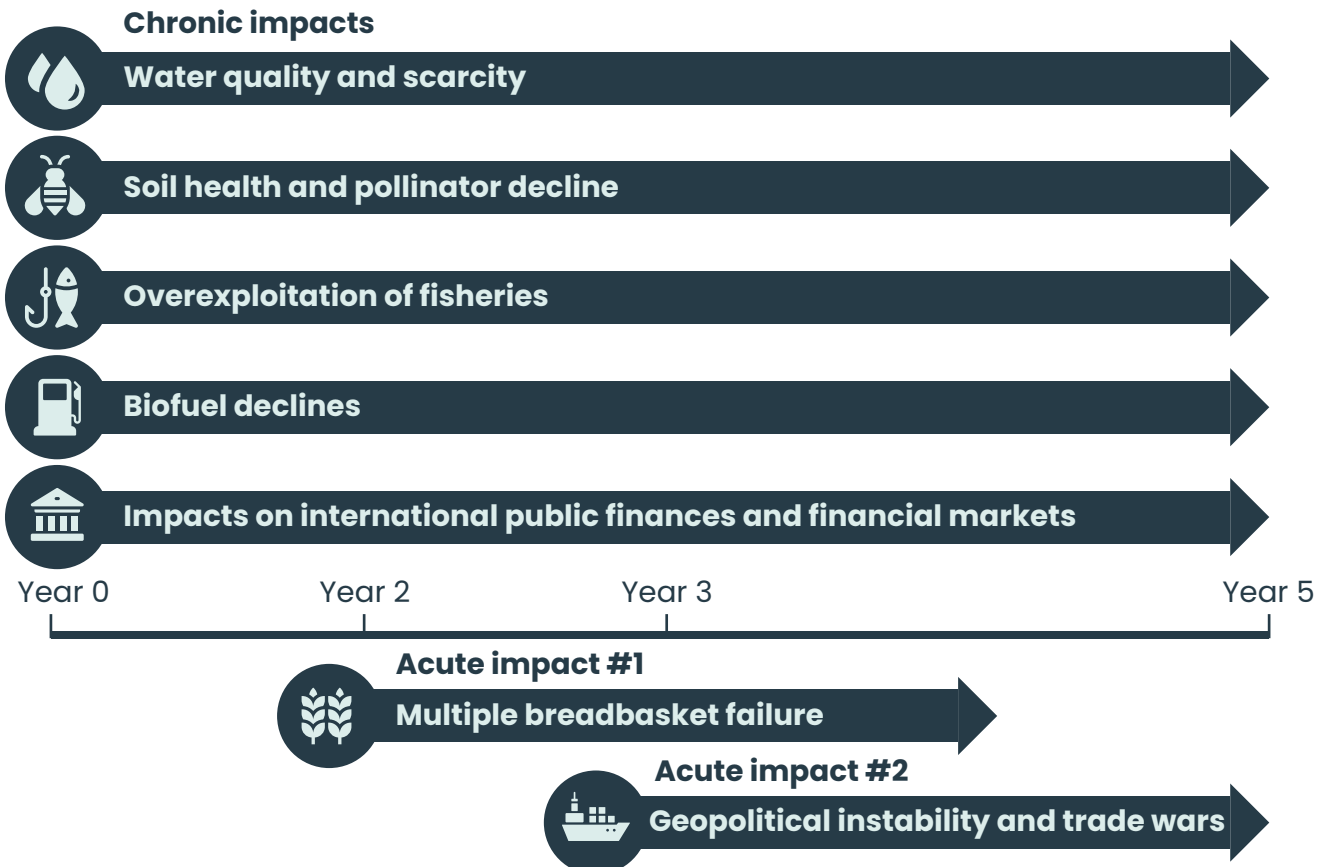


Figure 8: International (Supply Chain) Scenario



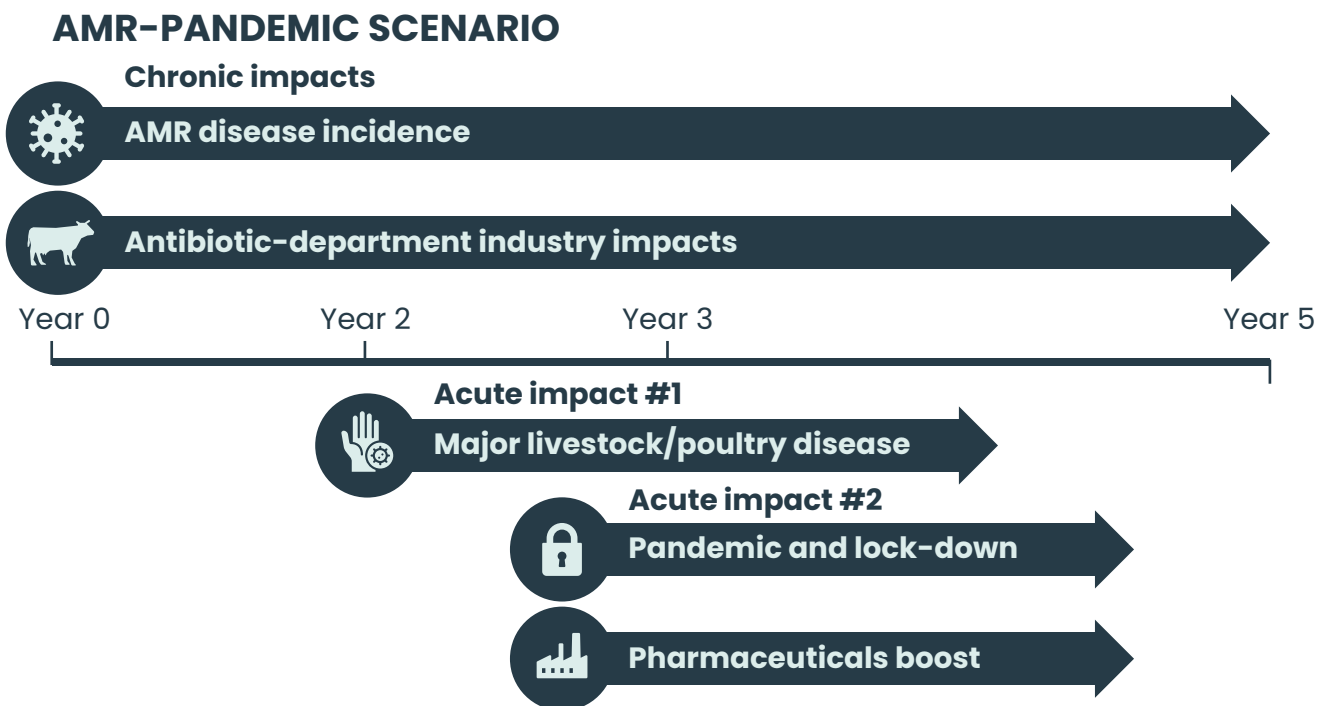


Figure 9: AMR-Pandemic Scenario



### Guide for readers

We recommend reading **Chapter 4** of the report and Annex 4 for more detail on scenario development, in particular the process for selecting the three scenarios developed for this analysis.

These documents will provide information and insights into:

- The challenge of integrated assessment models when developing nature risk scenarios
- The process of development of the three scenarios, including the criteria, the qualitative/narrative approach applied and inclusion of 'compounding' risks
- Detail on the domestic, international and AMR scenarios
- A discussion of chronic nature risks and acute nature-related shocks for the UK
- Evidence for the three scenarios selected.

# 5. Macroeconomic Impacts of Nature-related Physical Risk Scenarios

## What is it?

The qualitative scenarios explained in the previous chapter (4) were translated into quantitative inputs that could be used for NiGEM in order to produce the GDP impact results.

This involved taking sector-specific impact pathways from Part A of the analysis (highlighted in blue), and then assessing potential indirect and second-order effects (highlighted in orange) drawing on the scenario development in Chapter 4 (see Figure 10). This second part involved developing 'transmission channels' or narratives that explain how the scenarios impact pricing, labour, public expenditure etc. and estimating the values of impact.

Domestic Scenario	International Scenario	AMR-Pandemic Scenario
Water quality and scarcity impacts on agriculture and energy generation	Risks to UK supply chains re pollination, soil erosion, forestry and water	Labour force impacts of higher mortality and morbidity
Soil health decline impacts agriculture	Changes in trade and commodity prices	Increased public expenditure on public health to combat disease
Agricultural supply shock impacts prices	Reduced biofuel production puts upward pressure on oil prices	
Increases in health expenditure due to air pollution and loss of recreation	Growing global macroeconomic uncertainties lead to increase in investment and term risk premia	Fall in export shared of advanced economies due to production decline
Labour productivity impacts of pollution and biodiversity loss		
<b>Chronic</b>		
<b>Acute</b>		
Amplified impacts of water and air related to heatwave and wildfire	Impacts on UK supply chains linked to El Nino drought conditions globally	Major livestock and poultry disease outbreaks lead to fall in trade shares
Labour impacts increase due to heat and air pollution from wildfire	Multiple breadbasket failure linked to El Nino and nature leads to increase in both import and export prices	
Amplified agricultural supply shock		New geopolitical instability manifests as increases in oil prices and reduced prices of government bonds
Water constraints lead to price shock and public expenditure		
Increased risk premia due to disasters	Public expenditure to counteract impacts on public and business	

Figure 10: Stacked inputs for each scenario for the NiGEM model

These stacked inputs and the estimated values of those inputs were run through NiGEM to simulate the macroeconomic impact on the UK in terms of key macroeconomic variables such as GDP, inflation and public expenditure.

### **Why is it important?**

The narratives, channels through which shocks are translated, the shock types (be those on demand, supply and/or on prices), and the shock values, allow us to convert nature-related scenarios into GDP impacts. This work, therefore, quantifies the material financial risk to the UK economy from nature degradation and ecosystem services depletion.

The final data can tell us a lot about nature-related risks. For example, it quantifies the final GDP impact solely for chronic risk (which demonstrates that the ongoing degradation of nature alone is putting our economy at risk).

It quantifies the chronic risks with acute shocks. And finally, it quantifies chronic and acute risks combined with chronic climate change risk.

It also quantifies the impact on specific variables such as prices, unemployment etc.

### **How was this work developed?**

NiGEM was developed by NIESR in 1987, is well-used by Central Banks around the world and was adopted within the NGFS climate scenarios.

The team at NIESR worked with the project team at the Environmental Change Institute at Oxford University to develop the narratives and shock values as shown in Fig 10 above.

The nature scenarios were run with and without NGFS climate scenarios 'on top' to assess the potential impacts of compounding nature-climate risks. Please see Chapter 5 of the full report for detail on how this approach ensured that no double counting of climate risk occurred.

The timelines for the analysis were selected on discussion with financial institutions to reflect those timescales usually considered in financial stress testing. This means that they are relatively near-term and it is important to note that risks will increase over time.

### **What does it tell us?**

Across the three scenarios, **chronic nature-related risks** are resulting in a slowdown in economic growth, equivalent to an **erosion of 1.5% to 3% of GDP (or £35bn to £70bn)** compared to what it would have been otherwise by the late 2020s.

When **acute risks**, starting in 2030, are **added to chronic nature-related risks**, this loss to GDP increases to **6% (for the domestic and international scenarios) and 12% for the health (AMR-pandemic) scenario, equivalent to wiping out £140bn to £300bn of GDP.**

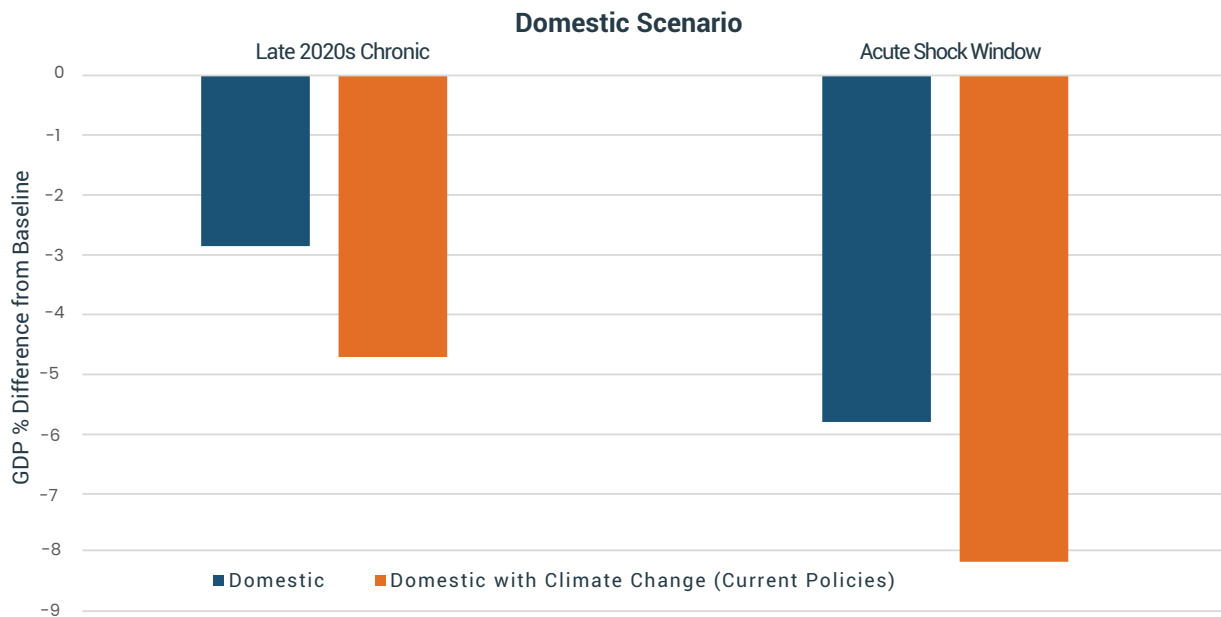
Finally, when the scenarios are run alongside **climate-related risk scenarios** - again over the next decade - we can see **a potential for GDP erosion to increase from 6% to over 8%** for the domestic and international scenarios, and **from 12% to more than 14%** for the health scenario. By 2035, growth could be set back by some four years behind where it would otherwise be.

Importantly, this analysis implies that chronic nature-related physical climate risks are at least on a par with chronic climate change physical risks.

The analysis also points to the persistence of potential acute nature-related shocks. From Figure 1, it is clear that the domestic and particularly the international shock persist for multiple years as the second and third-order impacts play out in terms of changing trade balances, employment and adjustments to wider macroeconomic conditions.

It should be noted that these scenarios are conservative, in that the acute scenarios do not assume any semi-permanent ecological regime shifts (e.g. tipping points that lead to long lasting impacts on food and other commodities); the evidence shows that such scenarios are very plausible in the medium to longer-term without early action to halt environmental degradation.

Human health impacts may also persist longer than expected, with longer-term suppression of economic recovery (e.g. as is potentially the case with Long Covid), plus complex, cumulative interactions between physical and mental health.



**Figure 11:** GDP impacts for the Domestic Scenario

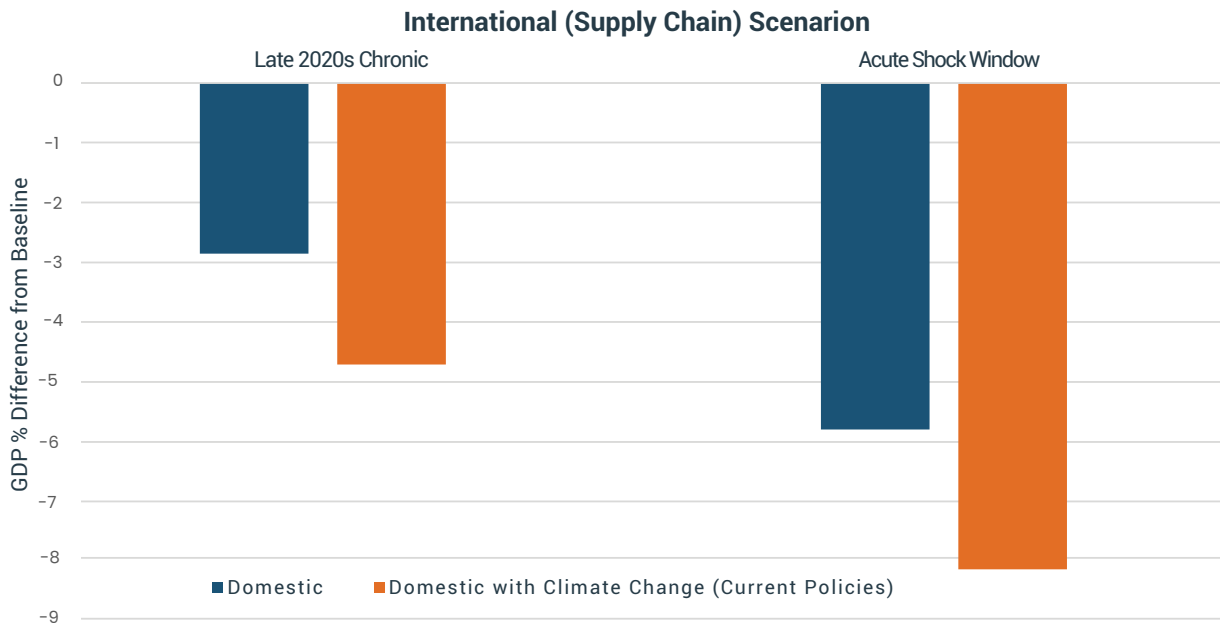


Figure 12: GDP Impacts for the International (Supply Chain) Scenario

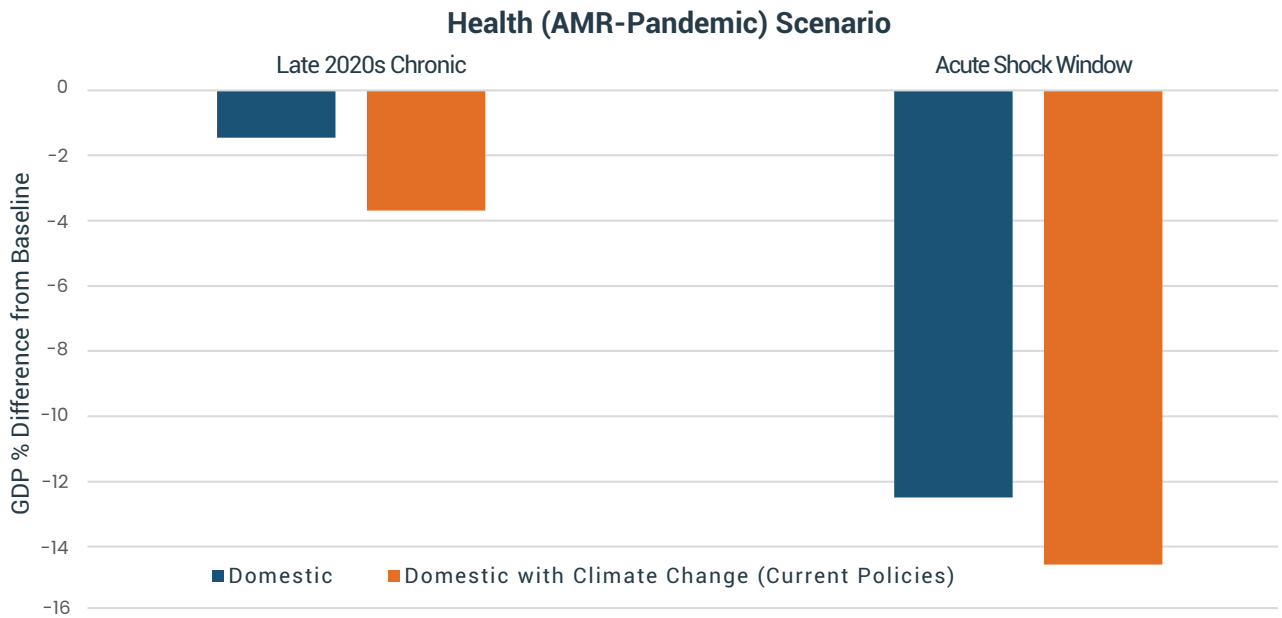


Figure 13: GDP Impact for the AMR-Pandemic Scenario

### BOX 3: Risks not Captured

It is important to note that not all impacts of the three scenarios can be currently modelled within NiGEM which means these estimates may be low.

Those transmission channels that are relevant to the three scenarios, but not captured by NiGEM, and therefore not captured in the final results were captured by the team at the University of Reading and are detailed in Chapter 5 and its corresponding annex within the full report. As part of this analysis, one broad type of systemic risk dimension per scenario was also unpacked with a more detailed evidence review.



### Guide for readers

We recommend reading **Chapter 5** and Annexes 5 and 6 within the final report for more detail on how to translate nature-risk scenarios into macroeconomic scenarios in order to quantify impacts to GDP, and for the final results.

In particular, these documents will provide information and insights into:

- An overview of NiGEM
- Detail on the narratives and macroeconomic shocks (macroeconomic scenarios) for each of the three nature-risk scenarios
- The final results breaking down the impact on GDP for each scenario
- Detail on chronic vs acute impacts vs sectoral impact
- A breakdown of the results to show impact on inflation, unemployment, government spending, price increases etc.
- A timeline tracking the scenarios and their impact on GDP by year
- Detail on transmission channels that were not captured in the modelling (systemic risk component analysis).

## 6. Financial Risk Assessment

### What is it?

To understand the implications for the financial sector, we need to consider how risks in real economy sectors are likely to affect financial institution portfolios. To address this question, a team at the University of Oxford with partners at Utrecht School of Economics and Ca Foscari University of Venice carried out a preliminary 'nature stress test' of the financial impacts of the nature and biodiversity loss scenarios described in the previous chapters on the value of the loan portfolios of the seven largest UK banks: Barclays, HSBC, Lloyds Banking Group, Nationwide, NatWest, Santander and Standard Chartered using public data.

Specifically, the analysis translates the sector-level nVaR impacts developed under Chapter 3 to estimate how these might impact the value of loans to those sectors within the UK. Importantly this does not capture the impacts of the wider macroeconomic changes found in Chapter 5, so gives very much a lower bound estimate of the potential risks.

### Why is it important?

Nature-related risks will be of direct concern to the financial sector if they have the potential to significantly impair the value of the assets that the financial sector holds. In particular, nature-related risks could cause:

- Market risk, in which the market value of equity or other securities issued by a company falls,
- Credit risk, in which there is an increase in the probability of a borrower defaulting or an increase in the loss a bank faces when a borrower does default,
- Broader forms of risk beyond the valuation of assets such as reputational risk, operational risk and strategic risk.

To provide an indication of risk to the financial sector, this analysis offers an approximation of how nature-related risks may create credit risk for loans held by the largest banks in the UK. It is important to recognise that this is only one dimension, and nature-related risks can create a wide range of risks to all asset classes and for all types of financial institutions.

Many of the risks considered in this analysis will affect a high proportion of companies in the most affected sectors. If these risks are found to be material, this could simultaneously pose a substantial risk to a large share of financial institutions in the UK. If these risks are significantly correlated across different financial portfolios, nature-related risks could also pose a material risk to financial stability, which would be of interest to financial supervisors.

### How was this analysis developed?

The analysis applied a peer-reviewed methodology to translate direct risk to sectors in the real economy (e.g. construction, manufacturing), in terms of lost output, into changes in the value of loans made by banks to those sectors. It builds on methods that have been widely applied for climate financial risk assessment by central banks and financial regulators.

This produced the average expected loss in value for a loan to a company in a given sector in the UK under the scenarios explored in Chapter 4.

These average losses by sector were then applied to seven of the UK's largest banks' lending portfolios using publicly available data on their credit exposure to each sector. This provides a view on the expected total loss in value across these portfolios. This initial analysis applies the valuation approach only to the domestic holdings of banks, so does not consider the sizable impacts of nature-related risks internationally.

### What does it tell us?

Across the sectors, **we find potential adjustments in average loan values of up to -9.5% for the agriculture sector in the domestic scenario, -2.3% for electricity and utilities and around -1% for manufacturing and transport.** (See Figure 14) The adjustments are assumed to occur in 2028 based upon projected revenues over the following five years.

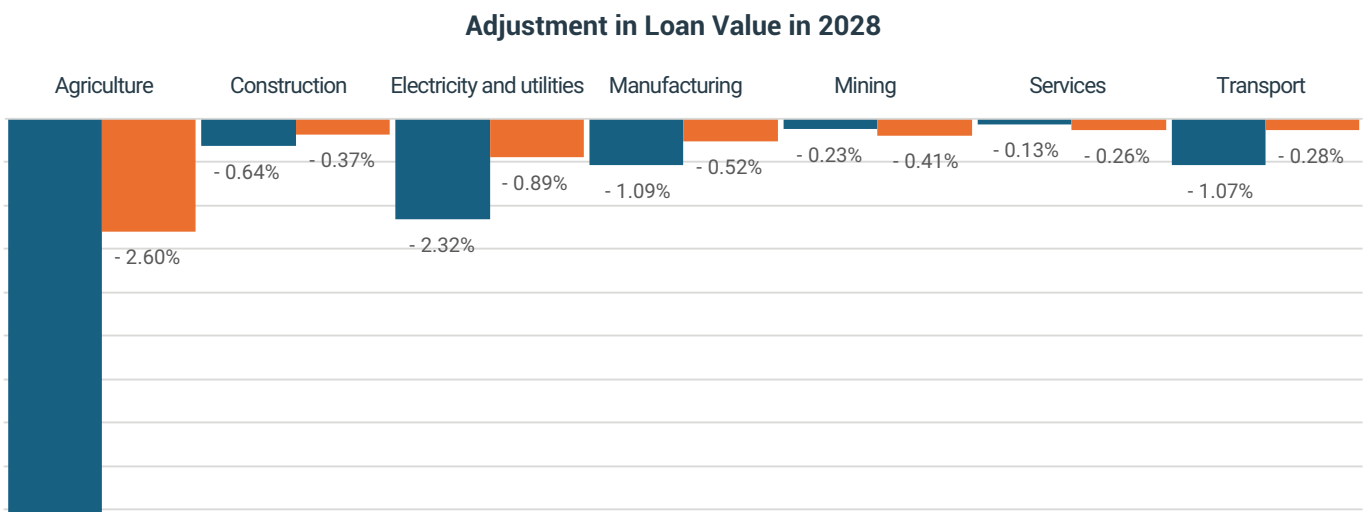


Figure 14: Adjustment in Loan Values

These adjustments to the value of individual loans lead to adjustments in the values of the portfolios of banks holding those loans. **Under the domestic + international scenario, the value of some UK bank portfolios (excluding finance and services) could fall by up to 5%.** All seven of the banks experience significant declines in value of more than 1-2%.

Banks with relatively higher credit exposure to agriculture, construction, electricity and utilities, and manufacturing tend to face the highest overall losses in value. This demonstrates that for the UK banking sector, the most material risks at a portfolio-level, are in these four sectors. Initial risk assessment and management efforts could be most effective by focussing on these sectors.

The preliminary results presented here offer a partial view and are likely to be an underestimate for reasons detailed in Chapter 6 of the full report. They suggest, however, that even in the short term, nature-related risk is not insignificant, especially if the losses are considered in relative terms to specific fractions of the portfolio.





## Guide for readers

We recommend reading **Chapter 6** and Annex 7 of the report for a more detailed discussion of the impact on loan book value as well as the asset valuation approach used to arrive at this.

In particular, these documents provide:

- An overview of academic work assessing the impact of climate risks on asset values
- A description of the asset valuation approach and financial datasets used
- Discussion of the key results across the seven banks and broader implications for the UK financial sector as a whole.

## 7. Summary, Recommendations and Next Steps

The findings of this report take us further than previous studies to-date by clearly demonstrating the materiality of nature-related financial risks to the economy and the financial sector, and the potential for financially material compounding impacts between climate and nature.

These are preliminary estimates, but all the evidence points to them being conservative. In addition, our analysis is focused on the near- to medium-term, and the evidence clearly shows that without action, these risks will increase over time with the potential to cross ecological tipping points that could accelerate and amplify the severity and persistence of impacts markedly. While our focus has been on the UK, the findings and underpinning methodologies are relevant to all countries.

Further work is required to fully assess the implications of these findings for regulation. This report did not explore this explicitly. However, based on the evidence provided here and in other studies, we believe that there is a case for action by Central Banks and supervisors, regulators and governments to assess if and how nature-related risks need to be incorporated within existing prudential and other financial and fiscal regulatory and policy frameworks, and for financial institutions to take steps to assess the potential materiality for their own portfolios.

While our focus has been on nature, the findings also have implications for climate risk assessment. Our findings demonstrate that if nature-related feedback loops are not considered within climate risk assessments, these will underestimate the risks.

Our recommendations below focus on finance and economics, though it is important to recognise that this is just part of the picture; addressing those risks outlined in this report will require actions across society.

### **Recommendations for Central Banks, Supervisors, Financial Regulators and Governments**

Given the evidence and the unique characteristics of nature-related risks, there is an urgent need to assess if and where these nature-related risks may 'fall through the cracks' of current supervisory, regulatory and policy frameworks and where this would necessitate actions. Based on such an assessment, actions may include:

1. Advancing disclosures of nature-related risks and impacts in the UK.
2. Broadening supervisory statements on climate to explicitly include environmental risks, and incorporating aspects of environmental degradation into exploratory scenario exercises.
3. Advancing disclosures of asset-level information and supply chains.
4. Taking timely opportunities to incorporate nature, as appropriate, fully within emerging regulatory frameworks and standards, for example the ISSB, new green taxonomies and transition plans.

5. Creating policy and regulatory coherence through closer collaboration between environmental and financial regulators.
6. Collaborating internationally to enhance disclosures and risk management.
7. Encouraging financial firms to begin to build capability in assessing and managing nature-related financial risks.
8. Investing in enhancing the underpinning data, analytics and modelling of nature-climate-economy interactions as a global public good.

**For government, the findings also highlight the material importance of protecting and restoring nature both domestically and globally, including through meeting the goals of the Kunming-Montreal Global Biodiversity Framework (GBF).** This includes making progress on Targets 14 and 15 to align financial flows with the GBF, and strengthening disclosures and risk assessment, as well as Target 19, ensuring we are mobilising private sector capital into nature-restoration activities.

There is also a clear role for Government in working to align public financial flows and working with partners across the international financial architecture to upscale nature finance and fully integrate nature.

**While our analysis is focused on financial risks, there are potential fiscal and wider implications for the UK that require further consideration.** For government, there is a rationale for similarly exploring where nature risks may be falling through gaps within current fiscal policy and risk management frameworks and acting accordingly. Also, considering if and how to more fully integrate nature-related risks within the UK National Risk Register and the UK Climate Change Risk Assessment, building upon the NRRI.

## **Recommendations for Financial Institutions and Corporates**

It is clear that the potential risks to financial stability can be sizeably reduced with an early and orderly transition toward a nature-positive resilient net zero economy, both in the UK and globally. Given the high exposures to transition risks, early action by firms to begin to assess, disclose, price in and manage nature-related risks and impacts will deliver benefits. This can also begin to steer financial flows away from activities that damage nature and toward nature-positive activities, thus reducing the physical nature-related risks to society and the financial sector.

1. Take steps to assess and manage nature-related financial risks, in line with the TNFD framework and guidance.
2. Collaborate with industry bodies and peers to support the development of technologies and business practices that reduce the impacts of the sector on nature.
3. Integrate nature within transition plans.
4. For financial institutions specifically, work with clients to support their transition.

## Recommendations for Enhancing Analytics and Scenarios

**The project has also demonstrated that significant benefits of strengthening collaboration between financial institutions and the scientific community, including toward the co-development of next generation scenarios and analytics.**

Central Banks and supervisors might consider how existing successful fora, such as the Climate Financial Risk Forum could, for example, provide a central platform for collaboration. Such efforts need to be mirrored across countries and internationally.

**An immediate priority could be the co-development of a preliminary benchmark set of nature-related scenarios for the UK, in collaboration with the scientific community, to support financial institutions to build technical capability and conduct the first analyses.**

## Next Steps

This project, conducted at pace over one year, has led to several innovations. But there have been limitations in the methods possible and there are still a substantial number of areas that need urgent progress if financial institutions are able to adequately assess and manage nature-related risks.

A particular limitation has been the lack of counterparty-level data adequate for a full credit risk assessment, as well as the availability of granular information on the state of ecosystem services in the UK and globally, and quantitative evidence on the linkages between those ecosystem services and firm performance.

**Future work that we would like to explore in Phase II to enhance the assessment includes:**

- 1.** Extending the analyses to include transition risks and opportunities, building upon the initial transition exposure analysis presented in this paper and existing initiatives such as the Inevitable Policy Response scenarios.
- 2.** Enhancing scenarios, including assessing medium-to long-term risks and considering more extreme but plausible outcomes.
- 3.** Working with financial institutions to incorporate counterparty-level data and assess portfolio-level risks, leading to much more granular analyses and specific recommendations on risk management actions that can be undertaken.
- 4.** Moving beyond banks to explore risks to and opportunities for the wider financial sector, in particular asset owners and managers and insurers.
- 5.** Developing an open toolkit that can be used by financial institutions and others. The modular approach taken in this study is suitable for turning into an open tool.

**In addition, in order to move towards informed responses we recommend:**

1. Drawing up sector transition pathways with firms and governments to guide business, and provide guidance on how to construct credible nature-positive transition plans, which are also robust to transition risks.
2. After incorporating impacts into the analysis, understanding how collective impact across companies may degrade specific ecosystems of particular importance to the UK economy - prioritising efforts to protect the most vital ecosystems and reduce the impacts that threaten them.



### Guide for readers

We recommend reading **Chapter 7** of the final report for the full set of recommendations, rationale for recommendations and next steps.

In particular, Chapter 7 provides:

- The report's key takeaways
- Detailed recommendations
- Notes on how the NRRI can support investment in data
- Reflections on advancing modelling of systemic nature-related risk

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