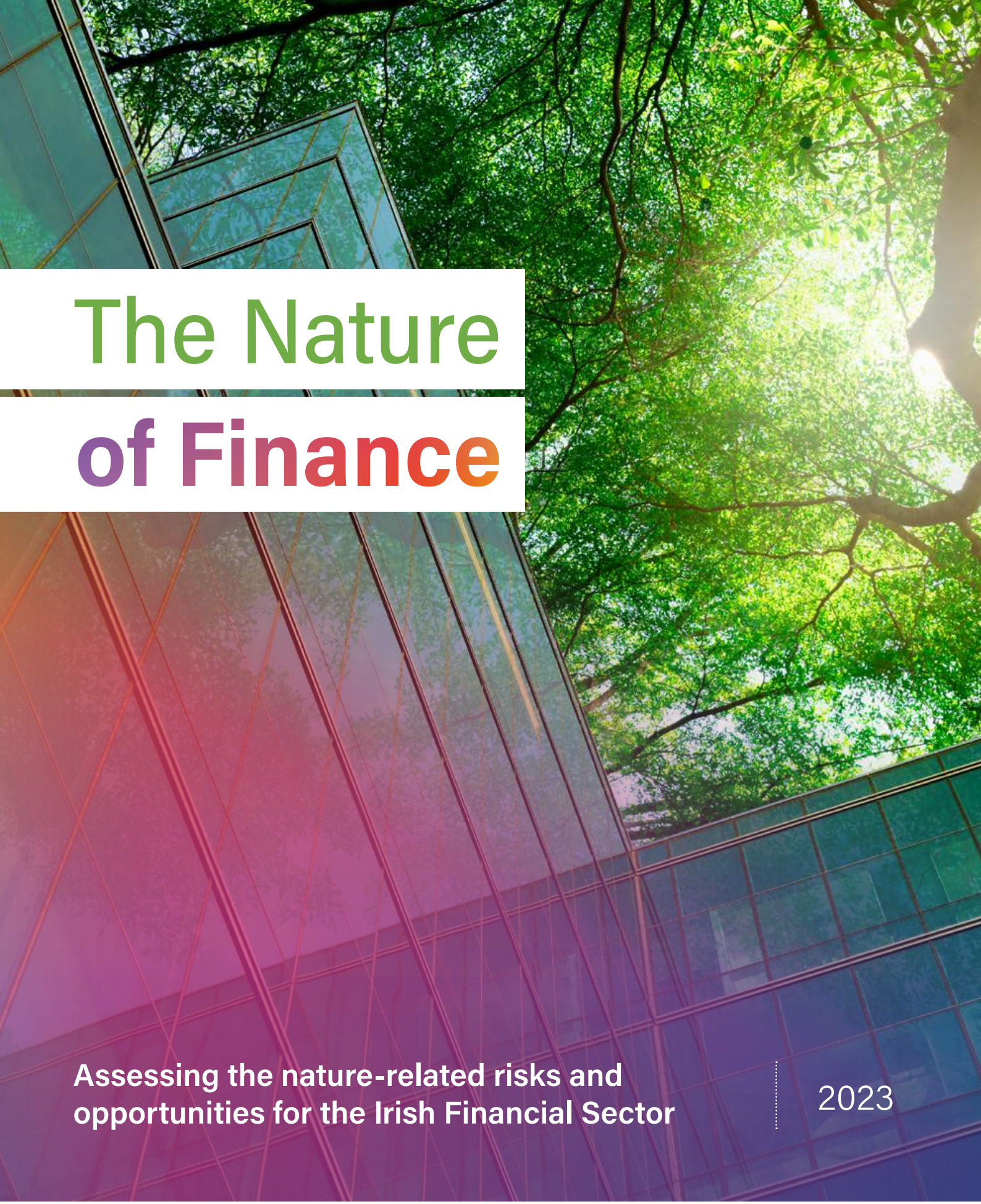


The Nature of Finance

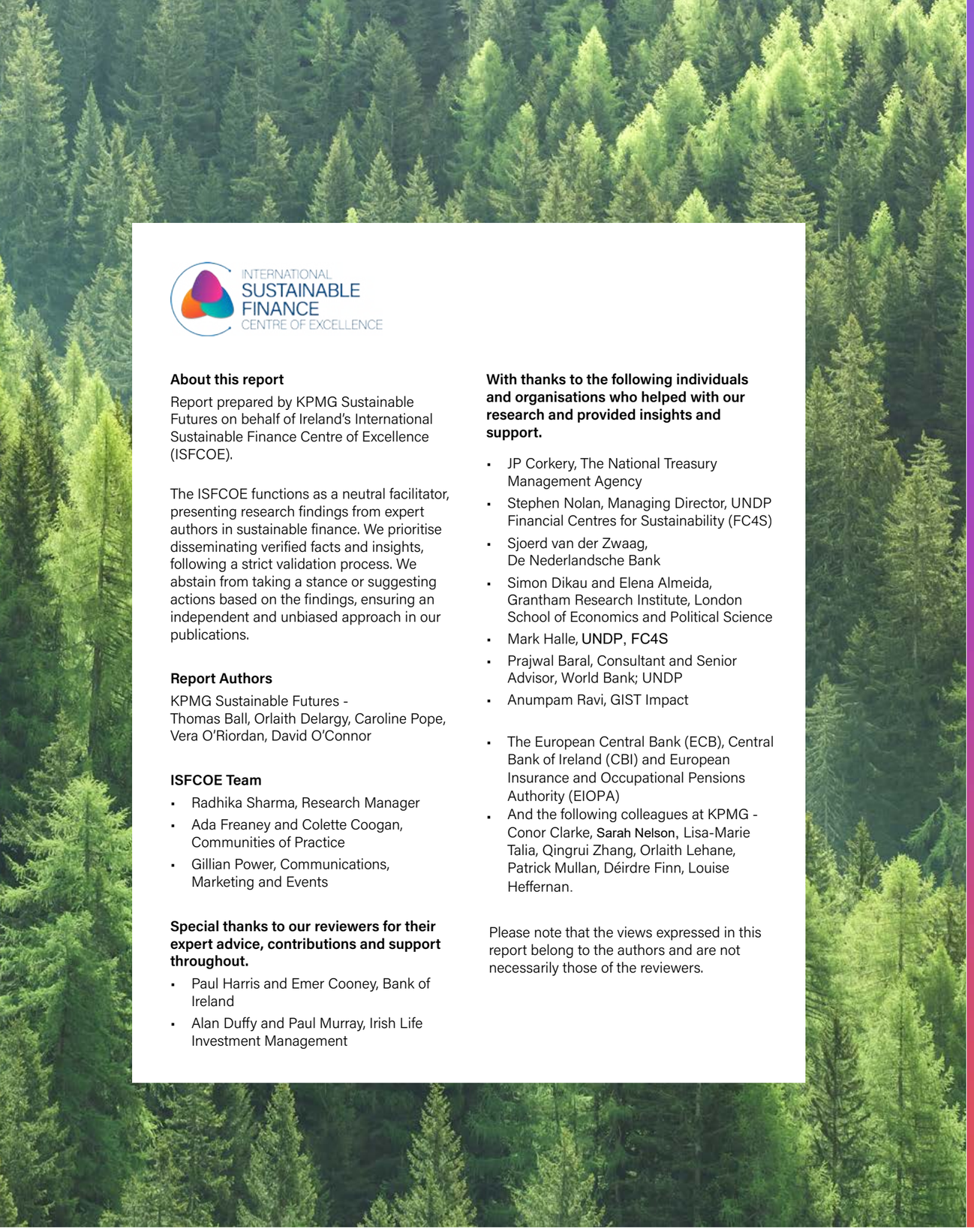
Assessing the nature-related risks and opportunities for the Irish Financial Sector

2023

INTERNATIONAL SUSTAINABLE FINANCE CENTRE OF EXCELLENCE

PREPARED BY KPMG

IN PARTNERSHIP WITH Skillnet IRELAND



INTERNATIONAL SUSTAINABLE FINANCE CENTRE OF EXCELLENCE

About this report

Report prepared by KPMG Sustainable Futures on behalf of Ireland's International Sustainable Finance Centre of Excellence (ISFCOE).

The ISFCOE functions as a neutral facilitator, presenting research findings from expert authors in sustainable finance. We prioritise disseminating verified facts and insights, following a strict validation process. We abstain from taking a stance or suggesting actions based on the findings, ensuring an independent and unbiased approach in our publications.

Report Authors

KPMG Sustainable Futures -
Thomas Ball, Orlaith Delargy, Caroline Pope, Vera O'Riordan, David O'Connor

ISFCOE Team

- Radhika Sharma, Research Manager
- Ada Freaney and Colette Coogan, Communities of Practice
- Gillian Power, Communications, Marketing and Events

Special thanks to our reviewers for their expert advice, contributions and support throughout.

- Paul Harris and Emer Cooney, Bank of Ireland
- Alan Duffy and Paul Murray, Irish Life Investment Management

With thanks to the following individuals and organisations who helped with our research and provided insights and support.

- JP Corkery, The National Treasury Management Agency
- Stephen Nolan, Managing Director, UNDP Financial Centres for Sustainability (FC4S)
- Sjoerd van der Zwaag, De Nederlandsche Bank
- Simon Dikau and Elena Almeida, Grantham Research Institute, London School of Economics and Political Science
- Mark Halle, UNDP, FC4S
- Prajwal Baral, Consultant and Senior Advisor, World Bank; UNDP
- Anumpam Ravi, GIST Impact
- The European Central Bank (ECB), Central Bank of Ireland (CBI) and European Insurance and Occupational Pensions Authority (EIOPA)
- And the following colleagues at KPMG - Conor Clarke, Sarah Nelson, Lisa-Marie Talia, Qingrui Zhang, Orlaith Lehane, Patrick Mullan, Déirdre Finn, Louise Heffernan.

Please note that the views expressed in this report belong to the authors and are not necessarily those of the reviewers.

Contents

The International Sustainable Finance Centre of Excellence is co-funded by Skillnet Ireland and partcipating businesses. Skillnet Ireland is funded from the National Training Fund through the Department of Further and Higher Education, Research, Innovation & Science

An Roinn Breisoideachais agus Ardoideachais, Taighde, Nuálaiochta agus Eolaíochta
Department of Further and Higher Education, Research, Innovation and Science

Co-funded by the European Union

01

Executive Summary

Nature is in a perilous state, both in Ireland and across the world, with most critical indicators trending in the wrong direction. The loss of nature is dangerous for human wellbeing and, as noted recently by the European Central Bank, "[is] also existential for the economy and the financial system, as our economy cannot survive without nature." [1]

The financial sector is waking up to and increasingly taking action on the issue of climate change, by integrating climate risk assessments and modelling into financial decision-making. In recent years, nature has also arrived on the financial sector's agenda, thanks in part to landmark studies by the Dutch, French and Malaysian central banks, and NGO and industry initiatives such as Business for Nature and Finance for Biodiversity.

This report is understood to be the first independent assessment of nature and biodiversity-related risks and opportunities for Ireland's financial sector. It is hoped that this study will raise awareness of how Ireland's financial sector both impacts and depends on nature, and spurs further research into how these links to nature can generate both risks and opportunities for Ireland's financial services and economy.

The study is comprised of four main elements:

1. Assessment of nature-related risks and opportunities for national lending portfolios
2. Assessment of nature-related risks and opportunities for insurance written in Ireland
3. Exploration of forward-looking nature scenarios and what they could mean for Ireland's financial sector
4. A proposed Nature Finance Roadmap for Ireland and recommendations to guide future work on this topic

1 Frank Elderson, ECB 2023. The economy and banks need nature to survive (europa.eu)

The main findings of the study and key recommendations are provided below.

On national lending portfolios, we find that:

58% of Irish lending (€56 billion) to non-financial corporations is exposed to economic sectors that are highly dependent on 1 or more ecosystem services.

94% of Irish lending (€92 billion) to non-financial corporations is exposed to economic sectors that have a high impact on 1 or more aspects of nature.

This means that the financial sector is exposed to nature at a time when we are seeing unprecedented nature loss globally and in Ireland. Loss and degradation jeopardise nature's ability to provide critical ecosystem services enjoyed by people and businesses alike. The sectors that depend on ecosystem services for business continuity could suffer interruption or delays due to the loss of these services, potentially increasing the risk of default, stranded assets or ability to repay loans. In this way, nature loss can generate risks that are transmitted to the financial sector. These transmission channels must be explored in greater detail to improve our understanding and mitigation of nature-related risks.

On insurance underwriting, we find that:

- Few quantitative methodologies exist to link insurance underwriting activities to economic sectors or nature;
- And that approaches from the literature on climate risk for the insurance sector can be adapted for analyses of nature-related risks and we explore, through a case study in section 5, whether these risks and opportunities are being fully accounted for.

On scenario analysis, we find that there is an absence of robust quantitative nature-related scenarios available to the sector. We discuss our findings from the literature review and an industry scenario analysis working session with Irish financial institutions and nature experts in section 6.

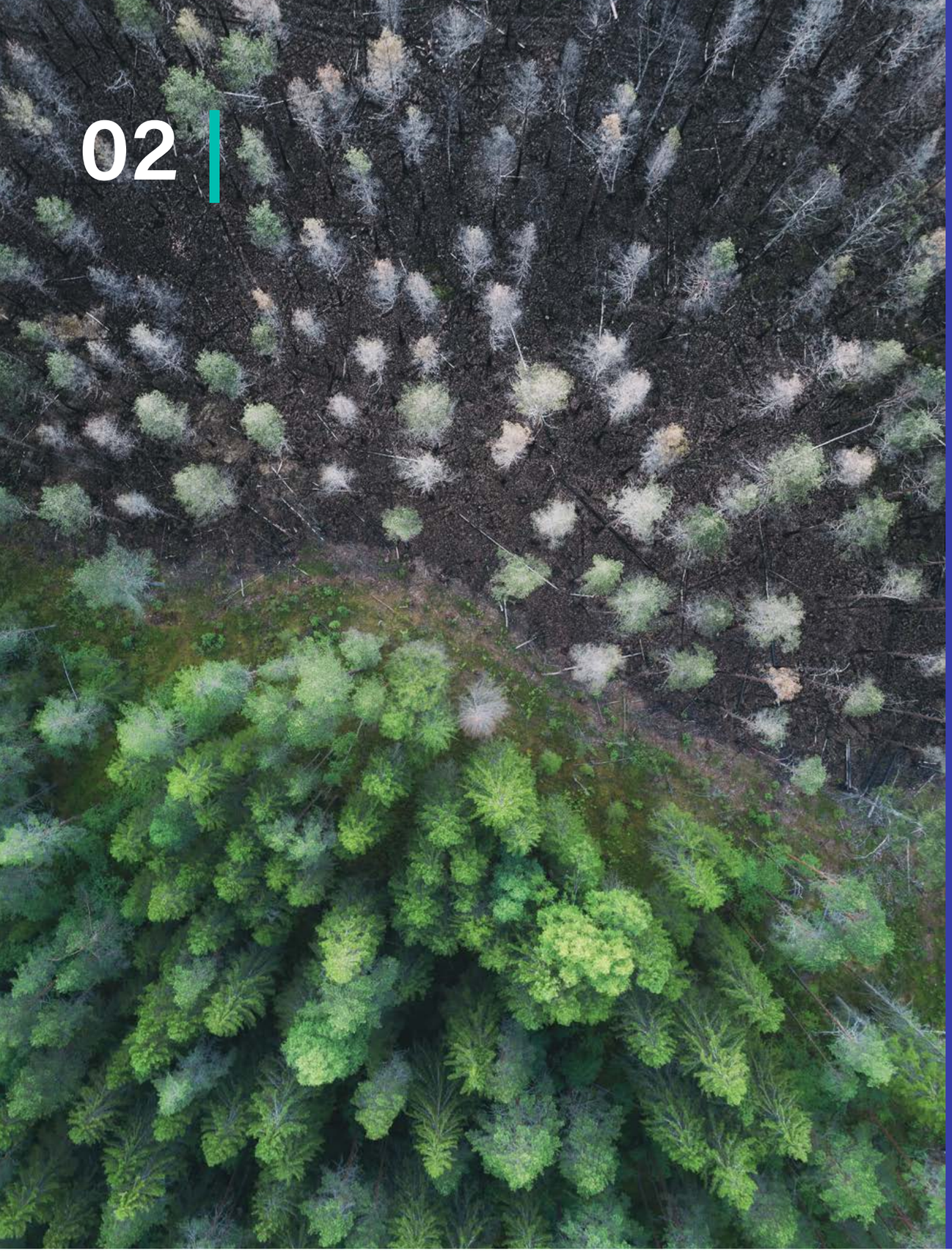
In section 7, we propose a draft Nature Finance Roadmap to position Ireland as a leader on the nature finance agenda. The Roadmap is built around five pillars to: Develop talent; Improve industry readiness; Leverage digital and data; Create a nature positive enabling environment; and Enhance communications and engagements on nature and finance risks and opportunities.

Finally, the report closes with a series of conclusions.

- In line with the findings of the ECB and other central banks, our quantitative analysis shows a clear link between bank lending in Ireland and economic sectors that are highly dependent on ecosystem services and impacting on nature.
- Urgent collaborative efforts between the financial sector and the State are needed to strengthen the enabling environment for nature finance and a nature positive economy in Ireland.
- The nature finance skills gap is a key barrier to progress.
- There is an urgent need to develop common frameworks, tools, and languages.
- Access to robust and standardised data is critical for improved decision making and action.
- Ireland has a clear opportunity and strong foundations to position itself as a leading centre on nature finance. The establishment of a Nature Finance Roadmap Delivery Group, bringing together public, private and civil society stakeholders, will be an important sign of ambition and intent.

Given its central position in the Irish and global economy, the financial sector has an urgent and important task of assessing and mitigating nature-related risks, and ultimately in supporting and financing nature protection and restoration in Ireland and overseas. There are compelling opportunities and benefits not just for the sector but for Ireland's people, our natural environment and our economy.

02



Introduction

This report has been commissioned by the International Sustainable Finance Centre of Excellence (ISFCOE) to explore how and to what extent Irish financial institutions are exposed to risks from loss of nature and biodiversity. Within this report we have endeavoured to take the first tentative steps in quantifying impacts and dependencies across the Irish banking and insurance industries – where there are limitations in our results these are largely based on the limits of publicly available financial and nature-related data.

This report is intended to build on the existing body of research already conducted by Central Banks (as referenced later in our report) and ISFCOE's previous December 2022 scoping study, *Nature and biodiversity finance: risks and opportunities for Ireland*, which produced an initial high-level overview of nature and finance in Ireland. The 2022 report made the point that the biodiversity finance agenda is defined by the risks and opportunities presented to financial systems as a result of the inherent dependency of the economy on the natural world. Moreover, that global biodiversity has been in significant decline over the past 50 years and Ireland is not immune to this global crisis.

The objective of this report is to take this recognition of nature linked financial risk further and to define and quantify some of those risks as they specifically relate to Irish banks and insurers.

2.1 Setting the context

Our intention in this chapter is to set a level playing field of knowledge for our readers – whom we assume to be largely members of the finance community in Ireland. We will define key principles and theory, however we do not go into significant detail on these theories and rely on the reader having a basic knowledge of the nature and biodiversity agenda, as well as the Irish financial system.

Just as a stable climate enables the conditions for humans to thrive, biodiversity enables the natural world to be productive, resilient and adaptable (Dasgupta, 2021), and to provide ecosystem services that are vital for the functioning of the global economy.

With this in mind, nature can be understood through a construct of four realms which society both impacts and depends on:

Land, Ocean, Water and the Atmosphere

Within nature, biodiversity refers to the diversity within species, between species and with other ecosystems. Together, this biodiversity provides important ecosystems services to society and the economy which are commonly divided into four categories (Haines-Young & Potschin, 2018; MEA, 2005):

1. Provisioning services are tangible products of ecosystems, such as food, timber and cotton.

2. Regulating services are the benefits of the regulating processes, such as pollination, air and water purification and soil fertility.

3. Cultural services are the non-material benefits of ecosystems, such as their contributions to education, recreation and tourism.

4. Finally, nature provides **supporting services**, such as the nutrient cycle, soil conservation and habitat creation, which support the other three categories of ecosystem services.

With those general principles understood, it would be prudent to note that biodiversity is declining faster now than at any time throughout human history, and ecosystems and the services they provide are under enormous pressure from, among other things, urban sprawl, intensive agriculture, pollution, invasive species and climate change (WWF, 2022).

The current rate of species extinction is estimated to be hundreds of times higher than the natural, pre-human rate, and it is accelerating. This unprecedented depletion of nature is causing specific and broader systemic risks for the economy and even the stability of the global financial system (OECD, 2023). Ireland is not immune to this global challenge and has also experienced a significant level of nature and biodiversity degradation. For example, around 31,000 species are known to occur in Ireland, yet the conservation status of only 10% has been assessed. Of those assessed 20% are threatened with extinction (IPBES, 2019). In a separate report on the conservation status of EU protected habitats by the National Parks and Wildlife Service (NPWS) in Ireland, 85% of habitats are reported as being in Unfavourable status (46% Unfavourable inadequate and 39% Unfavourable bad) and 46% of habitats are demonstrating ongoing declines since the last assessment in 2013 (NPWS, 2019). This corresponds with Ireland's ranking of 227th out of 240 in terms of biodiversity intactness levels by the Natural History Museum of London in 2018.

Understanding the intersection between ecosystem decline, climate change and social inequality

At this stage, early in the report, we want to express that nature loss and risk does not occur in isolation. It is now increasingly understood that climate change and nature loss are inextricably linked. Simply put, climate change will result in significant nature loss, and such nature loss will accelerate the impacts of climate change. Some of the main observable direct impacts of climate change on species and communities are changes in phenology (meaning the cyclical nature of biological events such as flowering, breeding and migration), species abundance and distribution, community composition, habitat structure and ecosystem processes (NPWS, 2019).

Similarly, increasing temperatures linked to climate change are leading to ecosystems being disrupted, thereby reducing or even destroying their capacity to provide services. For example, and specific to Ireland's temperate location, temperature plays a key role in the timing of phenological processes in the annual cycle of plant species, such as the start of the growing season and the timing of fruit set. Shifts in the annual cycle of organisms can lead to mismatches in the interactions between species, for example in the relations between predators and their prey and between plants and their pollinators, which can cause structural changes in the functioning of ecosystems (Ockendon et al., 2014).

Similarly, marine ecosystems are impacted by warming temperatures, changing wind patterns, shifting oceanic circulation patterns, increasing acidification and altering precipitation rates and hence salinity. These changes have the potential to change the distribution, abundance, size and behaviour of aquatic organisms, including economically important fish stocks (Molinos, 2015). A final example, and of significant relevance to Ireland at the time of writing, is the correlation between loss of vegetation and forest cover and the increase in fluvial and pluvial flooding .

In short, the more the climate changes, the more nature and biodiversity is degraded or lost, which then leads to further climate change. It is therefore important to consider climate and biodiversity risks as intrinsically linked. This is significant for the financial system when assessing the full spectrum of risks.

As we shift now to consider the social element of biodiversity loss, it would be fair to reflect that global biodiversity loss has been disproportionately driven by consumption of people in rich nations, yet it disproportionately affects the world's poorest communities, whose livelihoods often rely on natural resources. Global GDP per capita increased by more than 60% between 1992 and 2014, natural capital stocks per capita declined by nearly 40%, undermining future economic growth and wellbeing. Worldwide, nearly two thirds of ecosystem services have been degraded since 1950 (OECD, 2021). Increasingly, economists and researchers are calling for a 'just nature transition' towards delivering decent work, social inclusion and the eradication of poverty in the shift to a net zero and climate-resilient economy, while simultaneously delivering on biodiversity goals in agriculture, forestry, land-use and the oceans (Muller & Robins, 2022). Put simply we need to transition to an economy that delivers benefits and positive outcomes for people, nature and climate.

Relationship between nature and biodiversity and the financial sector

The economy is embedded within the natural world, not external to it. This presents significant risks and opportunities to the financial sector. In recent years, economic and financial actors have started to assess the complex interlinkages between such losses and financial risks to economic activities and the financial system (Svartzman et al., 2021). As an emerging research topic and increasingly urgent priority for financial intuitions, nature finance is concerned with how financial and capital markets operate and align in order to deliver nature positive returns. The nature finance agenda is driven by the risks and opportunities presented to financial systems as a result of the inherent dependency of the economy on the natural world.

What does the term nature positive mean?

The global coalition of organisations represented by The Nature Positive Initiative (NPI) define Nature Positive as a global societal goal to "halt and reverse nature loss by 2030 on a 2020 baseline, and achieve full recovery by 2050. To put this more simply, it means ensuring more nature in the world in 2030 than in 2020 and continued recovery after that". NPI, 2023.

www.naturepositive.org

UNEP's State of Finance for Nature (2022)[3] found that the total funding required to finance nature based solutions (NbS) is estimated to be US$384bn per year by 2025 and US$484billion per year by 2030. Current finance flows to NbS per year is US$154bn and therefore without significant increases in finance in the next 12 months we could expect to see a US$230 billion per year nature finance gap by 2025.

In March of 2022, the joint study group of Biodiversity and Financial Stability initiated by the Network for Greening the Financial System (NGFS) which represents over 100 central banks, concluded that "biodiversity loss is a source of financial risk and addressing this risk is part of central banks' and regulators' mandate." This is the first time that central banks and supervisory authorities have publicly recognised the potential for nature and biodiversity loss to threaten financial stability. This was then reiterated in a more recent blog by the European Central Bank (ECB) in June 2023 where Frank Elderson, member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB is quoted as saying "Humanity needs nature to survive, and so do the economy and banks. The more species become extinct, the less diverse are the ecosystems on which we rely. This presents a growing financial risk that cannot be ignored".

> "Humanity needs nature to survive, and so do the economy and banks. The more species become extinct, the less diverse are the ecosystems on which we rely. This presents a growing financial risk that cannot be ignored".
>
> Frank Elderson (ECB, 2023)

3 Fluvial (river flooding); Pluvial (flooding from excessive rainfall)

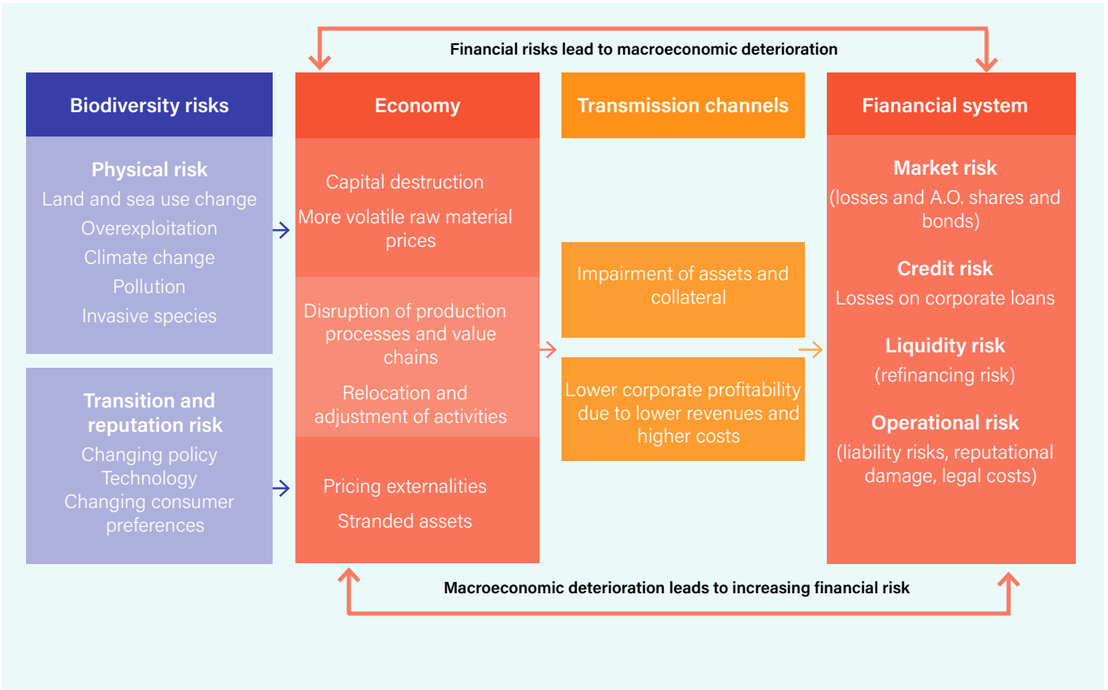
Against this backdrop, central banks around the world are beginning to examine the extent to which nature risks could pose a threat to financial stability. De Nederlandsche Bank (DNB) and Banque de France were some of the first central banks to quantify the extent to which the financial institutions they oversee are exposed to risks from nature and biodiversity loss. These studies found that nature-related financial risks can emerge from two main categories (physical and transition) but impact economic activities through multiple channels (e.g. at the household, corporate, sectoral or macroeconomic levels) before materialising as typical financial risks such as credit risk or market risk and liabilities. Moreover, and slightly differently to climate risks, physical and transition sources of nature-related risk could merge, and multiple contagion channels could appear between different financial risks with potential feedback loops on the economic system (Svartzman et al. 2021).

Indeed, the recent ECB report "Living in a world of disappearing nature" (Boldrini et al, 2023) l found that of the 4.2 million euro area non-financial corporations (NFCs) that were included in the research, 3 million are highly dependent on at least one ecosystem service, meaning that nature degradation can impair their activities and consequently weaken these companies' creditworthiness. This translates to 75% of euro area banks' corporate loans to NFCs (nearly €3.24 trillion) being highly dependent on at least one ecosystem service, as a result continued pressure on biodiversity and ecosystems may therefore have a significant impact on loan portfolios.

The ECB (Boldrini et al, 2023) also found that Banks with lower Tier 1 capital ratios tend to have a slightly higher average total dependency, suggesting that banks with lower capital are more exposed to nature and biodiversity risks. And finally, the report concluded that euro area banks are vulnerable to future biodiversity losses. If the world follows its current emission pathway and continues to exert significant pressure on biodiversity, euro area banks' losses linked to biodiversity loss would be on average almost 3x higher than under a Paris-aligned future scenario (Boldrini et al, 2023). We further discuss nature-related scenarios in section 6 of this report.

It is noteworthy that in a second paper by the ECB (Ceglar et al, 2023) published in December 2023, they found that "NFCs headquartered in Ireland are among the five biggest contributors to biodiversity loss at the euro area level". The report authors acknowledge that the calculations could be over estimated due to the large number of consolidated NFCs that have their headquarters in Ireland but whose production activities are overseas, but nevertheless this points to significant nature-related risks and impacts associated with Irish businesses and the banks lending to them. This is an area that requires further investigation and research in Ireland.

Figure 1: Biodiversity risks to financial risks (adapted from DNB, 2020)



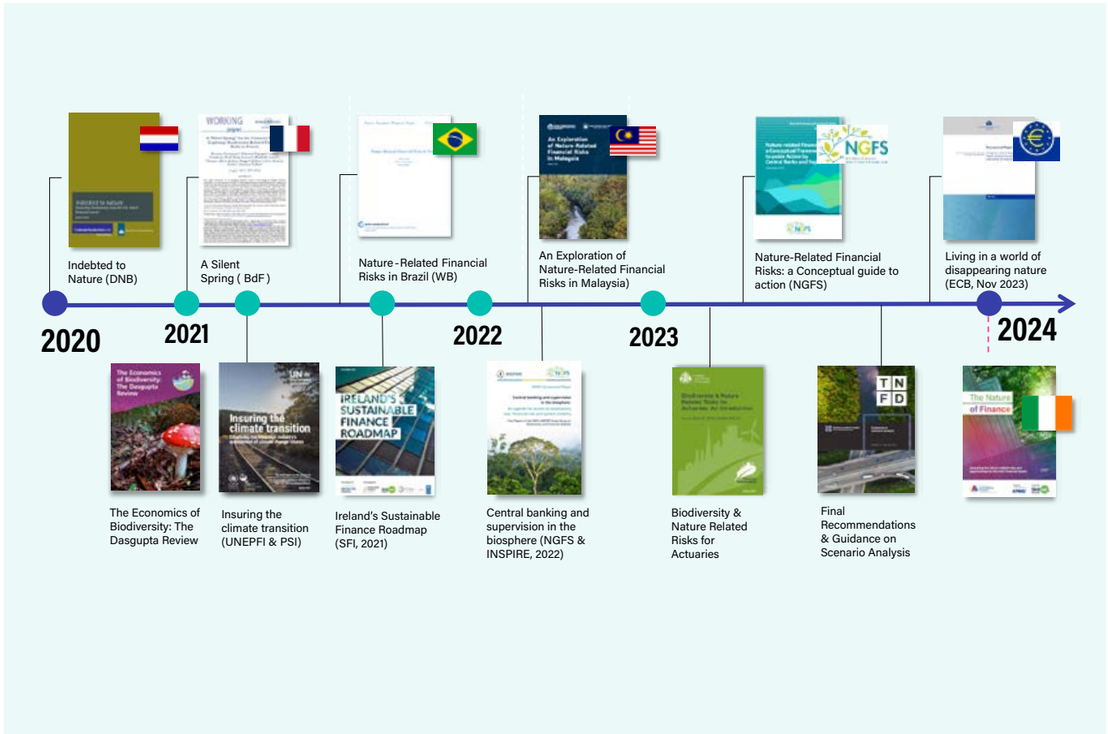
2.2 How is this agenda being addressed in other jurisdictions?

The rate of change in the awareness and activity to address nature and biodiversity risks in business and across financial systems has been exponential. The past two years have seen a significant number of new frameworks and standards that either incorporate nature and biodiversity, such as the EU Corporate Sustainability Reporting Directive (CSRD), or are specific to nature, such as the Taskforce on Nature Related Financial Disclosures (TNFD).

It is particularly important to note that the CSRD, which covers all aspects of sustainability, does not avoid or miss the significance that all five of the Environmental ESRS[4] are drivers of nature and biodiversity loss.

Below is a simplified timeline showing a snapshot of prominent nature and biodiversity-related reports and initiatives.

Figure 2: Timeline of seminal research reports and nature-related framework releases since 2020



As you can see from Figure 2, there are a limited number of national studies completed to date on nature and biodiversity risk to financial systems. However, those that have been developed are detailed and have begun to forge the way on how nature and biodiversity risks are being considered and quantified. Below we have provided a table comparing five central bank reports developed so far. These all adopt different methodologies but are guided towards the same end, quantifying the risk of nature loss on the financial systems.

4 ESRS – European Sustainability Reporting Standards

Figure 3: Comparison of central bank studies quantifying nature-related risks on their financial systems

Report & Authors	Scope & approach	Findings	Encore	EXIOBASE	GLIOBIO	MSA
Indebted to Nature: Exploring biodiversity risks for the Dutch financial sector (De Nederlandsche Bank, DNB 2020)	Banks, pension funds and insurers Dependency score from two perspectives: 1. Degree to which production processes are disrupted 2. Projected extent of financial losses if ecosystem service is lost **Impacts:** 1. Determine the biodiversity footprint of Dutch financial institutions globally 2. Biodiversity impact per euro of turnover by sector and geographical area	▪ 36% of Dutch financial institutions' portfolios worldwide are exposed to NFCs with high or very high dependency on at least one ecosystem service ▪ EUR 28 billion is exposure to products that depend on pollination ▪ In 2019 Dutch financial institutions worldwide ▪ contributed €97 billion to finance NFCs involved in environmental controversies and which are thus vulnerable to transition risk ▪ financial institutions assessed have an exposure of EUR 28 billion to companies operating in areas that are protected or that might come under protection	Yes	No	Yes	Yes
A "Silent Spring" for the Financial System? Exploring Biodiversity-Related Financial Risks in France (Banque de France, 2021 BdF)	**All French financial institutions** Three step approach: ▪ Link securities to the companies that issued them and the sectoral and geographical breakdown of turnover ▪ Assessed the dependencies and impacts of each security issuers ▪ Combined amount of securities held with biodiversity footprint	▪ 42% of the value of securities held by French institutions come from issuers that are highly or very highly dependant on one or more ecosystem service ▪ The securities held by French financial institutions in 2019 produce an accumulated terrestrial biodiversity footprint that is comparable to the loss of at least 130,000km^2 of "pristine" nature	Yes	Yes	Yes	Yes
Nature-Related Financial Risks in Brazil (World Bank/Banco Central do Brasil)	**Domestic Banks** Domestic exposure of banks to biodiversity loss through lending activities 1. Physical risk: established the extent of the banking sector's potential exposure to reduced availability of ecosystem services 2. Transition risk: determined loan allocation to protected areas.	▪ Brazilian banks have an outstanding credit exposure of BRL 811 billion to non-financial corporates that operate in sectors highly or very highly dependent on one or more ecosystem services ▪ In 2021 Brazilian banks had an outstanding loan exposure of BRL 254 billion or 15% of their corporate portfolio to firms potentially operating in protected areas ▪ Brazilian banks' exposure to transition risks could increase to BRL 437 billion (25% of the corporate credit portfolio) should conservation gaps close, and to BRL 664 billion (38% of the portfolio) should all priority areas become protected.	Yes	No	No	No
An Exploration of Nature-Related Financial Risks in Malaysia (World Bank and Bank Negara Malaysia 2022)	**Banks** Analysed the biodiversity impacts and dependencies of banking to economic sectors 1. Assessed dependencies on ecosystem services of different economic sectors 2. Present banks exposure to transition risks in exposed sectors 3. Performed a partial scenario analysis of hypothetical risks concerning biodiversity and ecosystem services. 21 possible scenarios of nature-related financial physical risk and 7 nature-related financial transition risk scenarios were identified.	▪ 54% of commercial loans exposed to sectors that depend to a high extent on ecosystem services, which amounted to RM 398 billion (USD 94 billion) ▪ Physical risk from ecosystem deterioration, particularly related to deterioration in surface water (29%), climate regulation such as carbon storage (26%), and flood and storm protection (16%). ▪ 87% of commercial loans are exposed to sectors that strongly impact ecosystem services (therefore facing a high transition risk).	Yes	No	Yes	Yes
Living in a world of disappearing nature (ECB, Nov 2023)	**Euro area banks** The scope of this study is to raise awareness about nature-related risks by assessing the relationship between nature, our economy and euro area banks. To do so, they: 1. Assess the dependency of non-financial corporations (NFCs) financed by euro area banks on nature and study the magnitude and likelihood of shocks caused by nature depletion 2. Discuss policy implications of our study for central banks. In this study the ECB looked at the dependency on nature of more than 4.2 million individual NFCs accounting for over €4.3 trillion in corporate loans in the euro area. They assessed how dependent NFCs and banks are on the various benefits that humanity obtains from nature in the form of ecosystem services.	▪ Approximately 72% of NFCs (corresponding to around 3 million individual NFCs) are highly dependent on at least one ecosystem service. ▪ Almost 75% of corporate bank loans in the euro area are granted to NFCs with a high dependency on at least one ecosystem service. ▪ The report observes only moderate differences between countries, as indirect supply chain dependencies offset smaller direct dependencies, especially in small and open economies.	Yes	Yes	Yes	Yes

Spotlight: Network for Greening the Financial System (NGFS)

The Network for Greening the Financial System (NGFS) released their report on Nature-related Financial Risks: a Conceptual Framework to guide Action by Central Banks and Supervisors, on 7th September 2023. The Framework seeks to create a shared science-based understanding of, and common language for, these nature-related financial risks to help central banks and financial supervisors navigate the complexities and challenges associated with assessing and addressing these risks. Importantly, the NGFS have considered climate as a part of Nature which is a significant marker for future thinking and planning for central banks. The aim of the NGFS report is to provide greater clarity on the meaning of key concepts and the way these interrelate and set out a principle-based approach to help operationalise that understanding. Building on previous work by the joint NGFS-INSPIRE Study Group on Biodiversity and Financial Stability, the Conceptual Framework charts an important step towards an integrated assessment of climate and broader nature-related risks.

The principle-based risk assessment framework consists of three phases. Phase 1 involves the identification of sources of physical and transition risk based on exposures. Phase 2 encompasses the assessment of the potential economic effects and risks that can stem from these exposures. These may be relevant in their own right as macroeconomic risks (e.g., inflationary pressures) or transmit physical and transition risks to the financial sector. This phase draws attention to three elements that should at least be considered when assessing economic risks: (i) direct and indirect effects; (ii) micro, sectoral/regional and macro effects; (iii) substitutability. Finally, Phase 3 involves assessing risks to, from and within the financial system. This may include an evaluation of factors such as contagion (e.g. the potential to spread throughout financial systems and/or create feedback loops to the real economy).

2.3 Ireland's work to date on nature finance

It should be noted that Ireland has taken significant steps in recent years to understand and tackle the nature and biodiversity challenges we face. Below are some of the positive actions taken in recent years:

Strong societal engagement

The Government established a Citizens' Assembly on Biodiversity Loss – the first such national citizens' assembly anywhere in the world. Although the group expressed a level of disappointment at the State's failure to adequately fund, implement and enforce existing laws and policies, it is commendable that such a platform was made available, and the views of society are being considered as nature policy and action is increased.

Perhaps what was most striking from the final recommendations of the Assembly was the recommendation for a "referendum of the people to amend the Constitution with a view to protecting biodiversity… including a right to a clean, healthy, safe environment; a right to a stable and healthy climate; rights of future generations to these or other environmental rights."

Agreed ambition for the financial sector

Through several working groups, the Department of Finance and Ireland's International Sustainable Finance Centre of Excellence there is broad agreement and alignment to position Ireland as a global centre for sustainable finance. This was cemented and articulated through the Sustainable Finance Roadmap published by the Department of Finance and ISFCOE as an output of Ireland for Finance in 2021.

Clear policy signals

A mixture of national, regional and global regulations will enable a nature positive transition. Those of particular note are:

- Ireland's imminent fourth National Biodiversity Action Plan
- The EU Deforestation Regulation
- The incoming EU Nature Restoration Law

Allocation of budget

Finally, budget allocation from government is critical to send signals to the financial markets and society that the government is in support of a nature positive transition. Significantly, in budget 2024, the Minister for Finance announced that a fund, The Infrastructure, Climate and Nature Fund, will be established. The objective of this fund will be to ensure that Governments of the future can continue to finance capital spending even during an economic downturn. Recognising the environmental challenges affecting all parts of society, the fund will also have a climate and nature component, worth over €3 billion, the aim of which is to help the achievement of carbon budgets and a nature positive transition though capital projects where it is clear such nature, carbon and climate targets are not being reached.

In addition to the positive indicators above, we have completed a high-level review of a sample of financial institutions in Ireland to see what they already provide publicly in relation to nature and biodiversity policies. The results are unsurprising and indicate to a transition period in how institutions are gaining momentum and applying nature and biodiversity risk logic to their organisations. The table below summarises what we found:

Nature & biodiversity-related policies in Irish financial institutions

	Nature/ Biodiversity Policy	Deforestation/ Conversion Policy	Exclusion Criteria	Nature & Biodiversity Products/Services	Notes on Policies/ Sources
Bank of Ireland	⚙	X	✓	✓	Sustainability Report Nature-related lending exclusions First Nature-based funding instrument for carbon sequestration
AIB	⚙	X	✓	X	AIB Group Excluded Activities List AIB 2023 CDP Climate Change Response
Aviva	✓*	✓*	X	✓*	Commitment Letter on Eliminating Deforestation Aviva Biodiversity Policy Sustainable Transition Loan Framework
Citi Bank	✓*	✓*	✓*	X	Environmental and Social Policy Framework
PTSB	X	X	X	X	
Barclays	⚙	✓*	✓*	X	Climate Strategy, Targets and Progress 2022 Forestry & Agricultural Commodities Statement
FBD Insurance	X	X	X	X	

⚙ Publicly mentioned as in progress or specific to a sub-component of nature *Overarching Group Policy

In contrast to the positive steps mentioned above, the National Biodiversity Expenditure Review in 2020 found that a suite of legislation and policies are in place to protect biodiversity in Ireland, however the underlying fact remains that the continued strategic focus of the economy is on increased production and intensification in agriculture, forestry and fisheries. Against this background, environmental and biodiversity measures are simply mitigating damage at the edges. This is despite the fact that each of these sectors depends on biodiversity and its associated ecosystem services, including soil productivity, pollination, pest control and the survival of wild fish stocks. These services are aside from the societal benefits from water purification, moderation of run-off and flood mitigation, coastal protection, carbon sequestration, and tourism, amenity and quality of life (Mc Guinness, S.K. & Bullock, C. 2020).

2.4 Learning from other jurisdictions

For the purposes of this study, we have chosen to capture some of the leading practices currently underway in France and provide readers with a high-level view of some of the components needed for creating an effective ecosystem to mobilise finance and address nature risk. We outline some of those activities below and suggest an ecosystem for how the three main stakeholder groups can work together.

Public Sector

Actions that originate from the public sector:

- Policy clarity and stability (see case study 1)
- Incentives such as risk guarantees or cheap debt
- Decision making infrastructure (see case study 2)

Key stakeholders: International and national government; central banks; government departments; citizen assemblies

Supporting Services

Actions that originate from supporting services:

- Transparent systems of data and insights (see case study 3)
- Capacity building networks and training
- Industry working groups and networks (see case study 4)

Key stakeholders: NGOs; academia; data providers; skills providers; industry working groups

Finance

Actions that originate from financial sector:

- Viable products/financeable propositions with strong return on investment (see some examples in table xx)
- Improved risk/reward balance which, similar to the early days of climate finance, is likely to come from the use of market mechanisms and project aggregation
- Incentives to encourage market participation in nature based financial solutions e.g. guarantees from insurance companies

Key stakeholders: Finance sector and regulators

Case Study 1: Policy clarity

France's **Biodiversity Framework Law**, adopted in August 2016 resulted in several advances:

- Created the French Biodiversity Agency
- Set out new principles in the Environmental Code and Civil Code:
- Non-regression of environmental law;
- Environmental solidarity and "no net loss of biodiversity" objective;
- Protection of soils of common interest, by making them a part of common heritage of the nation.
- Laid out in the Civil Code a redress scheme for environmental damage to strengthen and consolidate jurisprudence achievements.

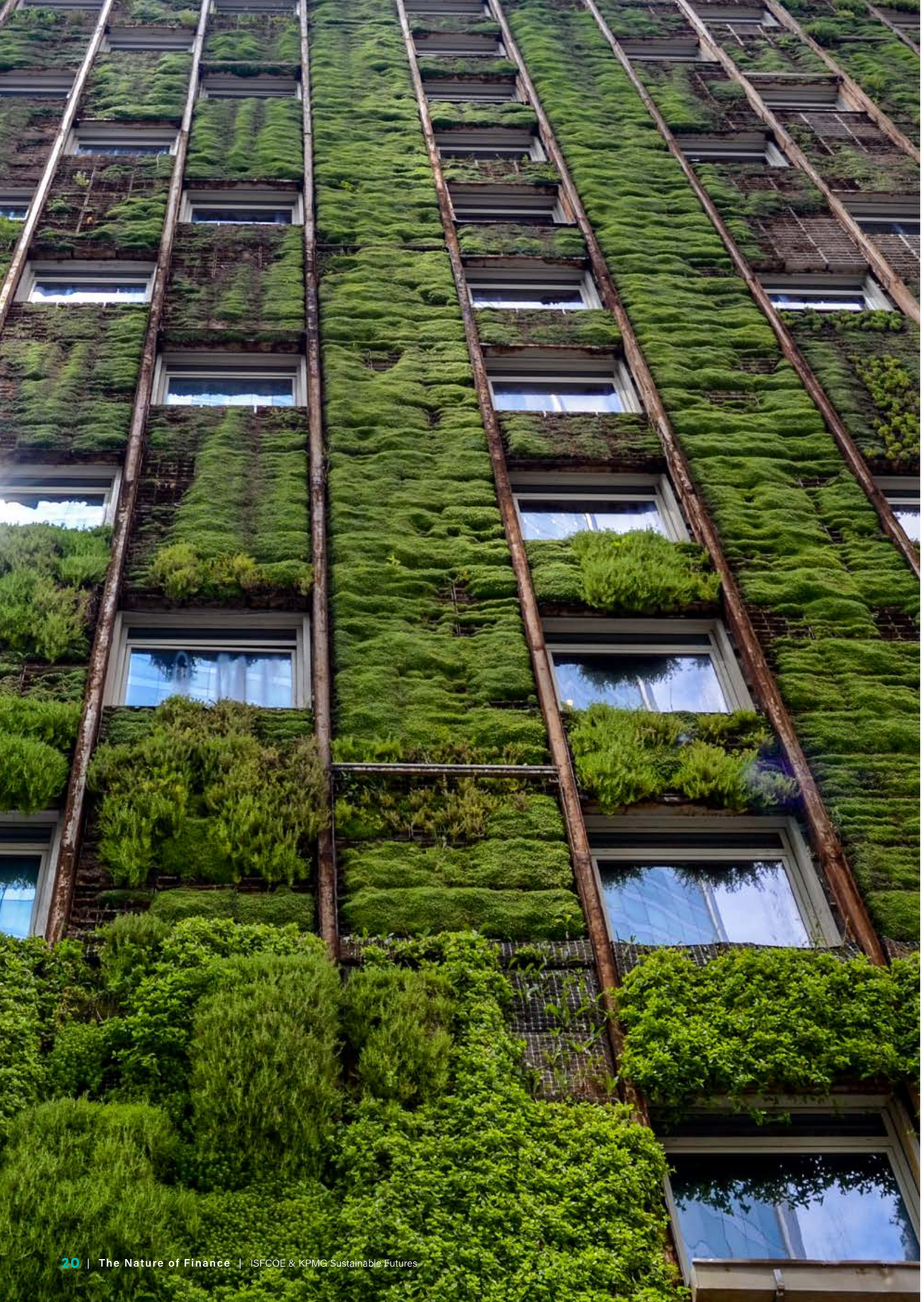
Case Study 2: Decision-making infrastructure

The **French Biodiversity Agency** (OFB) was created by law on 1st January 2020 (Law no. 2019-773 of 24 July 2019) to protect and restore biodiversity in Metropolitan France and its Overseas Territories. It is a public institution under the authority of the ministries responsible for Ecology and Agriculture & Food.

The Agency has five complementary roles:

1. Sharing knowledge, research and expertise about species, habitats and their uses
2. Environmental and wildlife health policing
3. Supporting the implementation of public policies
4. Assisting and supporting protected natural area managers
5. Supporting stakeholders and mobilising civil society

www.ofb.gouv.fr/en



Case study 3: Data and fintech

Carbon4 Finance is a provider of Climate, and Biodiversity Data Solutions for the financial sector and was used for the Banque de France report we reviewed earlier in this section. It offers climate data solutions covering both physical and transition risks, as well as biodiversity footprinting solutions. These methodologies allow financial organizations to measure the carbon and biodiversity footprint of their portfolio, assess the alignment with a 2°C-compatible scenario and measure the impacts that arise from events related to climate change and biodiversity loss.

www.carbon4finance.com

Iceberg Data Lab provides environmental data solutions to financial institutions. Their models calculate the environmental impact of issuers and assets throughout their value chain (supply chain to end use) and deliver science-based metrics that identify the most harmful and material impacts of issuers on a bottom-up basis. In 2020, Iceberg Data Lab was selected by a leading consortium of investors - composed of Axa Investment Managers, BNP Paribas Asset Management, Sycomore Asset Management and Mirova - to develop a measurement tool for investments' impact on biodiversity. The database aims to quantify the biodiversity impact of constituents of financial portfolios and enables financial institutions to integrate that impact into their investment strategies.

www.icebergdatalab.com

Aside from creating an ecosystem that supports positive action to address nature and biodiversity risks, we also recognise the need for new financial products available in the market to direct flows of capital into nature impact. **A range of examples and cases studies are presented and analysed in section 8 of this report.**

Case study 4: Industry working groups and networks

Act4nature was launched in 2018 by the French Association of Companies for the Environment (EpE) and numerous partners. Its objective is to engage businesses in addressing their direct and indirect impacts, dependencies, and opportunities for nature-positive actions. It was launched with the aim of showcasing these achievements at international milestones: the launch of the first global scientific assessment by IPBES, the World Nature Congress, and COP15. The objective was to approach these milestones with solid concrete accomplishments. Act4nature now has over 70 French companies as members with commitments on biodiversity. Its aim is to showcase these companies internationally.

www.act4nature.com/en

Finance for Biodiversity Pledge
In total 153 financial institutions representing 24 countries and over 21.4 trillion euro in assets signed the Finance for Biodiversity Pledge in 2023. The Pledge was initiated by a group of 26 financial institutions calling on global leaders and committing to protect and restore biodiversity through their finance activities and investments.

Pledge signatories call on global leaders and commit to protecting and restoring biodiversity through their finance activities and investments by:

- Collaborating and sharing knowledge
- Engaging with companies
- Assessing impact
- Setting targets
- Reporting publicly on the above before 2025

www.financeforbiodiversity.org

The **Institut de la Finance Durable** (IFD) aims to coordinate, manage and accelerate the action of Paris' financial centre to achieve the ecological transition and the transformation of the economy towards a low-carbon and inclusive model, aligned with the objectives of the Paris Agreement and the Sustainable Development Goals.

Created in October 2022, the IFD takes over from Finance for Tomorrow and brought together all private, public and institutional actors of the Paris financial centre willing to commit to a finance that is focused on a sustainable future and combines long-term investment with the consideration of environmental and social challenges.

In terms of biodiversity and natural capital their objectives are to:

- Promote an increase of skills and knowledge of the actors on biodiversity financing tools
- Share information on life-saving initiatives in which working group members are involved.

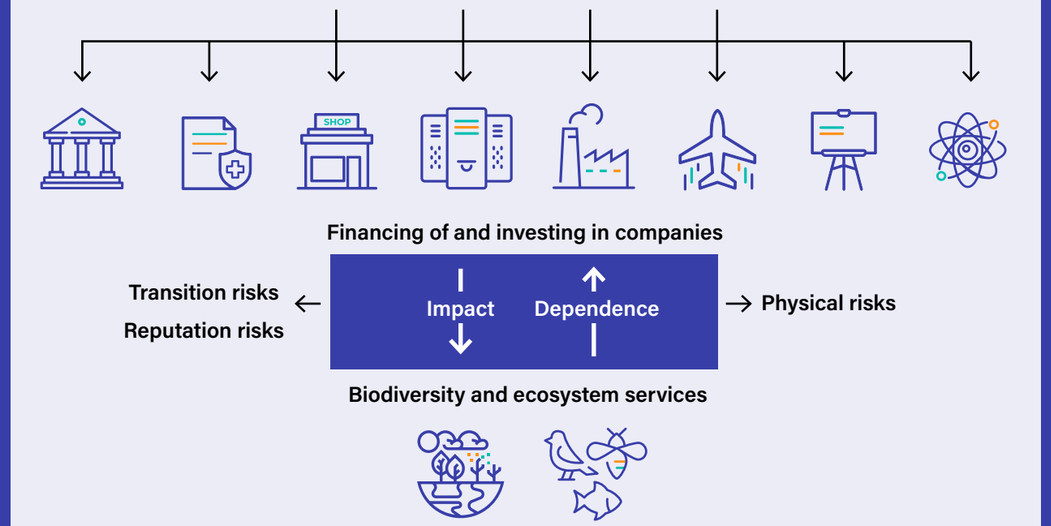
www.institutdelafinancedurable.com

03

Nature and Biodiversity-related Risks for Ireland's Financial System

The relationship between biodiversity and financial institutions is indirect and two-way (Van Toor et al., 2020). The sector both finances companies that are dependent on ecosystem services for the production of their goods and services, and also finances companies that can have an impact on nature through their production processes (e.g. overexploitation of ecosystems, contribution to climate change and pollution). The figure below illustrates the relationship.

Figure 4: Relationship between financial sector, economy, biodiversity and ecosystem services



With this in mind, and taking the relationship model above one step further, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services ("IPBES", the equivalent of the IPCC for biodiversity) goes on to identify the five direct drivers of biodiversity loss as: (IPBES, 2019)

(i) Changes in land and sea-use

(ii) Over-exploitation (i.e., extraction of living and non-living materials)

(iii) Climate change

(iv) Pollution

(v) Invasive alien species

3.1 Categorising nature-related risks

Nature-related risks stem from the same risk factors as climate risks - physical and transition. They also have similar characteristics to climate risks in that they are subject to complex and non-linear dynamics, and are likely irreversible when certain critical thresholds or 'tipping points' are crossed; they are both foreseeable and uncertain; and delayed action increases risk (INSPIRE, 2022).

The TNFD defines nature-related risks as: "Potential threats (effects of uncertainty) posed to an organisation that arise from its and wider society's dependencies and impacts on nature." (TNFD, 2023)

In the recently released Nature-related Financial Risks: a Conceptual Framework to Guide Action by Central Banks and Supervisors the NGFS defines nature-related risks as:

The risks of negative effects on economies, individual financial institutions and financial systems that result from: (i) the degradation of nature, including its biodiversity, and the loss of ecosystem services that flow from it (i.e., physical risks); or (ii) the misalignment of economic actors with actions aimed at protecting, restoring, and/or reducing negative impacts on nature (i.e., transition risks). (NGFS, 2023).

Where the TNFD provides a concise definition of risk, the NGFS definition goes one step further to outline some of the transmission channels (such as physical and transition risks). Both are helpful and continue to grow a narrative for nature risk reporting that is new and intends to mirror that already developed for climate.

As such, and in line with the NGFS report, we have aligned this report and thinking with their risk categorisations:

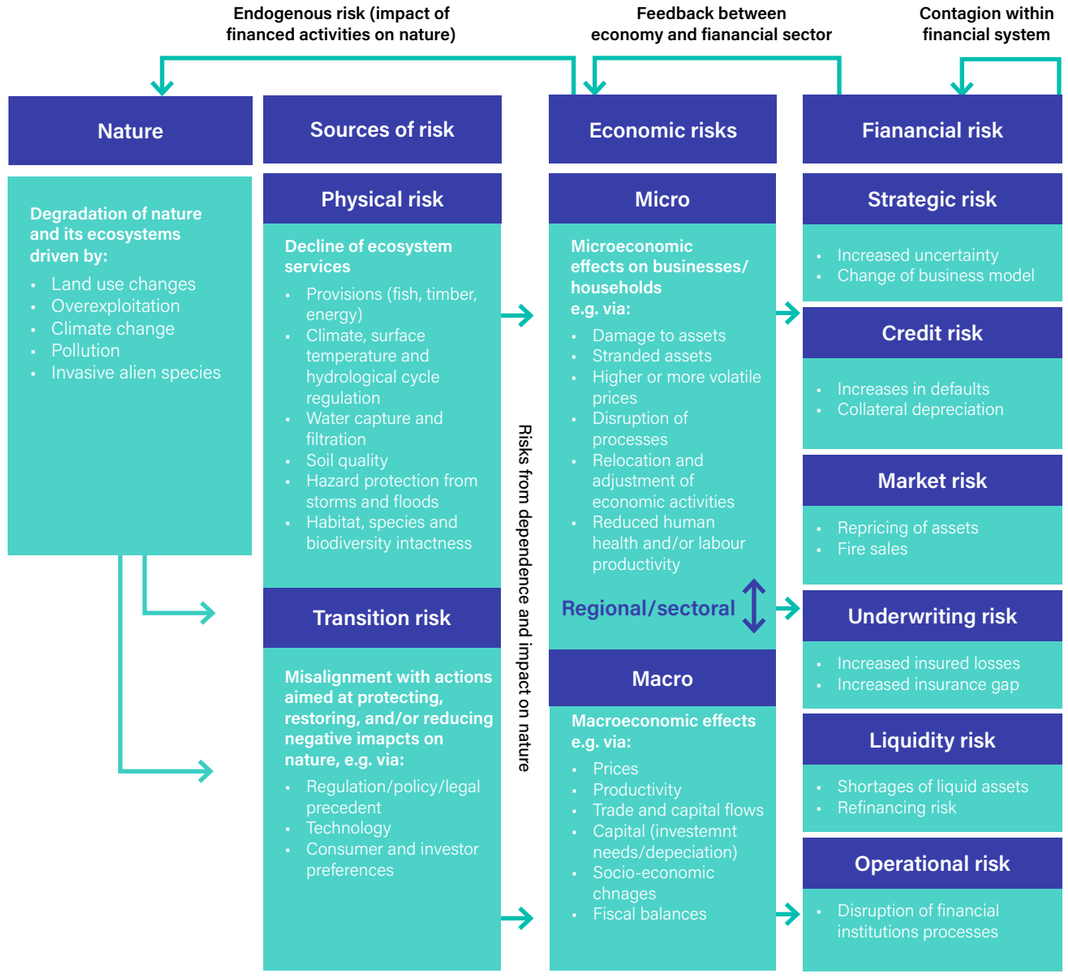
- **physical risks** - stemming from the degradation of nature and loss of ecosystem services
- **transition risks** - stemming from a misalignment of economic actors with actions aimed at protecting, restoring, and/or reducing negative impacts on nature
- Note that **litigation risk** is considered as a subset of both physical and transition risks

Finally, and uniquely to climate and nature, there are systemic risks which are risks arising from the breakdown of the entire system, rather than the failure of individual parts. Nature-related systemic risks are characterised by modest tipping points combining indirectly to produce large failures and cascading interactions of physical and transition risks, one loss triggers a chain of others and stops systems from recovering their equilibrium after a shock.

While there is acknowledgement of systemic risk in principle, there is currently limited consideration of systemic risk in existing risk management and disclosure frameworks. An example is the loss of a keystone animal or plant species, which play a critical role in ecosystem structure and functioning. The loss or extinction of such species can have detrimental impacts in local and regional levels and present particular challenges in parts of the world which our economies and communities rely.

Figure 5 adapted from Svartzman et al. (2021) and NGFS (2023), provides an overview of the relevant transmission channels demonstrating that it is more complicated and multi-dimensional than climate, with contagion and feedback loops.

Figure 5: Transmission channels (Adapted from Svartzmann et al., 2021; NGFS, 2023)



3.1.1 Physical Risk

Nature-related physical risks are a direct result of an organisation's dependence on nature. Physical risks arise when natural systems are compromised, due to the impact of climatic events (e.g. extremes of weather such as a drought), geologic events (e.g. seismic events such as an earthquake) events or changes in ecosystem equilibria, such as soil quality or marine ecology, which affect the ecosystem services organisations depend on. Physical risks are usually location-specific – sometimes to a regional level and often at a hyper-local level.

The degradation of biodiversity and natural ecosystems could lead to physical and transition risks that could transmit through the economy. Physical risk could emerge from the loss of ecosystem services that firms are depending on. Such dependencies could be direct (e.g., fisheries decline for the aquaculture sector) or indirect via supply chain impacts and relative price changes (e.g., higher food prices). Physical risk could either be triggered through 'slow-onset' loss of ecosystem services (e.g., reduced agricultural yields) or 'sudden-onset' events like the triggering of an ecological regime shift e.g., eutrophication of a lake (World Bank and Bank Negara Malaysia, 2022).

While general principles of diversification of dependencies on nature will remain central to effective risk management, in some cases, managing the risks associated with nature loss may require total business transformation and new ways of conducting business. This could include, for example, new ways of approaching business with a granular understanding of where operations and value chains are located.

3.1.2 Transition risks

Nature-related transition risks are risks that result from a misalignment between an organisation's or investor's strategy and management and the changing regulatory, policy or societal landscape in which it operates. Developments aimed at halting or reversing damage to nature, such as government measures, technological breakthroughs, market changes, litigation and changing consumer preferences can all create or change transition risks (NGFS, 2023).

Transition risks include new regulations and policies aimed at creating a more sustainable future, which might lead to restrictions on certain economic activities. New and stricter nature and biodiversity related regulations are currently be introduced, possibly resulting in transition risks and stranded assets.

For transition risks, existing and announced nature-related policies on a global, regional and/or national level could provide a starting point to develop scenarios (for example the Global Biodiversity Framework GBF, which defines 2030 targets on, among other things, protecting 30% of land and water or the reduction of harmful subsidies). It is relevant to understand and consider the expected time horizon for these scenarios (i.e., will they materialise in the short, medium or long term).

Sudden changes in policy, technology, and consumer preferences in response to nature loss can have a substantial impact on the economic, financial, and reputational position of firms and their financing banks with large impacts on biodiversity and ecosystems. Business operations may have an impact on biodiversity and ecosystem services via excessive natural resources extraction, disposal of waste, or land-use change. If firms do not adapt in a timely manner and banks do not adjust their lending portfolio, nature-related financial transition risk could materialize following sudden changes in policy, technology, and consumer preferences. Those pressures on companies could stem from domestic changes as well as changes in important export markets.

3.2 Snapshot of key nature related policies and frameworks:

Taskforce on Nature-related Financial Disclosures (TNFD)

The Taskforce on Nature-related Financial Disclosures (TNFD) is a global, market-driven, science-led and government-backed initiative which has developed a risk management and disclosure framework for organisations to report and act on nature-related risks. It aims to help organisations of every size, across every sector that interacts with nature and participate in global supply chains and the financial system. The TNFD framework closely and purposively resembles the Task Force on Climate Related Financial Disclosures (TCFD) as it recommends disclosures across four pillars; Governance, Strategy, Risk & impact management, Metrics & Targets, and 11 of the 14 disclosures are the same or very similar to TCFD – again reflecting the interlinkage between climate and nature and the risks they present. The TNFD offers voluntary guidance on how to prepare these disclosures: a science-based 'step-by-step' guide for an integrated, nature-related risk and opportunity assessment process called the LEAP approach, standing for Locate, Evaluate, Assess, Prepare.

Corporate Sustainability Reporting Directive (CSRD)

Where the TNFD is a global, voluntary framework, the Corporate Sustainability Reporting Directive (CSRD) is EU-specific and mandatory. The CSRD significantly expands existing rules on non-financial reporting, with almost 50,000 companies across Europe likely to be affected in the coming years. The disclosure requirements go much further than the previous Non-Financial Reporting Directive, with corporates and financial institutions required to assess the materiality of a range of environmental social and governance topics. The environmental topical standards (ESRS) span many aspects of nature, including water, climate and biodiversity, and the TNFD's LEAP approach is explicitly referenced across many of the environmental standards. For organisations that identify biodiversity as a material topic, the standard on Biodiversity and Ecosystems (ESRS E4) will apply. Organisations are required to

identify and assess their material impacts, risks and opportunities relating to biodiversity and ecosystems, as well to disclose their governance, strategy, metrics and targets, and potential financial effects arising from biodiversity and ecosystem related impacts and dependencies. As a result of this, organisations will be required to disclose their nature-related issues in a more consistent, transparent and credible way than ever before.

EU Biodiversity Strategy for 2030

The European Union (EU) Biodiversity Strategy for 2030 responds to the alarming loss of nature that undermines wellbeing and prosperity. It is a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of ecosystems. The Strategy aims to put Europe's biodiversity on a path to recovery by 2030, and contains over 100 specific actions and commitments ranging across several policy areas, including identifying and designating additional protected areas and ecological corridors and improving the status of protected species and habitats.

EU Nature Restoration Law

The European Commission's proposal for a Nature Restoration Law is the first continent-wide, comprehensive law of its kind. It is a key element of the EU Biodiversity Strategy, which calls for binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters. It requires countries to develop national plans on restoration measures, including voluntary rewetting of peatlands, restoring marine habitats and restoring rivers to a free-flowing state.

EU Deforestation-Free Regulation (EUDR)

The European Commission approved a first-of-its-kind European Union (EU) deforestation-free regulation (EUDR) on 6 December 2022, signalling that the European supply chains of cocoa, coffee, soy, wood, palm oil, rubber, and cattle need to prepare for closer due diligence. Over the course of the next two years a review will be carried out, potentially adding additional products to this list. The new Regulation will require any company importing or exporting these commodities from the EU to prove the products are deforestation-free. This applies to any company, regardless of whether they are EU-based or not, and for legal and illegal sources of deforestation in Europe and overseas. The Regulation defines a product as deforestation-free when the product itself, its ingredients or its derivatives were not produced on land subject to deforestation or forest degradation after the cut-off date of 31 December 2020. Whether they do it themselves or via expert third parties, companies wishing to import or export these products will be required to perform proper due diligence. The new Regulation will require any company importing or exporting these commodities from the EU to prove the products are deforestation-free. This applies to any company, regardless of whether they are EU-based or not, and for legal and illegal sources of deforestation in Europe and overseas.

04

Quantitative Analysis - Methodology

Our quantitative analysis was guided by two primary research questions:

1. What is the quantified potential impact of nature degradation on the Irish financial market based on **national lending portfolios?**
2. What is the quantified potential impact of nature degradation on the Irish financial market based on **insurance written in Ireland?**

4.1 Industry engagement and interviews

Throughout the project, we spoke to a range of industry experts to obtain a variety of perspectives on the current state of play of the sustainable finance and nature agenda in Ireland and globally. We were fortunate to speak with a number of individuals with deep expertise and experience in these topics who provided insights from their own work and that of their organisations. They also shared some of the challenges and opportunities they see as critical for progress and supported on some of the technical quantitative questions and challenges we faced. Our engagements included:

Sjoerd van der Zwaag, Nature Lead with De Nederlandsche Bank (Dutch Central Bank) and advisor to the co-chairs of the Network for Greening the Financial System (NGFS) nature and biodiversity taskforce.

Simon Dikau, Distinguished Policy Fellow and **Elena Almeida,** Senior Policy Fellow at the Grantham Research Institute, London School of Economics and Political Science.

Mark Halle, Senior Advisor, UNDP-FC4S

Prajwal Baral, Consultant and Senior Advisor, World Bank; UNDP.

Anumpam Ravi, Senior Vice President, GIST Impact – global leader in nature and biodiversity data and platforms.

We also spoke to expert representatives at the European Insurance and Occupational Pensions Authority (**EIOPA**), the Central Bank of Ireland (**CBI**) and one of the lead authors of the European Central Bank's (**ECB**) latest series of papers on nature-related impacts and dependencies of Euro area financial institutions published in November (Boldrini et al, 2023) and December (Ceglar et al, 2023).

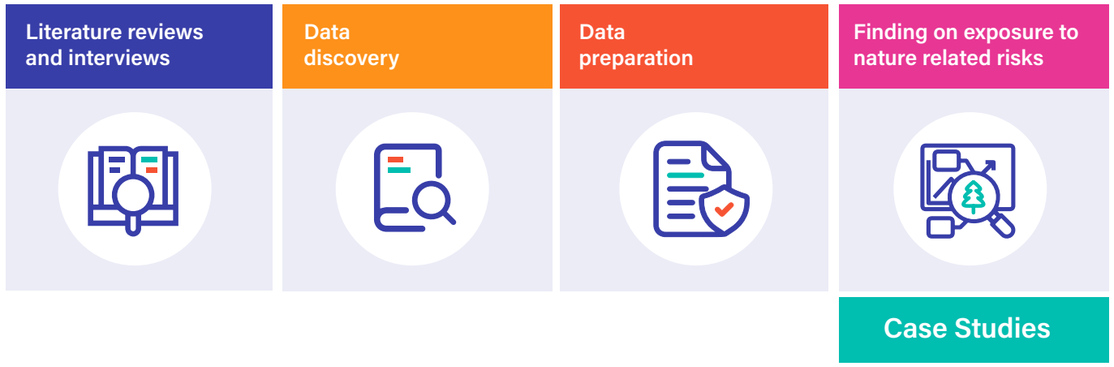
From our discussions there was consensus that action by central banks and financial institutions on nature and biodiversity related risks, impacts and dependencies was markedly behind the progress made on climate change. However, all agreed that assessment of nature risks and topics were rising rapidly up the agenda and significant progress had been made in the last year. Recent initiatives and research by the Network for Greening the Financial System (NGFS) and of the ECB were cited as evidence that nature was now being taken seriously at the very highest levels.

Our discussions with these experts also allowed us to test our thinking and better understand the gaps in nature and financial data and also in the methodologies to quantify risks. In particular, we were able to confirm that the challenges we faced for insurance underwriting were common to other researchers, and that much work was still needed to close the knowledge and methodological gaps. These are outlined further in section 4.3.

One interesting insight from our discussions was that people with nature-related skills or experience or a personal interest in nature topics can be critical driver of change in financial institutions. Without the drive and perseverance of these individuals pushing the nature agenda and prioritising research and action, progress to date could have been even slower. All the experts we spoke to pointed to the urgent need for financial services and regulators to upskill existing teams or to recruit experienced talent. These topics are discussed further in sections 7 and 8.

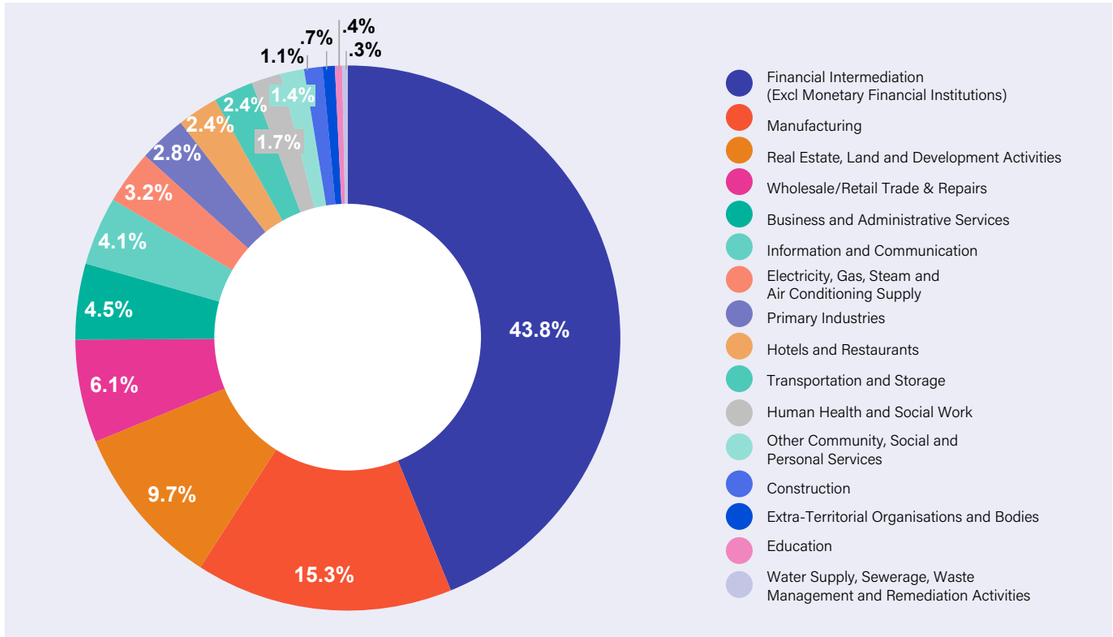
4.2 National Lending Portfolios - approach to analysis of nature-related risks and opportunities

The approach to analysis of nature-related risks and opportunities for national lending portfolios is summarised in the graphic below. The initial phase of research involved a review of the literature and interviews with industry experts (as discussed in 4.1). The key findings from the literature review are summarised in sections 2 and 3. An extensive data discovery exercise was also carried out, to determine which financial data could be available for analysis. The data were then prepared and analysed to determine the key findings in Section 5.1. Finally, two case studies were prepared to demonstrate how further and more detailed analysis can be carried out in future studies.



4.2.1 Lending data from the Central Bank of Ireland

Data on national lending portfolios were obtained from the Central Bank of Ireland (CBI). The datasets used are the 'Credit Advanced to Irish Resident Private-Sector Enterprises' and the 'Credit Advanced to Irish Non-resident Private-Sector Enterprises' – available to the public here. The list of over 80 credit institutions included in the dataset can be found here. The data covers counterparties of Irish credit institutions that are: private-sector enterprises, irrespective of legal form (corporation, partnership, sole trader etc.); and Irish resident and non-Irish resident.[5] The data are quarterly in frequency and cover outstanding amounts as of March 2023. The sectors used by the CBI are the "Functional Sector Classifications" and lending amounts per CBI sector are provided in € million.



5 It's important to note that the data do not include mortgage lending.

The sector that receives the greatest proportion of lending is *'Financial Intermediation (excluding monetary financial institutions)'* or also known as non-bank financial intermediation (NBFI).[6] This sector breaks down into subsectors as shown in Table 1. It's noteworthy that Ireland's NBFI Sector has grown in recent years to be one of the largest in the world, accounting for roughly nine times Ireland's GDP and 17 times its GNI (Lai, 2022). The challenge in assessing the NBFI sector is determining any links to real economy sectors (e.g. Agri-food, Manufacturing). Without clear, traceable links to real economy sectors, it is difficult to assess impacts and dependencies on nature using tools such as ENCORE (discussed in section 4.2.2 below). As such, we have followed the approach of the ECB report (Boldrini et al, 2023) and have excluded non-bank financial intermediation sector from our primary headline findings for national lending portfolios set out in Section 4.2.3. However, we do provide figures including non-bank financial intermediation sector in the Appendix 10.1 for completeness and comparison purposes.

Table 1 – Breakdown of Financial Intermediation sub-sectors

Financial Intermediation Subsectors	Value of lending (€m)	% of total lending
Financial vehicle corporations (FVCs)	36,039	21%
Other financial intermediation / Unallocated	17,836	10%
Non-bank credit grantors, excluding credit unions	10,078	6%
Investment funds, excluding financial vehicle corporations and money market funds	6,310	4%
Financial leasing	2,583	1%
Life insurance	1,535	1%
Security broker/fund management	2,491	1%
Pension funding	8	0%
Non-life insurance	29	0%
Total lending to Financial Intermediation sector	**76,910**	**43.83%**

4.2.2 Data from ENCORE

ENCORE (Exploring Natural Capital Opportunities, Risks and Exposure) is a globally recognised tool that helps organisations to assess their exposure to nature-related risk and take the first steps to understand their dependencies and impacts on nature.[7] The ENCORE tool provides a materiality score to indicate the level of impact and dependency that different industry sectors have on different aspects of nature. The scores are on a five-point scale of Very Low, Low, Medium, High, Very High. The sectors used by ENCORE derive from the Global Industry Classification System (GICS), which comprises a four-level hierarchical structure with 11 sectors, 24 industry groups, 68 industries and 157 sub-industries. In ENCORE, each GICS sub-industry is associated with multiple production processes.

ENCORE provides details of how these production processes depend on the following 21 ecosystem services:

1. Animal-based energy
2. Fibres and other materials
3. Genetic materials
4. Ground water
5. Surface water
6. Maintain nursery habitats
7. Pollination
8. Soil quality
9. Ventilation
10. Water flow maintenance
11. Water quality
12. Bio-remediation
13. Dilution by atmosphere and ecosystems
14. Filtration
15. Mediation of sensory impacts
16. Buffering and attenuation of mass flows
17. Climate regulation
18. Disease control
19. Flood and storm protection
20. Mass stabilisation and erosion control
21. Pest control.

Definitions for each impact area are provided here.

6 Non-bank financial intermediation used to be commonly referred to as 'shadow banking' is described by the as "broad and diverse with numerous heterogenous business models." Non-Bank Financial Intermediation | Central Bank of Ireland. For example it includes fixed income funds, Equity funds, Securitisation Special Purpose Entities (SPEs), and Hedge Funds.

7 ENCORE (encorenature.org). Note that a new update Version 2.0 of the ENCORE tool is due for publication in early 2024 as part of the EU SUSTAIN project.

4.2.3 Data preparation

Sector mapping

The datasets described above used different sector classifications which must be mapped to one another to allow further analysis. The CBI Functional Sector Classifications were first mapped to the EU NACE Rev 2 codes. Further details of the mapping are available in the CBI Explanatory note. A "crosswalk" provided by the SBTN Sector Materiality Tool was used to match the NACE sectors to GICS, which is the classification used by ENCORE. An example of the mapping can be found in Figure 7.

The CBI Functional Sector Classifications mostly aligned with NACE Rev 2 codes although not exactly. Not all NACE sectors were covered by the CBI Functional Sector Classification. In some cases, CBI data was provided to NACE Level 1 (less granular), in others, it was available for NACE Level 2 (more granular).

It should be noted that that the dataset for Irish Non-resident Private-Sector Enterprises did not provide the same level of sectoral granularity as was available for the dataset on Irish Resident Private-Sector Enterprises. To overcome this, the lending proportions per sub-sector in the Irish Resident dataset were applied to the Irish Non-resident dataset. In other words, if the Irish Resident dataset showed 5% lending to the 'Growing of crops' subsector, the same proportion of 5% was applied in this subsector for the Irish Non-resident dataset.

Figure 7: Mapping sector impacts and dependencies using ENCORE

CBI sector	CBI sub-sector*	NACE sub-sector*	GICS Production Process	Impacts & Dependencies*
Manufacturing	Manufacture of food, beverages and tobacco products	Manufacture of beverages	Alcoholic fermentation and distilling	**Impacts** GHG emissions H Soil pollutants H Solid waste H Water Pollutants H **Dependencies** Ground Water VH Surface water VH

*Non-exhaustive list

Lending amounts per sector from the CBI dataset were matched to the production processes used in ENCORE. In some cases, one CBI Functional Sub-Sector Classification was linked to multiple production processes, as illustrated below. In these cases, the amount of lending to the CBI Functional Sub-Sector was divided evenly between Processes.

CBI Functional Sub-sector Classification	NACE Rev 2 - Level 4 - Class	GICS Sector	GICS Sub-Industry Name	Production Process
Manufacture of food, beverages and tobacco products	Distilling, rectifying and blending of spirits	Consumer Staples	Distillers & Vintners	Alcoholic fermentation and distilling
	Processing and preserving of meat	Consumer Staples	Packaged Foods & Meats	Processed food and drink production

Sector impacts and dependencies on nature

In Figure 8 on the following page, CBI sectors are plotted against ecosystem services and impact areas. The plot shows the number of ecosystem services on which the sector is highly or very highly dependent, versus the number of impact areas on which the sector has high or very high impacts. As a reminder, the full list of ecosystem services and impact areas are available in the previous section.

The graph indicates that the Primary Industries, Manufacturing and Wholesale/Retail Trade and Repairs sectors have the highest number of 'high' and 'very high' impacts and dependencies on nature. Meanwhile, the Water Supply, Sewerage, Waste Management and Remediation Activities and non-bank financial intermediation sectors show a low number of 'high' and 'very high' impacts and dependencies on nature.[8]

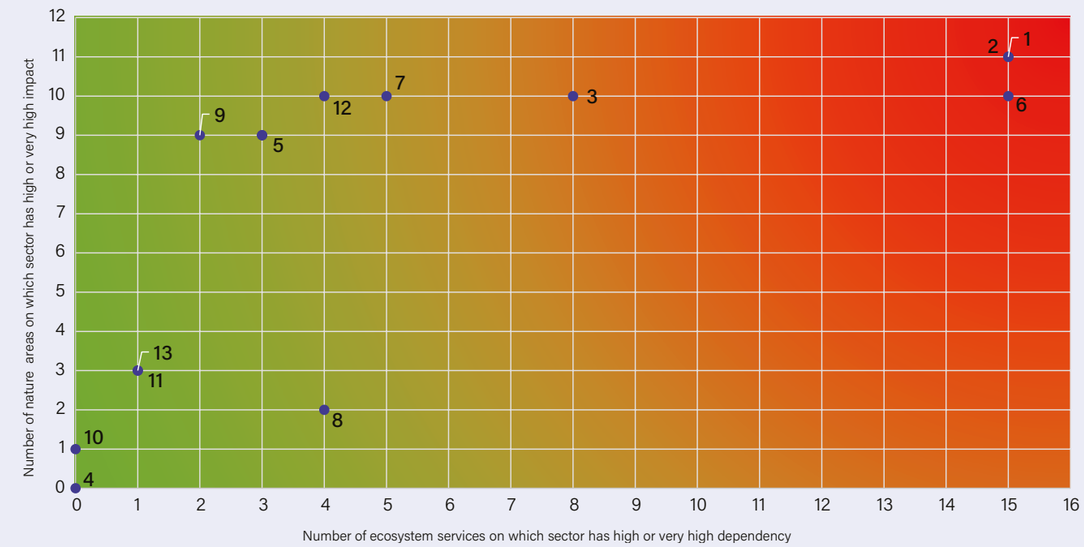
The scores provided by ENCORE give a high-level view of sectors' direct impacts and dependencies on nature. They do not account for value chain or "Scope 3" impacts and dependencies on nature. For example, the Financial Intermediation sector scores relatively low for impact on nature as it does not have significant direct impacts (e.g., impact on nature through land use for its office buildings etc.). However, the upstream and downstream impacts of the financial sector are significant due to financing activities. These effects are not captured in the ENCORE scoring system.

Furthermore, ENCORE does not account for geographical variations such as the differences between a food and beverage manufacturer operating in Ireland versus in Brazil. The scores are provided at global and sector level.

Finally, ENCORE provides a static view of impacts and dependencies, and does not account for changes that companies may make to mitigate their risks; nor potential or observed degradation of ecosystem services and the potential risks this could generate for the sectors involved in those processes.

It's important to note, that despite these limitations, ENCORE is a robust and industry recognised tool that was used by amongst others, the DNB, Banque de France and ECB studies.

Figure 8: High and very high sector impacts and dependencies on nature per sector



Sectors

1. Primary Industries
2. Manufacturing
3. Electricity, Gas, Steam and Air Conditioning Supply
4. Water Supply, Sewerage, Waste Management and Remediation Activities
5. Construction
6. Wholesale/Retail Trade & Repairs
7. Transportation and Storage
8. Hotels and Restaurants
9. Information and Communication
10. Financial Intermediation (Excl. Monetary Financial Institutions)
11. Real Estate, Land and Development Activities
12. Business and Administrative Services
13. Other Community, Social and Personal Services

8 Water Supply, Sewerage, Waste Management and Remediation Activities' corresponds to the production process of 'Environmental and facilities services,' which is assessed in ENCORE to have have no high or very dependencies on ecosystem services.

In Tables 2 and 3 below, the most common ecosystem services and impact areas per sector are presented.

Table 2 presents the ecosystem services which have the greatest share of production processes depending on them. According to the ENCORE rankings, the most important ecosystem services are the provision of surface water and groundwater, climate regulation, water flow maintenance, and mass stabilisation and erosion control.

Table 3 presents the impact areas which have the greatest number of GICS Processes depending on them. The most significant impact areas are water use, GHG emissions, and water pollutants.

The key findings and analysis are presented in Section 5.

Table 2 – Share of production processes per sector with High or Very High Dependency on each ecosystem service

	Manufacturing	Primary Industries	Wholesale/Retail Trade & Repairs	Electricity, Gas, Steam and Air Conditioning Supply	Transportation and Storage	Business and	Hotels and Restaurants	Construction	Information and Communication	Other Community, Social and Personal Services	Real Estate, Land and Development Activities
Total number of production processes in sector	55	24	14	12	10	12	3	5	6	3	1
Number of ecosystem services on which the sector is highly dependent	15	15	15	8	5	4	4	3	2	1	1
Surface water	42%	58%	43%	25%	10%	25%	33%	20%	0%	33%	100%
Ground water	35%	50%	29%	17%	10%	8%	33%	0%	0%	0%	0%
Climate regulation	18%	42%	57%	25%	30%	25%	33%	20%	0%	0%	0%
Flood and storm protection	15%	33%	43%	17%	30%	25%	33%	40%	17%	0%	0%
Water flow maintenance	16%	38%	43%	17%	0%	0%	0%	0%	0%	0%	0%
Mass stabilisation and erosion control	13%	29%	43%	25%	20%	0%	0%	0%	0%	0%	0%
Soil quality	15%	33%	43%	0%	0%	0%	0%	0%	0%	0%	0%
Water quality	11%	29%	43%	8%	0%	0%	0%	0%	0%	0%	0%
Disease control	13%	29%	36%	0%	0%	0%	0%	0%	0%	0%	0%
Pest control	11%	25%	29%	0%	0%	0%	0%	0%	0%	0%	0%
Pollination	11%	25%	29%	0%	0%	0%	0%	0%	0%	0%	0%
Buffering and attenuation of mass flows	9%	21%	36%	0%	0%	0%	0%	0%	17%	0%	0%
Fibres and other materials	11%	21%	21%	8%	0%	0%	0%	0%	0%	0%	0%
Animal-based energy	5%	13%	14%	0%	0%	0%	0%	0%	0%	0%	0%

Note: this table only lists high and very high dependencies. i.e. it excludes medium to low dependencies on ecosystem services.

The following ecosystem services had no production processes with high or very high dependencies:

- Dilution by atmosphere and ecosystems
- Bioremediation
- Mediation of sensory impacts
- Genetic materials
- Ventilation

The following sectors had no production processes with high or very high dependency on ecosystem services:

- Water Supply, Sewerage, Waste Management and Remediation Activities
- Financial Intermediation (Excl. Monetary Financial Institutions)
- Education
- Human Health and Social Work
- Extra-Territorial Organisations and Bodies

Table 3: Share of production processes per sector with High or Very High impacts on each nature impact area

	Manufacturing	Primary Industries	Transportation and Storage	Electricity, Gas, Steam and Air Conditioning Supply	Wholesale/Retail Trade & Repairs	Business and Administrative Services	Construction	Information and Communication	Human Health and Social Work	Other Community, Social and Personal Services	Education	Real Estate, Land and Development Activities	Extra-Territorial Organisations and Bodies	Hotels and Restaurants	Financial Intermediation (Excl. Monetary Financial Institutions)	Water Supply, Sewerage, Waste Management and Remediation Activitie
Number of production processes in sector	55	24	10	12	10	12	5	6	3	3	1	1	2	3	3	1
Number of production processes with high or very high impacts	11	11	10	10	10	10	9	9	4	3	3	3	3	2	1	0
Water use	67%	63%	50%	67%	60%	42%	60%	50%	33%	33%	100%	0%	50%	0%	0%	0%
GHG emissions	56%	63%	80%	58%	40%	58%	80%	17%	33%	0%	0%	100%	0%	33%	33%	0%
Water pollutants	40%	42%	50%	42%	50%	42%	0%	67%	33%	33%	100%	0%	50%	33%	0%	0%
Terrestrial ecosystem use	35%	63%	40%	50%	80%	8%	60%	17%	0%	0%	0%	100%	0%	0%	0%	0%
Soil pollutants	38%	38%	50%	33%	40%	42%	20%	50%	33%	33%	100%	0%	50%	0%	0%	0%
Solid waste	27%	38%	30%	25%	0%	17%	40%	17%	0%	0%	0%	100%	0%	0%	0%	0%
Non-GHG air pollutants	29%	29%	40%	25%	10%	17%	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Disturbances	15%	29%	60%	25%	10%	25%	40%	33%	0%	0%	0%	0%	0%	0%	0%	0%
Freshwater ecosystem use	13%	38%	30%	33%	50%	8%	40%	17%	0%	0%	0%	0%	0%	0%	0%	0%
Marine ecosystem use	7%	21%	30%	17%	30%	17%	20%	17%	0%	0%	0%	0%	0%	0%	0%	0%
Other resource use	4%	8%	0%	0%	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Note: this table above only includes high and very high impacts. i.e. it excludes medium to low impacts on ecosystem services

4.3 Approach to case studies

The preceding sections set out our approach to analysing exposure to nature-related risks and opportunities. However, exposure does not on its own give a measure of risk. Following the climate risk literature, risk can be expressed as an equation as follows:

Hazard x Exposure x Vulnerability = Risk

Relationship between Hazard, Exposure, Vulnerability and Risk.

Source: IPCC AR6

To explore these concepts in more detail, case studies on two subsectors were prepared to provide an example of how deeper, more granular analysis can be carried out. The case studies are presented in Section 5.

The CBI sub-sectors of 'Manufacture of food, beverages and tobacco products' and 'Property investment/development of commercial real estate'[9] were selected as they represent the sub-sectors that received the largest proportion of lending outside of the non-bank financial intermediation sector. Furthermore, the Manufacture of food, beverages and tobacco products is expected to have strong links to nature upstream, whereas the links to nature in the Property investment/development of commercial real estate sector are less obvious.

In the sections that follow, we provide definitions and explanations of the three key concepts that underpin the case studies (Hazard, Exposure, and Vulnerability) as well as the impact chain approach. The case studies that explore and operationalise these concepts for the two sub-sectors are presented in Section 5.

4.3.1 Hazard

Hazard is defined as the potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources (IPCC, AR6).

Following the TNFD definitions, acute risks refer to the occurrence of short term, specific events that change the state of nature, while chronic risks are gradual changes to the state of nature.

As much of the literature deals with climate hazards, we have developed a list of example nature-related hazards (Table 4) following the five top drivers of biodiversity loss globally (IPBES, 2019). It should be noted that the importance of the different drivers varies by region and by country.

Table 4 - Example nature-related hazards

Driver	Example hazards (non-exhaustive)	Type
Land and Sea Use Change	Land degradation	Chronic
	Desertification	Chronic
	Deforestation	Acute or Chronic
	Urbanisation	Chronic
	Coastal development	Chronic
	Extreme storms	Acute
Direct Exploitation	Overfishing	Chronic
Climate Change	Temperature Increase (heatwaves/ changing temperatures/wildfires)	Acute or Chronic
	Wind-related (storms, increased wind)	Acute or Chronic
	Water-related (flooding, drought)	Acute or Chronic
Pollution	Air	Acute or Chronic
	Water	Acute or Chronic
	Soil	Acute or Chronic
	Noise	Acute or Chronic
	Light	Acute or Chronic
	Thermal	Acute or Chronic
Invasive Alien Species	Invasive alien species	Chronic

9 Under the CBI sector classification, 'Property investment/development of commercial real estate' refers to the buying and/or developing of land zoned for commercial property. This includes: projects where in excess of 75 per cent of floorspace is commercial real estate; funds advanced to counterparties whose primary economic activity was not in real estate, land or development, but who are using the funds for this purpose; lending related to both green field and brown field commercial real estate sites (CBI, 2015).

4.3.2 Exposure

Exposure is defined as the presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural assets in places that could be adversely affected. ENCORE provides one measure of potential exposure, by providing a list of sectors that have high impacts and dependencies on nature.

In the case studies, we consider additional measures of exposure, including but not limited to:

- Volume of lending to the sector
- Economic importance of the sector, as measured by Net National Product
- Upstream sector impacts and dependencies.

Volume of lending to the sector

The volume of lending to a particular sector or sub-sector is one measure of the financial sector's level of exposure to the risks in that sector. As shown previously (see Section 4.2.1), after the Financial Intermediation sector, the Manufacturing sector receives the greatest proportion of lending, at 15%. Of that 15%, the largest proportion is lent to the sub-sector of 'Manufacture of food, beverages and tobacco products.'

Table 5 - Share of national lending to the Manufacturing sub-sectors

Manufacturing sub-sector	% of national lending
Manufacture of food, beverages and tobacco products	6.84%
Production, installation and repair of commercial machinery/equipment, not including computers	3.31%
Other manufacturing	1.74%
Wood, pulp, paper, paper products, printing and reproduction of recorded media	1.49%
Pharmaceutical products and preparations, medical and dental instruments and supplies	0.80%
Chemicals, rubber/plastic products, other non-metallic mineral products	0.50%
Computer, electronic and optical products	0.45%
Fabricated metal products, except machinery and equipment	0.15%

Table 6 - Share of national lending to the Real Estate sub-sectors

Real Estate sub-sector	% of national lending
Property investment/development of commercial real estate	5.46%
Property investment/development of residential real estate	2.07%
Property investment/development of mixed real estate	1.67%
Other real estate activities	0.50%
Investment in unzoned land	0.00%

Economic importance of the sector, as measured by Net National Product

Another measure of level of exposure is to account for the different sectors' importance to the Irish economy. Following the Economic and Social Research Institute's Understanding the Irish Economy special article (ESRI, 2023), this can be expressed through the National Net Product (NNP) measure. NNP is a measure for the economic wellbeing of a country. It captures the total value earned from all economic activities in a country, after factoring in depreciation. NNP is calculated differently for domestic and foreign Multinational Enterprises (MNEs). The contribution of domestic firms to NNP is equivalent to the Gross Value Added (GVA) after factoring in depreciation (i.e., net profits after factoring in depreciation). For foreign MNEs, NNP includes wages paid (wage bill) and the corporation tax paid by firms in the sector from their profits.

Table 7 - Structure of the Irish Economy. Share of Net National Product % in 2021.

Activity	Share of NNP
Public Sector	20%
Distribution, transport, restaurants and hotels	16%
Professional, admin etc.	15%
Manufacturing	13%
Real Estate	10%
Information & Communication	9%
Financial	8%
Construction	5%
Agriculture	2%
Arts, etc.	2%
Electricity, gas, and water	1%

Source ESRI[10]

Upstream sector impacts and dependencies

The third measure of level of exposure relates to how sector activities in Ireland relate to other products, services and countries. The EXIOBASE database can be used to demonstrate how sectors are connected to other products and other countries. EXIOBASE is a global, detailed Multi-regional Environmentally Extended Supply and Use / Input Output (MR EE SUT/IOT) database. The data are available from 1995 to 2022.

The EXIOBASE Use table shows the use of goods and services categorised by product and by type of use (Eurostat, 2010) and provides the intermediate consumption of a given region/sector that is then exported to other regions/ sectors in a given year, measured in current basic prices (EUR millions). The Use table for 2022 was used to demonstrate the links between the two case study sectors and products and services in other countries. The sectors used by EXIOBASE were mapped to the CBI sectors, as shown in Table XX.

The results of the EXIOBASE analysis are presented in Section 5.

CBI Code	CBI Sector	Exiobase Sector
2.1	Manufacture of food, beverages and tobacco products	Processing of meat cattle
		Processing of meat pigs
		Processing of meat poultry
		Production of meat products n.e.c
		Processing vegetable oils and fats
		Processing of dairy products
		Processed rice
		Sugar refining
		Processing of Food products n.e.c
		Manufacture of beverages
		Manufacture of fish products
		Manufacture of tobacco products (16)
11.2	Property investment / development of commercial real estate	Real Estate Activities (70)

n.e.c = not elsewhere classified

10 Source ESRI Understanding the Irish economy (esri.ie). Note that the total percentages add up to 101%. This original ESRI source provides no explanation for this.

4.3.3 Vulnerability

Vulnerability refers to the propensity or predisposition to be adversely affected by a particular hazard, and is a function of sensitivity and adaptive capacity, as set out below.

Vulnerability = Sensitivity – Adaptive Capacity

Sensitivity refers to the degree to which a system or species is affected, either adversely or beneficially, by climate variability or changes to the state of nature.

Meanwhile, adaptive capacity is defined as the capacity of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. Two important aspects of adaptive capacity are the ability to "shift in space" and/or "persist in place."

Table 8 Examples of climate risk factors and indicators

	Risk factor (example)	Indicator (example)
Hazard	Precipitation	Sum of rainfall over three consecutive months
Exposure	Location of smallholders (incidence)	Number of smallholders in a given area
Sensitivity	Crop type	Percentage of area cultivated with drought sensitive crops
Adaptive capacity	Capacity to switch to resilient crops	Percentage of income available for investment into new crop types

Source: ISO 14091

4.3.4 Impact chains

Impact chains serve to better understand, visualise, systemise and prioritise factors that drive risk in a given system. Following the guidance in ISO 14091 *Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment*, impact chains can serve as a starting point for a risk assessment and specify which hazards potentially cause direct and indirect environmental change impacts. The impact chains show a high-level approach for how nature-related risks may be analysed for different sectors. The impact chains can be used to, for example identify data requirements, assess data gaps, conduct further analysis and communicate analysis in a simple way. Sample impact chains were developed for the two subsectors and are presented in Section 5.

4.4 National Insurance Underwriting

The research question for this part of the study was:

What is the quantified potential impact of nature degradation on the Irish financial market based on insurance written in Ireland?

Data on National Insurance Underwriting was obtained from the Central Bank of Ireland's data repository on Solvency and Financial Condition Reports (SFCRs). All insurance and reinsurance undertakings are required to publicly disclose their SFCR under the EU Solvency II Regulation. The latest data available was for 2021. The figures are provided in Table 9.

Table 9 - Insurance premiums written in Ireland by category, 2021[11]

Category	Line of Business	Premium written (€bn)	Proportion of total
Life	Index-linked and unit-linked insurance	41.50	42.71%
Property & Casualty	Fire and other damage to property insurance	11.21	11.53%
Property & Casualty	General liability insurance	8.76	9.01%
Life	Life reinsurance	6.31	6.49%
Property & Casualty	Motor vehicle liability insurance	5.55	5.71%
Property & Casualty	Medical expense insurance	3.50	3.60%
Life	Other life insurance	3.44	3.54%
Property & Casualty	Marine, aviation and transport insurance	2.94	3.03%
Property & Casualty	Other motor insurance	2.73	2.81%
Property & Casualty	Insurance with profit participation	2.23	2.29%
Property & Casualty	Credit and suretyship insurance	1.73	1.78%
Property & Casualty	Property	1.72	1.77%
Health	Health reinsurance	1.61	1.66%
Property & Casualty	Casualty	1.29	1.33%
Health	Health insurance	1.27	1.30%
Property & Casualty	Income protection insurance	0.59	0.60%
Property & Casualty	Marine, aviation, transport	0.20	0.20%
Property & Casualty	Assistance	0.18	0.19%
Property & Casualty	Legal expenses insurance	0.17	0.17%
Property & Casualty	Workers compensation insurance	0.14	0.15%
Health	Health	0.10	0.10%
Grand Total		**97.17**	**100.00%**

11 Note: some categories appear twice, such as Marine, aviation and transport insurance and Marine, aviation, transport. One category refers to direct business while the other refers to reinsurance.

4.4.1 Approach to underwriting

A review of the literature and a series of interviews were carried out to determine an approach to assess nature-related risks and opportunities for the insurance sector. A summary of the principal publications reviewed and their key messages as relevant to this report is provided in Table 10 below. It is noted that several of the reports and studies relating to nature and insurance that were reviewed were published in the last six to nine months, potentially indicating an increased interest and focus on the topic of nature-related risks for insurance underwriting activities. It is also noted that certain studies on climate risks for the insurance sector were included, as climate- and nature-related risks are closely connected.

The central finding of the literature review and interviews is that the availability of robust methodologies for assessing and quantifying nature-related risks for the insurance sector is low. Critically, there is no publicly available and established methodology for connecting insurance underwriting activities (e.g. lines of business such as property insurance, motor insurance) with real-economy industry sectors (e.g. food manufacturing). This means that the ENCORE tool, which links industry sectors to impacts and dependencies on nature, could not be applied to underwriting in the same way as it was applied for the lending portfolios. This absence of a publicly available methodology was confirmed by multiple conversations with finance sector and insurance sector experts.

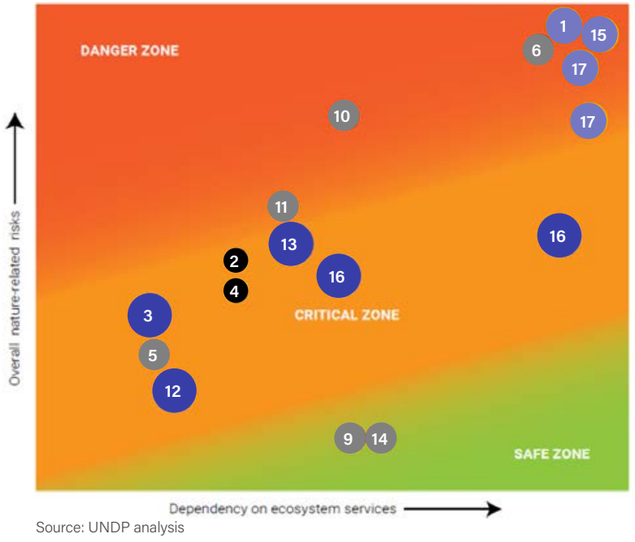
Given the lack of established approaches from the literature, it was not possible to quantify the exposure of Irish insurance premia to nature-related risks. Instead, a case study was developed based on emerging guidance for the assessment of nature-related risks in the insurance industry. The case study is presented in Section 5 results and analysis.

Table 10 - Review of recent grey literature on nature- and climate related risk and insurance underwriting

Publication	Key findings
Nature-Related Risks in the Global Insurance Sector. UNDP Sustainable Insurance Forum, November 2021	This is one of the only reports to link insurance lines of business to real economy sectors. The insurance premium corresponding to an individual sector was estimated based on McKinsey & Company's Global Insurance Pools database, publicly available insurance premium data from various market research firms and consultation with insurance industry experts. The author's estimate found that the total global Property and Casualty insurance premiums is distributed among 17 economic sectors, as illustrated by Figure 9 below The report also put forward a partial quantification of insurance premium at risk for Property & Casualty insurers – see Figure 10 below. In an interview with the author of the paper, it was noted that some insurers were ahead of others in their approach to nature-related risk assessment, with some having established internal models on nature-related risks. However, these models are not publicly available.
Staff paper on nature-related risks and impacts for insurance. European Insurance and Occupational Pensions Authority (EIOPA), March 2023	The EIOPA Staff paper discusses the transmission of nature-related risks into society and economy; the links between nature- and climate-related risks; and discusses approaches to nature-related risk assessments. It states that there are two main approaches for identifying and quantifying nature-related risks (assessing impacts and assessing dependencies) and notes that entities can combine data on economic sectors' dependency and impact on nature with data on exposure to these sectors through investments and liabilities. On the topic of linking economic sectors to nature, EIOPA refers to the SIF paper above but does not provide any further details on how insurers can make this link.
Biodiversity & Nature Related Risks for Actuaries: An Introduction. Institute and Faculty of Actuaries, June 2023	Among other areas, this paper discusses how general insurance liabilities are connected to biodiversity loss. The paper provides high-level guidance for insurers to identify how nature related risks could impact claims. Insurers may explore potential transmission channels across the underwriting book, which involves assessing policyholder dependencies on nature by activity or geographical location and exploring whether loss or degradation of the identified ecosystem services would give rise to a claim under the policy terms. The paper also recommends exploring interconnections between risk drivers, as nature-related risks interact with each other as well as climate-related risks.

Publication	Key findings
Insuring the climate transition: Enhancing the insurance industry's assessment of climate change futures. UN Environment Programme's Principles for Sustainable Insurance, 2022	This is the final report of a pilot project run by the Principles for Sustainable Insurance. The aim of the pilot was to contribute to the development of consistent and transparent analytical approaches to identify, assess and disclose climate change-related risks and opportunities in insurance underwriting portfolios in a forward-looking, scenario-based manner. The lessons learned and approaches to climate risk assessment put forward in the report can serve as a useful starting point in considering how to assess nature-related risks, although further work is needed to adapt climate approaches to the assessment of nature risks.
UN Environment Programme's Principles for Sustainable Insurance, 2022 WWF, September 2023	This WWF report differs from the others in that it does not focus on nature-related risks to insurers, but rather on the ways in which insurers enable certain business activities by underwriting them. In this way, insurance underwriting activities can have material positive and negative impacts on climate, nature and biodiversity. The focus here is on Property & Casualty insurance with Life & Health not in scope. The paper explores the incentives and / or unintended consequences created by insurance products, as well as addressing the short-term nature of most insurance contracts, with most insurers able to reprice annually.
Underwriting Our Planet: How Insurers Can Help Address the Crises in Climate and Biodiversity. UN Environment Programme's Principles for Sustainable Insurance Initiative, September 2023.	The paper outlines the role that insurers can play in supporting the goals of the Global Biodiversity Framework and provides insights from qualitative interviews and two workshops held with key experts from the insurance industry and wider financial community. The report notes that, to effectively integrate nature-related risks into risk management and underwriting frameworks, insurers must update their methodologies, models, and decision-making processes. They must enhance their understanding of the interdependencies between natural systems and insured assets, which involves collecting and analysing relevant data, developing relevant indicators and metrics, and developing risk assessment tools.

Figure 9 - Directional estimate of overall nature-related risks for economic sectors (UNDP, 2021)



Source: UNDP analysis

Sectors

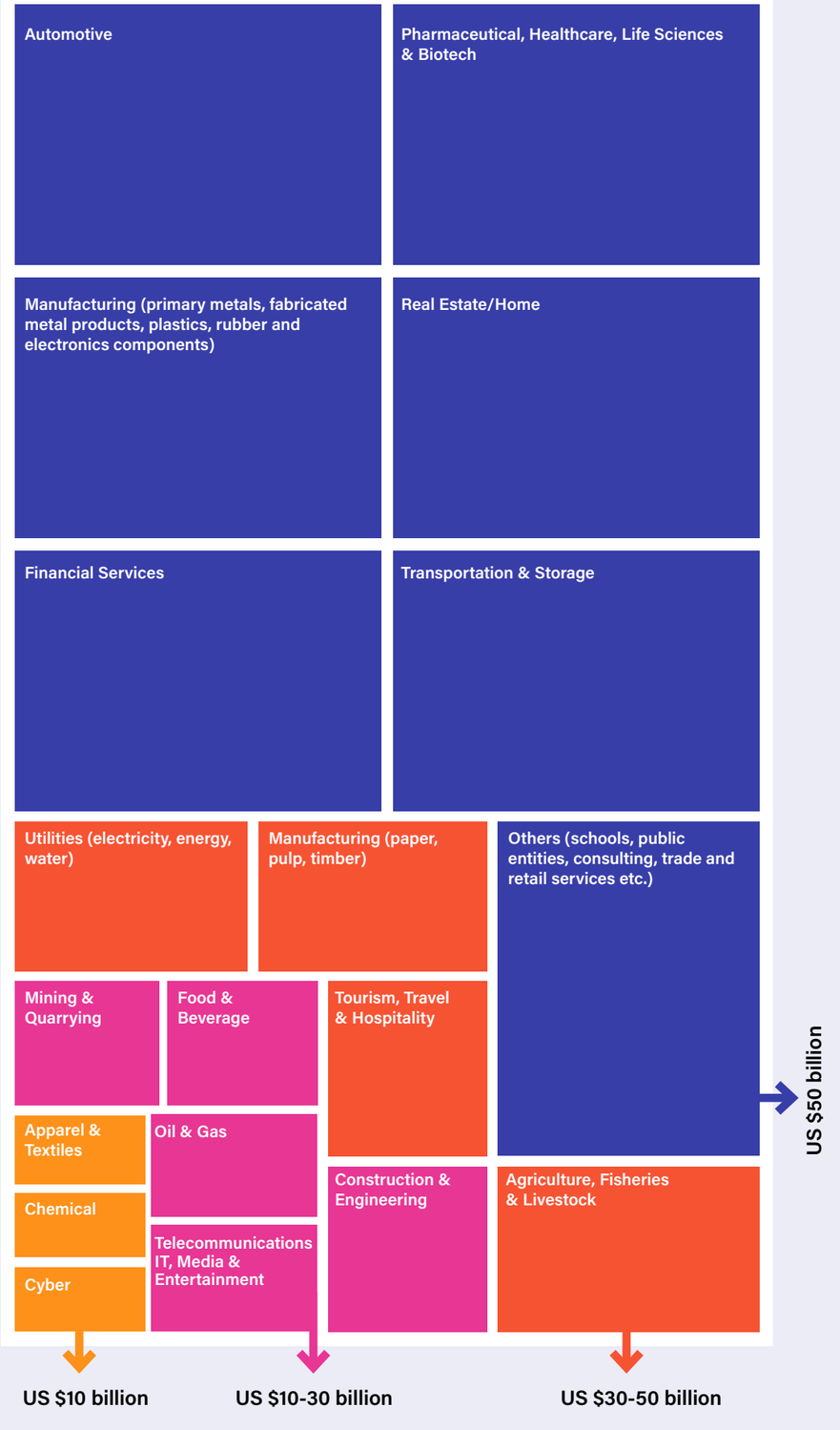
1. Agriculture, Fishery & Livestock 2 Apparel & Textiles
3. Automotive
4. Chemical
5. Construction & Engineering 6. Food & Beverage
7. Manufacturing (paper, pulp, timber)
8. Manufacturing (others; e.g. metals)
9. Media & Entertainment
10. Mining & Quarrying
11. Oil & Gas
12. Pharmaceutical, Healthcare, Life Sciences & Biotech
13. Real Estate
14. Telecommunications & IT
15. Tourism, Travel & Hospitality 16. Transportation & Storage
17. Utilities (electricity, energy, water)

Danger Zone: Where business operation will potentially be highly disrupted
Critical Zone: Where business operation will potentially be moderately disrupted
Safe Zone: Where business operation will likely continue as business-as-usual

Global property & Casualty Insurance Premium (2019)

- > US$50 Billion
- > US$30-50 Billion
- > US$10-30 Billion
- > US$10 Billion

Figure 10 - Distribution of global property and casualty insurance premium among economic or business sectors (UNDP analysis with McKinsey Global Insurance Pools data, 2021)



05

Results of Quantitative Analysis

In this section we present the key findings from our quantitative analysis on lending and insurance written in Ireland.

5.1 Key findings from analysis of national lending portfolios

By combining the lending data with the impact and dependency scores from ENCORE, it is determined that 58% (€56 billion) of Irish lending to non-financial corporations (NFCs) is exposed to sectors that are highly dependent on one or more ecosystem services (Figure 11) and 94% (€92 billion) is exposed to sectors that have a high impact on one or more nature impact areas (Figure 12).[12]

These results show that Ireland's financial sector has considerable exposure to sectors with high impacts and dependencies on nature.

Sectors with high dependency on nature may be more exposed to nature-related physical risks. As we continue to degrade and lose nature and the ecosystem services it provides, activities in these sectors could be delayed or disrupted, potentially affecting corporate profitability and performance and, in turn, the ability to repay loans.

Sectors with high impacts on nature may be more exposed to nature-related transition risks, such as the strengthening of policies and regulations targeting the conservation and restoration of nature. For example, if a corporate has a high impact on soil quality due to its activities in a given location, and regulation is introduced to increase protections on soil quality (e.g. the EU's proposed Soil Monitoring Law), the corporate's activities may be interrupted or even halted. This changes the operating environment for the corporate, and may increase the risk of default or potentially create stranded assets, such as corporate sites in locations that are converted to protected nature areas.

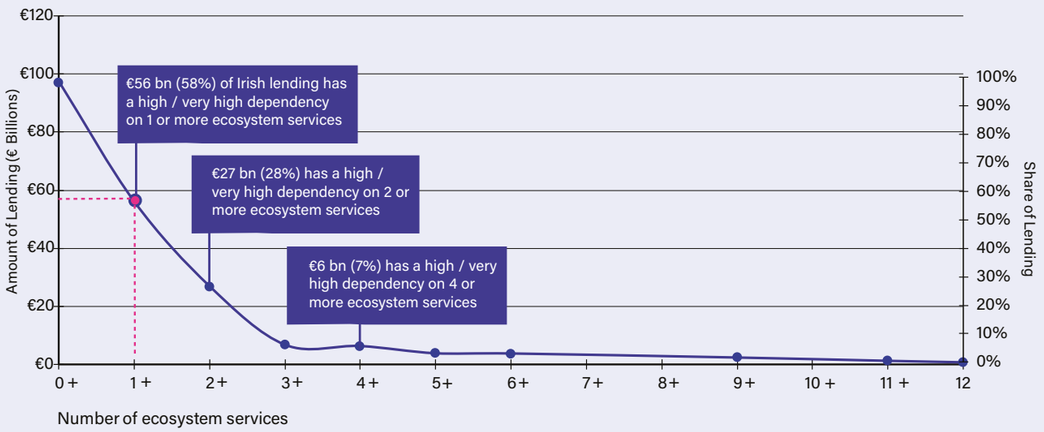
Through these transmission channels, the degradation of nature and regulatory efforts to halt this degradation may generate risks in the corporate sector which can spread to the financal system, potentially affecting financial stability and the performance of the economy.

58% of Irish lending (€56 billion) to non-financial corporations is exposed to economic sectors that are **highly dependent** on 1 or more ecosystem services.

94% of Irish lending (€92 billion) to non-financial corporations is exposed to economic sectors that have a **high impact** on 1 or more aspects of nature.

12 Note: These figures exclude lending to the Non-bank financial intermediation (NBFI) sector (see discussion above in Section 4.2.1). Figures including lending to NBFI are included for comparison purposes in Appendix 10.1.

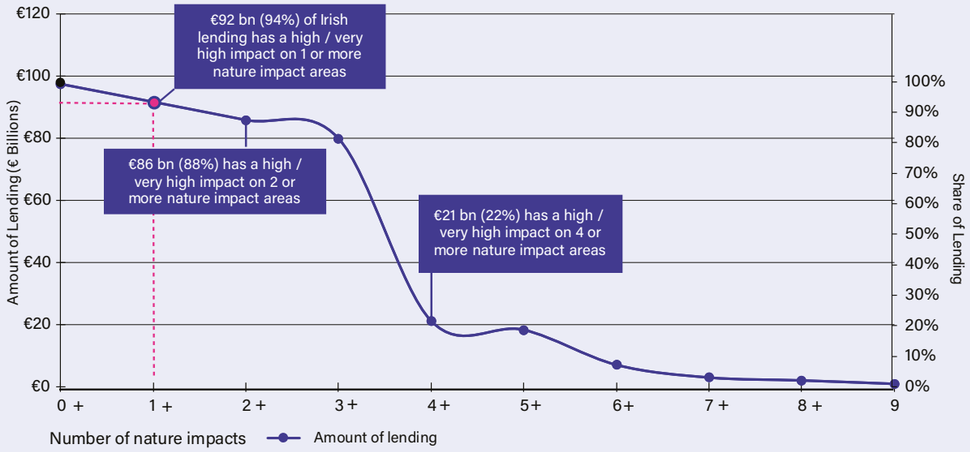
Figure 11 – Share of Irish lending with high or very high dependency on ecosystem services



Note: Data from March 2023. Figures exclude the non-bank financial intermediation sector

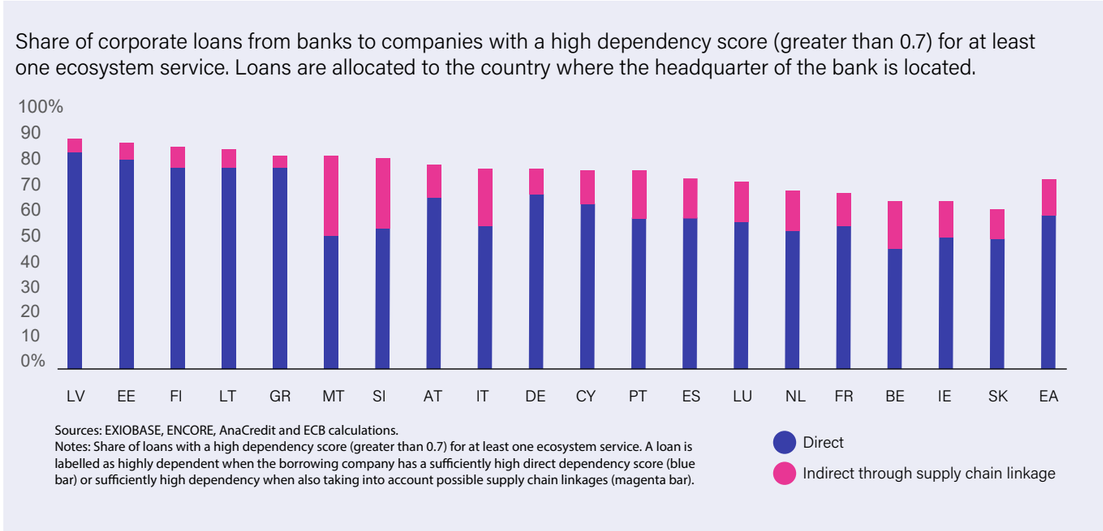
Note: The full list of ecosystem services is provided on page 31 of this report. They are: Animal-based energy; Fibres and other materials; Genetic materials; Ground water; Surface water; Maintain nursery habitats; Pollination; Soil quality; Ventilation; Water flow maintenance; Water quality; Bio-remediation; Dilution by atmosphere and ecosystems; Filtration; Mediation of sensory impacts; Buffering and attenuation of mass flows; Climate regulation; Disease control; Flood and storm protection; Mass stabilisation and erosion control; and Pest control.

Figure 12 – Share of Irish lending vs number of high or very high impact on nature impact areas. Excluding non-bank financial intermediation (data from March 2023)



It is important to note that our calculations assess direct impacts and dependencies via the ENCORE tool. We would expect to see even greater lending exposures if the indirect impacts and dependencies of sectors were included. For example, the ECB's research (Boldrini et al, 2023) found an additional 14-15% exposure for Ireland's loans to NFCs with high dependency on nature - see ECB's chart below in figure 13. In future studies, the EXIOBASE database discussed in Section 4.2.2 may be used to complete this analysis.

Figure 13 - Dependency of euro area banks on ecosystem services



Source: ECB, Boldrini et al, 2023

Note: The full list of nature impact areas is provided on page 32 of this report. They are: Disturbances; Freshwater ecosystem use; GHG emissions; Marine ecosystem use; Non-GHG air pollutants; Other resource use; Soil pollutants; Solid waste; Terrestrial ecosystem use; Water pollutants; Water use.

We also note the slight difference between the ECB findings on dependencies for Ireland and the findings in this report. The ECB report found that, of the loans from euro area banks to Irish-headquartered NFCs, approximately 52% went to NFCs with a high direct dependency on at least one ecosystem service (blue bar in Figure 13 above). Meanwhile, our finding is that 58% of Irish lending (excluding lending to the **non-bank** Financial Intermediation sector) is highly dependent on one or more ecosystem service.

Our analysis suggests that the reason for the difference is the higher granularity of the AnaCredit dataset used by ECB. This dataset provides disaggregated information on each of the companies receiving loans, including their sector and location of operation. This enables more precise analysis of the corporate, its production processes and, using ENCORE, potential dependencies on nature.

The CBI dataset used in this report provides information on lending to subsectors such as Manufacture of Food, Beverage and Tobacco products but does not include information on individual companies. This means that due to their being part of a given subsector, some companies may be counted as having a high dependency on a certain ecosystem service even though they do not engage in the relevant production process. This lower granularity could account for the higher dependency finding in this report

5.2 Analysing nature risk - Case studies

In Figures 14 and 15, we have used the impact chain framework to operationalise the concepts explained in Section 4 on Hazard, Exposure, Sensitivity and Adaptive Capacity.

The impact chains show a high-level approach for how nature-related risks may be analysed for different sectors. The type of analysis conducted will depend on who is conducting the analysis and what questions they are seeking to answer. For example, this study focuses on nature-related risks to the financial system as a whole, but an individual bank or investor, or a company itself may approach the assessment differently. Future analyses could add qualitative or quantitative scores or indicators to each area to further enhance the insights.

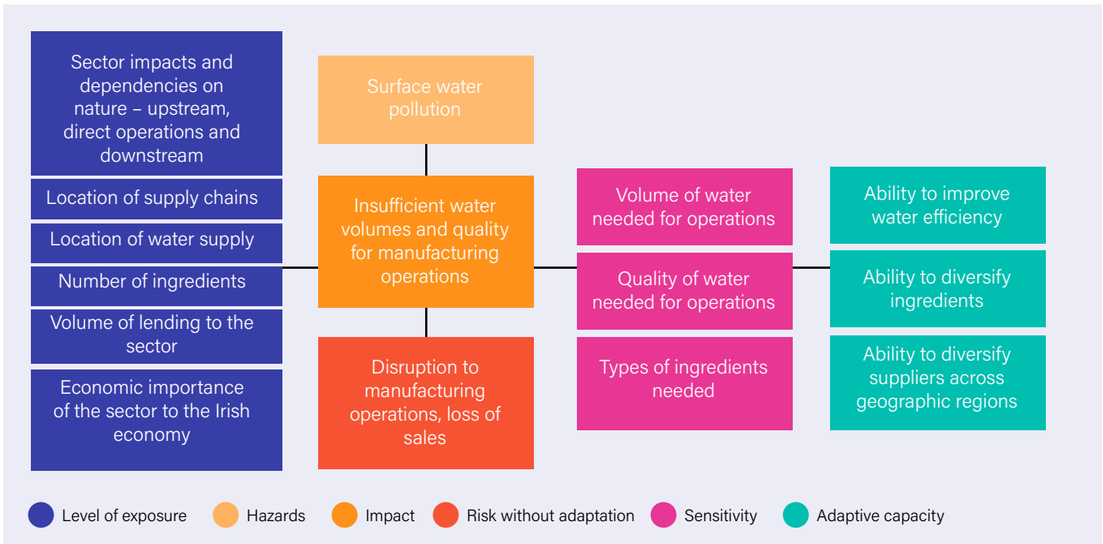
5.2.1 Food, Beverage and Tobacco Manufacturing

Considering the impact chain for the Food, Beverage and Tobacco Manufacturing sector first, we consider the hazard of water pollution and the potential impact that insufficient water volumes and quality could have on manufacturing operations. The potential risk is a disruption to manufacturing operations and a loss of sales, potentially affecting the sector's creditworthiness and ability to repay loans.

The level of exposure can be assessed by considering sector impacts and dependencies on nature throughout the value chain, using tools such as ENCORE and EXIOBASE, as well as metrics such as location of supply chains, volume of lending to the sector and economic importance of the sector to the Irish economy. The sector's sensitivity to this hazard is a function of volume and quality of water needed for manufacturing operations, as well as the ingredients required.

The sector may be able to adapt to the risk and take measures to improve water efficiency and diversify its suppliers and ingredients. This adaptive capacity would reduce the overall risk.

Figure 14 - Impact chain for Manufacture of food, beverage and tobacco products



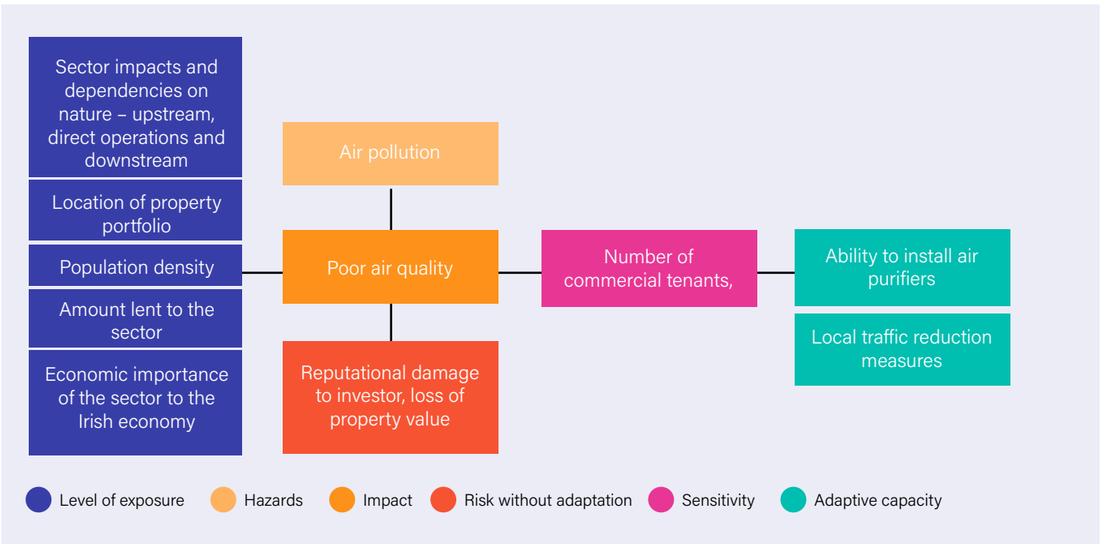
5.2.2 Property investment / commercial real estate sector

In the impact chain for the Property investment/ commercial real estate sector, we consider the hazard of air pollution on commercial real estate sites, and the potential impact that this could have on commercial tenants and people living locally. The potential risk is reputational damage to the investor and a loss of property value.

The level of exposure is again informed by sector impacts and dependencies on nature throughout the value chain, as well as where the property portfolio is located and the amount of people that could be affected by the issue.

The sector's sensitivity to this hazard is a function of the number of commercial tenants and the nearby population. The sector may have adaptive capacity and could reduce the gross risk by installing air purifiers and advocating for traffic calming measures locally to reduce air pollution. This could represent a reputational risk for the company if tenants complain, or potentially a loss in property value if the site is known as an air pollution hotspot. In turn, the financial sector could be affected by these potential changes in the company's profitability.

Figure 15 - Impact chain for Property investment/commercial real estate



5.3 Upstream impacts and dependencies

In addition to the development of the impact chains, we explored upstream impacts and dependencies using the EXIOBASE database.

The EXIOBASE Use tables for 2022 were employed to determine which upstream countries and products and services were linked to the two sectors under review. The top five upstream countries and the top five upstream products and services were identified. These are presented in Figures 16 and 17 below. Interestingly, in both cases the top countries affected are identical: Ireland, the US, the UK, Netherlands and Germany.

The top products and services affected naturally vary by sector. For example, the Manufacture of food, beverage and tobacco products in Ireland is closely linked to Cattle and Food products in Ireland, as well as Food products in the UK. Meanwhile, Property investment/development of commercial real estate activities in Ireland are linked to Financial Intermediation services in the US, the UK and Germany. Making the link between sector activities and the locations in which they take place is a critical component of the analysis of nature-related impacts and dependencies.

EXIOBASE can also be used to estimate various impacts on nature and biodiversity. Modelled values are provided per country and activity for a range of environmental impacts, including the Potentially Disappeared Fraction (PDF) of species metric, water withdrawal and consumption and the extent of land use for crop, forest, pasture. The modelled values for these impacts require interpretation and validation, and are therefore not presented here. However, it is recommended that these elements be explored in future analyses.

Figure 16 - Upstream links: Manufacture of food, beverage and tobacco products

Top countries upstream

Manufacture of food, beverage and tobacco products

	Ireland	United States	UK	Netherlands	Germany
Top products/services upstream	▪ Cattle ▪ Wholesale trade and commission trade services, except of motor vehicles and motorcycles ▪ Food products ▪ Air transport services ▪ Products of meat cattle	▪ Other business services ▪ Wholesale trade and commission trade services, except of motor vehicles and motorcycles ▪ Chemicals ▪ Rubber and plastic products ▪ Food products	▪ Food products ▪ Rubber and plastic products ▪ Other business services ▪ Paper and paper products ▪ Fish products	▪ Other business services ▪ Wholesale trade and commission trade services, except of motor vehicles and motorcycles ▪ Food products ▪ Rubber and plastic products ▪ Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods	▪ Food products ▪ Wholesale trade and commission trade services, except of motor vehicles and motorcycles ▪ Other business services ▪ Chemicals ▪ Rubber and plastic products

Figure 17 - Upstream dependencies in the Property investment/commercial real estate

Top countries upstream

Commercial Real Estate

	Ireland	United States	UK	Netherlands	Germany
Top products/services upstream	▪ Financial intermediation services, except insurance and pension funding services ▪ Public administration and defence services; compulsory social security services ▪ Other business services ▪ Post and telecommunication services ▪ Printed matter and recorded media	▪ Financial intermediation services, except insurance and pension funding services ▪ Other business services ▪ Real estate services ▪ Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods ▪ Chemicals	▪ Financial intermediation services, except insurance and pension funding services ▪ Real estate services ▪ Other business services ▪ Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods ▪ Electricity by gas	▪ Other business services ▪ Real estate services ▪ Financial intermediation services, except insurance and pension funding services ▪ Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods ▪ Sale, maintenance, repair of motor vehicles, motor vehicles parts, motorcycles, motor cycles parts and accessories	▪ Financial intermediation services, except insurance and pension funding services ▪ Real estate services ▪ Other business services ▪ Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods ▪ Chemicals

5.4 Key findings from analysis of insurance written in Ireland

As discussed in Section 4, our research found that there was no publicly available, robust methodology to link insurance underwriting lines of business to economic sectors and then to impacts and dependencies on nature. We expect that some large insurers and re-insurers have developed in-house methodologies and analysis, but these are not currently available to the public.

In light of this gap, we have developed a case study using the impact chain approach, with the intention of highlighting the potential links between insurance written in Ireland and loss of nature and biodiversity. We follow the impact chain or impact pathway approach as set out in ISO 14091 standard 'Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment' and in the Principles for Responsible Insurance paper 'Insuring the climate transition: Enhancing the insurance industry's assessment of climate change futures.' Note that the case study focuses on risks to the insurer as a result of nature degradation. It does not address potential impacts on nature enabled by insurance underwriting activities (see the Underwriting Our Planet, WWF 2023 paper discussed in the summary of the literature review above).

Figure 18 - Impact pathway framework for climate risk for insurers (PSI, 2020).

Risk	Sector impact	Business line impact	Metrics impact	Strategic impacts
Change of risk e.g. for PHY: based on hazard, vulnera- bility and exposure, changing risk profile of typhoons/ hurricanes e.g. for TRA: changing market, technology and regulations	**Economic impact on the sector because of risk** e.g. for PHY: severity of damage to property e.g. for TRA: CO2 pricing or shift in share of renewables/ fossil fuels	**Impact on the line of business and the resulting business impact** e.g. impact on the amount or frequency of claims, AAL, AEP	**Potential change in key insurance metrics** e.g. loss ratio, premium profitability, sum insured	**Impact on strategic decisions to be made** e.g. insurability for products, demand

Figure 18 – PHY = Physical risk, TRA = Transition risk

5.4.1 Case study – Flood insurance

'Fire and other property insurance' is the second largest category of underwriting in Ireland with €11.2 billion in premiums written. Fire and other property insurance covers a range of hazards or perils including fire, explosions, storms and flooding. In this case study, we focus on flood risk, specifically the hazard of fluvial (river) flooding, a risk which is of increasing relevance to Ireland.

In Figure 19, the impact chain proposes that the level or size of the risk to the business from fluvial flooding is informed by the services that nature provides, or ecosystem services. In other words, ecosystem services such as water flow maintenance and flood and storm protection will contribute to making flooding more or less severe. The ability of nature to provide these ecosystem services is informed by, among other things, ecosystem extent and ecosystem condition.

We take the example of an Irish town (e.g. Midleton in County Cork or Enniscorthy in County Wexford) that is prone to fluvial flooding. The scientific data tell us that climate change presents a risk of increased frequency and severity of storm and rainfall events. For example, acute weather events that may previously have occurred once every five to ten years are now more likely to occur with greater frequency and severity within this same period. Insurers can factor these climate-related risks into their models to take account of potential increases in insurance claims from businesses and residents in these flood-prone towns.

In our example, we propose that the risks to insurers from these fluvial flooding events may also be influenced by the services nature provides, or ecosystem services. Nature's ability to provide these ecosystem services is influenced by the extent and condition of ecosystems.

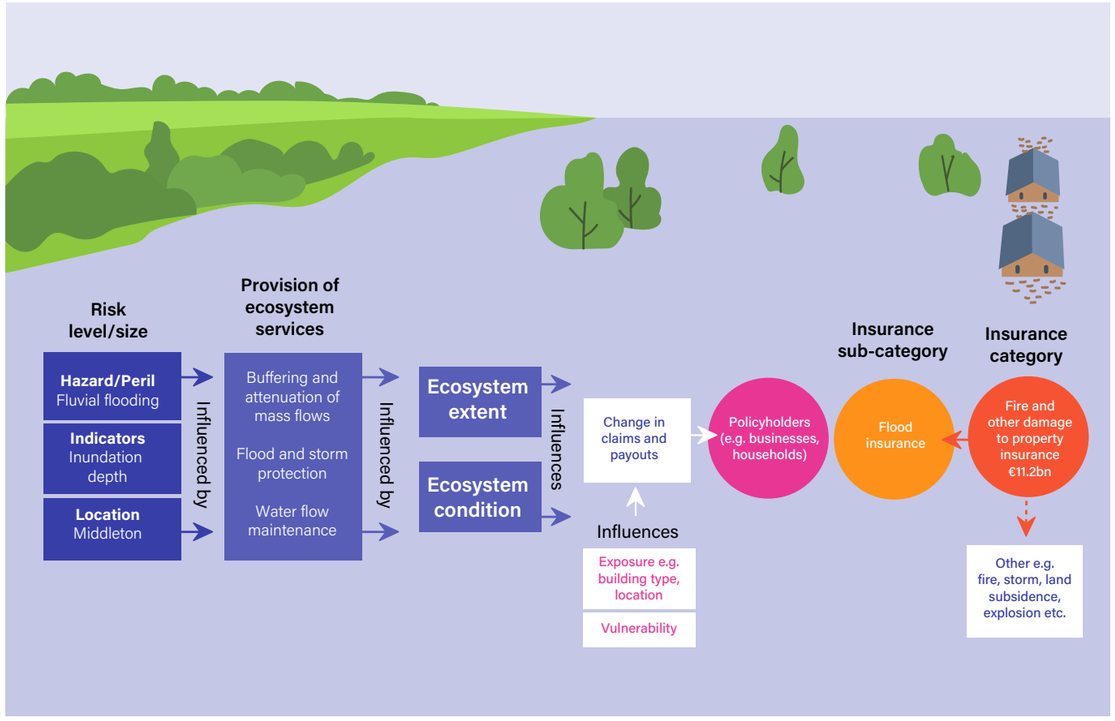
For example, nature's ability to provide flood and storm protection services may depend on the extent of vegetation cover and the condition of forest ecosystems upstream. If vegetation has been lost, or ecosystems upstream are in poor condition, the absorption and storage of rainfall may be adversely affected, meaning greater volumes of water entering the river at speed. If the riverbank also lacks natural features to slow water flow, then the impact of flooding downstream could be increased and potentially more severe. In turn, there could be a risk to insurers of increased claims from insured properties and businesses affected.

Conversely, if ecosystems in the upstream river catchment have sufficient extent and are in good condition, then rainfall may be more easily absorbed and the speed and quantity of water entering the river may be lower. This could lessen the impact of flooding downstream and reduce the number of claims on flood insurance policies.

This is a highly simplified impact chain linking nature-related risks to one line of business of insurance underwriting. Organisations with access to data should be able to add further layers of detail to the approach. The type of analysis conducted will depend on who is conducting the analysis and the questions they are seeking to answer.

The case study also highlights the need to assess the interlinkages between climate- and nature-related risks. This area requires further research and analysis, and public and private sector collaboration to understand and quantify these risks, and potential opportunities arising for new investments in nature-based solutions and infrastructure or new insurance products and services.

Figure 19 - Impact chain – Flood insurance



5.5 Implications for Irish financial sector

5.5.1 Lending

In line with the findings of the DNB, Banque de France and the ECB, our quantitative analysis shows a clear link between bank lending in Ireland to economic sectors with high or very high dependency on one or more ecosystem services.

The 'high or very high dependency to one or more ecosystem services' criterion is used to allow for comparability with these and other central bank studies. At face value, dependency on one or more ecosystem service may not seem like a major issue for financial stability. However, this finding must be contextualised: nature in Ireland and globally is already severely degraded. According to the Stockholm Resilience Institute, six of nine planetary boundaries including one on biodiversity, have been breached (Stockholm Resilience Centre, 2023). Moreover, we know that the loss of nature is inextricably linked to climate change and vice versa. We may be approaching ecological tipping points which are not well understood and almost impossible to predict.

These issues combined with the global nature of the financial system, the complex web of corporate supply chains, and the impacts of geopolitical or economic disruptions could mean that failure or loss in one part of the system could have severe impacts in another. Thus, a shock to or loss of one ecosystem service that an economic sector is highly dependent on could potentially have far-reaching consequences. Furthermore, sectors that have high dependencies on multiple ecosystems services have greater exposure to such risks, which could in turn be transmitted to the financial system and economy.

> **"The loss of ecosystem services may have far-reaching consequences for the economy, including through the amplified effects of close interaction between biodiversity loss and climate change. Recognition of nature degradation and related biodiversity loss as a potential source of economic and financial risks is only a first step in the development of a response strategy to maintain financial and price stability. For capital markets to better consider the risks stemming from nature loss and limit their impact, gaps must be filled in disclosure and quantitative risk modelling frameworks."**
> (ECB, Boldrini et al, 2023)

As the ECB highlights, recognition of the risk to the economy and the financial sector is only one part of the challenge. Central banks and supervisors therefore need to understand how vulnerable the economy and the financial system are to nature degradation. Following the NGFS conceptual framework discussed in Section 3, they will need to map potential hotspots, interdependencies and risks of tipping points.

Further work is required to better understand the impacts of economic sectors on nature, for example by measuring impact areas such as water use or biodiversity footprints. Sectors with the highest impacts on nature may be exposed to reputational and transition risks, as regulatory regimes and consumer preferences change in light of increasingly visible nature degradation. For example, governments may begin to limit access to or trading of raw materials and soft commodities or introduce tariffs on particular products and services.

The knock-on impacts to Irish businesses and financial institutions from loss of nature and ecosystem services can come from within Ireland, but also upstream from the many countries we trade with and rely on.

> **"From a macroeconomic perspective, these risks could hamper the real economy via effects on GDP, inflation, unemployment and/or long-term interest rates in response to changing policies or to physical climate shocks. From a financial stability perspective, the double materiality of nature-related risks – similarly to climate-related risks – emphasises the need to account not only for the exposures of financial institutions to those risks, but also to evaluate their contribution to them. Looking at the former, financial institutions can incur nature-related losses due to physical risks as well as transition risks driven by policy implementation, technological developments, market dynamics and reputational issues."**
> (Boldrini et al, 2023).

These areas require further research and quantification in Ireland, and the development of strategies to mitigate risks. The research and findings in this report may be seen as a first step towards this goal.

5.5.2 Insurance underwriting

The absence of a publicly available and robust quantitative method to link insurance underwriting lines of business to economic sectors and on to ecosystem services presents a significant challenge for understanding the nature-related risks and opportunities for the sector in Ireland. There are methods and approaches that can be adapted from the climate risk literature, however significant gaps remain, and we recommend urgent and collaborative work to close them.

Nevertheless there are logical approaches that can help to draw the links between nature loss and insurance underwriting. The example of flood insurance and the simplified impact chain we present in this report can be used to qualitatively assess potential changes to insurance claims. Insurers can then consider potential mitigation strategies and opportunities for new products and services. In our example, we draw attention to the interlinkages and interdependencies between climate and nature related risks for a flood-prone town and posit that there are potentially a range of unquantified risks and opportunities that need addressing by the sector. The benefits of this analysis could extend far beyond the reduction or mitigation of risks to the sector, but could provide critical information that drives actions to restore ecosystems in upstream river catchments and provide long term benefits to people, nature and climate. In this way, improving our understanding of nature-related risks for insurance underwriting could open a range of possibilities and co-benefits.

> **"Both physical and transition risks stemming from climate change and nature degradation are strongly correlated. This means that interdependencies and reinforcing mechanisms may exist and there is therefore a risk of drastically underestimating climate and nature risk when they are seen in isolation"**
> **European Central Bank**
> (Ceglar et. al, 2023)

Although it is beyond the scope of this report, we acknowledge that the insurance sector also has a critical role in reducing potential impacts on nature through their underwriting activities.

> **"What insurance companies choose to insure or not to insure matters, as they act as important enablers of economic activity. To act as catalysts in the green, fast and fair transition, insurance companies should therefore think strategically, and consider which economic activities they wish to enable and which they plan to phase out."**
> (WWF, 2023)

As Ireland hosts one of the largest insurance services sectors in Europe, there is an opportunity for collaborative public and private sector efforts to close the methodological gaps for underwriting that we have identified and to position Ireland as a leading centre supporting nature positive insurance.

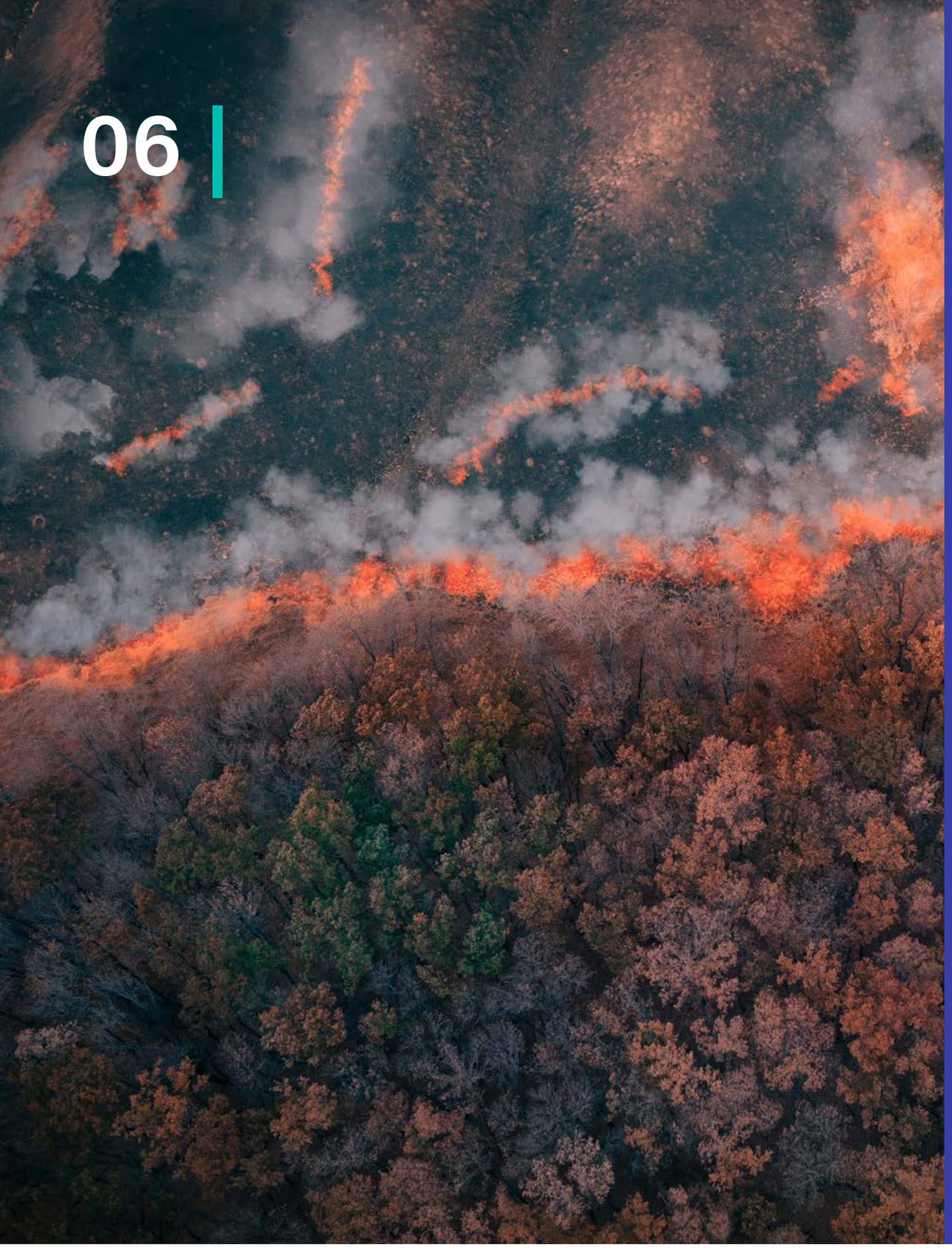
5.5.3 Wider financial sector and economy

Our analysis of nature-related risks to lending and insurance underwriting in Ireland points to a number of areas that require further study and investigation. This will undoubtedly require effort and collaboration across all parts of the financial services sector. As discussed in sections 2 and 3, Ireland has strong foundations to build on with clear national and EU regulatory signals, measurable climate and biodiversity action plans and targets to meet and indications of strong public support from the Citizens' Assembly on Biodiversity Loss. There are challenges to overcome but urgent and ambitious action to develop a net zero, nature positive aligned financial sector and economy can deliver immense benefits for Ireland in the long term.

5.6 Limitations

Extensive efforts have been made to ensure the robustness and credibility of the findings and analysis in this report. However, it is important to note a number of limitations to our research and findings:

- Our quantitative analysis was limited to publicly available data which is only a small portion of the actual data that is reported and collected. For example, it is expected that the Central Bank of Ireland, national lending institutions and insurers have greater access to more granular data which could support more detailed studies in the future.
- Our analysis of lending covers Irish credit institutions and the Irish-resident and non-Irish resident corporates to which they lend. However, the ENCORE tool only deals with direct impacts and dependencies on ecosystem services. For example, the tool captures the impacts the real estate sector may have through land use for buildings, but not the upstream impacts such as the sourcing of timber, concrete and steel. Through our EXIOBASE analysis, we have attempted to demonstrate how this further analysis on supply chain impacts and dependencies can be conducted and it is recommended that such analyses be further developed to provide a fuller picture of exposure to nature-related risks. It is important that further geospatial analysis is done to highlight the differences between, for example, companies in the Irish food and beverage sector versus companies in this sector in other countries.



06

Scenario Analysis

What is nature-related scenario analysis?

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) defines nature-related scenarios as representations of possible futures for one or more components of a system and for drivers of change in nature and nature's benefits, including alternative policy or management options[13] (IPBES, 2016).

The TNFD (2023) describes scenarios as a "set of plausible descriptions or narratives about how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces and critical uncertainties. They are used to provide a view of the implications of developments external to the organisation and inform actions by the organisation.

[Scenarios] are intended to challenge thinking about what the future might be like and how an organisation might respond under circumstances different from those it faces today. The emphasis is on identifying several plausible views of the future, not predicting or forecasting forward from today's reality, or describing the world in which the organisation hopes it might be operating."

6.1 Context

In the face of the twin crises of climate change and loss of nature, scenario analysis can play an important role in assessing a range of potential futures and making decisions on appropriate courses of action. Climate scenarios and integrated assessment models[14] (IAMS) have become increasingly sophisticated and detailed and are widely used by financial institutions who need to quantify and manage a growing range of environmentally related physical, transition and litigation risks. Although scenarios cannot provide predictions of the future and are underpinned by a range of assumptions, they do offer a useful and effective tool for exploring, discussing and planning decisions around a range of different pathways that could play out for an entity, a sector or an economy.

It's important to note that scenarios are developed with different objectives and use cases in mind. IPBES (Ferrier et al, 2016), identified three prominent groups of scenarios that are in use around the world – see figure 20.

1 **Exploratory scenarios** examine a range of plausible futures based on the potential trajectories of direct and/or indirect drivers of biodiversity loss.

2 **Intervention scenarios** are used to evaluate policy or management options. Intervention scenarios are divided between **target-seeking scenarios and policy-screening scenarios.**

   a) Target-seeking scenarios identify one or more objectives and then determine different pathways to achieve that outcome.

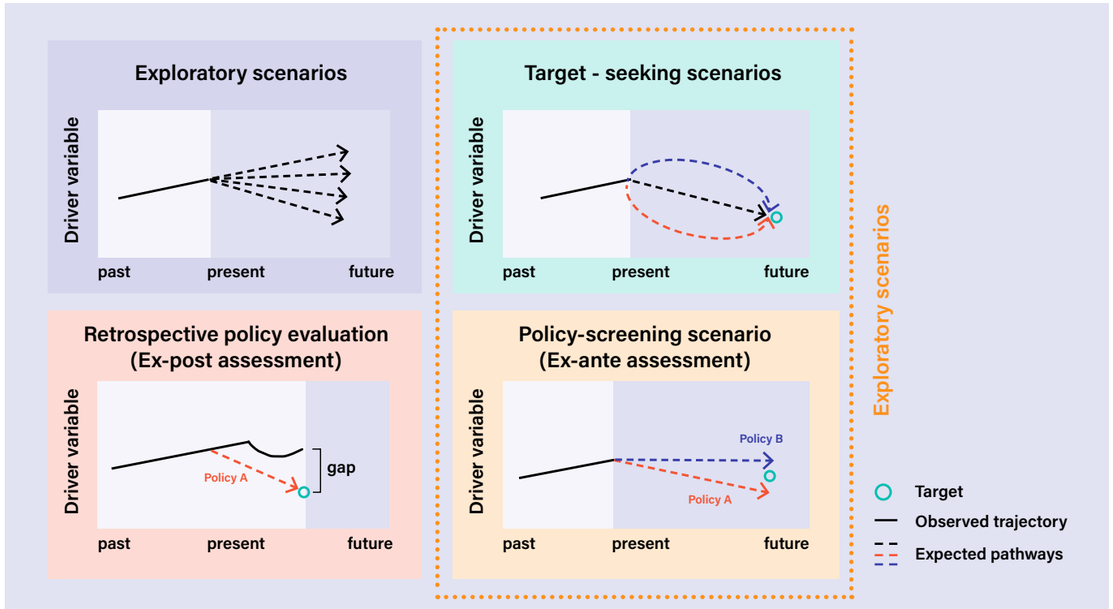
   b) Policy-screening scenarios allow for before the event assessments to predict the effects of different interventions on environmental outcomes.

3 **Retrospective policy evaluation** scenarios are used for post event evaluations, i.e., current assessments of past efforts to achieve policy objectives across all stages of the policy cycle and decision-making context.

13 The methodological assessment report on Scenarios and Models of Biodiversity and Ecosystem Services www.files.ipbes.net (IPBES, 2016)

14 Integrated Assessment Models (IAM) aim to "provide policy-relevant insights into global environmental change and sustainable development issues by providing a quantitative description of key processes in the human and earth systems and their interactions. The modelling is integrated, i.e. it uses information from many scientific disciplines and describes both the human and earth system. The term assessment refers to focus on generating useful information for decision-making, even in case of large uncertainties" UNFCCC www.unfccc.int.

Figure 20 - The main types of scenarios that can be developed regarding the purpose of developers and users (adapted from Ferrier et al., 2016)



Source - Global biodiversity scenarios: what do they tell us for Biodiversity-Related Financial Risks?

Nature-related scenarios lag behind climate scenarios in terms of detailed modelling and geographic scope and are more limited in their specificity and utility. Most available nature scenarios are largely or entirely narrative based and therefore have a more limited uses when it comes to making business or policy decisions. Climate scenarios can generally fit more normative approach (i.e. target seeking), back casting from a future target state (1.5C, Net Zero) to understand the required pathway to achieve that target. On the other hand, nature is much more location and geographic specific and in the absence of a globally agreed equivalent for 1.5C, nature-related scenario analysis usually requires an exploratory scenarios approach, which describes critical uncertainties and sets out a range of plausible futures (TNFD, 2023).

> **"Nature is place-based and unique. The loss of a hectare of rainforest in the Amazon is not interchangeable with the loss of a hectare of wetland in Africa or threatened native species in Australia. While globally agreed goals and targets for nature now exist in the GBF (Global Biodiversity Framework), there are multiple normative goals and targets, not one."**
> TNFD 2023

This absence of quantitative or normative nature-related scenarios is supported by two AFD Research Papers published in December 2022 (Maurin et al, 2022 A,B). The authors reviewed the literature and available scenarios through the lens of financial risks and socio-economic impacts and concluded that:

> **"...there are [currently] no comprehensive scenarios designed to assess the resilience of financial systems to specific physical or transition hazards or shocks related to biodiversity, making difficult to conduct biodiversity-related financial stress tests. Indeed, biodiversity scenarios, in their current state, do not allow for visualizing the risks incurred by the financial system through its portfolio of assets."**

Nevertheless, the European Central Bank (Boldrini, et al, 2023) has attempted to calculate the impact of global biodiversity shocks to the Euro area financial sector under a range of scenarios. Building on the work of Schipper et al (2020), the ECB compute biodiversity shocks to the Euro area financial sector using mean species abundance (MSA), an indicator of biodiversity intactness, and a function of multiple anthropogenic pressures such as land use and climate change and development of infrastructure or pollution. The ECB explore MSA changes under three different scenarios[15] (below) of how future socio-economic development may affect biodiversity intactness by 2050.

The ECB use the following three scenarios in their analysis;

1. **Sustainability scenario** with a low level of climate change[16]. This scenario is based on the assumption of relatively low population and consumption growth due to less resource-intensive lifestyles, more resource-efficient technologies and increased regulation. This scenario is broadly aligned with a 1.5C pathway and is the most benign in terms of impacts on people and the environment.
2. **Regional rivalry scenario** with moderate levels of climate change, is characterised by high population growth, resource-intensive consumption, low agricultural productivity and limited regulation of land use change, leading to continued deforestation.
3. **Fossil-fuelled development scenario** with high levels of climate change, is characterised by low population growth, strong economic growth, a consumption-oriented and energy-intensive society, and highly intensive agricultural practices.

It is notable that the ECB's analysis finds that under the fossil fuelled development scenario, Ireland's financial sector could experience some of the highest losses in the Euro from nature loss when compared to the losses under the sustainability scenario. They don't offer a specific explanation as to why Ireland's financial losses could be higher than other Euro area jurisdictions, but it is worthy of further research and exploration.

6.2 TNFD Scenarios

In the absence of quantitative, sector- or regionally-specific nature-related scenarios for Ireland, it was decided that the TNFD's guidance (TNFD, 2023) on scenario analysis released in September 2023 could provide insights useful for this research and to help articulate the potential risks and opportunities for the country's financial sector.

Although TNFD's Version 1 guidance on scenario analysis is designed primarily for individual businesses, we used their scenarios to discuss future pathways for the whole financial sector in Ireland. Notwithstanding the limitations of this approach we used the TNFD's four scenarios to run a financial sector industry working session in September 2023.

The four TNFD scenarios are built around two critical uncertainties.

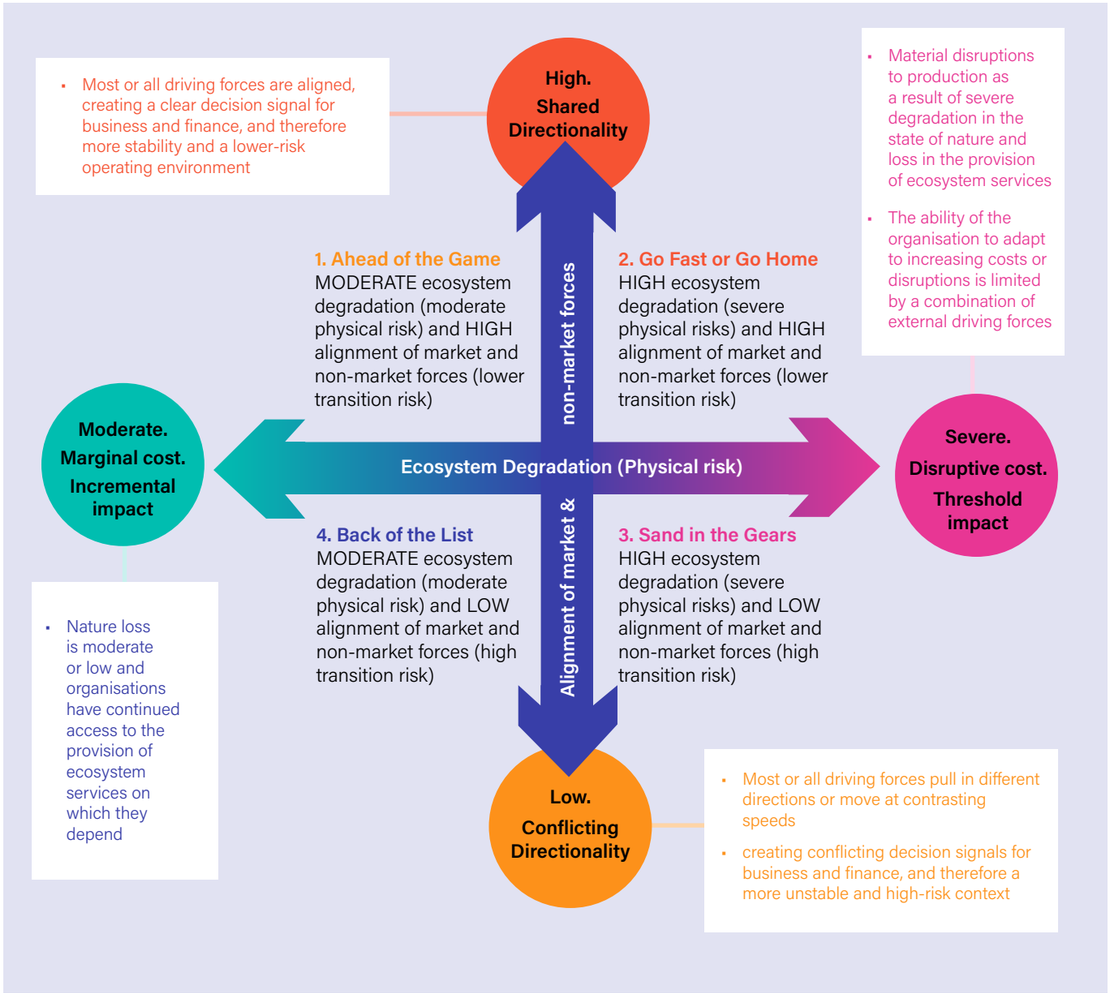
1. **Ecosystem service degradation** - physical risks associated with nature degradation, with climate change as a key driver.
2. Alignment of market and non-market driving forces – transition risks from nature loss and connected with actions to address climate change.

The TNFD Scenarios are summarised high level narratives below[17].

1. **Ahead of the game** - Positive progress on carbon and climate accelerates the turn toward a policy and macro-prudential environment for nature-positive outcomes, but actual experienced loss from nature degradation is low. There are opportunities for organisations to lead, but also increasing scepticism of overreach on nature, given the lack of proof points about impact and risk, and the lack of visible opportunities in carbon neutral growth.
2. **Go fast or go home** - In a nature-crisis environment where immediate and material business risks are broadly experienced, there will be threshold impacts that bolster the push for faster and more systematic action. Public attention and policy focus shifts toward nature as the master problem that subsumes carbon and climate. Macroeconomic disruption further compresses the time frame for action on nature, and investment in technologies for nature-positive outcomes skyrockets.
3. **Sand in the gears** - Environmental assets are deteriorating fast, but politics and finance are too noisy, slow and bogged down in complexity to drive broad and systematic action. Organisations are incentivised to stopgap their most severe and acute business disruptions, and externalise the costs and negative consequences where possible. There are perverse incentives to overuse environmental assets in the short term. The developed–developing economy divide on benefits from environmental assets widens.
4. **Back of the list** - Nature falls down the list of priorities. Meaningful progress on carbon reduction becomes an even stronger magnet for finance, tech and corporate action because it seems relatively tractable, and a moderately effective – if indirect – way to make progress on nature issues. Organisations turn towards a strategy of reducing short-term harm to environmental assets and pull away from long-term planning as there seems to be no way of winning.

15 MSA losses under different future scenarios are obtained from GLOBIO model calculations (Schipper et al., 2020; Appendix B).
16 Scenario 1 is underpinned by SSP1 x RCP2.6, Scenario 2 by SSP3 x RCP6.0 and scenario 3 by SSP5 x RCP8.5.
17 The full long-form narratives can be found in the Version 1 guidance released in September 2023 (TNFD, 2023)

Figure 21 - Summary of the four TNFD scenarios, adapted from TNFD (2023)



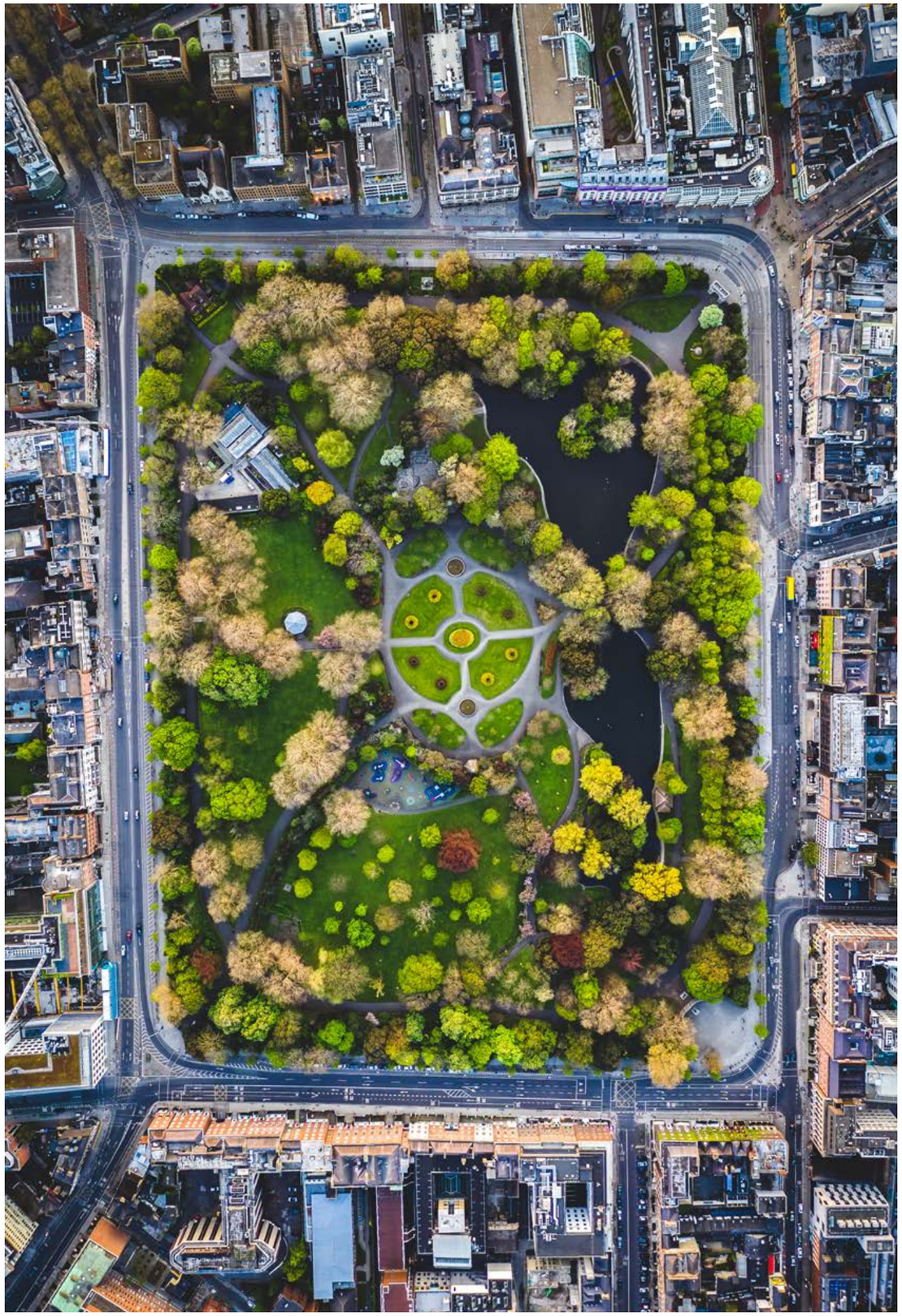
6.3 Our approach and findings

The four scenario narratives provided by the TNFD describe a different future state under each pathway based around the critical uncertainties. However, they are broadly sector and geographically neutral. Therefore, for the purposes of this research we needed to interpret the scenarios to make them more specific and relevant for Ireland and the financial services sector.

To do this we undertook a PESTLE (Political, Economic, Social, Technological, Legal, Environmental) analysis of each scenario to make them more specific to Irish context. We set the scenario year as 2030 and then identified example impacts, risks and opportunities (IROs) for each element of PESTLE and for each of the four scenarios.

6.4 Scenario Analysis - Industry working session

To test and build on our analysis we held a finance sector industry working session in Dublin on 28th September 2023 with representation from Irish financial services and experts in nature, biodiversity and ecology. Participants were introduced to the research project, given the context of nature-related risks to the finance sector and introduced to each of the four TNFD scenarios and the PESTLE analysis. The attendees were then divided into breakout groups with representatives from banking, insurance and nature and biodiversity in each group. The groups then went through the materials to discuss their scenario and to provide their perspectives on what each scenario could mean for Ireland's economy and different parts of the financial sector. Notes were taken in each group to capture additional insights, impacts, risks and opportunities.



6.4.1 Insights and findings from breakout groups

For the majority of the participants of the industry working session, this was the first time undertaking nature-related scenario analysis. It was clear that there are limitations in running the TNFD narrative based scenarios for a whole economic sector. However, there was general consensus across the groups that running scenario analysis in this way was an important and insightful exercise, especially combining perspectives from across financial services with nature and biodiversity experts. This cross fertilisation of ideas, insights, questions and sharing of challenges and opportunities was found to be highly beneficial. Nevertheless, it will be important for such scenario workshops to now be held within individual companies or within financial services subsectors such as banking or insurance underwriting to garner more specific and granular insights. And work needs to be done within Ireland to support the development of quantitative, sector- and regionally-specific scenarios.

In figure 22, we present some of the high-level takeaways from each of the four TNFD scenario industry breakout groups. It is notable that Ahead of the Game - the most benign of the scenarios - was regarded by the group as not plausible for Ireland, whereas scenarios 2-4 which articulate more adverse impacts for Ireland's financial services were seen as more plausible to varying degrees. Of course, such an exercise will carry a number of assumptions and biases, but it does perhaps point to how nascent nature-related scenario analysis remains and that more cross sector collaboration in Ireland is required to better understand the possible futures we face and the associated risks and opportunities that will arise.

Alongside these breakout discussions, the groups built on and improved the PESTLE analysis and associated potential impacts, risks and opportunities for each scenario. Please refer to Appendix 10.2 for a full breakdown of these findings.

Qualitative and narrative based nature-related scenarios like those developed by the TNFD are useful and beneficial for initiating structured discussions and high-level analysis at the sector or entity level. However, there are significant limitations, assumptions and biases embedded in these approaches which need to be mitigated or reduced through detailed quantitative and regionally relevant scenarios.

Figure 22 - Summary of takeaways from industry break-out groups for each TNFD scenario

TNFD SCENARIO	Industry group summary	Plausibility (2030)
1. Ahead of the Game (moderate physical risk & moderate transition risk)	▪ Group felt the scenario was too optimistic and less plausible for Ireland. ▪ The current difficulties of measuring nature related impacts and dependencies and opportunities is hampering progress and makes this scenario less realistic. ▪ We're not yet seeing a strong appetite from Irish financial services to be a leader on nature. Many corporates and financial services are feeling overwhelmed with compliance and responding to regulation. ▪ Some signs of progress with EU Nature Restoration Law, Biodiversity Citizens Assembly & 4th NBAP which could deliver on elements of this scenario.	Not plausible under current trajectory
2. Go Fast or Go Home (high physical risk & moderate transition risk)	▪ Group felt this scenario was plausible. There was recognition that it could take high levels of ecosystem degradation to occur before the government and private sector coalesce with urgency around a coherent response. ▪ In this scenario, it was felt that individual institutions would likely be able to make adjustments to their portfolios to minimise the risks, but raised questions as to what implications this would have on the market and regulation of the sector as a whole. ▪ Group felt that one of the reasons that financial services would be late to respond to nature degradation is that consumers are not demanding new products or services now that would speed up their response in the short term. For example with much more attention focussed on the cost of living, housing shortages.	Plausible under current trajectory
3. Sand in the Gears (high physical risk & high transition risk)	▪ "This scenario seems awfully familiar". Group saw this scenario as plausible - albeit the group was unclear on the severity of physical risks and impacts in that would occur in Ireland compared to other jurisdictions. ▪ There was agreement that the effects of severe nature degradation under this scenario would lead to significant economic and political instability in Ireland. Swift government intervention will be necessary to ensure financial institutions can continue to provide essential services to citizens. ▪ Group felt there is potential for marginal land to become extremely expensive/profitable. This could evolve into land-grabbing, or an emphasis on the value of land ownership over other means of production. ▪ Group discussed how banks and Insurance companies will/may increasingly look to minimise exposure to natural disasters and "acts of god" such as chronic flooding events. Could result in uninsurable businesses or towns.	Plausible under current trajectory
4. Back of the List (moderate physical risk & high transition risk)	▪ There was a general agreement that this scenario felt like "business as usual" – with an emphasis on short term thinking holding back action on nature. ▪ This scenario suggests that moderate physical impacts are experienced and therefore the motivation for action up to 2030 is low. This is storing up problems for the future. ▪ Reputation risk and investor activism was discussed as a potential key driver in promoting action by financial services on nature. However, this could be minimised under this scenario as action is intensified on climate - which could "offset" the negative reputational risk associated with their inaction on nature. Leading to the climate and nature risk nexus being ignored or underestimated.	Plausible under current trajectory

07

Proposed Nature Finance Roadmap

7.1 Introduction and scope

Given the scale and complexity of nature-related financial impacts, risks and opportunities and how nascent this agenda is in Ireland, the Nature Finance Roadmap set out here should be viewed as an initial proposal for how such an initiative could be structured, actioned and financed in the coming months and years. As is set out below, it will be up to policy decision makers, government departments and a cross sector industry delivery group to build out the details of the roadmap further and how to fund and to deliver it.

It's important to acknowledge there are a number of existing initiatives, roadmaps and actions that this proposed Nature Finance Roadmap should look to support and complement, amongst others, the ISFCOE's Sustainable Finance Roadmap (2021), Ireland's International Climate Finance Roadmap (2022), recommendations from the Citizens' Assembly on Biodiversity Loss (2023) and Ireland's 4th National Biodiversity Action Plan (due 2024).

7.2 Suggested principles to underpin the proposed roadmap.

a. **Global to local** – Supports the Kunming-Montreal Global Biodiversity Framework (see section 7.4), recommendations from Irelands Citizens' Assembly on Biodiversity Loss and the forthcoming 4th National Biodiversity Action Plan to ensure the roadmap is relevant for Irish economic, social and cultural contexts.

b. **Encourages co-benefits** – Delivers for people, climate and nature. Setting a clear and consistent finance sector environment to catalyse action on nature protection and restoration.

c. **Public, private and third sector collaboration** – Underpinned by partnerships and collaboration to support nature positive policies, incentives and outcomes. No one entity or sector can solve the nature and biodiversity crises alone so the sharing of learnings, insights and data in pre-competitive fora is critical.

d. **Governance** – Supports transparent lines of accountability with clear measures of success and represents a diverse ranges of voices, views and ideas. Supports a just and equitable transition.

e. **Finance sector and public engagement** – Supports the mainstreaming of nature protection and restoration through effective engagement and communication with public and local communities. Engagement and buy-in will be critical to ensure effective and impactful delivery of finance into nature and any associated changes in land use or impacts on livelihoods.

7.3 Roadmap Audience

a. **Government policymakers, regulators and state agencies** – Department of Finance, Department of Environment, Climate Change and Communications, Department of Housing, Local Government and Heritage, and other state agencies. To provide the "enabling environment" for the mainstreaming of nature and biodiversity within financial decision-making and the alignment of financial flows.

b. **Central Bank of Ireland and other financial supervisory entities** with a mandate to support the implementation of financial policies and regulations and set prudential requirements and guidelines to catalyse and encourage the consideration and management of nature-related risks, dependencies and impacts and to ensure stability within the financial system.

c. **Public and private financial institutions** - banks, insurers, asset managers, as well as corporate investors, whose asset allocation decisions ultimately impact, or contributes to the protection, restoration and/or sustainable use of nature.

7.4 Supporting the Global Biodiversity Framework (GBF)

The Global Biodiversity Framework is comprised of 4 global goals and 23 ambitious targets. The Nature Finance Roadmap in Ireland could look to support and align its objectives to:

a. **Bridging the biodiversity finance gap** of USD $700 billion per year and aligning public and private financial flows with the GBF and 2050 Vision (Goal D).

b. **Mainstreaming biodiversity within policies**, strategies and decision-making processes, progressively aligning all relevant public and private activities, and fiscal and financial flows with the goals and targets of the GBF (Target 14).

c. **Encouraging disclosures on risks, dependencies and impacts** on biodiversity by large and transnational companies and financial institutions, in direct operations, supply and value chains, and portfolios (Target 15).

d. **Identifying by 2025 and reforming harmful incentives by USD 500 billion per year by 2030** and scaling up positive incentives for the conservation and sustainable use of biodiversity (Target 18).

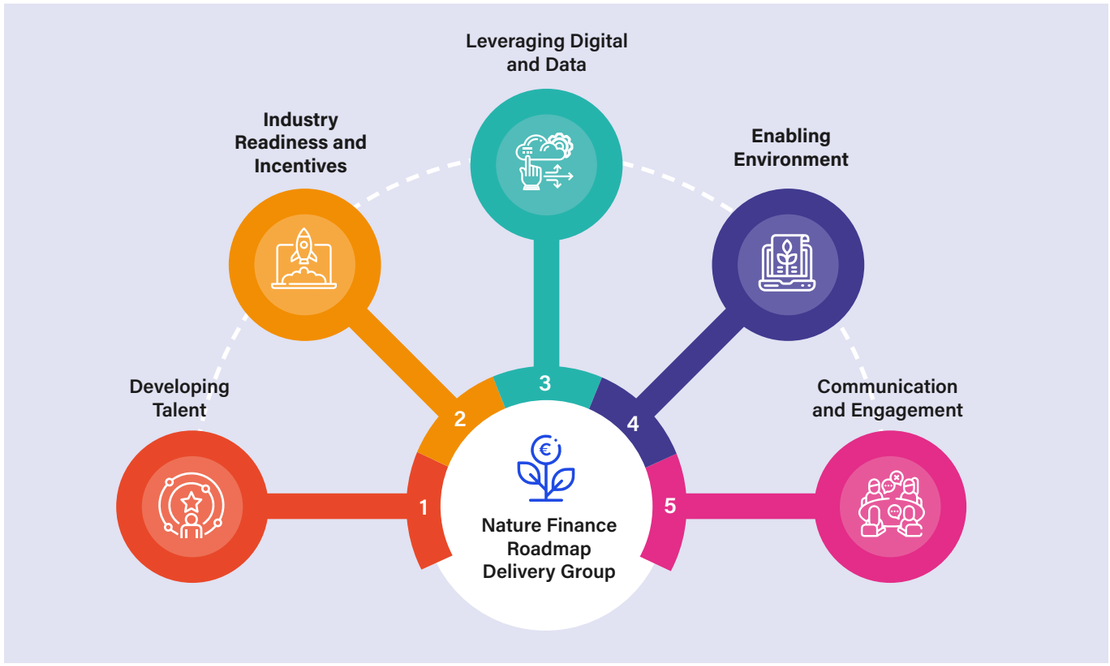
7.5 The Nature Finance Roadmap – proposed pillars and actions

The proposed roadmap follows the approach and structure used for Ireland's Sustainable Finance Roadmap produced in 2021 and is built around the same five core pillars of action.

Crucially, the Roadmap proposes an additional Pillar 0 – the establishment of a Nature Finance Roadmap Delivery Group. The role of this Delivery Group will be to take the proposed roadmap set out here and further develop the actions, assign lead organisations and individuals and agree on the delivery timelines.

Thus, this proposed roadmap sets out high-level action areas which will require further development into granular sub actions and sub-topics and associated business cases to support activities.

7.5.1 Overview of the Nature Finance Roadmap Pillars



7.5.2 Pillar 0 - Nature Finance Roadmap Delivery Group

We propose the establishment of a Nature Finance Roadmap Delivery Group comprised of public and private sector representation with expertise and experience across the breadth of the finance sector, but also representing nature and biodiversity experts and civil society. Once established, the group would be responsible for the further development and publication of the finalised Nature Finance Roadmap, including business cases to support activities and detailed workplans. Below are the proposed high-level actions, potential stakeholders and timelines. Clear leadership would be established, as a priority, by this delivery group.

Pillar 0
Nature Finance Roadmap Delivery Group

Actions	Potential Stakeholders	Timeline	Example KPIs
▪ Establish a delivery group comprised of expert members from public and private sector, academia and civil society to oversee the delivery of Ireland's Nature Finance Roadmap. Including governance structures, decision-making processes, funding model and key measures of progress. ▪ Define nature positive outcomes for the Irish Financial Sector – ensuring alignment with Global Biodiversity Framework goals and targets, National Biodiversity Action Plan and others.	▪ ISFCOE ▪ Skillnet ▪ Department of Finance ▪ Central Bank of Ireland ▪ DECC ▪ DHLGH ▪ National Parks and Wildlife Service	Q1-2 2024	▪ Establishment of Nature Finance Roadmap Delivery Group ▪ Publication of Terms of Reference for the Group ▪ 5x Pillar leads chosen within the delivery group ▪ Amount of euros secured as seed funding to support the work of the Nature Finance Roadmap Delivery Group ▪ Nature finance roadmap communications and advocacy strategy and workplan
▪ Once established, the delivery group will select 5x 'pillar leads' (individuals or organisations) to lead on the development of each of the pillars of the roadmap.	▪ Enterprise Ireland ▪ Industry associations and trade groups ▪ Academia ▪ National Biodiversity Data Centre ▪ National Biodiversity Forum ▪ UNDP, FC4S	Q 2-3 2024	
▪ Pillar leads to review, test and refine the draft roadmap actions and timelines and develop detailed workplans and an associated business case to support activities.		Q4 2024	
▪ Development of Nature Finance Roadmap communications and advocacy strategy to engage corporates and public sector leaders within Ireland, but also to raise the profile of Ireland as a leading centre of nature finance. ▪ Leveraging new and existing partnerships within Ireland and globally (e.g. UNDP, GFANZ)		Q4 2024	

18 For example, this could include existing cross sector expert groups such as the National Biodiversity Forum

7.5.3 Pillar 1 - Developing Talent

Perhaps one of the largest single barriers in understanding the risks to the finance sector from nature loss, and indeed to driving investment into nature, is a lack of sector skills and capacity. From a private investor point of view, this is around a lack of capacity, skills and expertise in nature and biodiversity to fully understand the issues and opportunities. Whilst from the side of many on-the-ground organisations or initiatives looking for funding, it is a lack of capacity, skills and expertise in understanding the different types of private finance mechanisms that are available and how best to access them. Private banks and investors and on-the-ground conservationists are generally very different communities, each with their own language and understanding which makes bringing these two communities together a challenge. However, positive steps are being made to address this and Ireland is well placed to lead on this agenda given the size of the country's land area and population.

It's notable that this skills gaps was confirmed in the ISFCOE Skills Study published in November 2023 (see figures 23 and 24 below), which surveyed financial sector participants from the Banking, Insurance and Asset Management sectors and showed that nature and biodiversity were cited as the most significant knowledge and skills gap in the finance sector in Ireland.

Figure 23 - Knowledge gaps within organisations across key ESG topics (% of respondents)

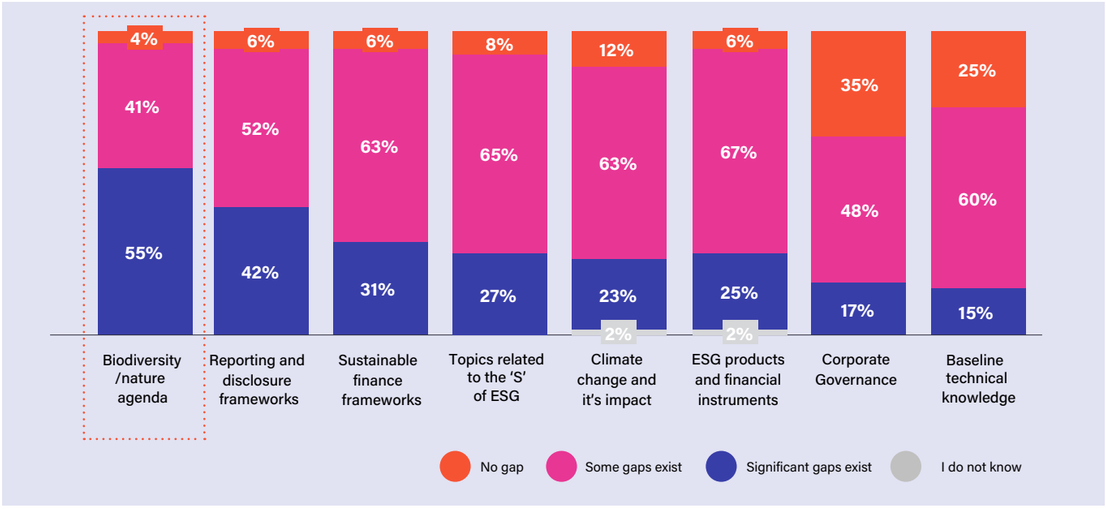
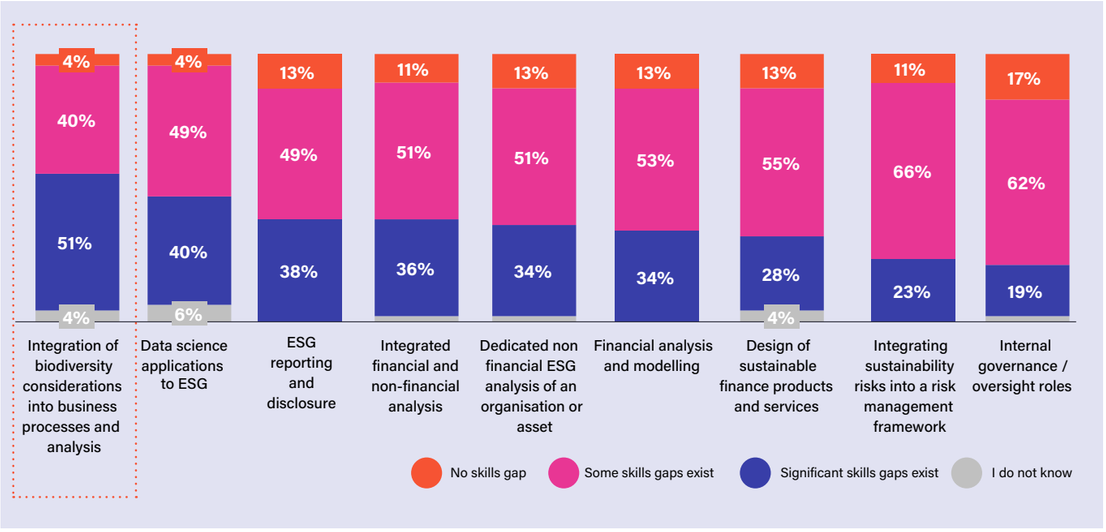


Figure 24 - Skills gaps within organisations across key ESG topics (% of respondents)



Source: KPMG industry survey, n=52.

Below are some of the suggested high-level actions towards addressing this knowledge and skills gap and to highlight and showcase the existing training and exciting career opportunities on offer or that will be expected in the future.

Pillar 1
Developing Talent

Actions	Potential Stakeholders	Example KPIs
▪ Develop and deliver finance sector-specific training on nature and biodiversity impacts, risks and dependencies. Including training on Taskforce on Nature Related Disclosures (TNFD) and LEAP assessments, transition planning, CSRD ESRS E4 biodiversity disclosures. Working with key industry bodies and initiatives to ensure wide reach and content relevance. ▪ Identify key roles within the finance sector to prioritise and target with training i.e. those with most need and/or influence - such as risk and compliance, client-facing relationship managers, boards and executive teams. ▪ Bringing nature to life – sector-specific guides and training to show risks from nature loss are significant and compounding with climate change. Starting with the most exposed sectors such as primary industries, agri-food and manufacturing. ▪ Develop guidelines for making the business case for financing nature with deep dives on topics such as nature & biodiversity credits. Made relevant to Irish and EU contexts. ▪ Develop training and integration programme for new and existing nature-related digital platforms, data dashboards and geo-spatial tools into Irish FI practices e.g. ENCORE, EXIOBASE, GLOBIO ▪ Support, develop and showcase employment opportunities within nature finance in Ireland. The potential career benefits to upskill in nature and biodiversity topics and to support Ireland's financial sector and economy to become a leader in nature finance. ▪ Explore collaborative training and skills development partnerships with Irish educational institutions. Support the development of pipeline of talent entering the finance sector workforce.	▪ Sustainable Finance Skillnet ▪ Skillnet Ireland ▪ Department of Finance ▪ Department of Further and Higher Education, Research, Innovation and Science ▪ DECC, DHLGH ▪ National Parks and Wildlife Service ▪ Central Bank of Ireland ▪ Academia ▪ National Biodiversity Data Centre ▪ Relevant state agencies such as Enterprise Ireland, Bord Bia ▪ Industry and trade bodies and initiatives	▪ % or no. of finance sector staff attended recognised nature & biodiversity training ▪ Sector survey of the number of nature experts employed by financial institutions, and detail of what level of seniority they occupy ▪ No of nature and biodiversity-related board trainings ▪ number of sector-specific guides developed ▪ % change in finance sector skills gap survey with regard to nature and biodiversity skills between 2023 and 2024 (via repeat industry skills survey) ▪ No. of people attending training on Nature and Biodiversity and geospatial tools

7.5.4 Pillar 2 – Industry readiness and incentives

Pillar 2 on Industry readiness and incentives focuses on the development of best-in-class support systems, public and private sector financing, tools and frameworks to enable Ireland's financial sector to take positive and measurable action for nature.

Pillar 2
Industry Readiness and Incentives

Actions	Potential Stakeholders	Example KPIs
▪ Accelerate the assessment, monitoring, reporting and disclosure of nature-related risks, dependencies and impacts within the financial sector in Ireland. Supporting sector specific and science-based approaches such as the Taskforce on Nature-related Financial Disclosures (TNFD), EU Sustainable Finance Disclosure Regulation (SFDR) and Corporate Sustainability Reporting Directive (CSRD) and most relevant ESRSs.	▪ ISFCOE ▪ Central Bank of Ireland ▪ NTMA ▪ Dept. of Finance ▪ DECC ▪ DHLGH ▪ National Parks and Wildlife Service ▪ Industry bodies and trade groups. ▪ National Biodiversity Data Centre ▪ Relevant state agencies such as Enterprise Ireland, EPA ▪ Industry and trade bodies and initiatives	▪ % or no. of financial institutions setting approved science-based targets for nature ▪ No. of financial institutions publishing TNFD-aligned disclosures ▪ % of Irish-based financial institutions scoring positively against agreed nature criteria and publishing integrated climate and nature transition plans (under CSRD requirements)
▪ Assessment of nature and biodiversity related data associated with Irish lending, investments and insurance underwriting. Development of outcomes-based strategy to fill gaps. Support cross sector collaboration, standardised practices and sharing of insights and learnings in pre-competitive fora.		
▪ Accelerate the development, adoption, and alignment of Irish finance sector with science-based targets to reduce exposure to risks, dependencies and negative impacts, and generate positive outcomes, leveraging wherever possible on opportunities to build synergies between climate and nature action i.e. via Science Based Targets Network (SBTN), Principles for Responsible Investment, Principles for Responsible Banking, Principles for Responsible Insurance.		
▪ Support collaborative efforts within the Irish Insurance sector to develop nature-related risk assessment tools and methodologies and innovations in new insurance products and services.		

7.5.5 Pillar 3 – Leveraging Digital and Data

The research and analysis undertaken for this report has highlighted a range of data challenges – quality, availability, accessibility and geographic scope. Good and reliable data is key for driving decision making and action and for independent research and analysis. Cross-sector collaboration to close these data gaps and agree common approaches across the sector will be critical. New digital solutions and tools to support financial institutions to understand their impacts and dependencies (direct and indirect) will be instrumental.

Pillar 3
Leveraging Digital and Data

Actions	Potential Stakeholders	Example KPIs
▪ Explore opportunities to invest in the development and deployment of tools, quantified scenarios and digital solutions relevant to the Irish context, to support financial institutions in assessing and quantifying nature related risks to their portfolios, investments and insurance underwriting activities.	▪ Dept. of Finance ▪ DECC ▪ DHLGH ▪ National Parks and Wildlife Service ▪ Skillnet Ireland ▪ Industry Representative Bodies, ▪ Academia ▪ Enterprise Ireland ▪ National Biodiversity Data Centre ▪ Relevant state agencies and bodies and commercial semi-state companies ▪ Rethink Ireland ▪ Local Authorities	▪ Release of new Irish specific nature-related financial data and/or insights, and collection and analysis tools ▪ No. of case studies published by FIs using publicly available datasets to assess nature-related impacts, dependencies, risks and opportunities ▪ euros unlocked from digital and technology sectors to support nature finance roadmap actions and outcomes
▪ Support common data sets (including geospatial data) to support pre-competitive collaboration and action amongst Irish based financial institutions. Supporting a joined-up approach across government departments		
▪ Encourage the collection, analysis and publication of financial data on exposure to nature and biodiversity risks and dependencies across Irish financial institutions (FIs)lending, investments and insurance underwriting.		
▪ Consider how existing nature and biodiversity datasets such as EPA data, the National Land Cover Map and spatial datasets can be made available to, and further developed by FIs. Consider how these efforts can support the aims of the National Open Data Strategy. Including detailed spatial mapping of nature impacting activities or infrastructure and for setting science-based targets for land ▪ Consider how the financial sector can support and benefit from the work of the Central Statistics Office on ecosystem accounting and the adopt the recommendations of the recently concluded Irish Natural Capital Accounting for Sustainable Environments (INCASE) project released in 2023.[19]		
▪ Leverage Irish based and global technology businesses and cross sector initiatives to develop nature positive digital solutions and platforms to improve data collection, analysis and standardisation in Ireland. Align around new or existing public and private sector initiatives that help support Ireland's reputation as a global centre for nature finance.		

19 www.incaseproject.com

7.5.6 Pillar 4 – Enabling Environment

Creating a supportive enabling environment for the delivery of the Nature Finance Roadmap will be critical. Government, regulators and industry bodies and initiatives will play a key role in providing the supports for action now and in the long term. If Ireland is to become a leader in nature finance, the enabling environment is likely to be one of the most important pillars of the Roadmap.

It is notable that Ireland's Citizens' Assembly on Biodiversity loss explicitly referenced their support of the State to become a global leader in sustainable finance models and recommendation number 3 from the final report (2023) reads:

"The ambition of the State needs to be significantly increased to reflect the scale of Ireland's biodiversity crisis. Adequate funding must be made available to address this crisis. This is likely to require substantial and sustained increases in expenditure, which should be made available immediately and guaranteed in the long term." (Citizens' Assembly, 2023)

Further, the draft 4th National Biodiversity Action Plan contained an action for the Department of Finance to mainstream biodiversity within its climate and sustainable finance work including taking it into account in financial services, multilateral development financing and fiscal policymaking, as appropriate (Draft Action 3C4).

Pillar 4
Enabling Environment

Actions	Potential Stakeholders	Example KPIs
▪ Support finance sector disclosure requirements on nature-related risks, dependencies and impacts, within the scope of voluntary or mandatory reporting frameworks and regulations CSRD, TNFD, EU Taxonomy etc. ▪ Explore opportunities to support target 18 of the Global Biodiversity Framework to direct increased flows of public and private sector finance into nature in a socially just and equitable way. ▪ Leverage the Climate and Nature Fund announced in Budget 2023 to increase finance to nature protection and restoration projects and to meet targets under the 4th National Biodiversity Action Plan and support the EU Nature Restoration law.	▪ Dept. of Finance ▪ DECC ▪ DHLGH ▪ National Parks and Wildlife Service ▪ Skillnet Ireland ▪ Industry Representative Bodies ▪ Academia ▪ Local Authorities ▪ Relevant government bodies such as Enterprise Ireland, Bord Bia, An Bord Pleanala ▪ National Treasury Management Agency	▪ €m of finance supporting Irish and overseas nature protection and restoration programmes ▪ % of Irish FIs published nature-related policies and strategies ▪ No. of new nature based solutions projects in Ireland and overseas funded through public and private nature positive financial products or funds
▪ Work with government departments and semi-state companies and agencies to support nature positive outcomes and to follow the mitigation hierarchy for nature ▪ Support Objective 6C of draft 4th Biodiversity Action Plan to include biodiversity and nature based solutions as a priority area both within Ireland and internationally.		
▪ Support the government in developing a 'First Mover Fund' (as outlined in Ireland's International Climate Finance Roadmap, 2022) to incentivise climate action in overseas missions and build on existing mechanisms and partnerships, and identify new funding opportunities, with a view to maximising co-benefits for climate adaptation and mitigation and which will include support for new themes such as oceans and sustainable blue economy, innovation and entrepreneurship, Loss and Damage, biodiversity and Nature Based Solutions.		
▪ Support the recognition of Ireland as a centre of excellence for financing nature protection and restoration, using science-based and socially just approaches. Using Irish specific case studies in key ecosystems such as peatlands and wetlands.		
▪ Incentivise the publication of integrated climate and nature transition plans - with progress of actions tracked and measured against requirements under CSRD (ESRS E1 & E4) but also in support of Irish Climate Action Plan and National Biodiversity Action Plan targets.		
▪ Encourage private sector finance to support the delivery of the Nature Restoration Law in Ireland. Explore collaborative opportunities to support multi-stakeholder, landscape-scale nature restoration initiatives.		

20 The Mitigation Hierarchy - www.thebiodiversityconsultancy.com

7.5.7 Pillar 5 – Communication and Engagement

It will be critical to drive clear science-based and finance sector ready messaging to support the delivery of the Nature Finance Roadmap. Communication and engagement on the Roadmap can also deliver a positive message, highlighting the many opportunities and innovations that can come from improving Ireland's performance on nature finance.

"The State must provide, communicate and implement a plan for the conservation and restoration of biodiversity for the benefit of its people" Recommendation number 5 – Citizens' Assembly on Biodiversity Loss (2023)

Pillar 5
Communication and Engagement

Actions	Potential Stakeholders	Example KPIs
▪ Explore the development of a 'nature positive finance' campaign and narrative articulating the opportunities for Ireland to finance a nature positive economy. ▪ Align with efforts to increase public awareness of nature and biodiversity, as set out in the draft 4th National Biodiversity Action Plan.	▪ Central Bank of Ireland ▪ Dept. of Finance ▪ DECC ▪ DHLGH ▪ National Parks and Wildlife Service ▪ Dept of Foreign Affairs ▪ Media – TV, Radio, Newspapers, online ▪ Teagasc ▪ Relevant industry and community based bodies ▪ Business for Biodiversity Ireland	▪ No. of people (public and finance sector) engaged through nature positive engagements and campaigns ▪ No. of key recommendations supported on finance and funding highlighted by the Citizen's Assembly on Biodiversity Loss ▪ No. of finance sector events, community workshops and initiatives supported
▪ Explore initiatives to promote the co-benefits of nature positive lifestyles and stimulate consumer demand for new products and services (loans, investments and insurance) to support nature and climate. Supporting Global Biodiversity Framework targets.		
▪ Strengthen public-private and wider stakeholder dialogues with the financial sector on nature, supporting the effective mainstreaming of the benefits of restoring nature within decision-making. ▪ Supporting and building on the recommendations of the Citizen's Assembly on Biodiversity Loss		

08

Opportunities for Ireland in the Nature Finance Agenda

A core objective of this report has been to identify and highlight the spectrum of risks to and impacts from the Irish financial sector on nature and biodiversity. We have shown the links between Irish bank lending to economic sectors and impacts and dependencies on nature. We have also highlighted the challenges in linking insurance underwriting to nature loss and the need to better understand where the insurance sector is most exposed. It is clear there is much work still to be done by Irish and global financial institutions and regulators to identify, reduce, mitigate or eliminate these risks.

However, as financial services is one of the most dynamic parts of the Irish and global economy, it is important that we identify and highlight the many opportunities for the sector, for the economy and for society in protecting and restoring nature and biodiversity. By ensuring finance is moving away from nature-damaging investments and business models, to supporting and driving nature positive outcomes.

"Finance flows to Nature Based Solutions (NbS) are currently US$154 billion per year, less than half of the US$384 billion per year investment in NbS needed by 2025 and only a third of investment needed by 2030 (US$484 billion per year) to limit climate change to below 1.5°C, halt biodiversity loss and achieve land degradation neutrality. Urgent and large increases in finance for nature are essential."

UNEP, State of Finance for Nature Report 2022

There are significant opportunities available to financial institutions and companies when they start to identify, avoid, reduce, mitigate or manage nature-related risks. These institutions can also benefit from the strategic transformation of business models, products, services, markets and investments that actively work to support nature restoration and regeneration and the implementation of nature-based solutions (WBCSD, 2023). Financial institutions can also create opportunities by developing new products that generate returns aligned with the nature-positive transition such as debt-for-nature swaps, blended finance, or sustainability-linked bonds, that could provide opportunities for financial institutions to reduce risks, increase resilience and support long term prosperity. We explore a number of these in the section below.

8.1 Exploring nature-related products and services for Ireland's financial sector

As financial institutions better understand their impacts and dependencies on ecosystem services and the potential for nature-based solutions, they can look to improve their pricing of loans and identify potential investment opportunities, unlocking capital towards these activities.

However, challenges need to be overcome to mobilise both public and private finance and increase the supply of nature and biodiversity projects which are 'bankable', and by default scalable and repeatable. Many financial institutions struggle to understand where and how to develop this pipeline of investible projects and investors are unsure where best to invest.

When thinking about nature finance, it's worth differentiating between the three types of potential investment projects:

1 Commercial investments that can provide a return of capital and a commercial yield;

2 Investments with a return of capital but zero or low yield, and

3 Investments that would provide no return of capital and no yield (i.e. donations/philanthropy)

When it comes to financing nature, most investments have broadly sat in categories 2 and 3, but this is rapidly changing and there are a growing number of commercial investment (category 1) opportunities coming to market.

Discussions around accurately and consistently pricing the value of nature in economic decision making across the global economy are accelerating. In turn this is incentivising changing market behaviour, helping to mobilise finance to protect and restore nature and fairly rewarding those who are on the front line of restoring it.

It's important to note that both nature and finance are part of globally interconnected systems, that are also highly influenced by regional and local variables. This presents challenges to repeating or scaling initiatives from one financial jurisdiction or ecosystem to another.

8.1.1 Integration of nature and biodiversity into existing investment strategies

A 2023 Robeco Global Climate Survey of over 300 investors found that mainstream global equities (48% of investors) and corporate green bonds (34%) are the most common asset classes being used to integrate nature and biodiversity into portfolios, followed by equities in domestic markets (33%) and green sovereign debt (31%).

The survey also found that currently, only 25% of the respondents are using investment products specifically targeting nature and biodiversity goals, but noted that there has been a big jump in demand for impact investing and thematic strategies compared with the 2022 survey. In this respect, the Sustainable Finance Disclosure Regulation (SFDR) is an important driver to increase transparency in the sector. The investors will need to describe their objectives, monitoring systems, KPIs and how ESG risks are integrated into the investment decisions. The SFDR distinguished impact investors (article 9) with a sustainable objective and ESG integration (article 8) where ESG is integrated in the decision making. Going forward it is expected that the number of nature focused impact funds will rise.

8.1.2 Integrating nature and biodiversity into new investment strategies

There are also growing calls for nature to be recognised as an asset class in its own right. This involves recognising and valuing biodiversity and ecosystem services in a way that enables them to be traded or invested in, similar to traditional financial assets. This approach aims to integrate the economic value of nature and biodiversity (and the benefits provided from ecosystem services) into financial markets and investment strategies, acknowledging the critical role nature plays in supporting our societies and our economies. Recognising nature and biodiversity in this way can help to mobilise and make these investments more visible. However, transparency of accurate and complete information to investors and issuers will be key to avoiding information asymmetries. A crucial element here is the need for robust evidence of nature performance through credible nature-related KPIs, and the use of transparent monitoring, reporting, and verification (MRV) techniques, to ensure genuine impact and managements of risks.

8.1.3 Nature Performance Bonds (NPBs), Green and Blue bonds

Governments and private financiers can also invest in natural assets via nature performance or "sovereign green or blue bonds". Funding invested by governments or private financiers in these interest-bearing bonds are used for funding projects that are considered to be nature and biodiversity positive. To date, green bonds have primarily funded climate mitigation and adaptation projects, but they can also be used to address and fund nature projects.

The Sustainable Blue Economy Finance Principles were launched in 2018. They provide a global guiding framework to finance a sustainable blue (ocean/marine) economy, which will be key in underpinning the success of blue bonds. The 14 principles were developed by the European Commission, WWF, the World Resources Institute (WRI) and the European Investment Bank (EIB) and are hosted by UNEP FI as part of the Sustainable Blue Economy Finance Initiative.

Nature and biodiversity bonds have gained a lot of interest but still cover only a tiny part of the bond market due to the fact that nature and biodiversity is so location specific - what works in one country may not work in another. Credibility provided by banks, for example through an AAA rating by the World Bank, can help de-risk the process and support investor confidence.

8.1.4 Overseas Development Assistance (ODA)

The risks and impacts from nature loss are not limited to national or jurisdictional borders. Therefore, it is important that financial institutions in Ireland support investments into nature and biodiversity protection and restoration here and overseas. Not least because of the dependencies Irish companies may have on upstream supplies of goods and materials from biodiversity hotspots as discussed earlier in sections 4 and 5. A range of mechanisms and policy actions, such as the Global Biodiversity Framework Fund, under the Global Environment Facility (GEF) have been established to try to increase public and private funding towards nature and biodiversity. Multilateral development banks (MDBs), bilateral development banks and development finance institutions (DFIs), along with other public development finance institutions, play a central role in securing multilateral ODA. Together they can catalyse finance, both public and private to increase the finance available for nature protection and restoration projects.

8.1.5 Sovereign Debt

Sovereign debt serves as a vital channel for the flow of capital from advanced economies (AEs) to emerging and developing economies (EMDEs). Given the annual Sustainable Development Goals financing shortfall for EMDEs, estimated by the UN at around $4 trillion , the imperative to enhance nature positive capital flows to sovereign borrowers, both in EMDEs and AEs, is paramount. Opportunities emerge through strategies that avoid, reduce, mitigate, or manage nature-related risks. Sovereigns actively addressing nature loss can potentially gain improved market access, increased capital inflows, and favourable financing terms. 'Debt-for-nature swaps' mean reducing a developing country's debt burden to free up fiscal resources, in exchange for guaranteed sovereign commitments on conservation and environmental protection efforts. To spend on nature based solutions and carbon sinks to support decarbonisation of the economy or investing in nature based coastal infrastructure such as protecting marshlands, mangrove forests or coral reefs. For example, in May 2023, Ecuador sealed the largest reported debt-for-nature swap with the US$656m "Galapagos Bond" building on other successful bonds that have been developed in biodiversity-rich countries such as Belize.

Case Study: Peatland Finance

Peatlands are central to Ireland's climate and biodiversity commitments. Rehabilitating peatlands has the potential to reduce carbon emissions and are vital for supporting biodiversity. Urgently scaling up peatland restoration requires significant upfront investment and deployment of skills for planning and execution and systemic stakeholder engagement. Peatland Finance Ireland (PFI) was established in 2022 with the overall goal of establishing (and ensuring the management of) a national and catchment scale financing system for peatland restoration in Ireland. PFI has been supported by the National Parks and Wildlife Service (NPWS) of the Department of Housing, Local Government and Heritage, and the Natural Capital Financing Facility (NCFF) of the European Investment Bank (EIB). PFI works with a range of stakeholders to unlock financing and identify opportunities for communities and regional development. www.peatlandfinance.ie. (PFI, 2023)

Figure 25 – Examples of nature products and initiatives from global financial institutions

	Banks	Investors	Insurers
Products	**Rabobank** **Planet Impact Loan:** ▪ This loan links in with Rabobank's Biodiversity Monitor tool (below) as a loan that creates an incentive for farmers to promote biodiversity. ▪ The better a farmers Biodiversity Monitor score the lower the interest rates.	**Mirova** ▪ Design solutions for public and private investors willing to invest in nature-based solutions. For example, projects around ecosystem conservation, restoration, and sustainable livelihoods. ▪ Launched first natural capital fund in 2012 which has grown into a solid Natural Capital platform for clients.	**MS&AD** Provide a selection of natural capital products and solutions: ▪ Simplified Evaluations of Biodiversity Related Risks. ▪ Biodiversity-conscious Land-use Consulting. ▪ Environmental supply chain wconsulting ▪ Providing coverage of additional expenses for dealing with marine contamination

	Banks	Investors	Insurers
Products	**HSBC** Green SME Fund: ▪ A £500m fund for businesses with turnover of less than £25m to support investment in green activities.	**Union Bancaire Privee** UBAM Biodiversity Restoration Fund: ▪ Global equity impact portfolio delivering positive returns by investing in businesses enhancing the protection and restoration of the natural world.	**Willis Towers Watson** Set-up Mesoamerican Reef Insurance Programme, the first multinational collaboration that will design and implement parametric insurance covering hurricane risk to the Mesoamerican Reef (MAR) and the communities that depend on it for protection, food security, and livelihoods.
	BNP Paribas ▪ Selection of financing tools linked to criteria related to biodiversity. ▪ Option to generate voluntary carbon credits from projects implementing nature-based solutions (NBS).	**Met Life** ▪ $25m investment in Series 2022A (Green Bonds) of The Nature Conservancy (TNC). Proceeds to be used to fund eligible green projects that advance priorities for achieving TNC's 2030 goals. These projects can include, but are not limited to, environmentally sustainable land use and biodiversity.	**AXA** Impact Investment fund: Invests to protect natural capital, promote resource efficiency, and improve the resilience of vulnerable communities
	Bank of Ireland Woodland Nature Credit: ▪ Ireland's first nature-based funding instrument to allow companies to fund large-scale afforestation in Ireland and report the benefits of their investments through CSRD.	**Federated Hermes** The Biodiversity Equity Fund ▪ Concentrated portfolio of best in class companies that aim to preserve / replenish biodiversity ▪ Engage with portfolio companies on biodiversity and broader ESG, e.g. in biodiversity advocacy	
Initiatives	**Rabobank** The Biodiversity Monitor ▪ Tool that uses a range of indicators to quantify dairy farmers' performance on biodiversity	**MSCI** ▪ Tools available to help investors assess biodiversity and deforestation risk in portfolios. The new screening tools combine thousands of ESG and climate data points, overlayed with MSCI's proprietary geolocation data that helps pinpoint a company's operations. The tools include Biodiversity-Sensitive Areas Screening Metrics & Deforestation Screening Metrics	**Aviva** ▪ Launched ESG Profiling tool on its adviser platform, enabling independently verifiable assessment of a client's holdings against six key ESG preferences
	Credit Agricole ▪ New fund "to support the development of agricultural techniques towards a competitive and sustainable agri-food system", with a target of raising up to one billion euros. As part of this commitment, the first €300m fund dedicated to the transition of agri-food companies in France and Italy was launched in 2023.		
Partnerships	**HSBC** Climate Solutions Partnership: ▪ Joined with World Resources Institute (WRI) and WWF to form a 5 year, $100m philanthropic partnership to help climate solutions become commercial reality and have real-world impact.		**Aviva** WWF partnership – UK Target Net Zero carbon by 2040 and taking action on the climate and nature crisis for its customers, business, shareholders and future.

8.1.6 Nature, biodiversity and carbon credits

Nature and biodiversity credits are a new and emerging mechanism, drawing on experiences with carbon markets and carbon credits. The concept is to sell "credits" of nature (e.g. a set metre square of a preserved or restored ecosystem) which is then managed for biodiversity. There are a growing number of initiatives underway or in the pipeline in Ireland and around the world, but significant challenges remain. Further research, investment and collaboration is required to develop robust standards and science based practices and to ensure projects are developed using a landscape approach that can deliver benefits to people, nature and climate. Particular attention is needed on community and stakeholder engagement and on impacts on land prices. Projects that generate credits need to not only be scientifically robust, but also have buy-in from a range of diverse stakeholders. Moreover, further work is needed to create a supportive enabling environment to connect financing with project developers in Ireland.

Incorporating nature and biodiversity considerations into high quality carbon credit projects can not only lead to environmental benefits but also to financial benefits. By meeting additional certification criteria related to nature, projects can earn premium prices for their credits. Several standards recognise the economic value of nature and provide incentives for projects that incorporate nature and biodiversity protection and restoration. These standards require project developers to demonstrate measurable positive impacts on biodiversity, such as the protection of endangered species, the restoration of degraded ecosystems, or the creation of new habitats. As such, credits may be priced higher in the market. It's important that buyers and sellers of credits follow best practice guidance by the Science Based Targets Initiative and Voluntary Carbon Market Integrity Initiative, amongst others, and follow the mitigation hierarchy and 'beyond value chain mitigation' guidelines[25].

Case Study: The Nature Trust is an Irish not-for-profit founded in 2021 and backed by Coillte and Forestry Partners and aims to increase native woodland cover in Ireland. The Trust worked with Bank of Ireland to develop the Woodland Nature Credit to successfully connect corporate investments with the creation of new, non-commercial native woodlands. The Trust has so far raised €7 million from businesses such as Aviva and Axa and is looking to raise further funds to buy more land and plant more woodlands in the coming years. www.naturetrust.ie

8.1.7 Sustainability-linked loans

Sustainability-linked loans incorporate environmental, social, and governance (ESG) criteria into the loan terms. These loans link interest rates to the borrower's sustainability performance, promoting responsible business practices. Lenders may assess the environmental and social risks associated with the borrower, reinforcing financial integrity while advancing sustainable goals. Some sustainability-linked loans are including specific key performance indicators (KPIs) linked to nature- or biodiversity-positive impacts.

There are also a range of different loans and equity arrangements that are being trialled at the small scale. Institutions such as the European Investment Bank are piloting a number of innovative approaches through their dedicated natural capital financing facility which included providing a €12 million equity contribution to the Irish Sustainable Forest Fund[26].

Nature based infrastructure and parametric insurance is a small, but innovative and growing area of the insurance market, which sees pre-defined pay-outs triggered if a certain event occurs such as a flood or hurricane. In the case of the latter, the pre-defined parameters could be wind speed and rainfall volume over defined period and geographic location. Parametric insurances disburse funds immediately after the triggering events, enabling rapid emergency responses as well as longer-term reconstruction (Bechauf, 2022). In 2019, The Nature Conservancy, and SwissRe worked with regional governments in Mexico to launch an insurance solution for natural infrastructure and to protect the nearby coral reef. The parametric insurance covers a coastline of 160 km of the Yucatán peninsula and once certain parameters are triggered funds are disbursed to trained community members to carry out restoration actions and minimize coral damage, protecting livelihoods and tourism assets.

There are many opportunities for the Irish Financial Sector to develop new and innovative financial products and services within Ireland and overseas to reduce risks to the economy and society but also to critically close the nature finance gap and to support the Global Biodiversity Framework and targets under Ireland's National Biodiversity and Climate Action Plans. Industry collaboration, innovation and investments in skills and training across the finance sector will be critical if Ireland is to position itself as a leader in nature and biodiversity finance. The benefits to early action and development of new and innovative solutions presents a significant opportunity for the sector and long-term benefits for people and nature.

"Given its central role in the economy, the financial system can either support nature protection or contribute to its degradation. On the one hand, financing of activities that contribute to nature degradation, including biodiversity loss, is very likely to contribute to both physical and transition risks. On the other hand, the financial system can also promote nature conservation, sustainable use of natural resources and nature restoration. Promoting and investing in a nature-positive and net-zero economy results in healthier and more biodiverse ecosystems, with beneficial effects for climate change mitigation, disaster prevention, water quality, clean air, healthier soils and overall wellbeing.

It is worth remembering that nature restoration does not imply stopping economic activity in restored ecosystems but is primarily about living and producing in a sustainable way."

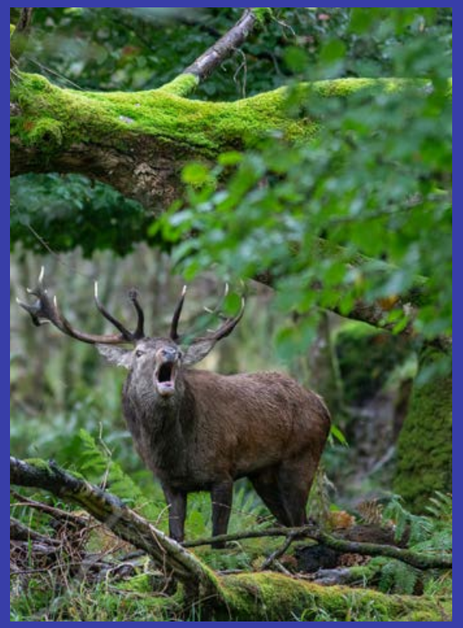
(Ceglar et al, ECB, 2023)

25 Beyond Value Chain Mitigation - www.sciencebasedtargets.org
26 Irish Sustainable Forest Fund - www.eib.org/en/projects/pipelines/all/20150605

09

Conclusions

In line with the findings of the ECB and other central banks, our quantitative analysis shows a clear link between bank lending in Ireland and economic sectors that are highly dependent on ecosystem services and impacting on nature.



We found that 58% of Irish lending to non-financial corporations (NFCs) is exposed to economic sectors and activities that are highly dependent on one or more ecosystem services, and 94% of Irish lending to NFCs is exposed to sectors that have a high impact on one or more aspects of nature. This exposure could present a material risk to the Irish financial sector and economy and further research is required to fully understand the nexus with climate-related risks and the implications on financial stability.

Urgent collaborative efforts between the financial sector and the State are needed to strengthen the enabling environment for nature finance and a nature positive economy in Ireland.

Strong and consistent international and domestic policies, regulations and standards can support financial market participants to close the gaps in nature finance and achieve the goals and targets of the Global Biodiversity Framework. Ireland and its financial services sector have many of the ingredients of success in this regard, but there is work to do to ensure the sector's business models and strategies actively support nature and biodiversity protection and restoration in Ireland and globally.

Concerted and collaborative efforts are urgently needed to build a pipeline of 'bankable' nature projects that demonstrate effective scalable solutions, with clear business cases and measures of success. There is a small but growing number of initiatives underway in Ireland, but we need a more effective 'match-making' process to connect on-the-ground projects with those looking to finance such projects.

The nature finance skills gap is a key barrier to progress.

Building skills and capacity and breaking down barriers between the different communities and stakeholders will require:

- Upskilling of financial institution personnel on nature and biodiversity topics to help them understand how to take action to reduce negative impacts, manage risks and leverage opportunities.
- Upskilling of personnel in environmental and conservation communities and landowners on the different funding strategies and models available to help improve understanding and to increase the pipeline of projects ready for investment.
- Developing Irish sector-specific nature finance training and guidelines to increase understanding within and between stakeholders and bridging the gap between finance sector actors and on-the-ground nature projects and initiatives.

The proposed Nature Finance Roadmap puts forward a range of actions to address these gaps, and Ireland is well placed to address them with continued support and leadership from the Skillnet Ireland-supported Sustainable Finance Skillnet and the support for the ISFCOE.

There is an urgent need to develop common frameworks, tools, and languages.

The analysis of nature-related risks and opportunities is being hampered by mismatches in data, terminologies, frameworks and standards. In this report, we have highlighted the challenge of mapping between different sector classification systems (e.g. NACE, GICS and CBI) and mapping lines of insurance underwriting to economic sectors and ecosystem services. This latter point in particular needs to be urgently addressed to enable future analyses and quantify risks. Ireland's insurance sector is one of the largest in the EU[27] and this could be a priority area for the sector to address and show leadership.

Robust and standardised data is necessary for improved decision-making and action.

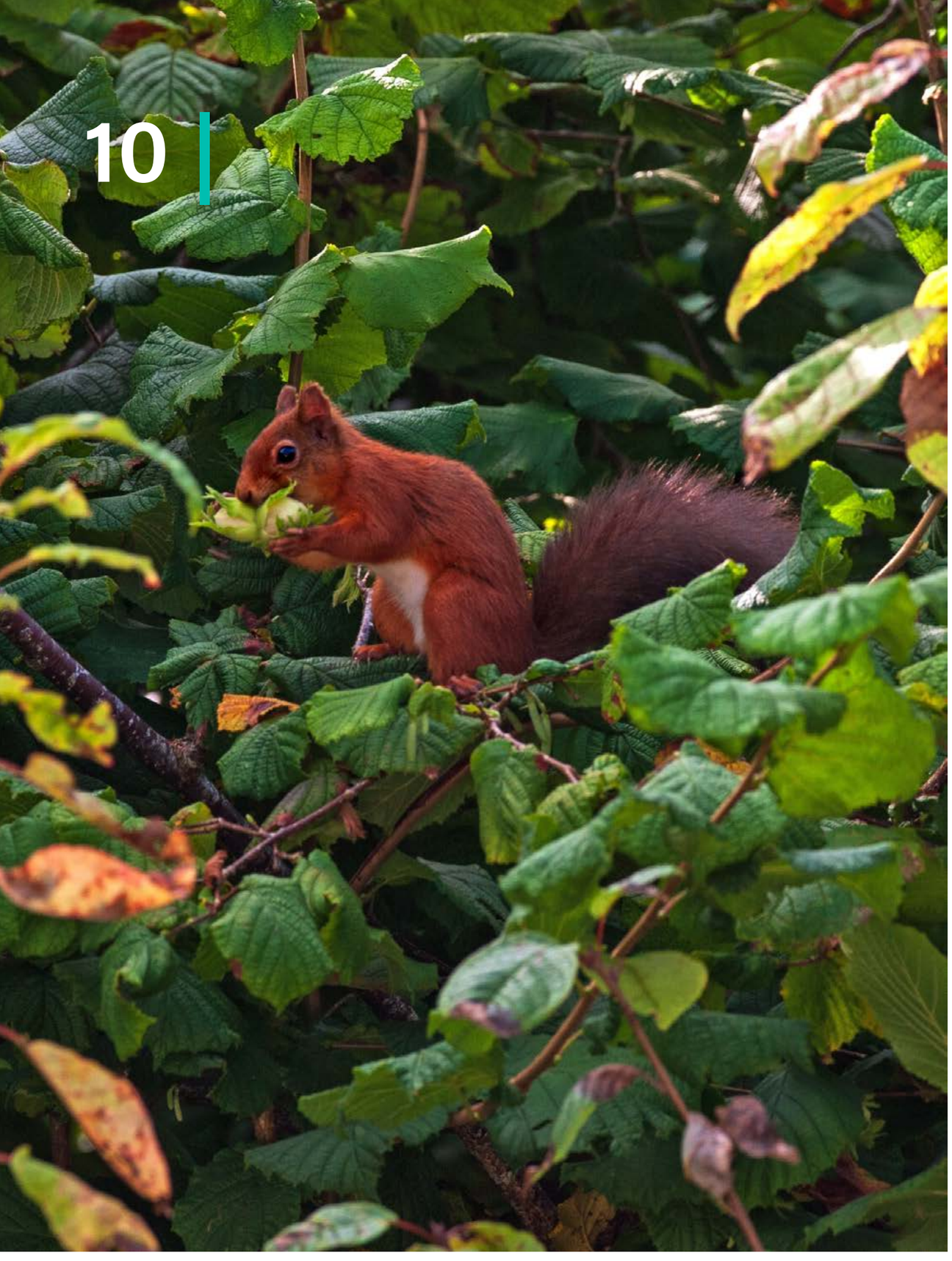
Our research has highlighted a range of data challenges across quality, availability, accessibility, and geographic scope.

- **Nature and biodiversity data.** Investment in nature and biodiversity data collection, standardisation and dissemination is needed to improve the quality and scalability of decision-useful data. Furthermore, supporting financial institutions and real economy businesses with directly measuring and disclosing their nature-related impacts, dependencies, risks and opportunities will help to improve the quality of measured data and increase confidence by users and reviewers.
- **Accessibility of financial data.** The Central Bank of Ireland and other central banks collect significant quantities of financial data which is not made available to the public for a range of legal and data protection reasons. This limits the scope and depth of independent research and could increase expectation on central banks to play the leading role in publishing research and analysis on nature and climate related risks and the nexus between the two.
- **Non-bank financial intermediation** (NBFI) sector. The scale of the NBFI sector in Ireland presents challenges with regard to identifying links to economic sectors in the real economy and in turn making links to ecosystem services and nature-related risks. Further research is needed here to assess the make-up of this sector and to quantify the potential risks that are not captured elsewhere.
- **Scenario Analysis.** Qualitative and narrative based nature-related scenarios like those developed by the TNFD can be used to initiate structured discussions and high-level analysis at the sector or entity level. However, there are significant limitations, assumptions and biases embedded in these approaches which need to be mitigated or reduced through detailed quantitative and regionally relevant scenarios. Ongoing work by the NGFS and the ECB should start to address some of these challenges. Can the Irish financial sector go further to support efforts to develop integrated quantitative climate and nature scenarios?

Ireland has an opportunity to position itself as a leader on the nature finance agenda.

Ireland has many of the elements required to drive a nature positive financial sector and economy and show leadership to other financial centres. Increasing national and EU regulatory signals, measurable climate and biodiversity action plans and targets, and indications of strong public support from the Citizens' Assembly on Biodiversity Loss are solid foundations to build on. The draft Nature Finance Roadmap proposed in this report sets out the high-level actions to help position Ireland as a leader. However, success will require increased and sustained efforts, support and coordination across stakeholder groups. An early and important signal of intent will be the establishment of a Roadmap Delivery Group in 2024. This Group can kickstart the delivery of innovative and ambitious nature positive actions to unlock long-term benefits for Ireland's people, nature and economy.

27 With EUR 81bn of gross written premiums in 2020, Ireland has the fourth largest insurance sector in the European Union (Ireland Technical Note, IMF, 2022). www.imf.org

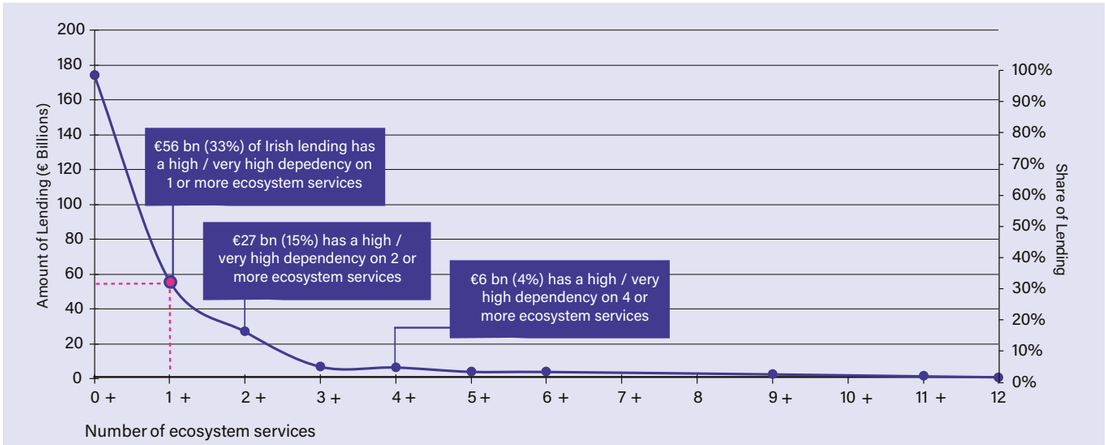


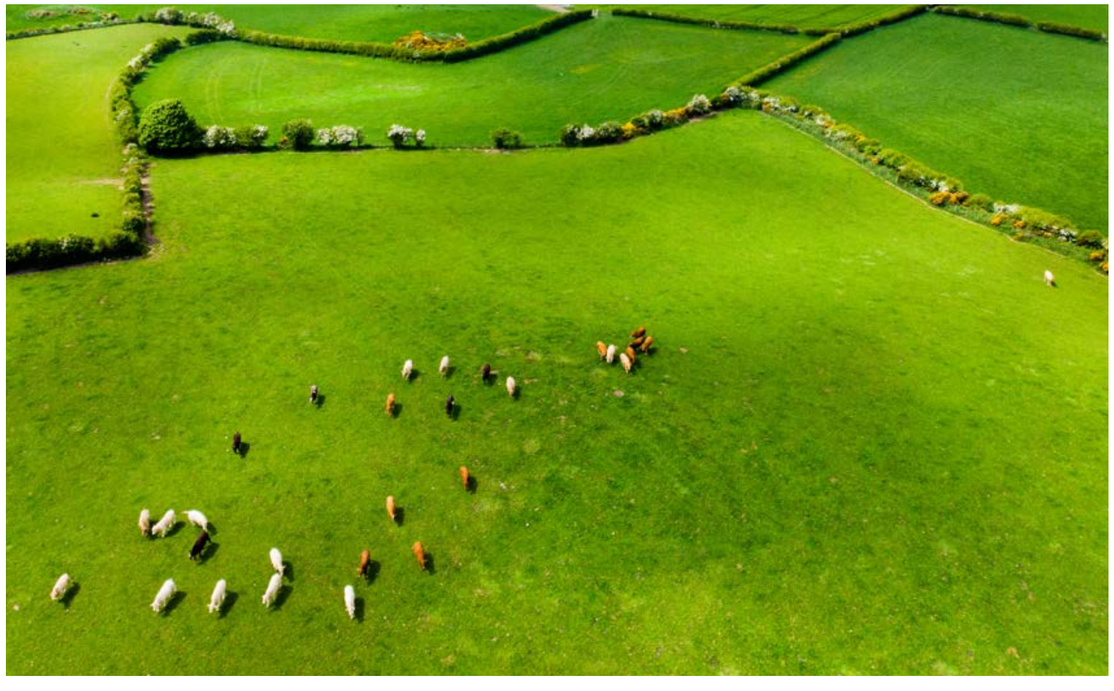
Appendix & Tables

10.1 Key findings from analysis of national lending portfolios – including non-bank financial Intermediation

For completeness and comparison purposes, we provide here our findings on national lending dependencies on ecosystem services (figure 26) with lending to the non-bank financial Intermediation sector included.

Figure 26 – Share of Irish lending with high or very high dependency on ecosystem services (data from March 2023). Including non-bank financial intermediation.





10.2 Scenario Analysis – PESTLE Analysis and Impacts, Risks and Opportunities

The tables below set out the PESTLE analysis 'narratives' developed to provide Irish relevant context to the four TNFD prepared scenarios. The impacts, risks and opportunities captured during the industry working session held in Dublin in September 2023 are displayed on the righthand side of each table. The workshop content is reproduced here so that others can test, improve or challenge in future scenario analysis workshops.

Scenario 1 – Ahead of the Game

PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Political	The Irish government aligns with global consensus on proactive nature conservation and restoration policies. High ambition global policies such as the US carbon tax show Irish policymakers that there is room for high ambition on nature. Spurred on by EU legislation and momentum such as the Nature Restoration Law, Irish political authorities, having missed previous opportunities and targets, are determined not to miss the chance to prioritise nature-positive actions. This commitment leads to supportive policies and regulations that encourage nature-related investments and initiatives.	**Impacts** • Political alignment around nature positive outcomes. • Increased resilience to nature and biodiversity risks. • Increased financing of nature protection and restoration projects. Integration with climate mitigation & adaptation outcomes. **Risks** • Politicisation of nature restoration - highlighting transition risks and downsides of nature positive decision making (certain business lines transformed, hesitancy to change, risk of communities feeling left behind). **Opportunities** • Nature positive actions that spur on savings and investments. • Irish & EU nature positive incentives & policies could act as leadership that other countries can follow. • Supportive government policies for lower insurance premiums for nature positive outcomes. • Marine based projects are a good opportunity to overcome land-based issues. • Supportive government policies for lower insurance premiums for nature positive outcomes.
Economic	Irish financial institutions shift investments towards biodiversity due to global trends in green finance. They take opportunities to invest in biodiversity and nature restoration projects across Ireland, as well as in biodiversity hotspots globally. Societal and financial pressures on Irish corporates to address biodiversity risks intensify. Irish corporates face increased demand for transparency and traceability regarding their biodiversity impacts.	**Impacts** • Nature positive finance & investments in increase in Ireland & globally. • Increased confidence in funds and insurance to support nature positive outcomes. • Banks make Nature protection a condition of lending. **Risks** • Transition risks with nature positive projects. Being a leader in the space could create additional uncertainty with spending and cost overruns. • High cost outlays. Initial costs for development of nature-based solutions and infrastructure building - can be difficult when you are the first country/ organisation to do so. • Lending to biodiversity and nature impacting industries may be seen as a high reputational risk **Opportunities** • Opportunity for a range of nature positive products to support green bond and lending support products. • Less risk of un-insurable events as a result of increased ecosystem condition and extent. • First move advantage. Commercial gains as a result of taking a leadership position in the market. • Opportunities for banks to take a stewardship role in financing a nature positive transition. This should help illustrate a roadmap to the adoption of nature based solutions for corporates. • Yields on biodiversity rich farms are higher. For insurance companies these farms could become a better risk as there is more expected capital. • Opportunity to invest in 'nature stable and climate stable' world.

Scenario 1 – Ahead of the Game

PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Social	Irish corporates experience growing pressure from customers to advance the nature agenda. Seeing the progress that has been made on carbon mitigation policies around the world, Irish civil society becomes more vocal about nature-positive lifestyles and biodiversity conservation. Nature restoration is a key part of the public discourse. Local, community, and culture movements in Ireland promote biodiversity preservation and become bolder in their demands.	**Impacts** • Growing expectations of stakeholders on nature positive corporate action. • Community and civil society demanding nature action. • Increased knowledge of nature and biodiversity. • Maintenance or improvements in quality of life. **Risks** • Transition and social justice issues could take second place to nature and biodiversity matters. • Increased activism or boycott of financial institutions not seen to be moving fast enough on nature issue. **Opportunities** • Landowners could take the opportunity to get paid for planting on their plots through new forestry programmes. • Opportunities for the top performing financial institutions on nature to improve their reputation and gain market share. • Change in consumer preferences connected to biodiversity awareness causing rise in new market entrants. • Increase in corporate and consumer lending to incentivise and support protection & restoration of ecosystem services.
Technological	Ireland is a leading supplier and developer of renewable energy projects, particularly wind. There is a spill–over effect into nature-based investments. Advanced technologies and data collection enable better monitoring and management of biodiversity risks in Ireland. Whole-island nature restoration programmes, working across critical landscapes are seen as best in class.	**Impacts** • Advanced technology and data collection methods result in increased nature-related data availability as well as better risk management. • Disclosure and transparency of nature related risks and dependencies enhances knowledge. **Risks** • There is continued difficulty in measuring nature-based impacts - requiring multiple indicators and data sources which aren't always readily available. **Opportunities** • Portfolio managers will see increasing opportunities to invest in nature positive technologies and businesses. • This includes investment in and deployment for nature positive technologies & data collection and platform innovations.
Legal	The Irish government introduces new incentives to drive biodiversity-positive investments. Irish financial institutions face increasing regulatory and legal requirements for disclosing their biodiversity impacts and efforts. CSRD and ESRS E4 have resulted in significant emphasis on biodiversity measurement and strategy.	**Impacts** • Regulations to force nature positive action and penalise inaction. • Litigation from investors and civil society against bad practice or inaction. **Risks** • Transition risks and justice in the transition to ensure benefits are shared equally throughout the transition. • Unwieldy or unclear legislation can create delays in innovation, and stall adaptive and responsive business, land use improvements, and general economic development. • Unplanned legal consequences could create distrust in the robustness of biodiversity and nature related targets, backstops, and laws to protect nature. **Opportunities** • The opportunity for science and legal disciplines to work together towards nature-positive legal frameworks.

Scenario 1 – Ahead of the Game

PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Environmental	Climate-related physical risks such as flooding and extreme weather highlight the importance of nature and biodiversity conservation in Ireland, reinforcing the need for all parts of society and the economy to support the protection and restoration of nature on the whole island. The data shows that nature loss is slowing down and, in some discreet areas, recovering. Targets and outcomes under the National Biodiversity Action Plan are receiving the investment and resources required to deliver on targets.	**Impacts** • Increase in the protection of nature and restoration projects. Integration with climate mitigation & adaptation outcomes gives rise to some areas of recovery and early signs of slowed nature loss. **Risks** • Risk that the deployment of nature finance is misplaced or does not deliver meaningful change on the ground. • Extraction from mining and other 'brown field sites' increases tensions between nature damaging and nature protecting initiatives. **Opportunities** • Improved quality of life due to improved air quality, access to nature for general wellbeing, and valuable eco system services being protected.

Scenario 2 – Go Fast or Go Home

PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Political	The Irish government has made good progress on the climate transition. However, as the public sees the loss of nature and ecosystem services across the country and abroad, there are loud calls for more rapid and concerted action on nature.	**Impacts** • Migration to Ireland increases the potential customer base for financial services - but access to services is under strain and limited. Issue becomes increasingly politicised. • Financial institutions scramble to quickly write and enact stronger nature policies. • There becomes an increased demand for policies to cover business interruption. **Risks** • Rapid or reactive decision making could result in significant trade-offs or unforeseen impacts on financial system stability. • Insurance companies experienced increased claims and remove coverage in flood prone areas with degraded ecosystem condition and extent. Creates tension with national government and county councils **Opportunities** • Rapid decision making in crisis could lead to positive nature impacts as multi-stakeholder groups demands grow

Scenario 2 – Go Fast or Go Home

PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Economic	The disruptions to businesses caused by nature loss erode market sentiment. Stakeholders now distrust the disclosures from corporates and financial institutions and investors make their anger felt at shareholder meetings. There is a scramble in the financial services sector to do more – and quickly. The Irish economy feels the effects of the global economic downturn, caused in part by the challenge of dealing with mass migration. Irish corporates across various sectors, such as agriculture, tourism, and manufacturing, face immediate and material harm from ecosystem service disruptions. These disruptions could impact the availability of water, pollination, and soil health, land availability, which are essential for their operations and resilience and profitability.	**Impacts** • Rise in claims on crop insurance, business interruption insurance, extreme weather insurance. • Agri-food sector heavily impacted by degraded ecosystem services **Risks** • Farming must become less intensive - but as a result the industry cannot deliver same quantity of output. Demands on government to support the industry grow. • Some low margin farmers default on bank loans **Opportunities** • Opportunity for government supports to be set-up in order to help mitigate the negative economic implications experienced across a range of sectors • Finance sector increasingly investing in nature restoration programmes
Social	Migration to Ireland increases dramatically as people are forced to move from their home countries due to climate and nature impacts. Ireland is seen as a safe haven due to its relatively temperate climate, but the growing numbers of climate refugees stoke social unrest due to competition for housing. The media makes a strong link between nature loss and climate change, and in light of the progress made on carbon targets, consumers and voters demand that governments and the private sector redouble their efforts on nature. NGOs lead public campaigns to name and shame companies that have done little on nature over the past decade and missed targets that they set.	**Impacts** • Financial institutions scramble to quickly write and enact stronger nature policies. • Cost of living continues to increase. Runaway inflation is a major concern for customers. **Risks** • Risk that collective action across companies and communities fails to materialise. • Cultural services are substantially eroded by increasing nature loss (physical, mental health and well-being of people). Tensions between rural and urban communities rise. **Opportunities** • Migration to Ireland increases the potential customer base for financial services - but access to lending and insurance does not keep apace. • Possibility for increased impact investing to support communities and innovations for new market disrupters

Scenario 2 – Go Fast or Go Home

PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Technological	As pressure mounts on government and the private sector to take action on nature, demand for new tools and technologies to enable the nature-positive transition explodes. Start-up accelerators and research funds launch nature-positive challenges to find solutions for nature protection and restoration.	**Impacts** • Investment in and deployment of nature positive technologies & innovations. • Advanced technology and data collection methods result in increased nature-related data availability as well as better risk management. **Risks** • Rapid technological transition and developments may lead to poor longer term design decisions that cause other economic problems – time lost, excessive costs. High failure of start ups. **Opportunities** • Use of advanced nature tools to model the impact of nature loss. This will help with nature-based data availability as well as risk management.
Legal	Financial market participants and corporates face litigation risks for not providing sufficient disclosure and transparency on how their activities impact and depend on nature.	**Impacts** • Regulations to force nature positive action and penalise inaction. • Litigation from investors and civil society against bad practice or inaction. **Risks** • Increased legal challenges – compulsory purchase orders, wider scale up of construction projects and NBS development may be open to local opposition and NIMBYism due to rapid pace of the change – less space for consultation and avenues to create dialogue for local community buy–in • Companies seek to avoid legislation and to avoid nature & biodiversity impacts as costs spiral **Opportunities** • Information sharing between nature and biodiversity experts and legal professionals open new avenues for pushing national and local council action.
Environmental	Increased storms and human pressures are causing coastal ecosystems such as sand dunes to collapse. Impacts of river flooding increases significantly. Tourism businesses such as whale-watching tours, surf schools, coastal and riverside hotels are interrupted for days and weeks at a time due to severe flooding. There are food shortages and price increases in supermarkets and restaurants due to decline in pollination services and availability of potable water.	**Impacts** • Signs appear of local and regional ecosystem collapse and degradation – keystone species lost or on brink of extinction **Risks** • Radical environmental and land use change to salvage the environment could be disruptive to species, require extreme efforts and be disruptive in the initial stages to nature and wildlife **Opportunities** • Concerted efforts to stem the losses result in increased protection and restoration mechanisms

Scenario 3 – Sand in the Gears

PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Political	The Irish government has fallen significantly behind on its carbon targets. Public backlash causes a general election, and a newly elected government redoubles its focus on decarbonisation.	**Impacts** • Nature and biodiversity fall down the agenda. • Central banks and regulators move quickly to stabilise the system as smaller or more exposed financial services companies start to fail. • The government increases pressure on banks to absorb losses to keep critical sectors afloat. **Risks** • Risk of increasing defaults from businesses unable to repay loans. • Public backlash – though direct connection to biodiversity breakdown may not be made. The same can be said for how the systematic impacts of nature issues (fodder crises, land breakdown, decreased food yields, water quality problems) and how those problems make food and services more expensive may not be made. • Political issues arising from economic issues as a result of this scenario. • Any decisions will be seen as abrupt one - decisions to make the quickest returns. **Opportunities** • Political parties that prioritise nature positive action start to gain traction with voters
Economic	Economic growth is sluggish, and attention is focused on creating jobs and opportunities. Local Enterprise Offices and SME groups pause their nature training programmes. Corporates are not taking action on nature, as data availability and quality are generally low. They have not hired people with the skillsets to deal with the complexity of biodiversity issues. Boards focus on making progress towards their net zero targets at the detriment of nature. In the absence of a globally agreed nature disclosure standard, Irish financial institutions reduce their transparency and disclosure quality on nature.	**Impacts** • Nature positive finance & investments are reduced. • Corporate action on nature stalls with disclosure & transparency reduced. • Investment performance drops in key nature dependent services. Increase in loss given defaults (LGDs) – lenders working in an increasingly risky financial space. **Risks** • Mortgage defaults as job losses increase in nature dependent sectors. • Run on savings as consumers fear bank defaults. • Increasing risk of contagion across the sector because of ecosystem service losses. **Opportunities** • Opportunities for investments in nature resilient companies for high risk appetite investors • Small scale risk pooling opportunities in climate and biodiversity uncertain world to protect against land degradation, water, and air quality issues,

Scenario 3 – Sand in the Gears

PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Social	In the media, there are regular clashes between two camps. The first group includes farmers, tourists, and nature lovers, who are dismayed by the visible loss of ecosystem services. This group is mobilising to get the Government to act and focus on more than just decarbonisation. Conversely, there is a growing countermovement that believes nature regulations had already gone too far. They advocate for productive use of land and sea to further Ireland's economic interests and create jobs and are against leaving space for nature.	**Impacts** • Conflicting stakeholder expectations fuel inaction by corporates • Growing division appears amongst community groups and civil society • High prices on restricted output and breakdown of ecosystem services which previously provided abundance at low cost **Risks** • Mortgage defaults as job losses increase in nature dependent sectors • Run on savings as consumers fear bank defaults • Potential for land grabbing scenarios - majority of land going to private ownership and being used for carbon credits **Opportunities** • Piecemeal acts of philanthropy and activism can inspire, though it will not be sufficient to abate all effects of biodiversity breakdown • Opportunities for large landowners to make money from carbon offsets
Technological	As nature is de-prioritised by government and the private sector, there is little demand for nature-relevant technologies. Science Foundation Ireland funding flows into other topics and start-up challenges set net zero as their main focus. Promising early-stage nature technologies cannot get traction and are stranded.	**Impacts** • Development of nature positive technologies and data collection are stalled or deprioritised **Risks** • Money and technologies that are ill conceived, with 'over engineered' solutions that do not address core societal issues or exacerbate social inequalities • Increased material uses and extraction to deal with adaptation aspects of nature and biodiversity breakdown **Opportunities** • Opportunities to invest in climate focussed start-ups
Legal	The Government faces litigation risks both for not meeting its carbon targets and for failing to adhere to EU Nature Directives. Agri-food companies face litigation risks for loss of earnings, broken supplier contracts, related to the loss of ecosystem services such as soil quality. Companies push back with their own legal cases	**Impacts** • Irish government faces increased litigation from EU and civil society • Litigation increases both against and from corporates **Risks** • Reduced transparency adds to uncertainty of wrongdoing and lack of clarity around environmental bad actors • Increasing defaults with stranded assets and defaulting loans. **Opportunities** • Opportunities for Human rights legislation to mitigate against worst impacts of biodiversity and nature loss

Scenario 3 – Sand in the Gears

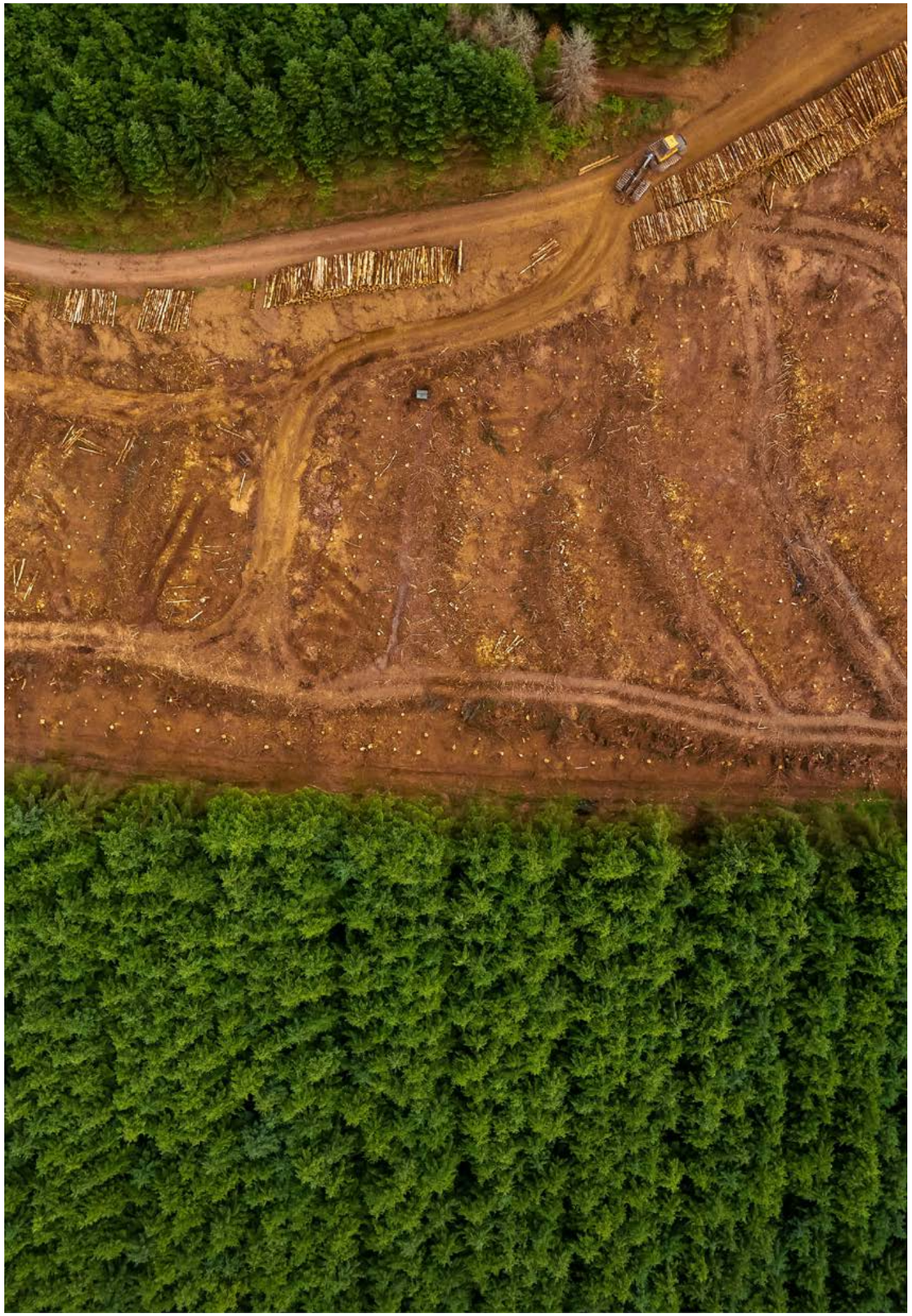
PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Environmental	Increasing signs that nature and biodiversity loss are increasing. National Biodiversity action plan is off target or deprioritised. Corporates experience significant negative material impacts from the loss of ecosystem services, with knock-on effects for the financial sector.	**Impacts** • Nature and biodiversity loss are increasingly degraded. • As a result, corporates face increasing disruption or losses around materials which has a knock-on effect for the financial sector. **Risks** • Risk of material impacts with corporates facing increasing disruption or losses. • Increased losses with invasive disease and invasive species **Opportunities** • Insurance pooling of risk against nature and biodiversity related breakdown can offer protection. • Opportunity for investment in increased adaptation requirements due to growing imperative as mitigation options and scale of mitigation possibilities are reduced.

Scenario 4 – Back of the List

PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Political	Ireland has conducted thorough climate risk assessments and has made progress in reducing carbon emissions due to its commitment to renewable energy and climate action. However, a national assessment of the risks posed by nature degradation has not been conducted. The Government has not mandated corporates and financial institutions to disclose on nature-related issues. Meanwhile, climate disclosure is the norm.	**Impacts** • Lack of political alignment around nature positive outcomes. • The breakdown of nature and biodiversity continues **Risks** • Biodiversity siloed from rest of government agenda. Trade-offs between climate and nature policies increase. **Opportunities** • As nature and biodiversity breakdown continues, and growing evidence for the importance of biodiversity and nature centric policy planning emerges, the opportunity would be to expand on this as the problem continues to not be addressed.
Economic	Irish corporates and financial institutions are highly focused on carbon reduction and managing climate risks. Nature restoration projects don't receive the financial backing they require and as a result are piecemeal and limited in impact.	**Impacts** • Lack of nature positive finance & investments in Ireland with little to no disclosure and transparency of nature related risks and dependencies. • Insurance industry is advanced on climate modelling but missing key risks to its business as it has not assessed the close relationship between climate and nature risks. **Risks** • Increased questions from shareholders on nature activities. • Risk on low quality carbon offset initiatives increase – driving land prices higher and negatively impacting nature. **Opportunities** • Opportunity for new market entrants to improve reputation and market share by focussing on supporting innovations in nature finance

Scenario 4 – Back of the List

PESTLE	Example narrative (2030)	Example Impacts Risks and Opportunities
Social	A small community of experts and NGOs in Ireland advocates for nature issues, including highlighting the inequality between countries that are most affected by nature loss, versus the rich nations that drive much of the negative impacts on nature. This narrative becomes politicised, with political parties and voters divided on the topic.	**Impacts** • Stakeholder expectations on nature positive corporate action increases • Certain community and civil society's demand nature action **Risks** • Communities affected by nature degradation or job losses in nature dependent sectors **Opportunities** • As on-the-ground impacts materialise, opportunity for action and solidarity at a community level arise as they battle the worst impacts of nature and biodiversity breakdown.
Technological	Some academics and entrepreneurs continue to work on technologies and solutions to tackle nature loss, but they struggle to receive funding. The demand for this type of work is low, as Irish financial institutions and corporates have not integrated detailed modelling of nature loss into their decision-making.	**Impacts** • Lack of any impactful investment in or deployment for nature positive technologies & innovations • Out of date or low quality nature-related data and lack of funding to close gaps **Risks** • With the lack of detailed modelling on nature loss being integrated into Irish financial institutions decision-making, there is a risk that little to no investment will go into nature positive technologies needed for crises abatement efforts **Opportunities** • High cost of materials resulting from degradation of ecosystem services create incentives for technological advancements in circular economy design.
Legal	Ireland has not reached consensus on standardised disclosures for nature-related risk. Without this standardised framework, litigation risk for corporates is low as NGOs do not have a basis to bring legal challenge against the lack of disclosure.	**Impacts** • Lack of regulations to force nature positive action and penalise inaction as a result of Ireland not having standardised disclosures for nature-related risk. • Similarly, there is no real chance of litigation from investors and civil society against bad practice or inaction **Risks** • Risk of there being no penalty against those who are financing nature degrading businesses and activities **Opportunities** • As crises continues – there is an opportunity to draw up legal frameworks and enforce broader powers to manage biodiversity and nature breakdown crisis issues to manage worst effects
Environmental	Nature degradation is occurring with moderate losses in ecosystem services such as water availability and pollination. However, most sectors are not suffering visible material financial impacts and where impacts are felt, companies have closed sites and moved locations.	**Impacts** • Nature degradation is occurring with moderate losses in ecosystem services such as water availability and pollination **Risks** • Nature and biodiversity loss continue degrading with little to no action to prevent it • With no environmental maintenance, increased losses with invasive disease and invasive species can be expected **Opportunities** • Opportunity for investment in increased nature based adaptation requirements due to growing imperative as mitigation options and scale of mitigation possibilities are reduced



11

References

Bechauf, Ronja (2020), Building the Investment Case for Nature-Based Infrastructure. IISD. www.iisd.org/articles/investment-case-for-nature-based-infrastructure

Boldrini, Simone, et al (2023) – Living in a world of disappearing nature: physical risk and the implications for financial stability. European Central Bank, Occasional Paper Series No. 333

Brondizio, E. S., Settele, J., Díaz, S. & Ngo, H. T. (2019). Global assessment report on biodiversity and ecosystem services. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). IPBES secretariat, Bonn, Germany. 1148 pages. https://doi.org/10.5281/zenodo.3831673

Ceglar, Andrej, et al (2023) The impact of the euro area economy and banks on biodiversity. European Central Bank (ECB), Occasional Paper Series No. 335

Dasgupta, P. (2021). The Economics of Biodiversity: The Dasgupta Review. (London: HM Treasury). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/96 2785/The_Economics_of_Biodiversity_The_Dasgupta_Review_Full_Report.pdf

De Nederlandsche Bank (2020), Indebted to nature Exploring biodiversity risks for the Dutch financial sector. Indebted to nature (dnb.nl)

EIOPA (2023) Staff paper on nature-related risks and impacts for insurance. European Insurance and Occupational Pensions Authority (EIOPA), March 2023

Elderson, F. (2023). The economy and banks need nature to survive (ECB Blog) The economy and banks need nature to survive (europa.eu)

Ferrier, S., Ninan, K.N., Leadley, P., et al. (2016). Summary for policymakers of the assessment report of the methodological assessment of scenarios and models of biodiversity and ecosystem services. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). https://ipbes.net/sites/default/files/downloads/pdf/SPM_Deliverable_3c.pdf

Haines-Young, R., & Potschin, M. (2018). Common International Classification of Ecosystem Services (CICES) V5.1 and Guidance on the Application of the Revised Structure, 1–10. doi:10.3897/oneeco.3.e27108

INSPIRE. (2022). Central Banking Toolbox – Policy Briefing no. 9. Beyond climate: addressing financial risks from nature and biodiversity loss. Beyond climate: addressing financial risks from nature and biodiversity loss - Grantham Research Institute on climate change and the environment (lse.ac.uk)

International Standards Organisation (2021). ISO 14091 Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment. https://www.iso.org/standard/68508.html

Institute and Faculty of Actuaries (2023) - Biodiversity & Nature Related Risks for Actuaries: An Introduction. Lucy Saye, June 2023. biodiversity-and-nature-related-risks-for-actuaries-an-introduction.pdf

IPBES. (2019). Global Assessment Report on Biodiversity and Ecosystem Services. https://ipbes.net/global-assessment

Lai, Matteo (2022) “Beyond “Big: Measuring Ireland’s Non-Bank Financial Intermediation Sector.” Central Bank of Ireland blog. https://www.centralbank.ie/statistics/statistical-publications/behind-the-data/beyond-big-measuring-ireland%27s-non-bank-financial-intermediation

Maurin, Julie et al (2022a) Global biodiversity scenarios: what do they tell us for biodiversity-related socio-economic impacts? Policy Paper December 2022. AFD Research Papers.

Maurin, Julie et al (2022b) Global biodiversity scenarios: what do they tell us for biodiversity-Related Financial Risks? Policy Paper, December 2022. AFD Research Papers.

Mc Guinness, S.K. & Bullock, C. (2020). Mobilising Finance for Biodiversity: A policy and institutional review of finance arrangements for biodiversity conservation in Ireland. Report prepared for the National Parks and Wildlife Service and the Irish Research Council. University College Dublin, Dublin

Millenium Ecosystem Assessment. (2005). Ecosystems and human well-being. Synthesis. A Report of the Millennium Ecosystem Assessment. https://www.millenniumassessment.org/documents/document.356.aspx.pdf

Molinos, G et al. 2015 Climate velocity and the future global redistribution of marine biodiversity. Nat. Clim. Chang. 6, 83-88. doi: 10.1038/nclimate2769

Muller S and Robins N (2022) Just Nature: How finance can support a just transition at the interface of action on climate and biodiversity. London: Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science Just_Nature_How_finance_can_support_a_just_transition_at_the_interface_of_action_on_climate_and_biodiversity.pdf (lse.ac.uk)

NGFS. (2023). Nature-related Financial Risks: a Conceptual Framework to guide Action by Central Banks and Supervisors. Technical Document. ngfs_conceptual-framework-on-nature-related-risks.pdf

NPWS. (2019). Ireland’s Biodiversity Sectoral Climate Change Adaptation Plan. Layout 1 (npws.ie)

NPWS. (2019). Habitats Directive, Article 17 Report. Article 17 Reports 2019 | National Parks & Wildlife Service (npws.ie)

Ockendon et al. 2014 Mechanisms underpinning climatic impacts on natural populations: Altered species interactions are more important than direct effects. Glob. Change Biol. 20, 2221–2229. doi: 10.1111/gcb.12559; pmid: 24677405

OECD. (2021). Biodiversity, natural capital and the economy: A policy guide for finance, economic and environment ministers. OECD Environment Policy Paper. https://doi.org/10.1787/1a1ae114-en

OECD. (2023) Assessing biodiversity related financial risks: Navigating the landscape of existing approaches. OECD Environment Policy Paper No. 36 Assessing biodiversity-related financial risks (oecd-ilibrary.org)

Phillips, Helen; Adriana De Palma; Ricardo E Gonzalez; Sara Contu et al. (2021). The Biodiversity Intactness Index - country, region and global-level summaries for the year 1970 to 2050 under various scenarios. Natural History Museum. https://doi.org/10.5519/he1eqmg1

Richardson, J., Steffen W., Lucht, W., Bendtsen, J., Cornell, S.E., et.al. 2023. Earth beyond six of nine Planetary Boundaries. Science Advances, 9, 37. https://www.stockholmresilience.org/research/planetary-boundaries.html

Saye, L. (2023). Biodiversity & Nature Related Risks for Actuaries: An Introduction. Institute and Faculty of Actuaries.

Schipper, A.M. et al. (2020), “Projecting terrestrial biodiversity intactness with GLOBIO 4”, Global Change Biology, Vol. 26, pp. 760-771.

Sustainable Finance Ireland. (2021). Ireland Sustainable Finance Roadmap. Irish Sustainable Finance Centre of Excellence. Irish-SusFinance-Roadmap-FINAL-FINAL-OCTOBER-2021.pdf (sustainablefinance.ie)

Svartzman, R., Bolton, P., Despres, M., Pereira da Silva, L. A., & Samama, F. (2021). Central banks, financial stability and policy coordination in the age of climate uncertainty: a three-layered analytical and operational framework. Climate Policy, 21(4), 563-580. https://doi.org/10.1080/14693062.2020.1862743

Svartzman et al. (2021), “A ‘Silent Spring’ for the Financial System? Exploring Biodiversity-Related Financial Risks in France”, ECB Working Paper Series, No 826. wp826_0.pdf (banque-france.fr)

Taskforce on Nature-related Financial Disclosures (2023). Glossary Version 1.0. https://tnfd.global

Taskforce on Nature-Related Disclosures (2023) Guidance on Scenario Analysis Version 1. TNFD Scenario analysis. Guidance_on_scenario_analysis_V1.pdf (tnfd.global)

UNDP (2021) Nature-Related Risks in the Global Insurance Sector. UNDP Sustainable Insurance Forum, November 2021

UNEP, (2022) Insuring the climate transition: Enhancing the insurance industry’s assessment of climate change futures. UN Environment Programme’s Principles for Sustainable Insurance, 2022. www.unepfi.org

UNEP (2022b). State of Finance for Nature. Time to act: Doubling investment by 2025 and eliminating nature-negative finance flows. Nairobi. UNEP https://wedocs.unep.org/20.500.11822/41333

UNEP (2023) Nature-Positive Insurance: Evolving Thinking and Practices. UN Environment Programme’s Principles for Sustainable Insurance Initiative, September 2023. www.unepfi.org

Van Toor J, Piljic D, Schellekens G, et al. (2020) Indebted to nature. Exploring biodiversity risks for the Dutch financial sector. Amsterdam: De Nederlandsche Bank; Planbureau voor de Leefomgeving.

World Bank and Bank Negara Malaysia (2022) An exploration of nature-related financial risks. Kuala Lumpur.

World Business Council for Sustainable Development (2023), Roadmaps to Nature Positive; Foundations for all businesses. 1 (wbcsd.org)

WWF (2022) Living Planet Report 2022 – Building a nature-positive society. Almond, R.E.A., Grooten, M., Juffe Bignoli, D. & Petersen, T. (Eds). WWF, Gland, Switzerland

WWF (2023) Underwriting our Planet. How insurers can help address the crisis in climate and biodiversity. Favier, Amandine et al, WWF Switzerland and Deloitte.

Design: cavecreative.ie

Contact us

E: info@isfcoe.org **W:** https://isfcoe.org/
The Black Church, St Mary's Place, Dublin 7, D07 P4AX

INTERNATIONAL SUSTAINABLE FINANCE CENTRE OF EXCELLENCE

PREPARED BY KPMG

IN PARTNERSHIP WITH Skillnet IRELAND

The International Sustainable Finance Centre of Excellence is co-funded by Skillnet Ireland and partcipating businesses. Skillnet Ireland is funded from the National Training Fund through the Department of Further and Higher Education, Research, Innovation & Science

Skillnet IRELAND

An Roinn Breisoideachais agus Ardoideachais, Taighde, Nuálaíochta agus Eolaíochta
Department of Further and Higher Education, Research, Innovation and Science

Co-funded by the European Union