Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Environmental Protection Agency

Climate risk assessment approaches in the financial and commercial sectors

Climate Risk Assessment in the financial and commercial sectors

Christopher Phillips, Lydia Cumiskey, Cathal O'Mahony, Camila Tavares Pereira, Catriona Iulia Reid, Conor Quinlan, Dervla McAuley, Mary Frances Rochford

ENVIRONMENTAL PROTECTION AGENCY

An Ghníomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle, Co. Wexford, Ireland, Y35 W821
Telephone: +353 53 9160600
Email: info@epa.ie Website: www.epa.ie
Lo Call 1890 33 55 99

Published by the Environmental Protection Agency, Ireland

Disclaimer

Cover photo: Mountmellick, Co Laois, *SkyPix Aerial Works Ltd.*

ISBN 978-1-80009-182-5 July 2024

Contents

Glossary and Abbreviations

ACPR	Autorité de Contrôle Prudentiel et de Résolution
AMF	Autorité des Marchés Financiers
APRA	Australian Prudential Regulation Authority
ASF	Autoritatea de Supraveghere Financiară
ASIC	Australian Securities & Investments Commission
BNR	Banca Națională a României
BVB	Bursa de Valori Bucureşti
CFRAC	Climate related Financial Risk Advisory Committee
CFTC	Commodity Futures Trading Commission
CIAN	Climate Ireland Adaptation Network
CMIP	Coupled Model Intercomparison Project
CNSM	Comitetul Național pentru Supravegherea Macroprudențială
CSA	Climate Scenario Analysis
CSRD	Corporate Sustainability Reporting Directive
EBA	European Banking Authority
ECB	European Central Bank
ECMWF	European Centre for Medium-Range Weather Forecasts
EPA	Environmental Protection Agency
ESG	Environment, Social and Governance
ESRS	European Sustainability Reporting Standards
FCA	Financial Conduct Authority
FDIC	Federal Deposit Insurance Corporation
FEI	Finnish Environment Institute
FIN	FSA - Finnish Financial Supervisory Authority
FIO	Federal Insurance Office
FMI	Finnish Meteorological Institute
FSOC	Financial Stability Oversight Council
GIS	Geographic Information Systems
IFoA	nstitute and Faculty of Actuaries
IFRS	nternational Financial Reporting Standards
IPCC	The Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
LSI's	Less Significant Institutions
NAF	National Adaptation Framework
NAIC	National Association of Insurance Commissioners
NFRD	Non-Financial Reporting Directive
NGFS	Network of Central Banks and Supervisors for Greening the Financial System
NOAA	National Oceanic and Atmospheric Administration
OBR	Office for Budget Responsibility
OFR	Office of Financial Research
OPW	Office of Public Works
PRA	Prudential Regulation Authority
RCPs	Representative Concentration Pathways
SBTI	Science Based Targets Initiative
SEC	Securities and Exchange Commission
SI's	Significant Institutions
TCFD	Task Force on Climate-related Financial Disclosures
UKCCRA3	UK Climate Change Risk Assessment version #3
WRI	World Resources Institute
WWF	Worldwide Fund for Nature

Executive Summary

The purpose of this study is to better understand current climate risk assessment practices within the financial and commercial sectors and identify lessons to inform the development of the National Climate Change Risk Assessment (NCCRA) methodology and criteria. This study did not undertake an assessment of the effectiveness or otherwise of how finance and commercial entities assess risk and does not make recommendations for individual sectors.

Focusing on lessons learned, the study explores the impact of guiding policies, legislation, and regulations on climate adaptation within the finance and commercial sectors, both internationally and nationally. The research includes a comprehensive literature review, emphasising the pivotal role of the Task Force on Climate-related Financial Disclosures (TCFD), Corporate Sustainability Reporting Directive (CSRD) and EU taxonomy frameworks in guiding climate risk assessment practices in relevant sectors.

The study included interviews conducted with 20 individuals in roles related to sustainability, risk management, and Environment, Social and Governance (ESG) within 11 diverse organisations spanning finance, commercial, consultancy, and climate services sectors. The interview topics were structured around three primary themes: current practices, policy and legislation, and climate actions.

Key findings

- The CSRD and EU Taxonomy are the main driving forces and main regulations that companies are reporting under regarding climate risk and sustainability.
- Organisations are increasingly aware of the potential impacts of climate change on their operations and assets. Interviewees within this study perceived the physical risks as having minimal direct impact to their business operations in the short to medium term. Transition risks were considered to be more impactful than physical risks especially potential disruptions and challenges associated with the introduction of new regulations and reporting standards, leading to the possibility of a "disorderly transition".
- Interviewees had concerns regarding data availability and the crucial need for easily accessible and usable climate data for effective climate risk assessments.
- The requirement for standardised and accessible criteria in utilizing climate data for risk assessment was strongly evident from interviewees.
- The establishment of standardised risk assessment criteria was seen as important. All financial institutions pointed out that they employ climate scenarios in their risk assessments. The most common Representative Concentration Pathways[1] (RCPs) employed are RCP8.5, and RCP6.0 but RCP4.5 with RCP2.6 being used primarily for transition risk and for reference.

1 RCPs are scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases (GHGs) and aerosols and chemically active gases, as well as land use/land cover (Moss et al., 2008). The word representative signifies that each RCP provides only one of many possible scenarios that would lead to the specific radiative forcing characteristics. The term pathway emphasises that not only the long-term concentration levels are of interest, but also the trajectory taken over time to reach that outcome (Moss et al., 2010). RCPs usually refer to the portion of the concentration pathway extending up to 2100, for which Integrated Assessment Models produced corresponding emission scenarios. (IPCC, 2024).

- Interviewees conveyed an explicit preference within the financial and commercial sectors for technical guidance and support rather than an increase in legislative or regulatory measures.
- Organizations in both financial and commercial sectors emphasize the importance of collaboration with external experts, as a valuable approach for sharing best practices, adopting international lessons, and addressing climate challenges effectively.
- There is a shared recognition of the cross-sectoral impact of climate-related physical and transitional risks. Climate events that impact one sector can affect others, highlighting the need for coordinated strategies and cross-sectoral collaboration. There is a strong willingness to engage in cross-sectoral work and some organisations have begun working in this space.

Key recommendations

- Ensure policies, regulations, and guidance prioritise access to relevant standardised data and address data gaps, emphasising user-friendly formats for non-experts across all sectors.
- Coordinated through the National Framework for Climate Services, standardised data is now accessible and should be used in comprehensive physical climate risk assessments across various sectors. Climate Ireland serves as the national platform for adaptation, providing a centralised and accessible resource to support informed decision-making and enhance the resilience of sectors to climate-related challenges.
- Common approaches to data use and risk assessment criteria should be encouraged through the provision of national and sectoral guidance.
- Promote mechanisms for collaboration amongst experts, practitioners, industry peers, and government agencies both within and across sectors. The Climate Ireland Adaptation Network (CIAN) and events held under the auspices of the National Framework for Climate Services can support this capacity building and knowledge sharing.
- Provide increased guidance on choosing appropriate climate scenarios, considering their impact and relevance.
- Promote adaptive risk management strategies into decision making that allow flexibility in response to evolving climate data, including adaptive strategies based on thresholds and triggering events.
- Ensure biodiversity data and guidance is produced in alignment with climate services to facilitate coherent reporting on the impact of sectoral activities as that requirement arises.

The insights derived from this study focusing on the financial and commercial sectors, will inform the development of the National Climate Change Risk Assessment (NCCRA) methodology and risk assessment criteria.

Section 1 Literature Review: Scoping the integration of climate adaptation in the Finance and Commercial Sectors

1. Introduction

The purpose of this study is to better understand current climate risk assessment practices within the financial and commercial sectors and identify lessons to inform the development of the National Climate Change Risk Assessment (NCCRA) methodology and criteria. This study did not undertake an assessment of the effectiveness or otherwise of how finance and commercial entities assess risk and does not make recommendations for individual sectors.

Within section 1, the literature review will assess the influence of guiding policies, legislation, and regulations on common practices for integrating climate adaptation into the finance and commercial sector practices – from international to national levels. The literature review will support and supplement the data collected through interviews with sector representatives, primarily in Ireland.

This section aims to identify:

1. What are the current financial regulations and legislation for climate risk assessment in Ireland?

2. Guiding policy, legislation, and regulations: international to national

2.1 International level

2.1.1 Task Force on Climate-related Financial Disclosures (TCFD)

In 2017, The Financial Stability Board (FSB), the international body that monitors and makes recommendations about the global financial system, established the Task Force on Climate-related Financial Disclosures (TCFD or Task Force) to develop recommendations for more effective climate-related disclosures that:

- could "promote more informed investment, credit, and insurance underwriting decisions" and
- in turn, "would enable stakeholders to understand better the concentrations of carbon-related assets in the financial sector and the financial system's exposures to climate-related risks."

The recommendations are structured around four thematic areas (Figure *1*) representing core elements of companies' operations: governance, strategy, risk management, and metrics and targets.

Governance
The organization's governance around climate-related risks and opportunities

Strategy
The actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning

Risk Management
The processes used by the organization to identify, assess, and manage climate-related risks

Metrics and Targets
The metrics and targets used to assess and manage relevant climate-related risks and opportunities

Figure 1: The core thematic areas that represent core elements of how organisations operate: governance, strategy, risk management, and metrics and targets.

Source: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures (2021).

The four recommendations are interrelated and supported by 11 recommended disclosures (Table 1) that build the framework with information that should help investors and others understand how reporting organisations think about and assess climate-related risks and opportunities.

Table 1: Task Force: Recommendations and Supporting Recommended Disclosures.

Governance	Strategy	Risk Management	Metrics and Targets
a) Describe the board's oversight of climate-related risks and opportunities.	a) Describe the climate-related risks and opportunities the organisation has identified over the short, medium, and long term.	a) Describe the organisation's processes for identifying and assessing climate-related risks.	a) Disclose the metrics used by the organisation to assess climate-related risks and opportunities in line with its strategy and risk management process.
b) Describe management's role in assessing and managing climate-related risks and opportunities.	b) Describe the impact of climate-related risks and opportunities on the organisation's businesses, strategy, and financial planning.	b) Describe the organisation's processes for managing climate-related risks.	b) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.
	c) Describe the resilience of the organisation's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organisation's overall risk management.	c) Describe the targets used by the organisation to manage climate-related risks and opportunities and performance against targets.

Source: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures (2021).

Once an organisation assesses climate-related issues and determines its response to them, it can consider actual and potential financial impacts on revenues, expenditures, assets and liabilities, and capital and financing. Figure 2 outlines the main climate-related risks (transition and physical) and opportunities organisations should consider in their strategic planning or risk management to determine potential financial implications.

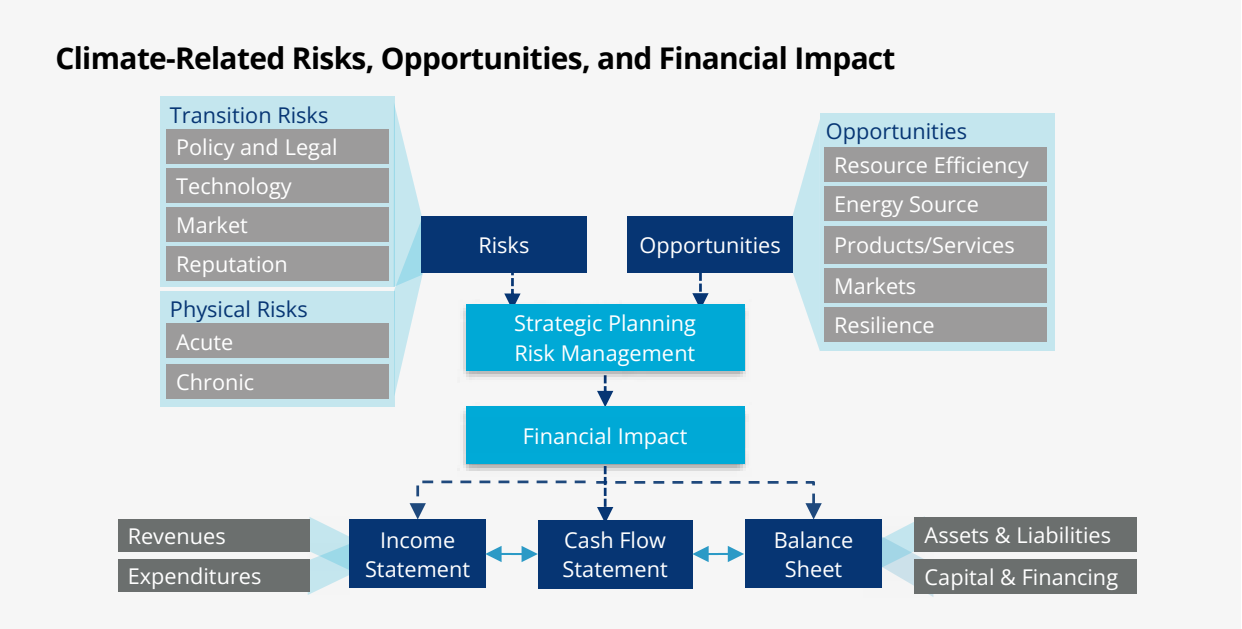


Figure 2: Climate-Related Risks, Opportunities, and Financial Impact.

Source: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures (2021).

Supplemental Guidance for the Financial Sector

A key element of the FSB's proposal for the Task Force was the development of climate-related disclosures that "would enable stakeholders to understand better the concentrations of carbon-related assets in the financial sector and the financial system's exposures to climate-related risks." The FSB's proposal also noted that disclosures by the financial sector would:

- "foster an early assessment of [climate-related] risks" and "facilitate market discipline" and
- "provide a source of data that can be analysed at a systemic level to facilitate authorities' assessments of the materiality of any risks posed by climate change to the financial sector, and the channels through which this is most likely to be transmitted."

The TCFD organised the financial sector into four major industries, primarily based on activities performed, as follows: banks (lending), insurance companies (underwriting), asset managers (asset management), and asset owners, which include public- and private-sector pension plans, endowments, and foundations (investing). Given the critical role of the financial sector as preparers of climate-related financial disclosures described in the FSB's proposal, the Task Force identified specific areas where supplemental guidance was warranted, as shown in Figure 3. This supplementary guidance is intended to provide additional context for the financial sector when preparing disclosures consistent with the Task Force's recommendations. For more information about each activity, please consult the *Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures (2021)*.

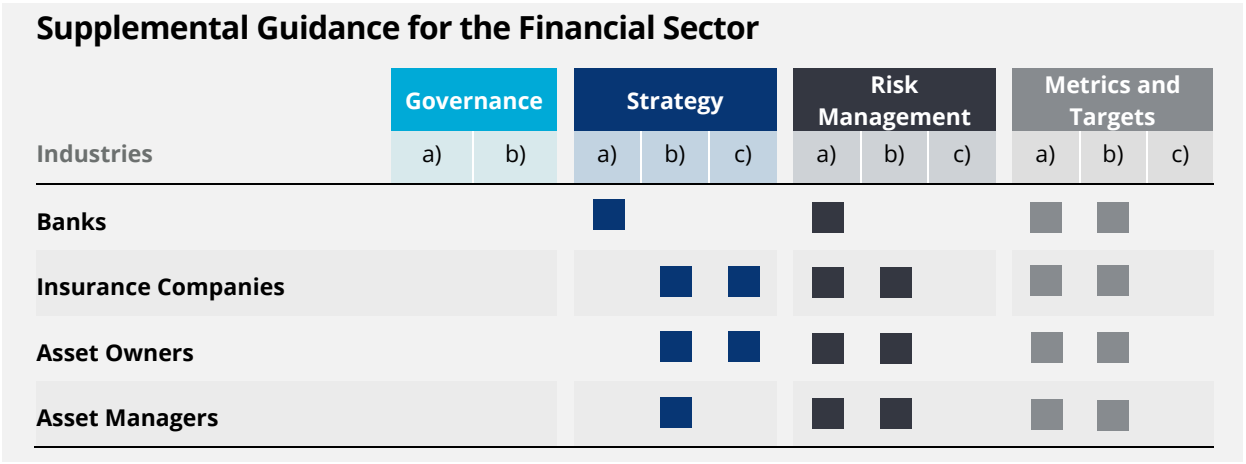


Figure 3: Supplemental Guidance for the Financial Sector.
Source: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures (2021).

Example Disclosures

Since the TCFD published its recommendations in 2017, many companies have been disclosing climate-related financial information in line with the recommendations.

Table 2 shows examples of climate-related financial disclosures that align with one or more of the TCFD's 11 recommended disclosures for banking. The examples included may help companies generate ideas for their disclosures[2].

Table 2: International examples of climate-related financial disclosures.

Company	Industry	Region	Relevant TCFD Report	Year	Company Report	Recommended Disclosure
ANZ (Australia and New Zealand Banking Group Limited)	Banking	Asia Pacific	*Guidance on Risk Management Integration and Disclosure (2020), p. 25*	2019	*2019 Climate-Related Financial Disclosures, p. 5*	Risk Management a); Risk Management b)
ANZ (Australia and New Zealand Banking Group Limited)	Banking	Asia Pacific	*2018 Status Report, p. 55-57*	2017	*2017 Annual Review, pp. 26-27*	Strategy c); Metrics and Targets c)
Barclays	Banking	Europe	*Guidance on Metrics, Targets, and Transition Plans, p. 20*	2020	*ESG Report 2020, p. 16*	Metrics and T argets b)
BMO Financial Group	Banking	North America	*2018 Status Report, p. 18*	2017	*2017 BMO Financial Group Annual Report, p. 112*	Risk Management b)

2 For more examples, please consult: *https://www.fsb-tcfd.org/example-disclosures/*

Company	Industry	Region	Relevant TCFD Report	Year	Company Report	Recommended Disclosure
Citigroup	Banking	North America	*Guidance on Risk Management Integration and Disclosure (2020), p. 27*	2019	*Form 10-K 2019, pp. 294–295*	Risk Management a); Risk Management b)
HSBC	Banking; Asset Owner	Europe	*Guidance on Metrics, Targets, and Transition Plans, p. 26*	2020	*TCFD Update 2020, p. 4*	Metrics and Targets a)
Intesa Sanpaolo Group	Banking	Europe	*2018 Status Report, p. 17*	2017	*2017 Consolidated Non-Financial Statement, p. 55*	Strategy a)
Itaú Unibanco	Banking	Latin America	*2019 Status Report, p. 14*	2017	*Consolidated Annual Report 2017, pp. A-405, A-406*	Risk Management a)
Royal Bank of Canada	Banking	North America	*2020 Status Report, p. 36*	2019	*Task Force on Climate-related Financial Disclosures Report 2019, pp. 10 and 16*	Strategy a); Strategy b)

2.1.2 Task Force on Climate-related Financial Disclosures Sixth report

The Task Force on Climate-related Financial Disclosures (TCFD), established by the Financial Stability Board (FSB) in 2015, has released its sixth[3] and final status report, outlining recommendations for effective climate-related financial disclosures. The sixth report has not made new recommendations but instead tracks the progress of companies aligning to the TCFDs existing 11 recommendations. Despite increasing momentum in companies disclosing TCFD-aligned information, the report emphasizes the need for more progress. In the fiscal year 2022, companies reported in line with an average of 5.3 out of the Task Force's 11 recommended disclosures, up from 3.2 in 2020. However, this still falls short of the complete set of recommendations. The TCFD expresses concern that insufficient companies are providing decision-useful climate-related financial information, particularly regarding the impact of climate change on their businesses, strategies, and financial planning. This information gap may impede the assessment and pricing of climate-related risks by investors, lenders, and insurance underwriters.

Results and Key findings from the Task Force's final status report include:

The Task Force initiated its investigation with an initial review population comprising 1,434 companies, subjects of the Artificial Intelligence (AI) review for the 2022 status report. Subsequently, this population was refined to 1,365 (Table 3) for the AI review for the current year, accounting for companies that had ceased to exist or lacked reports in English for the entire three-year period. Leveraging AI technology, a comprehensive review was conducted on over 19,000 reports sourced from the 1,365 companies. The objective was to ascertain whether the reports contained information aligning with one or more of the Task Force's 11 recommended disclosures.

3 Access TCFD sixth report *here*

Table 3: TCFD sixth report population size

AI Review Population Size

Industry	Number
Banking	235
Insurance	117
Energy	205
Materials and Buildings	345
Transportation	126
Agriculture, Food, and Forest Products	115
Technology and Media	91
Consumer Goods	131
Total	**1,365**

Source: TCFD sixth status report

The sixth TCFD report highlighted the following key findings:

- 58% of public companies disclosed information in line with a minimum of five out of the 11 TCFD-recommended disclosures, marking a significant increase from 18% in 2020. However, only 4% of companies disclosed in line with all 11 disclosures (See Figure 4).
- Climate-related financial information in financial filings remains limited.
- On average for fiscal year 2022, information aligned with the 11 recommended disclosures was four times more likely to be disclosed in sustainability and annual reports than in financial filings.
- Most jurisdictions with climate-related disclosure requirements specify reporting in financial filings or annual reports.
- Over 80% of the largest asset managers and 50% of the largest asset owners reported in line with at least one of the 11 recommended disclosures.
- Based on publicly available reports, nearly 70% of the top 50 asset managers and 36% of the top 50 asset owners disclosed in line with at least five of the recommended disclosures.

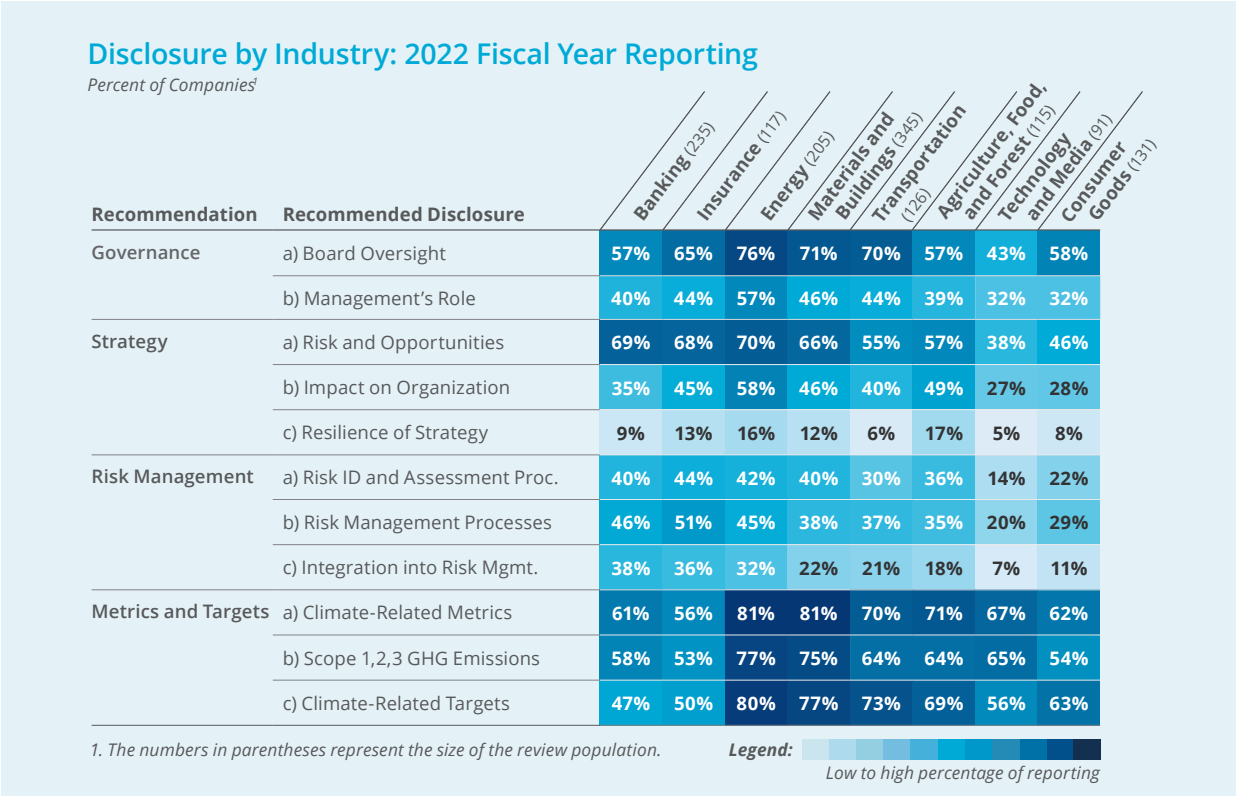


Figure 4: Progress on disclosures by industry in the 2022 fiscal year reporting.

Source: TCFD sixth status report

2.1.3 International examples

International examples of regulations pertaining to climate risk adaptation in the finance sector were examined with a focus on climate risk modelling carried out by central banks or financial regulators in select countries. The key findings from this researched are detailed in Table 4.

This research identified a persistent gap between climate research and the financial sector at a national level. For example, in the US, a report by the Financial Stability Oversight Council (FSOC) highlighted that climate data accessibility was a consistent issue in financial risk modelling – while such data exists and is produced by state bodies, it is not necessarily suitable for use in financial risk assessment. Such data is not standardised and may exist in many different formats, including PDFs, spreadsheets, or API.

Data granularity was another issue repeatedly highlighted by central banks and financial regulators across the countries examined. This was highlighted in reporting by the Reserve Bank of Australia and Banque de France, with both central banks expressing uncertainty about the level of insight provided by available climate data and its applicability to financial risk modelling. However, in each of the countries exemplified below, there existed a recognition of the need for better communication between the climate research and finance risk management sectors. Similarly, each report examined provided a critical evaluation of the progress made thus far and an assessment of the avenues for potential improvements in climate risk assessment modelling.

Table 4: International examples of regulations and guidance for integrating climate adaptation into the finance sector.

Indicators	US	UK	France	Finland	Romania	Australia
Key actors	Federal Reserve Board (Fed) FSOC OFR FIO CFRAC CFTC NAIC Department of the Treasury	FCA HM Treasury Bank of England PRA OBR	ACPR AMF Banque de France	FIN-FSA Bank of Finland FMI FEI Ministry of Finance	BNR ASF BVB CNSM	APRA Reserve Bank of Australia ASIC The Treasury
National guidance	SEC guidance 2010[1] FDIC[2] and OCC[3] have issued public consultation requests for new guidance NIAC issued new climate risk disclosures survey 2022[4] [5]	FCA Handbook Listing Rule 9.8.6B(G) TCFD recommendations on Climate-Related Financial Disclosures	ACPR Governance and Management of Climate-Related Risks	FIN-FSA 3/2011	BVB Ghid privind raportarea ESG 2022 (EN: Guide to ESG Reporting 2022)	APRA Prudential Practice Guide 229 ASIC Regulatory Guide 228 ASIC Regulatory Guide 247
International guidance	NGFS Firms encouraged to follow ISO 14090	NGFS ISO 14090 ISO 14091 *IFRS Sustainability Disclosure Standard* (expected end Q2 2023)	NGFS TFCD IFRS Sustainability Disclosure Standard (expected end Q2 2023)	NGFS IFRS Sustainability Disclosure Standard (expected end Q2 2023)	NGFS IFRS Sustainability Disclosure Standard (expected end Q2 2023)	NGFS IFRS Sustainability Disclosure Standard (expected end Q2 2023)
National regulation/ legislation	Dodd-Frank Act SEC is currently in process of writing new regulation following the end of a consultation period (expected end 2023)[6]	FCA Handbook Listing Rule 9.8.6(8)(R)	AMF Art 321-78 Decree LEC 29	FIN-FSA 3/2011	ASF Recommendations on a Prudent Approach to Climate Risk	Corporations Act s299A(1)(c) The Treasury opened a consultation period in Dec 2022 for the creation of new CRFD regulation [7]

Indicators	US	UK	France	Finland	Romania	Australia
EU regulation/ Legislation	N/A	N/A	Sustainable Finance Disclosure Regulation (Regulation (EU) 2019/2088) Directive (EU) 2022/2464 EU Taxonomy Regulation	Sustainable Finance Disclosure Regulation (Regulation (EU) 2019/2088) Directive (EU) 2022/2464 EU Taxonomy Regulation	Sustainable Finance Disclosure Regulation (Regulation (EU) 2019/2088) Directive (EU) 2022/2464 EU Taxonomy Regulation	N/A
Modelling capacity	Data on climate impacts is available from government institutions – however data exists in various formats and is not necessarily suitable for use in the finance sector[8]	Room for improvement in data granularity and accessibility – firms are making use of free datasets and guidance; however, such assessments remain qualitative in nature[9]	Banque de France repot highlights persistent uncertainty in scenario-based modelling – results of any such CSA highly dependent on chosen scenario, resulting in potential research gaps[10]	Bank of Finland recognises the existence of knowledge gaps and is working with partners to improve climate-related financial data[11]	Recognition of need for enhanced data availability – recommendations issued to various authorities to enhance climate-related finance disclosures[12] [13]	Recognition of availability gap in future-proof finance and climate data – simplified models used to assess banks' exposure only [14]
RCP scenario used in reporting (or equivalent)	RCP4.5 & RCP8.5 (Fed CSA pilot programme) NGFS scenarios "Current Policies" and "Net Zero 2050" (Fed CSA pilot programme)	RCP2.6 & RCP6.0 (UK CCRA3)	NGFS scenarios "Net Zero 2050", "Delayed Transition", "Divergent Net Zero"	N/A	NGFS scenarios "Below 2°C", "Net Zero 2050", "Delayed Transition" and "Divergent Net Zero" (BNR Climate Risk Dashboard 2022)	NGFS "Hot House World" scenario (Reserve Bank of Australia report)
Links to reports	*Fed CSA pilot programme*	*UK CCRA3 Technical Report*	*Banque de France report*	N/A	*BNR Dashboard 2022*	*Reserve Bank of Australia report*

References:

[1] *Commission Guidance Regarding Disclosure Related to Climate Change'*. Available at: https://www.sec.gov/files/rules/interp/2010/33-9106.pdf

[2] Federal Deposit Insurance Corporation. (2022), 'Statement of Principles for Climate- Related Financial Risk Management for Large Financial Institutions', *Federal Register*, Vol 87:64. Available at: https://www.fdic.gov/news/board-matters/2022/2022-03-29-notational-fr.pdf

[3] Office of the Comptroller of the Currency. (2021), 'Principles for Climate-Related Financial Risk Management for Large Banks'. Available at: https://www.occ.gov/news-issuances/bulletins/2021/bulletin-2021-62a.pdf

[4] National Association of Insurance Commissioners. (2022), 'Proposed Redesigned NAIC Climate Risk Disclosure Survey'. Available at: https://content.naic.org/sites/default/files/inline-files/2022ProposedClimateRiskSurvey_0.pdf?msclkid=e24cf6f2b47211eca09ac1c752e22857

[5] California Department of Insurance. (2023), 'NAIC Climate Risk Disclosure Survey'. Available at: https://www.insurance.ca.gov/0250-insurers/0300-insurers/0100-applications/ClimateSurvey/

[6] Securities and Exchange Commission. (2022), 'The Enhancement and Standardization of Climate-Related Disclosures for Investors'. Available at: https://www.sec.gov/files/rules/proposed/2022/33-11042.pdf

[7]The Australian Treasury. (2022), 'Climate-related financial disclosure consultation paper'. Available at: https://treasury.gov.au/sites/default/files/2022-12/c2022-314397_0.pdf

[8] Financial Stability Oversight Council. (2021), 'Report on Climate-Related Financial Risk', pg. 49. Available at: https://home.treasury.gov/system/files/261/FSOC-Climate-Report.pdf

[9] Prudential Regulation Authority. (2021), 'Climate-related financial risk management and the role of capital requirements', pg. 18. Available at: https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/publication/2021/october/climate-change-adaptation-report-2021.pdf

[10] Allen, T. et. al. (2020), 'Climate-Related Scenarios for Financial Stability Assessment: an Application to France', WP#774 for Banque de France, pg. 45. Available at: https://publications.banque-france.fr/sites/default/files/medias/documents/wp774.pdf

[11] Bank of Finland. (2022), 'Annual Report', pg. 93. Available at: https://publications.bof.fi/bitstream/handle/10024/52769/Bank-of-Finland-Annual-Report-2022.pdf

[12] National Committee for Macroprudential Oversight. (2021), 'Analysis of the NCMO Working Group on supporting green finance', pg. 9. Available at: https://www.cnsmro.ro/res/ups/Summary-Report-NCMO-green-finance.pdf

[13] Cojoianu, T. et. al. (2023), 'Romania's Roadmap to a Greener Financial System: An analysis of Environmental, Social and Governance Reporting on the Bucharest Exchange Trading Index', report for the British Embassy in Bucharest, pg. 28. Available at: https://dx.doi.org/10.2139/ssrn.4440516

[14] Bellrose, K. et. Al. (2021), 'Climate Change Risks to Australian Banks', Reserve Bank of Australia September 2021 Bulletin. Available at: https://www.rba.gov.au/publications/bulletin/2021/sep/pdf/climate-change-risks-to-australian-banks.pdf

2.2 Regional level

2.2.1 EU taxonomy

The EU taxonomy is a classification system, establishing a list of environmentally sustainable economic activities. The EU Taxonomy aims to clearly define economic activities that contribute to fulfilling the objectives of the European Green Deal. The EU taxonomy provides companies, investors, and policymakers with appropriate definitions for which economic activities can be considered environmentally sustainable. In this way, it should create security for investors, protect private investors from greenwashing, help companies to become more climate-friendly, mitigate market fragmentation and help shift investments where they are most needed.

The EU Taxonomy currently requires large, listed companies operating in the EU to report on their contribution to selected environmental objectives, the scope for companies will widen in line with CSRD requirements in 2026 (Figure 5):

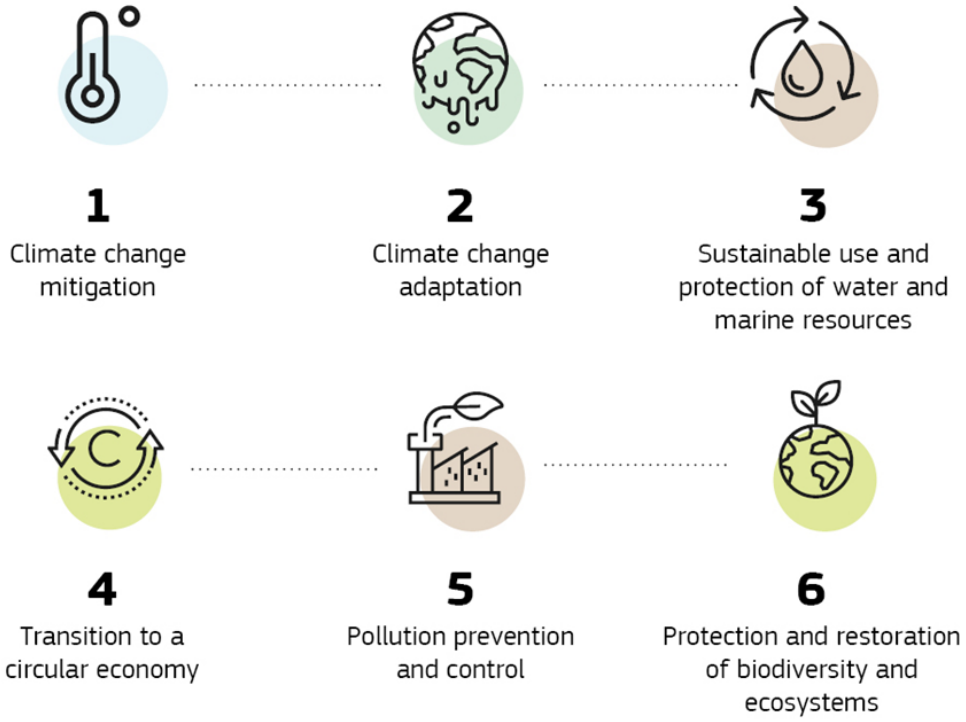


Figure 5: The six climate and environmental objectives set out by the Taxonomy Regulation.
Source: *EU Taxonomy Navigator.*

For reporting on their contribution to the goals of climate change adaptation and mitigation, companies need to carry out a "robust climate risk and vulnerability assessment" for certain economic activities listed in the Commission Delegated Regulation 2021/2139[4] (Climate Delegated Act), a supplement to the EU Taxonomy Regulation. Such an assessment aims to identify appropriate adaptation solutions to reduce physical climate risks to economic activity.

4 You can access the Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021 *here*.

Climate risk and vulnerability assessment

The demonstration of a robust climate risk and vulnerability assessment is part of the:

- Technical screening criteria regarding the substantial contribution to climate change adaptation. The Sustainable Finance Disclosure Regulation (SFDR)[5] requires financial market participants to use the disclosures on the Taxonomy-alignment of investee companies for assessing the level of the environmental performance of marketed financial products making sustainability claims.
- Do no significant harm (DNSH) requirements for climate change adaptation for climate change mitigation (already) and (likely in future for) all other environmental objectives (biodiversity, pollution, etc.).

As a result, it is a requirement that all economic activities must meet to achieve taxonomy alignment. In addition to the climate risk and vulnerability assessment, companies must demonstrate – or at least plan – adaptation solutions to reduce physical climate risks and meet the taxonomy requirements. The adaptation plan should also include a timetable for implementing the measures and a documentation of measures already implemented. Adaptation measures have to be implemented for new assets at completion and for existing assets within five years of identifying the associated climate risks.

Following the Climate Delegated Act, the assessment of physical climate risks has to consider the state-of-the-art methodologies "in line with the most recent report of the Intergovernmental Panel on Climate Change" (IPCC). The minimum requirements for a climate risk and vulnerability assessment in terms of scope and level of detail (materiality of risks etc.) are:

1. Lifespan;
2. All relevant objects of the economic activity should be considered;
3. A range of climate projections based on future scenarios, and
4. Catalogue of climate-related "hazards that are to be taken into account as a minimum"[6] (Table 5).

5 Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector (OJ L 317, 9.12.2019, p. 1).

6 (Climate Delegated Act, Annex I, Appendix A).

Table 5: Catalogue of climate-related hazards.

	Temperature-related	Wind-related	Water-related	Solid mass-related
Chronic	Changing temperature (air, freshwater, marine water)	Changing wind patterns	Changing precipitation patterns and types (rain, hail, snow/ice)	Coastal erosion
	Heat stress		Precipitation or hydrological variability	Soil degradation
	Temperature variability		Ocean acidification	Soil erosion
	Permafrost thawing		Saline intrusion	Solifluction
			Sea level rise	
			Water stress	
Acute	Heat wave	Cyclones, hurricanes, typhoon	Drought	Avalanche
	Cold wave/ frost	Storms (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	Landslide
	Wildfire	Tornado	Flood (coastal, fluvial, pluvial, ground water)	Subsidence
			Glacial lake outburst	

Source: Climate Delegated Act, Annex I, Appendix A

The Climate Delegated Act distinguish between activities with an expected lifespan of (1) less than ten years and (2) at least ten years. For each expected lifespan, the climate risk and vulnerability assessment must be performed using the following climate projections:

1. the smallest appropriate scale, and
2. "the highest available climate projections resolution, state-of-the-art climate projections across the existing range of future scenarios consistent with the expected lifetime of the activity, including, at least, 10 to 30-year climate projections scenarios for significant investments." In this case, the best approach is to use the IPCC scenarios (Climate Change 2021: The Physical Science Basis). However, based on the Regulation not all scenarios need to be used, e.g., "in many cases it may be enough to use a pessimistic scenario, such as RCP 8.5, and not consider all four RCP scenarios, provided that the consideration of additional scenarios is unlikely to yield new insights relevant for the risk assessment[7]". shows an example of climate data for a taxonomy-aligned climate risk assessment.

7 FAQs on the technical screening criteria set out in the Climate Delegated Act.

Table 6: Climate data for a taxonomy-aligned climate risk assessment.

Data	Resolution	To be considered for a taxonomy-aligned climate risk assessment?
Ireland: TRANSLATE: standardised and bias-corrected national climate projections for Ireland. National Framework for Climate Services: in future NFCS compliant information should be utilised in risk assessments. High-resolution Climate Projections for Ireland – A Multimodel Ensemble Approach (Nolan and Flanagan, 2020) (to be requested); online visualisation of projections: Climate Ireland	TRANSLATE: 4km to 12km 4km for Nolan and Flanagan, 2020.	For Ireland
Other countries: highest-resolution regionalised climate data (to be requested); for national information and points of[8] contact: Climate-ADAPT country profiles	Higher resolution than regional climate data (see below)	Outside Ireland, if available
Regional (e.g., Europe): CORDEX (Data download: Copernicus Climate Data Store); online visualisation of basic parameters: Interactive IPCC-Atlas	Approx. 12.5 km*12.5 km (Europe, Mediterranean) – approx. 25km*25km (other regions)	If no appropriate higher resolution national data is available
Europe: European Climate Data Explorer (mostly based on EURO-CORDEX and ERA reanalysis data)	Ranging from approx. 11 km*11 km to approx. 56 km*56 km	If no appropriate higher resolution national or regional data is available (e.g., for certain climate-related hazards or indicators)
EEA Hazard Report (mostly based on EURO-CORDEX and ERA reanalysis data)	Subnational basic regions (NUTS-2)	If no appropriate higher resolution national or regional data is available (e.g., for certain climate-related hazards or indicators)

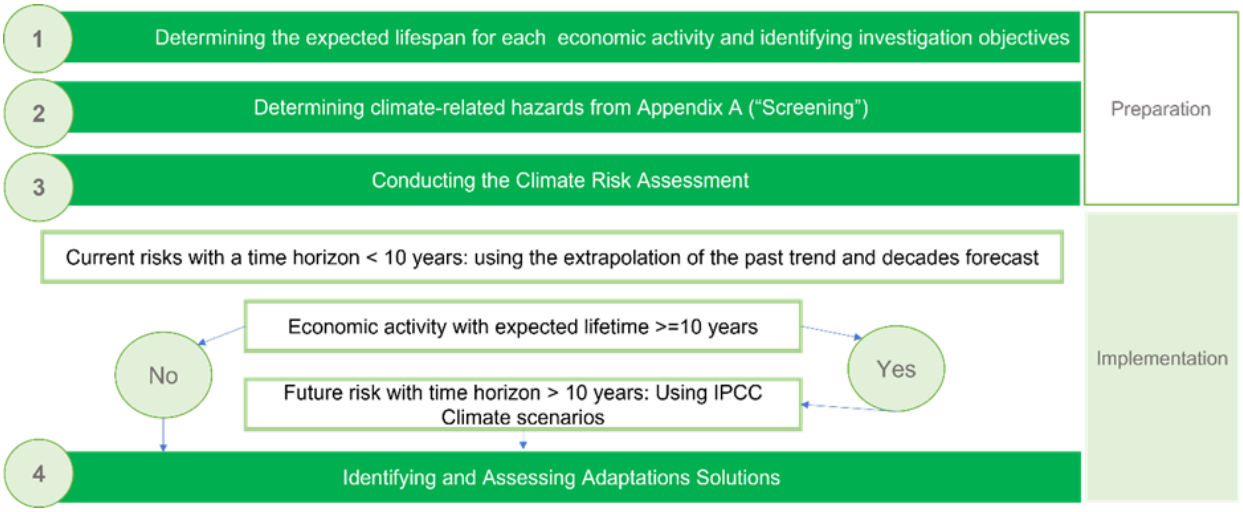
Source: Modified from German Environment Agency (2022).

The example of the Climate risk and vulnerability assessment presented here (Figure 6) was developed by the German Environment Agency (2022). It is compatible with IPCC assessment report six (IPCC AR 6) and the international standards for adaptation to climate change and climate risk assessments (ISO 14090/14091). There are many methods of developing climate risk and vulnerability assessment. They can be based on a wide range of approaches to gather information, from data and model-driven processes (e.g., climate data, impact models) to more review or expert-based methods. However, an ISO norm,[9] also transposed as a European standard and national standard in the Member States, contains useful tools covering the entire process of preparing, conducting, and communicating the assessment results.

8 The future climate was simulated under Representative Concentration Pathway 4.5 (RCP4.5) and RCP8.5 scenarios.

9 ISO/DIS 14091: Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment.

Figure 6: Example of a Climate risk and vulnerability assessment.



Source: German Environment Agency (2022).

2.2.2 Corporate Sustainability Reporting Directive

The Corporate Sustainability Reporting Directive (CSRD) is a transformative development arising from the European Green Deal, addressing the shortcomings of the existing Non-Financial Reporting Directive (NFRD) (Vikolainen, 2021). The NFRD currently mandates large, listed companies, banks, and insurance companies with more than 500 employees to report on various sustainability aspects such as environmental policies, social responsibility, human rights, anti-corruption, and diversity on company boards (Vikolainen, 2021). However, recognizing the need for more comprehensive reporting, the European Commission proposed the CSRD as part of its Sustainable Finance Agenda.

The CSRD expands the scope and depth of reporting requirements, necessitating detailed disclosures on environmental rights, social rights, human rights, and governance factors (KPMG, 2023; European Parliament, 2022). The directive aims to fill gaps in sustainability information and enhance the reliability, relevance, and comparability of Environmental, Social, and Governance (ESG) data. This robust disclosure framework is designed to attract private capital toward financing the green and social transition, aligning with the goals outlined in the European Green Deal.

Companies falling under the CSRD which exceed 2 out of the following three criteria: 250 employees, net revenue of €40 million or total assets of €20 million must report on a double materiality basis, disclosing not only the risks they face but also their impact on climate and society (KPMG, 2023; European Parliament, 2022). Irish companies, both subsidiaries of overseas multinationals and local entities, will experience a substantial expansion in reporting obligations, moving from an estimated 11,000 companies under the NFRD to approximately 50,000 under the CSRD (KPMG, 2023; European Parliament, 2022). The CSRD's timeline mandates member states, including Ireland, to transpose the directive by mid-2024, with mandatory reporting requirements commencing for financial years beginning on or after January 1, 2024, for entities already subject to the NFRD and from January 1, 2025, for other companies falling within its scope (European Parliament, 2022; European Council, 2022).

The directive introduces 12 reporting standards (see section below), encompassing cross-cutting themes and specific aspects related to the environment, social matters, and governance (EFRAG, 2022). The CSRD represents a fundamental shift toward more rigorous and standardized sustainability reporting, reflecting the European Union's commitment to mainstreaming sustainability in the financial sector. As the directive enters into force, companies and member states will navigate the challenges and opportunities presented by this landmark development in corporate reporting.

CSRD requirements and standards:

In light of the Corporate Sustainability Reporting Directive (CSRD), companies are prompted to assess their sustainability reporting scope and identify existing gaps in information. The new regulations aim to enhance transparency, ensuring that investors and stakeholders can evaluate companies' impacts on both people and the environment, while also enabling investors to assess financial risks and opportunities tied to climate change and sustainability issues (European Commission, 2023; European Parliament, 2022; European Council, 2022).

A nuanced challenge in sustainability reporting involves extending reporting requirements to a company's direct and indirect business relationships throughout the entire value chain (KPMG, 2023). This necessitates comprehensive information gathering, not only from the company's internal sustainability data but also from upstream suppliers and downstream customers and distributors. Early engagement in this process becomes crucial, particularly given that entities within the value chain may lack readily available reliable information.

The concept of "double materiality" emerges as a key driver in meeting the needs of various stakeholders (KPMG, 2023; EFRAG, 2022). While traditional reporting focused on financially material disclosures, the CSRD and its accompanying European Sustainability Reporting Standards (ESRSs) introduce a novel perspective. Companies are now required to evaluate their Environmental, Social, and Governance (ESG) position from an impact materiality lens, considering both the impacts caused by the organization and those incurred. This double-materiality principal challenges companies to provide a more holistic view of their sustainability efforts.

Relevant "sustainability matters" encompass environmental, social, human rights, and governance factors. The CSRD mandates companies to report on their entire value chain, leading to increased requests and requirements for information from suppliers to CSRD-reporting organizations. Over the next two years, the EU and its Member States will undertake crucial actions, including the formal transposition of legislation into national laws and the adoption of ESRS tranches by the EU Commission. The CSRD not only expands the range of businesses required to report on sustainability but also elevates the level of disclosure. In addition to NFRD stipulations, companies must provide detailed reports on environmental protection measures, social responsibility, human rights, anti-corruption measures, and diversity on company boards.

The Initial set of 12 draft European Sustainability Reporting Standards (ESRS) encompasses cross-cutting standards and topical standards in the areas of environment, social matters, and governance (EFRAG, 2022). These standards, currently under development by the European Financial Reporting Advisory Group (EFRAG), signify a significant step toward standardizing and regulating sustainability reporting practices across diverse sectors. The comprehensive list of these draft ESRS is as follows:

- Draft ESRS 1: General requirements
- Draft ESRS 2: General disclosures
- Draft ESRS E1: Climate change
- Draft ESRS E2: Pollution
- Draft ESRS E3: Water and marine resources
- Draft ESRS E4: Biodiversity and ecosystems
- Draft ESRS E5: Resources and circular economy
- Draft ESRS S1: Own workforce
- Draft ESRS S2: Workers in the value chain
- Draft ESRS S3: Affected communities
- Draft ESRS S4: Customers and end-users
- Draft ESRS G1: Business conduct

These standards, once adopted, will play a pivotal role in shaping and standardizing sustainability reporting practices for companies across the European Union.

2.3 National level

2.3.1 Governance and Policy

The Government's Climate Action Plan 2021 set out the range of measures needed for Ireland to reduce greenhouse gas emissions and tackle the climate crisis, as well as providing a detailed plan for taking decisive action to achieve a 51 per cent reduction in overall greenhouse gas emissions by 2030. This has been updated for 2023 with a new range of measures and activities to continue Ireland's journey to the required emission cuts while ensuring a just transition. These further demonstrate the areas in which the sustainable finance sector can grow in order to drive and support Ireland's net-zero transition, alongside the actions from Ireland's 2021 Sustainable Finance Roadmap[1]. With a view to Ireland being a leading sustainable finance centre by 2025, this roadmap sets out a range of actions to be undertaken in the coming years to ensure Ireland maximises the opportunities that arise from the transition to net zero, spanning five pillars: developing talent, driving industry readiness, leveraging digital technology, providing an enabling environment, and promotion and communication. The linchpin of the roadmap is establishing an International Sustainable Finance Centre of Excellence, announced in October 2022. It has been set up to deliver the skills necessary for the financial services industry to finance a net-zero future. The aim is for the centre to become an international hub from which the finance industry in Ireland will develop its response to sustainability demands. The centre will also lead in research and talent development to respond to sustainability demands and facilitate Ireland's net zero transition. Delivering its objectives and targets requires collaboration with all stakeholders – public and private.

Department of Finance (2021)[10]

Over 30 Irish based firms have adopted the framework of the Financial Stability Board Task Force on Climate-related disclosures (TCFD). As part of Climate Finance Week 2021, Sustainable Finance Ireland announced the number of firms reporting under the framework has tripled during the first phase of the TCFD campaign. The new supporters[11] include leading Irish semi-states such as ESB, CIE, Coillte and Bord na Mona. The campaign to increase the number of firms was an action measure under Ireland for Finance Strategy. This campaign was supported by Minister of State for Financial Services, Credit Unions and Insurance Sean Fleming TD. It featured dedicated training supported by Sustainable Finance SKILLNET and delivered by the United Nations Environment Programme, Finance Initiative.

Ireland for Finance[12]: The strategy for the development of Ireland's international financial services sector to 2026

Ireland for Finance is a strategic framework to support the further development of Ireland's international financial services sector to 2026. A government document, the strategy's vision is for Ireland to be a top-tier location of choice for specialist international financial services and to enhance and protect future Irish competitiveness. The framework consists of four Pillars and three Horizontal Priorities. Pillars focus on the operating environment; technology and innovation; talent; and communications and promotion. The three horizontal Priorities that apply across the four Pillars are Regionalisation, Diversity, and Sustainable Finance.

National Sustainable Finance Roadmap[13]

The National Sustainable Finance Roadmap (2021, Table) has been developed by Sustainable Finance Ireland, UN-convened FC4S and Skillnet Ireland in collaboration with key stakeholders across Ireland and internationally. Delivery of this roadmap was Action Measure no. 1 under the Ireland for Finance Action Plan 2021, demonstrating sustainable finance's increasing prominence as a priority for Ireland and as a key piece of our toolkit in addressing the climate crisis. This roadmap sets out targeted measures with a view to Ireland being a leading sustainable finance centre by 2026, informed by extensive research and stakeholder engagement. It outlines how public-private sector collaboration will develop talent, prepare industry, leverage digital solutions, enhance the enabling environment, and promote and communicate Ireland's sustainable finance priorities and capabilities. This roadmap fits into our broader climate action goals, aiming to facilitate the increased mobilisation of much-needed investments through setting out tangible actions to enhance Ireland's sustainable finance environment. Upon successful implementation of the roadmap, by 2026 it can be expected that Ireland's financial services sector is developing innovative products and services, funding transformative technology and innovations, and turning the billions committed to climate investment through public channels into trillions of total climate investment, nationally and further afield. And finally, local companies big and small are being

10 You can access the publication *here*.

11 The Irish organisations supporting TCFD include AIB, Amundi, Atlantic Bridge, BnP Paribas, BOI, Bord na Mona, Coillte, CRH, Davy, Dept of Finance, Dublin Bus, Dunport Capital Management, ESB, Euronext, Glenveagh, Greencoat Capital, Hibernia Reit, ILIM, IPUT, Irish Rail, KBI, NTR, PTSB, Setanta Asset Management, Shannon Group, Smurfit Kappa, Sustainable Finance Ireland.

12 You can access the Action Plan *here*.

13 You can access more information about the National Sustainable Finance Roadmap *here*.

helped to realign their business models to take advantage of these significant opportunities. Building on existing strengths and underpinning future competitiveness, the intent of Ireland's first sustainable finance roadmap and subsequent public-private sector implementation out to 2026, is to ensure that Ireland takes a leadership position in sustainable finance.

Table 7: 18 actions identified in a new Sustainable Finance Roadmap.

PILLAR 1 DEVELOPING TALENT	PILLAR 2 INDUSTRY READINESS	PILLAR 3 LEVERAGING DIGITAL	PILLAR 4 ENABLING ENVIRONMENT	PILLAR 5 PROMOTION AND COMMUNICATION
Build the knowledge and capability required to meet future workforce needs for sustainable finance skillsets	Development of best-in-class insights, tools, and mechanisms for leadership	Apply digital technology solutions to the ESG data and risk management challenge	Leverage existing structures within the system to underpin the growth of sustainable finance	Raise awareness of Ireland's sustainable finance priorities, commitments and capabilities
1. Establish an International Sustainable Finance Centre of Excellence				
2. Accelerate access to Sustainable Finance knowledge and skills	4. Build capacity and ensure best practice in reporting and disclosure	9. Build a sustainable finance data roadmap for Ireland	12 Establish a public private Climate and Sustainable Finance Group	16. Deliver a coordinated public-private campaign to promote Ireland as a centre for sustainable finance
3. Support international sustainable finance, biodiversity and nature-related capacity building endeavours	5. Increase industry commitments	10. Develop a Sustainable Finance Fintech strategy	13. Ensure the legislative environment is representative of best practice in sustainable finance	17. Identify international sustainable finance initiatives in which Ireland should participate and strengthen existing links
	6. Establish an innovation programme to support the development of new sustainable finance products and services	11. Launch a sustainable finance digital flagship programme	14. Embed sustainable finance and climate risk into supervisory and financial stability assessments	18. Continue to develop and grow Climate Finance Week Ireland
	7. Assess the viability of a climate funding platform in Ireland		15. Explore next steps in Ireland's sovereign funding of climate action projects	
	8. Conduct analysis on the risks and opportunities for the biodiversity finance agenda			

3. Conclusions

A literature review of international and national reports, regulations, and publications on climate risk and adaptation assessment in the private sector was conducted. Based on this research, the recommendations of the TCFD and the newly implemented CSRD were identified as the frameworks that predominantly guide the finance and commercial sectors in performing climate-related hazards and adaptation assessments. Since 2021, the Irish Government has encouraged Irish firms to use the TCFD framework. The Irish TCFD Campaign, supported by Sustainable Finance Skillnet and output from Action 4 from Ireland's Sustainable Finance Roadmap, aims to increase Irish support of TCFD and enhance the levels of climate-related reporting and disclosures in Ireland. Moreover, the CSRD's timeline mandates member states, including Ireland, to transpose the directive by mid-2024, with mandatory reporting requirements commencing for financial years beginning on or after January 1, 2024, for entities already subject to the NFRD and from January 1, 2025, for other large companies. The CSRD will likely be the most relevant framework for Irish companies that exceed 2 out of the following three criteria: 250 employees, net revenue of €40 million or total assets of €20 million.

Section 2 Finance and Commercial sector methods for climate risk disclosures

1. Introduction

Section 2 of the report focuses on understanding the approaches, criteria and data used by a sample of organisations and companies within the financial and commercial sectors in Ireland for identifying and disclosing climate risk, with the aim of learning lessons for adaptation risk assessment at a national level which will be applicable to other sectors. Conversations were held with 20 individuals occupying roles in sustainability, risk management, and ESG within 11 organizations across finance, commercial, consultancy, and climate services sectors. The interviews were structured around three primary topics: current practices; policy and legislation; and climate actions.

2. Study methods

2.1 Approach

This research engaged with representatives from organizations and companies in finance, commercial, consultancy, and climate services sectors, obtaining insights from a small, invited sample of key stakeholders in Ireland. To guide the interviews, a questionnaire was developed and utilized consistently across all discussions. Questions were themed around three core areas: current practices; policy and legislation; and climate actions (see Annex 1 for more detail). This method ensured a systematic and comprehensive exploration of the participants' perspectives and practices in relation to climate risk assessment.

Interviews were conducted with representatives from each organisation listed in Table 2.1. Interviews were audio recorded and transcribed using the Microsoft Teams recording and transcription functionalities, each interview lasted approximately 40 - 60 minutes. Each interview transcript was assessed by the lead interviewer for accuracy and necessary amendments were made. Following transcription, a basic thematic analysis was conducted for each sector whereby the most relevant themes for each question were identified. The study received ethical approval from the UCC Social Research Ethics Committee. All interviewees and roles within each organisation/company will remain anonymous.

2.2 Sample description

Twenty-Four organisations/companies were contacted from these sectors in total. Eleven companies responded as seen in Table 2.1 and nominated representatives who work in sustainability or risk management to take part in an interview. Interviews took place with twenty participants from the finance, commercial, consultancy, and climate services sectors working in various departments and ESG roles within the participant companies (Table 2.2).

Organisation/company name
AIB
Dairygold
Elavon
Environment Agency UK
Glenveagh
KPMG
Met Éireann NFCS team
Moody's Risk Management Solutions
Musgraves
Natcap UK
New ERA

Tabe 2.1: List of participating organisations and companies

Sector	Organisation Count	Interviewees
Finance Sector	3	9
Commercial Sector	3	3
Climate Services/Consultancy	5	8

Table 2.2: Number of interviewees aggregated by sector.

2.3 Report structure

Key commonalities for answers to each question have been identified, collated, and discussed in Section 3 with supporting text and quotes provided where necessary. Identified themes and accompanying discussions provided in Section 3 have been distilled into key findings in Section 4 which then inform a list of recommendations.

3. Results

3.1 Current practices

3.1.1 Concerns regarding climate risk and adaptation.

Interviewees disclosed that they report on two primary categories of risk: physical risks; and transition risks. Companies that are registered in the UK and meet the requirements of the Task Force on Climate-related Financial Disclosures (TCFD) have been mandated to report on such risks since April 2022. Reporting for organisations/companies in Ireland is mandated under the Corporate Sustainability Reporting Directive (CSRD) for financial years on or after: 1 January 2024.

Physical risks relate to the potential impact of climate change on each organisation's own activities, premises, staff, and third-party suppliers, these risks included, for example, flooding, heatwaves, and extreme weather events. These risks were considered lower for some of the financial institutions as they have a minimal physical footprint (e.g., premises, warehouses etc.)

compared to other businesses, thus reducing their exposure to physical risk. In some instances, organisations may not directly own many physical assets. Interviewees stated that many finance companies can mitigate physical risks by relocating their business operations and investments away from a particular area. The extent of physical risks is perceived as limited unless the organisation owns significant material assets entrenched in a vulnerable location; however, the specific level of asset ownership was not disclosed by interviewees. One interviewee supported this finding by saying, *"In the context of corporate [entities] it is quite different from adaptation in the context of a public sector body because ultimately they can just move their…production or asset, etcetera, unless it's really material".*

They further elaborated on physical risk to owned infrastructure, which in most cases is not a physical building but the assets within a leased building *"when I say own, we own the infrastructure within a leased building. So, moving to another leased building that's not in such a location [at risk location] is relevant. Equally considering the risk of you know of extreme heat and how that might impact on the on the air conditioning units of them and these are things that we do consider in terms for assessments of our infrastructure."*

Interviewees are fully aware of the physical risk to infrastructure (e.g., buildings) but as these are often leased buildings, they perceive the risk as minimal to their business and consider owned assets within leased buildings a priority in assessments. Companies have the ability to re-locate to a less vulnerable location. Due to this, there were few physical risks reported by participants in both the financial and commercial sectors as interviewees felt that their assets were not directly impacted, and that physical risk was less prominent for their specific industries. In the financial sector one interviewee said, *"Our exposure to climate risk is more physical risk in terms of our own activities [such as] premises, our staff and how that might impact our third-party suppliers like [through] flooding of premises or otherwise…So it tends to be that kind of aspect of physical risk".* All interviewees acknowledged that material impacts are happening now and there's a requirement to adapt; however, the consensus was that the measurement of such risk is not where it should be. This includes understanding the potential impact of climate change on financial assets and operations, as well as taking action to support sustainability and adaptation to climate change. This may also relate to upstream and downstream impacts in value chain discussed further in Section 3.1.2.

Insurers and reinsurers are increasingly concerned about the physical risks associated with climate change, such as hurricanes, cyclones, flooding, and heat waves. The Institute and Faculty of Actuaries (IFoA) released two publications "A practical guide to climate change for risk management actuaries" and "Climate Change for Actuaries: An Introduction" which present key insights into the growing concerns of insurers and reinsurers regarding the physical risks associated with climate change. The focus is on the financial implications of these risks, encompassing both direct damage to assets and indirect effects such as supply-chain disruptions. The texts emphasize that climate change poses a dual threat to financial institutions, arising from the changing climate itself (physical risks) and the transition to a net-zero carbon economy (transition risks). Failure to effectively manage these wide-ranging risks could lead to consumer harm and substantial financial losses for the firms. The increasing frequency and severity of physical risks, including flood events, wildfires, and droughts, are noted to have operational impacts on companies, prompting considerations for enhancing insurance and reinsurance cover. Importantly, the texts underscore

that while the operational impacts of climate change may currently be limited, decisions and plans made today will yield benefits in the years to come. The IFoA practical guide delves into how climate risk can influence product risk factors, market landscapes, pricing assumptions, and affordability, necessitating risk mitigation measures like reinsurance and underwriting changes. The overall trend indicates a steady growth in the investment market for reinsurance, driven by an increasing number of catastrophes, highlighting the evolving landscape of risk management within the insurance and reinsurance sectors.

One commercial organisation highlighted that flooding is a concern, and they assess flood risks within their business practices and incorporate it into their decision-making process. Interviewees emphasized the need for immediate action on climate adaptation. Although not a dominant sentiment/opinion to emerge from the results of the interviews, a small number of participants did state concerns regarding some in the finance sector may perceive physical risks as a distant problem.

Transition risks which encompass changes in legislation and business practices related to climate change, were acknowledged as a significant concern. These were highlighted as potential disruptions and challenges associated with the introduction of new regulations and reporting standards. Examples of these challenges are the possibility of a "disorderly transition" by society to net-zero carbon future or undertaking climate adaptation which may disrupt operations if carried out in a disorderly fashion. The commercial sector is very concerned with transition risks associated with decarbonisation:

As one Interviewee explained:

"it's a significant concern, disorderly transitions, with the new regulations. I'm thinking 2030, 55 or 51% reduction in emissions and the European elections…next year and how much of that is going to be influenced because whoever is elected in that game for that five year stint is going to be in the driving seat of meeting that 2030 target and whether it's going to happen or whether it's going to be something like a last minute gasp and radical solutions".

While another interviewee mentioned that they need to adhere to the *"net Zero transition plan, which sets out [their] commitment to science-based targets and what [their] going to do to reduce those…emissions."*

In navigating the complex landscape of climate-related risks, the financial and commercial sectors are proactively taking steps to future-proof against all transition risks. This involves the development of products and initiatives that support sustainable communities (i.e., for altruism, business model enhancement and ESG requirements), such as sustainable cities initiatives, and comply with EU regulations such as those under CSRD or requirements for ESG reporting.

A crucial aspect is assessing the impact of potential legislative changes or disruptions that may necessitate a rapid transition away from fossil fuels. Stress tests are conducted to evaluate the resilience of energy supplies, considering potential shocks like interruptions in gas supplies due to geopolitical events or terrorist attacks on critical gas pipelines.

The development of transition plans is also a key focus, there's a growing awareness of the need to incorporate climate risk considerations, including the potential physical impacts on organisations.

The sector is focused on reporting climate risks and ensuring compliance with the Corporate Sustainability Reporting Directive (CSRD), recognizing the importance of a long journey toward a net-zero transition.

Some actions being taken by the financial and commercial sectors are as follows:

1. **Development of Transition Plans:** Identifying strategic steps, partnering with stakeholders, and conducting stress tests and scenario analysis to navigate the transition landscape.
2. **Technology adoption and implementation:** Embracing innovative technologies to enhance operational efficiency and reduce environmental impact such as the adoption of alternatives (e.g., bio-methane) for energy provision.
3. **Reporting compliance:** Complying with reporting standards and guidelines, especially focusing on climate risks and sustainability metrics. Ensuring adherence to the Corporate Sustainability Reporting Directive, which serves as a comprehensive framework for reporting on climate risk and transition.

Other concerns identified by the interviews were:

- **Balancing between adaptation and financial constraints:** Concerns are expressed that corporate adaptation plans (i.e., organisations/companies in finance/commercial sector) could be over-specifying adaptation measures to the point of financial impracticality. *"[Companies] are very conscious not to over spec their designs to the point where it becomes almost unrealistic from a financial point of view… So, the concern is really trying to find what's the sweet spot? "* There is a shared recognition that corporate adaptation efforts need to be financially viable in long run. This feeds into other concerns such as the standardisation and accessibility of climate information that can be used in cross-sectoral decision making to make financially viable adaptation plans.
- **Data standardisation, accessibility of climate information:** There are some issues highlighted regarding usability and access to climate data. High-resolution, localized climate data is deemed crucial for making informed decisions, such as designing infrastructure with the appropriate level of resilience. Data at appropriate scale can often be hard to access.

  Data or climate information is sometimes present in inaccessible formats. Concerns were raised about the need for standardised and accessible climate information, tailored to users' skill levels, to facilitate informed decision-making across sectors.

  Accessible and standardised climate data is seen as crucial for meeting regulatory reporting requirements, as well as being useful to avoid potential over-spec in adaptation planning. Ensuring that standardised information is being used in planning within sectors to avoid duplication of data sets or indices which have been derived using different approaches was also deemed important by interviewees. The science sector is working to address such concerns and package data sets and climate outputs in user friendly formats such as GIS layers which is often the most widely used product. This can be achieved by providing *"coordinated delivery of climate information here in Ireland [but] not just the provision of standardised climate information, but also the accessibility and ease of use [providing] the right information tailored to the skill level of the user".*

- **Transition to reducing carbon emissions:** This was mainly a concern brought up by the commercial sector companies who reported that they are engaged in the process of reducing emissions in line with national and international targets, however, they have raised concerns about the scale of the challenge to reduce emissions in their supply chains and some emissions are not directly under their control[14]. The process of reducing emissions in their supply chain is seen as a big challenge by interviewees in the corporate sector

3.1.2 Lack of reporting on upstream and downstream risks

Bridging the gap between scientific knowledge about climate change and practical financial actions is a shared challenge across both the financial and commercial sectors. Interviewees acknowledge the limited climate expertise among professionals in these sectors, emphasizing the need for effective translation of scientific knowledge into financially viable strategies. As one interviewee noted *"There are a lot of ways that climate can impact the finance sector and a lot of them aren't very well known to the finance sector, one of the biggest challenges for the finance sector has been getting from the science bits to the finance bit. And the finance sector, as you might expect, is not very well versed in the science of climate change."*

Insights from the above interviewee also raised the point that the current state of climate considerations within the financial and commercial sectors reveals a notable gap in addressing upstream and downstream effects within value chains. This is corroborated by the Non-Financial Reporting Directive (NFRD) reporting requirements as large, listed companies within its scope are presently not mandated to disclose material impacts, risks, and opportunities related to their upstream and downstream value chain impacts. This omission may contribute to a lack of consideration for the broader physical impacts of climate change on financial and commercial systems.

However, the forthcoming CSRD, grounded in the principle of "double materiality," will require assessments covering both impact and financial materiality. This includes disclosures on the entity's operations and its entire value chain, reducing unknown climate change impacts. Interviewees in the finance sector recognize the early stages of addressing risks across sectors and broader environmental concerns, emphasizing the need to comprehensively evaluate the interconnected elements of climate change. The CSRD will play a pivotal role in making such considerations mandatory and fostering a holistic approach to climate-related risks.

3.1.3 Climate risk assessments in the finance and commercial sectors.

There is a varying level of climate risk assessment and disclosures being carried out amongst all organisations interviewed. Larger corporate entities or what were referred to as significant institutions (SI's), have the in-house expertise and capability to carry out their own climate risk assessments with collaboration from outside expertise where necessary. SI's often act as third-party

14 ***Scope 1 Emissions:*** Direct greenhouse gas emissions owned or controlled by a company, including activities like fossil fuel combustion, on-site industrial processes, and internal transportation.

Scope 2 Emissions: Indirect greenhouse gas emissions tied to purchased energy, such as electricity and heat. Although beyond a company's boundaries, these emissions result from its energy consumption, providing opportunities for carbon footprint reduction through energy choices.

Scope 3 Emissions: All other indirect emissions in a company's value chain, encompassing diverse activities like raw material extraction, product manufacturing, transportation, product use, and disposal. Managing Scope 3 emissions involves collaboration with various stakeholders, making it a complex aspect of a company's carbon footprint management.

vendors for less significant institutions (LSI's) which often require greater input from third party vendors. While they still often have good internal expertise, they may require outside guidance in modelling, scenario stress testing and risk assessments. All the finance companies are carrying out climate risk assessments through their regulatory reporting, mainly linked to the CSRD. This is an emerging space for the commercial organisations which are beginning to report under CSRD. Common themes across the financial and commercial sectors are:

- **Climate Risk Assessment and reporting compliance:** All financial institutions interviewed carry out climate risk assessments, considering both physical and transition risks. One interviewee from the financial sector commented: "*So, we look across all of the risk types and the interconnections between them, we look at risk identification, particularly in space of emerging risks and we do what's known as scenario analysis or stress testing.*"

  For the commercial sector, while it was reported that organisations have always considered the carbon and emissions perspective in investment decisions, climate risk is a relatively new focus. *"it's really emerging for us now…. We would always look at impact from the carbon and tons perspective, but from a climate risk perspective, I think that's something that's only emerging for us at this stage."* There is a shared focus on compliance with regulatory reporting requirements, particularly the CSRD. Organisations are preparing for these requirements for reporting in 2024.

- **Use of climate scenarios:** Climate scenarios such as Representative Concentration Pathways (RCPs), play a significant role in risk assessments and modelling carried out by financial and commercial organisations. All financial institutions pointed out that they employ climate scenarios in their climate physical risk assessments. The most used RCPs being RCP8.5 and RCP4.5 with RCP6.0 also being considered. RCP 2.6 is also used for comparative purposes; interviewees were aware that it is not a very realistic target.

  "In terms of physical risk…8.5 and 2.6 are the two that we will consider in our assessments and sometimes 4.5 as well 6.0."

  Interviewees highlighted that there are no obligations/regulations to use specific scenarios, and companies could use the best case to meet minimum compliance to push new developments (e.g., assets, investments) through. The range of scenarios that are used by companies can be seen in Table 3.1.

Number of organisations/companies using each RCP Scenario or thresholds (n=6)					
8.5	6	4.5	2.6	1.5-degree thresholds	4-degree threshold
3	1	2	2	3 (commercial only)	1 (commercial only)

Table 3.1: Number of total organisations/companies from the finance and commercial sectors using each RCP Scenario ranging from RCP 2.6 to RCP 8.5 as well as 1.5- and 4-degree warmer world thresholds. Some use more than one scenario. Climate services excluded from the analysis.

Representative concentration pathways: *"specify concentrations of greenhouse gases that will result in total radiative forcing increasing by a target amount by 2100, relative to pre-industrial levels, Radiative forcing targets for 2100 have been set at 2.6, 4.5, 6.0 and 8.5 watts per square*

metre (W m-2) to span a wide range of plausible future emissions scenarios and these targets are incorporated into the names of the RCPs; RCP2.6, RCP4.5, RCP6.0 and RCP8.5. Each pathway results in a different range of global mean temperature increases over the 21st century" (Met Office, 2018).

RCP2.6 (0.9-2.3 °C): A stringent mitigation scenario which aims to keep global warming likely below 2°C above pre-industrial temperatures (IPCC, 2014).

RCP4.5 (1.7-3.2 °C): Intermediate scenario assuming that climate policies and global greenhouse gas emissions prices, are invoked to limit emissions and radiative forcing (Thomson et al, 2011).

RCP 6.0 (2.0-3.7 °C): Intermediate scenario, without additional efforts to constrain emissions (IPCC, 2014).

RCP8.5 (3.2-5.4 °C): Very high GHG emissions, without additional efforts to constrain emissions (IPCC, 2014).

The range of RCPs employed by companies and organisations shows that some are using a wide envelope of risk. This may introduce uncertainty regarding which climate actions to take as risks may range from close to zero to extreme. This may create uncertainty regarding the best course of action, especially when translating climate science into financially viable actions. Interviewees expressed a need for more information and guidance on which scenarios to use, with some interviewees highlighting that there may be too much freedom of choice.

- **Global perspective:** Organisations consider climate scenarios that encompass various geographic regions and their specific risks. Some companies may use global data sets for risk assessment or if they have a wider European footprint. *"We use CMIP and Cordex [They] would be the two key ones, there is a rationale for that and in most instances large corporates have a global footprint."*

  Some companies with a wider European footprint may not carry out risk assessment at a local asset level which they may leave for local governing bodies. This scale may not be useful for their business operations as they operate over larger geographic regions.

- **Collaboration and government guidance:** Collaboration between government agencies such as the Office of Public Works (OPW) (flood modelling) and EPA (reporting and licensing), Met Eireann (supplying data e.g., TRANSLATE[15]) and industry is highlighted as crucial for developing standards and guidance related to climate scenarios and modelling. Organisations seek consistency and alignment with government-driven standards. This was particularly relevant to flood risk modelling, often at the property level. In the context of enhancing the accuracy of flood modelling, collaboration with the OPW is mentioned. *"The OPW…develop their flood maps and so they're sort of well used to the Irish market and so they give us…the frequent types of flooding at a range of return periods for the locations of our individual properties and they supply the four different IPCC scenarios to sort of stress those for sort of climate change."*

15 The TRANSLATE project is a Met Éireann lead initiative to standardise future climate projections for Ireland and develop climate services that meet the climate information needs of decision makers. TRANSLATE focuses on reviewing existing climate models to produce a national set of standardised climate projections. Climate services are then developed from these standardised climate projections to aid climate risk decision making across multiple sectors (for example, transport, energy, water). For more information see *TRANSLATE*.

- **Limited in-house resource:** Some commercial organisations expressed concerns about having sufficient in-house resources to manage climate risk adequately.

  "we'll have to see whether we have enough in house resource [to conduct climate risk assessments] or what we learn…. through the process of the CSRD requirements as well. So, we are really only getting into it."

- **Science-based targets:** The Science Based Targets initiative (SBTi) is a collaboration among CDP, the United Nations Global Compact, World Resources Institute (WRI), and the Worldwide Fund for Nature (WWF)**16**. Functioning as the lead partner of the Business Ambition for 1.5°C campaign, SBTi mobilizes companies to establish net-zero science-based targets aligning with a 1.5°C future. By driving ambitious climate action in the private sector, SBTi empowers organisations to set emissions reduction targets grounded in scientific principles. These science-based targets offer a clear roadmap for companies to decrease greenhouse gas (GHG) emissions, mitigating the adverse impacts of climate change and ensuring resilient business growth. SBTi establishes criteria, tools, and guidance, enabling businesses and financial institutions to align their GHG emissions reduction targets with scientific recommendations, specifically aimed at limiting global warming to 1.5°C above pre-industrial levels, as outlined in the Paris Agreement. Upon developing targets, companies and financial institutions can submit them to SBTi for validation. If validated against SBTi criteria, the targets are deemed science-based, and organisations can communicate this achievement. The SBTi's Corporate Net-Zero Standard, introduced in 2021, sets the bar for companies to establish comprehensive science-based targets aiming to eliminate all possible emissions by 2050. The process involves submitting an intent letter, developing targets, presenting them for validation, announcing them to stakeholders, and annually reporting emissions and target progress.

  One interviewee highlighted: *"we've also committed now to the development of science-based targets. So, we'll be conducting modelling to determine what do we need to do in order to align to the 1.5 degrees Celsius pathway."*

  Three commercial companies indicated they have adopted targets associated with a 1.5-warming threshold while one company has adopted targets associated with 1.5 degrees for transition risks and 4-degrees for physical risks (see table 3.1). Below are some actions companies mentioned to align with SBTi targets:

1. **Development of Net Zero Transition Plans**
2. **Adoption of Recent SBTi Guidance for SCOPE 3 Emissions**
   - Companies are aligning with recent SBTi guidance to address emissions associated with forest land and agriculture.
3. **Evaluation of Different Fertilizer Types**
   - One company is considering the environmental impact of different fertilizer types to reduce greenhouse gas emissions.

16 You can access the SBTi fourth report here.

4. **Advocacy for Change in Agriculture Practices**
   - One company pointed out they are advocating for sustainable agriculture practices and introduction of incentives, such as a sustainability bonus, to encourage sustainable practices.
5. **Exploration of Biomethane for Decarbonization**
6. **Commitment to Science-Based Targets**
   - Demonstrating commitment to science-based targets and actively participating in the validation process.
7. **Continuous Monitoring and Improvement**
   - Companies are ensuring ongoing scrutiny and improvement in line with science-based targets. Some companies are using third party vendors such as "The Big four" to assist with meeting science-based targets.

These actions collectively demonstrate a proactive approach by companies to align with SBTi targets, encompassing various aspects of their operations, supply chains, and sustainability initiatives.

3.1.4 Information/ knowledge access for risk assessments

- **Data sourcing and outsourcing:** All sectors source climate data from various external sources, including established climate data providers and third-party vendors. It was mentioned that data may come from publicly available sources such as NASA and Copernicus while data can be obtained for models run by the *"Met Office in the UK, Met Eireann or ECMWF or NOAA".* Outsourcing data-related tasks and relying on external expertise is a recurring theme for both the financial and commercial sectors. Out of the organisations/companies that participated in interviews 55% had internal expertise to carry out risk assessment while 45% relied on outsourcing.

  One large finance institute employs flood map data produced by the OPW while another utilizes Cordex and Coupled Model Intercomparison Project (CMIP) data sets because they have in-house expertise and capacity to utilize such data sets. Data sets such as Cordex and CMIP often have guidance included within them on thresholds and scenarios to use. Interviews highlighted diverse data sets with varying scales and applications provided by sources such as the OPW, Cordex, and the CMIP in addressing climate-related challenges. The OPW operates at a virtually site-specific scale, developing maps, hydrometric data, and technical specifications to inform stakeholders and guide policy and planning. The real-time water level data provided by OPW's hydrometric gauging stations offer detailed insights into localized flood risks. In comparison Cordex with a 12 km resolution caters to a broader scale analysis. While CMIP datasets due to their global coverage and extensive temporal scales, are particularly valuable for large-scale regional assessments, enabling researchers, policymakers, and organisations to analyse climate trends, project future scenarios, and formulate strategies for climate adaptation and mitigation at a broad geographic scale. CMIP5 and CMIP6 are comprised of many models which have different spatial resolutions. Climate projections derived from IPCC-CMIP climate models generally offer resolutions averaging about 200 x 200 kilometres (Copernicus, 2023). In contrast, certain regional climate models (RCMs) produce simulations at finer resolutions, typically ranging from 10 to 50 kilometres,

often through programs such as CORDEX (Copernicus, 2023). CMIP resolution is very coarse and not the most appropriate data for local scale use and must be downscaled. Dynamically downscaled data sets such as those provided by TRANSLATE are more appropriate for use at local scales. The choice of data and models depends on specific needs; finer-scaled OPW data sets suit site-specific risks, Cordex may facilitate broader national analysis, and CMIP supports large-scale regional assessments, allowing organisations to tailor their approach based on the scale and scope of their operational footprint.

It's an emerging space for commercial sectors, while they have teams related to sustainability, they often collaborate with external experts for risk assessments. Some financial institutions (Big Four) through their consulting services and climate services providers act as an outsource for the commercial sector and smaller finance institutions.

- **Standardisation and regulatory alignment:** The importance of having standardised thresholds, scenarios, and guidelines is emphasized across all sectors which many organisations already use (See section 3.1.4 for scenarios and thresholds). Interviewees in the finance sector pointed out that guidance from IPCC AR6 is important in meeting their regulatory requirements.

  One interviewee said that they "take on-board IPCC scenarios and advice." While another said, *"you obviously have the ESRS, the CSRD etcetera, we essentially then…look at those requirements through the context of the IPCC [AR6] Risk assessment framework."*

Regulatory guidance and alignment with regulatory expectations, particularly from bodies like the European Central Bank (ECB), play a significant role in shaping organisations' approaches to climate risk assessment and compliance. The ECB employs a multifaceted approach to stress testing, addressing climate-related risks in the financial sector. This includes EU-wide stress tests, conducted in coordination with the European Banking Authority (EBA), and the ECB's proprietary stress tests integrated into the Supervisory Review and Evaluation Process (SREP). Mandated by EU law, these annual stress tests provide crucial insights for supervisory evaluations. The ECB extends its stress testing framework to include thematic stress tests and forward-looking vulnerability analyses, ensuring a comprehensive assessment of the resilience of supervised banks. Aligned with the Network for Greening the Financial System (NGFS), the ECB actively participates in collaborative efforts with central bankers, banking supervisors, and climate institutions. NGFS has developed an analytical toolkit to assess economic scenarios under diverse climate policy paths. Notably, the ECB does not specifically recommend Representative Concentration Pathway (RCP) scenarios. It was mentioned by one interviewee in the finance sector that *"the German Environment Agency produced some guidance on how to undertake an assessment under the EU taxonomy"* but no further mention of their guidance was discussed, and no specific mention of RCP recommendations were made.

- **Collaboration with experts:** Leveraging external expertise is seen as crucial for well-informed climate analysis and strategic development. Many of the organisations interviewed in both the financial and commercial sectors bring in the expertise they don't have. Commercial sector often works with the Big 4. One interviewee outlined how they act as an outsource:

"We are the outsource people, so people come to us. We would access and use Copernicus quite a bit, and we'd also access the CMIP archive, and we get data directly from Cordex as well… So, we access that and then generally we pull it down, we'll do any kind of, I suppose extraction of data in house".

- **Cross-industry and sectoral consistency:** While not explicitly stated by all interviewees, there is an implicit theme of cross-industry consistency, as organisations align with similar standards and practices, such as those used by peer banks in Europe. While there is no specific standard or obligations, the interviewees in the finance sector acknowledge that other peer organisations in Europe use similar RCP scenarios and guidance to them, suggesting a level of consistency in climate risk assessment practices. There is also a significant effort within the science community to standardise climate information to enable cross sector collaboration. *"We know…. of our peers and other banks…across Europe are using similar scenarios (RCPs 2.6, 6.0 and 8.5). We're members of the Net Zero Banking Alliance (NZBA) as well, so there's different activity there and just through our own networking, we would engage with other peer banks across Europe and likeminded banks on various topics as just keep ourselves informed that way."*

3.1.5 Key climate and risk assessment challenges

- **Data challenges:** These challenges include limited standardisation of data, limits to accessibility and skills required to use it, low data granularity, and the need to deal with inconsistency of data sets being released by EU Member States. Often, the financial sector needs data at an individual address level and it's not available.

  "There's lots of challenges, so I think…if we put it in the case of…the really good data for Ireland, the dynamically downscaled data…I think it's situating that within the current requirements that they have and the example I gave would be for EU taxonomy. It requires for activities that have a life span of greater than 30 years. You can use Cordex. That's perfectly acceptable. However, for activities that are less than 10 years that it states you must use most highly resolved climate data available. So, I think that is something that needs to be considered, particularly when you think about the number of sites, assets, mortgages, houses, [take] data at a bank as an example, we might want to look at in terms of its mortgage book and when you consider the lack of the information that they might have around those assets as well."

  The interviewees also discussed challenges related to data availability, mentioning issues with data release by different EU Member States, and the impact of data granularity on their work. *"it's a little bit frustrating when some Member States release their data and others don't, I think there's a clause where if it's commercially sensitive or whatever, then then Member States can sort of opt out".*

  Some interviewees work for data providers creating data products that align with regulatory requirements related to climate, nature-based risk, and biodiversity risk. These products are tailored to meet the demands of the market driven by regulatory compliance for example under CSRD. The Met Éireann funded TRANSLATE project is working to create standardised climate information that is easily accessible for all skill levels, which addresses many of these problems.

- **Accessibility and useability of climate data:** Accessibility and useability of data is highlighted as a significant concern, for both organisations and individuals within those organisations who may lack the required skill sets to access and work with the data effectively. Expertise is highlighted as a crucial factor in effectively handling climate data, especially for individuals outside the climatology sector. In the commercial sector, they have data related to their own operations, but this is an emerging area for them, and they are on a learning curve regarding the use of climate data.
- **Economic considerations:** Economic challenges associated with climate risk and sustainability efforts are discussed in both the financial and commercial interviews. These challenges include costs of transitioning and impacts of climate change, resource allocation, and potential impacts on consumers for making the transition.

3.2 Policy and regulation

3.2.1 Regulations and legislation for climate adaptation and risk management.

All the financial and commercial organisations were aware of the EU Taxonomy, TCFD and CSRD as seen in Table 3.1a. All these organisations are preparing to report to the CSRD and in doing so fall under the remit of the EU Taxonomy (see Table 3.2b). The TCFD was described as more relevant to UK-based firms or those with a footprint in the UK. One financial company and one commercial company are reporting to the TCFD as they have a UK footprint (see Table 3.2b).

a)

Familiarity with regulatory frameworks (n=11)		
TCFD	NFRD/CSRD	EU Taxonomy
9	10	10

b)

Currently reporting or will be reporting on (n=11)		
TCFD	NFRD/CSRD	EU Taxonomy
2	8	8

Table 3.2a and 3.2b: a) Familiarity with regulatory frameworks b) Currently reporting or will be reporting on

- **Regulatory compliance:** The primary theme that emerges across the sectors is the importance of regulatory compliance, particularly regarding various sustainability reporting directives and frameworks. This includes the CSRD, EU Taxonomy, and TCFD. Organisations are well-versed in TCFD, and its recommendations and such frameworks are mentioned as *"broadly adopted by most regulators, providing a starting point for assessing climate-related considerations"*. Organisations generally have a clear understanding of TCFD recommendations at a high level, particularly regarding governance, metrics and targets, and risk management. "*Organisations clearly understand the governance piece, they clearly understand the metrics and targets, piece, they clearly understand the risk management aspect mostly from a reporting perspective."*

However, the utility and applicability of TCFD vary among organisations and jurisdictions. While it is seen as valuable for *"a climate only perspective, the TCFD has been particularly helpful for.… organisations and.… clients and the recommendations are very easy to grasp at a headline level for any organisation."* there are questions about its relevance in certain jurisdictions outside of the UK such as Ireland.

"I would say TCFD doesn't apply to Ireland, so the usefulness of it there then is questionable. So, unless you have a footprint in a jurisdiction that requires TCFD, it doesn't apply to you." t is the consensus that the CSRD and EU Taxonomy would be the main driving forces now, and the main regulations that companies are reporting to around climate and sustainability in Ireland.

"CSRD has taken over. People are working towards those recommendations and timelines making sure they are compliant".

The alignment with Irish regulatory frameworks, data products, and reporting with international standards, such as CSRD and the EU Taxonomy, is emphasized as important for helping companies meet their climate action goals specifically with reduction of emissions.

- **Challenges with TCFD:** Scenario analysis within TCFD is recognized as challenging, with some organisations finding it complex and requiring further clarity to improve understanding. Some concerns are raised about the quality of TCFD reporting (see literature section), with some companies not achieving high alignment due to a lack of expertise or understanding.

  "So, the FCA in the UK did a survey of the top of FTSE 100. I think they had a look at 29 or 30 of those organisations who mandatorily had to report on TCFD last year. So, of those responders, 90-95% of respondents said they were aligned with TCFD. The FCA took a technical lens and applied that and only about 50% of them had actually got the spirit of it never mind the letter of the law."

  One interviewee believes that this is because companies with low compliance *"haven't really had the expertise necessarily to understand, what it is they are saying they're aligned to"* while many other companies may have only being doing their first pass at aligning with the TCFD requirements and may have found some recommendations challenging to align with. The TCFD sixth report has also highlighted that "varying levels of maturity in understanding climate-related information" was a challenge. The report also mentions that companies find some recommendations such as "its Strategy recommendation — which asks companies to disclose the actual and potential impacts of climate-related risks and opportunities on their businesses, strategies, and financial planning particularly difficult to implement". The TCFD have noted that there is still a lot of work to be done to increase the number of companies "disclosing decision-useful climate-related financial information" and improve the quality of reporting.

- **Environmental and climate risk:** The EU Taxonomy is very good for encouraging companies to assess their risk but can lead to companies worrying about risks they may not actually have. The EU Taxonomy has a list of hazards to assess but as one interviewee explained *"if you don't own ski chalets in Switzerland, you're probably not at risk of avalanche. Rather than worrying about whether or not you're going to catch a landslide and tornadoes when you're not in an area that has landslides and tornadoes."* They also said that

"one of the challenges with the EU Taxonomy for businesses is that not all of these things will be relevant to every business, but the business has been asked to assess all of these".

- **Voluntary commitments:** The distinction between voluntary commitments, like science-based targets, and regulatory requirements was discussed. Organisations may voluntarily commit to specific sustainability goals beyond what is mandated by regulations. More guidance on how to commit to regulations is needed. Banks are pretty much left to their own devices and in some cases fall short in their reporting as shown by the TCFD results. The CSRD will make climate risk reporting mandatory for companies that fall under its remit. All companies that fall under the scope of the CSRD will be subject to mandatory reporting in accordance with ESRS standards. While it is currently unknown if use of specific climate scenarios or thresholds will become mandatory under the CSRD, compliance with the 12 ESRS standards will be mandatory (see literature section). Companies that do not comply can face legal action, financial repercussions, and reputational impacts. Non-compliance may also lead to operational challenges as businesses lag behind competitors and impacts to business opportunities as other companies assess their value chains hindering partnerships and growth prospects.

3.2.2 Guidance used by financial and commercial institutions for climate adaptation and risk management.

A lot of guidance used is based on compliance with regulations like CSRD, EU Taxonomy and TCFD. As stated previously the CSRD appears to be the most important for Irish based companies which will make disclosing information on risks and opportunities arising from social and environmental issues, including climate change, mandatory (see Literature review). Other important sources of guidance which are not mandatory come from sources such as the IPCC AR6 and recommendations from Science-Based Targets Initiative.

- **Use of standardised international frameworks and guidance:** The use of established frameworks is emphasized by the financial and science sectors, such as the IPCC AR6 guidance on risk assessment and EU Taxonomy. These frameworks do not have mandatory requirements but provide a basis for assessing climate risk and environmental management. The organisations emphasize the use of the IPCC guidance as a foundational reference for risk assessment and guidance.

  Currently the TCFD recommendations are not mandatory and do not mandate use of specific RCP scenarios. The TCFD is seen as a *"good place to start in terms of looking at what sort of climate related things you should be interested in and what you should be looking at."* while *"The corporate sustainability, reporting directive, the EU Taxonomy which relates to climate finances seem to be driving a lot of reporting and guidance around hazards."*

  The IPCC is seen as the best standardised guidance and *"the only standardised guidance, that's available that can be applied globally to nationally."* The NAF has been mentioned as providing a good baseline they *"also looked at the National Adaptation Framework published in 2018 and that was the sort of a good baseline overview"* this framework provides good guidance but no mandatory criteria for adapting to physical risk.

- **Climate Action Plan awareness:** Interviewees from the commercial sector emphasized awareness of the Climate Action Plan and its associated targets, particularly the goal of achieving a 51% reduction in greenhouse gas emissions by 2030. Currently these targets are not legally binding for companies. However, interviewees from the commercial sector who align with SBTi have done so voluntarily.

  "The likes of the Climate Action plan…. we're very conscious of the targets that have been set at a national level, the 51% reduction in…greenhouse gas emissions and that great target for 2030."

  Awareness of and alignment with national climate targets, as exemplified by the Climate Action Plan in the commercial sector, is a theme that demonstrates a commitment to contributing to broader national climate goals regardless of whether such targets are mandated.

- **Collaboration and knowledge sharing:** Collaboration with external groups and working groups such as the NetZero Banking Alliance is seen as a valuable way to inform organisations' approaches, share best practices, and adopt lessons from other jurisdictions and international banks. This theme is prevalent in the financial sector.

- **Adaptation networks:** While networks like the NetZero Banking Alliance for climate adaptation were not mentioned in interviews, interviewees discussed having conversations with peers regarding adaptation and climate risk through the NetZero Banking Alliance. The newly launched (2023) Climate Ireland Adaptation Network (CIAN) serves as a national-level practitioner network, promoting the sharing of expertise and learning opportunities for climate adaptation in Ireland. CIAN provides a valuable forum for practitioners engaged in climate risk and adaptation planning to enhance their effectiveness in preparing for the future climate and environment of Ireland. On the international front, the Global Adaptation Network (GAN), initiated by the United Nations Environment Programme (UNEP) in 2010, operates as a knowledge-sharing platform connecting various adaptation organisations worldwide. GAN serves as a global network, facilitating the exchange of vital information among stakeholders from government, academia, private sector, and civil society. These networks, like CIAN and GAN, can provide valuable avenues for the financial and commercial sectors to engage, share insights, and contribute to effective climate adaptation strategies both at a national and international level.

- **Mandatory reporting:** Interviewees from both the finance and commercial sectors while also aware of the TCFD and EU Taxonomy are beginning to report on CSRD which will see mandatory reporting of ESRS standards and climate risk disclosures (see Literature review). The UK has also announced a roadmap to making the TCFD mandatory by 2025 (see Literature review for TCFD). Currently there are no mandated scenarios to be used by companies/organisations as discussed in section 3.1.3 For commercial companies, the SBTi suggest using the 1.5-degree threshold. Most guidance on which RCP scenarios (e.g., RCP8.5, RCP4.5) to use come from external sources such as third-party vendors in the climate services sector or frameworks such as the IPCC AR6.

3.2.3 Policy improvements and international learnings

Common themes across finance and commercial sectors interviews related to policy and regulatory improvements:

- **Policy translation, practical guidance, and support:** Interviewees from both sectors touch upon the translation of policies and regulations into actionable measures at the national or organisational level that are clearly communicated to the sectors. The focus is on translating European policy into actionable measures for Ireland, especially in sectors that are already responding to European policies but may need more guidance on how best to meet or improve upon regulatory requirements. This involves aligning Irish initiatives to meet policy requirements.

  "Their [Finance sector] already responding to European policy, so it's essentially…looking at translating European policy into what can Ireland do to support the difference, whether it be financial sector, etcetera to meet those policy requirements and at the same time pushing out the Irish products [data, climate information] that will help them do it."

  There is a consistent theme of organisations seeking more guidance and practical support to navigate and comply with regulatory frameworks and climate-related requirements. This includes the EU Taxonomy and CSRD. Most interviewees acknowledged that the policies already exist, and emphasis should be placed on providing practical guidance.

  "I think guidance on how an Irish company should undertake the taxonomy or CSRD that's really what's required, and the policies are already there."

- **Impact of regulation:** Regulations like CSRD are expected to shift reporting from voluntary to mandatory which will affect reporting practices. The introduction of regulations like CSRD is expected to bring organisations into compliance and reduce the voluntary nature of reporting, leading to more standardised and comparable reporting from sectors. CSRD is set to significantly expand the scope of organisations subject to reporting requirements, increasing from 11,000 covered by the NFRD to around 50,000 covered under the CSRD, making it a major regulatory focus (KPMG, 2022). This new directive will capture organisations/companies which meet one of the following criteria; more than 250 employees, assets above €20m or annual turnover over €40m ((KPMG, 2022).

- **Data access, standardisation and quality:** Any policy/regulation that can ensure access to relevant data and addressing data gaps was discussed. From the interviews emerged a clear call by those in the finance and science sectors for useable data in formats for non-experts that's standardised for all sectors which could be supported by improved climate policy. The National Framework for Climate Services (NFCS), established by the Irish Government in June 2022, serves as a collaborative mechanism to coordinate, and strengthen the interaction between climate information providers and users. Led by Met Éireann, Ireland's meteorological service, the NFCS aims to facilitate the co-production, delivery, and utilization of accurate, actionable, and accessible climate information and tools. As part of the NFCS, the TRANSLATE project, coordinated by Met Éireann and partner organisations, plays a pivotal role. This project acts as a stepping-stone in the development of the NFCS, addressing issues related to climate information provision. TRANSLATE focuses on supporting climate adaptation by offering tailored information and services regarding

Ireland's changing climate to the public and key stakeholders, including the energy sector. The climate projections generated by TRANSLATE will be made freely accessible to the public and decision-makers across the country, aligning with Met Éireann's commitment to enhancing the comprehensibility of complex future climate scenarios for all stakeholders. The NFCS, through initiatives like TRANSLATE, strives for standardisation and consistency in approaching climate-related risk assessment, emphasizing common reporting rules, and avoiding duplication in climate product production and information dissemination. One interviewee from the climate services sector indicated that they believe any policy which increases standardisation of data, measuring and reporting climate risk would be welcome.

- **Advocacy for compliance:** All sectors have highlighted advocacy for compliance with existing regulatory frameworks. They emphasize the importance of adhering to regulations like CSRD and the EU Taxonomy, and in the finance sector, the influence of the Global Reporting Initiative (GRI) is also driving reporting practices.

3.3 Climate adaptation actions

3.3.1 Acceptable levels of risk, expected standards of protection and drivers for climate risk management.

- **Assessing and accepting risk:** Interviewees in both the finance and commercial sectors said they are still in the process of evaluating what are acceptable levels of risks for their organisations in the context of climate change. This hasn't been measured extensively by the finance sector or commercial sector so statements regarding levels of acceptable risk cannot be accurately made at present.

  This theme underscores the evolving nature of climate risk assessment in these sectors and awareness that more information is needed. The interviews highlight that these institutions are in the process of evaluating what they consider acceptable risks in the context of climate change, but this is an emerging space.

- **Variability in risk aversion:** The variation in risk aversion among different institutions is mentioned across the interviews. Companies have already been adapting to climate related risks before it was called climate adaptation, such as floods and storms. Risk appetites are expected to evolve over time, based on learning and experience, reflecting the adaptive nature of risk management.

- **Innovative approaches:** The concept of innovative approaches to managing risk is highlighted. This suggests a shift toward more flexible and responsive risk reduction strategies, particularly in the context of infrastructure and investment which focuses on adapting to thresholds and triggering events and reducing the risk of over or under adapting.

  "So, there's been a general shift now towards threshold-based decision making in the adaptation space. So, it's rather than building a risk on let's say for sake of, right in the middle of RCP 8.5, you're now building your emission scenario triggered based on threshold events."

The need for adaptive risk management strategies rather than rigid, long-term plans based on uncertain information is highlighted by the climate services sector. One interviewee from the climate service sector describes avoiding adaptation pathway lock in based on uncertain information by adopting dynamic threshold-based decision making *"You're actually taking action based on an actual threshold that you're seeing, you're adapting dynamically rather than making a plan for 100 years now on a lot of information that's uncertain, you can do something now for the next 20 odd years and then you can reassess it…you're not building that bridge with steel spec for the high end of 8.5 which may come in at 50 times the cost… you're building it in such a way that we can add extra supports to allow for the expansion of steel or otherwise".* This reflects a more dynamic approach to climate risk management which aims to avoid maladaptation and lock in, to rigid adaptation pathways which fall short of future requirements.

- **Excluded activities:** One financial organisation refers to the publication of excluded activities on the institution's website, indicating certain activities that they currently do not support. These exclusions are subject to review and may be updated as the institution's risk appetite evolves; this indicates an awareness of risk.

3.3.2 Climate adaptation measures to manage the risk.

- **Implementing climate adaptation actions is an emerging area.**

  The interviewees in finance and commercial sectors indicated that they don't engage in climate adaptation measures to manage risk. Engaging in specific actions regarding managing climate risk is still an emerging space for these sectors. They *"talk about it from a transition perspective as regards to policy and regulation, but [they] don't really talk about the physical risk of it… that's quite a new concept".*

- The focus appears to be to continue to build on what they have already been doing by committing to reduction of emissions, reporting to CSRD, and abiding by science-based targets and national commitments under the Climate Action Plan. While also continuing to work with customer and clients and continue to support them through any transition.

- **Emissions reductions**

  One of the main focuses for both the finance sector and commercial sectors would *"probably be our emissions reductions targets, is probably the most important, so we…have set emissions reduction targets for some of our key portfolios."*

- **Insurance**

  One commercial company highlighted that it has insurance for its assets to mitigate physical risks. However, the method for calculating the level of insurance for risks and the timeframe the risk is insurable for was not captured in the interviews. One interviewee explained that the insurance of assets is usually short term, around a year *"an insurance company, [will] insure something for a year, so that's what they're interested in, the risk in that given year"*. It also conducts flood risk assessments to try and mitigate future flood risk on its sites.

3.3.3 Policy, regulation or guidance needed to support climate adaptation actions.

- Adequate policy/ regulation Exists, guidance needed on implementation.

  There was a consensus opinion among interviewees that there are sufficient policy and regulation and that companies are responding to European and national level regulation. However, as previously discussed there is a desire to see more guidance on how to effectively comply with existing policy/regulation.

  "I think guidance on how an Irish company should undertake the taxonomy or CSRD that's really what's required, and the policies are already there."

  There is an element of hesitation about additional reporting on top of current requirements, there was a view that, it could lead to a focus on prepping for reporting as opposed to getting meaningful actions completed. *"So, we have a very small sustainability team and I suppose the challenge for me now is that I could get caught in the realm of ESG reporting and climate risk reporting etcetera, etcetera that actually we get to do nothing."*

3.4 Climate science sector

In-depth interviews conducted within the climate science sector have revealed key insights into the challenges and considerations surrounding climate-related risks in the finance and commercial sectors. Climate scientists, engaged in understanding the complexities of climate change and its impacts, offer valuable perspectives on risk under-estimation, measurement challenges, data source diversity, and the usability of climate data. These insights shed light on the evolving landscape of climate risk assessment and adaptation actions, emphasizing the need for robust standards and collaborative efforts to fortify the resilience of financial and commercial organisations. The key takeaways to emerge from these interviews include:

1. **Risk underestimation:** Interviewees from the climate science sector expressed concern about potential under-estimation of climate-related risks. This apprehension is linked to insufficient measurement practices and the absence of obligations or regulations mandating the use of specific climate scenarios. A respondent emphasizes this risk by stating, *"One of the biggest risks wrapped up in the finance sector is that the risk hasn't actually been measured that thoroughly yet."*

   The sector's predominant focus on average temperatures is identified as a potential limitation, with suggestions that such a focus might not adequately capture the intricate impacts of climate change and a full range of possible scenarios. This key insight points to a substantial gap in understanding, indicating that a predominant focus on average temperatures as a measure might be limiting the scope of risk assessments. The interviews suggested a learning gap in comprehending how to effectively measure climate impacts. The highlighted risks extend beyond average temperature changes, encompassing more severe and impactful factors like extreme weather events such as heatwaves, floods, and fires. The consistent emphasis on average temperatures might lead to a significant under-estimation of potential risks, highlighting a critical challenge for sectors in achieving accurate and comprehensive risk management.

2. **Standardisation of climate data:** Interviewees highlighted key insights into why standardised data are crucial in the financial and commercial sectors. They emphasise the need for standardisation of climate information to address challenges arising from non-experts attempting to utilize climate data across multiple sectors. The concern is that, without standardised information, different actors manipulate climate data in various ways, leading to duplication and complicating cross-sectoral decision-making. The climate science sector recognises the importance of not only providing standardised climate information but also ensuring its accessibility and ease of use tailored to users' skill levels.
3. **Climate risk assessment criteria:** Interviewees highlighted the significance of not just having standardized data but also emphasized the need for standardized and accessible criteria for conducting climate risk assessments. Stakeholders in the climate science sector underscored that the lack of standardized guidance might lead to users choosing options based on their immediate needs or foster diverse interpretations of climate risk assessment requirements.
4. **Financial feasibility of adaptation:** The interviews also delved into the concern of sectors over-specifying designs for climate adaptation. There is a need to strike a balance between resilience and financial feasibility. The uncertainty about the appropriate level of risk for infrastructure adaptation is highlighted, emphasizing the need for refined views and high-resolution data to guide risk calculations. The NFCS and TRANSLATE project aim to answer these concerns by providing a more detailed and region-specific understanding of climate risks, addressing the current lack of clarity, and providing valuable insights for better risk management and decision-making in these sectors so financially viable decisions can be made.
5. **Adaptation Beyond Business Scope:** Interviews from the climate science sector acknowledged the significance of adaptation actions and recognize that responsibility for adaptation often extends beyond individual businesses. Local governments and infrastructure owners are identified as pivotal in adaptation efforts. Additionally, it was highlighted that the cost of adaptation is likely to be borne by consumers and more vulnerable populations.

4. Conclusions

The analysis of these interviews provides useful insights which are relevant in other sectors as to how climate-related challenges, risk assessment and disclosure are being dealt with across the finance and commercial sectors in Ireland. The following key insights reflect the complexities and evolving nature of climate risk assessment, regulatory compliance, and climate actions in today's financial and commercial landscape.

4.1 Key findings

- **Legislation, policy, and regulatory compliance:** Regulatory frameworks and compliance requirements, such as the CSRD, EU Taxonomy and TCFD have a significant impact on organisations' approaches to climate risk assessment and reporting. Compliance with these regulations is seen as a priority for both the financial and commercial sectors. Organisations are well-versed in TCFD and familiar with its recommendations particularly regarding governance, metrics and targets, and risk management with one financial and one commercial organisation actively reporting on it. However, the utility and applicability of TCFD varies among organisations and jurisdictions with it being more relevant to companies with a UK footprint and less relevant to Irish only companies. However, it has not been relevant for many Irish based commercial organisations; there was consensus that the CSRD and EU Taxonomy would be the main driving forces and main regulations that companies are reporting to regarding climate risk and sustainability.
- **Physical risk and transition risk:** Across all interviews, a primary theme is the recognition of climate-related risks and urgency of risk reduction and adaptation. Organisations, regardless of their sector, are increasingly aware of the potential impacts of climate change on their operations and assets. This awareness has led to a growing commitment to sustainability and emissions reductions in the sectors. Interviewees identified two types of risk: physical risk; and transition risk.

Physical risks relate to the potential impact of climate change on each organisation's activities, premises, staff, and third-party suppliers. Flooding, heatwaves, and extreme weather events were highlighted as the main causes of physical risk. In many cases these risks were perceived as lower for some of the financial institutions due to physical infrastructure such as buildings being leased and not owned. Interviewees within this study from the commercial sector perceived the physical risks as having minimal direct impact to their business operations. The reasons for this view were similar to those expressed by interviewees within the financial sector. It is worthy to note that physical risk to physical/material assets (e.g., leased buildings) lies with the asset owner which may have an impact on the financial system. However, this impact was not explored within this study and would require further investigation involving entities which lease assets to the financial/commercial sector. Interviewees reported few physical risks as they felt that they were not as prominent in their specific industries which are impacted more indirectly. Interviewees also highlighted that many in the financial sector see the physical risks as materializing further into the future.

Transition risks on the other hand encompass changes in legislation and business practices related to climate change, which were acknowledged as a significant concern. Transition risks were seen as being more impactful than physical risks especially potential disruptions and challenges

associated with the introduction of new regulations and reporting standards, leading to the possibility of a "disorderly transition". It was also mentioned that "disorderly transitions" could occur through changes in political leadership. Key lessons for all sectors in Ireland to future-proof against transition risks involve developing sustainable initiatives, complying with EU regulations, and anticipating legislative changes. Stress tests can evaluate energy supply resilience and consider potential shocks. Sectors must prioritize the development of transition plans, incorporating climate risk considerations and adhering to reporting standards like the Corporate Sustainability Reporting Directive (CSRD) where relevant. Specific actions for climate-proofing transition actions include emissions reduction, technology adoption (e.g., bio-methane), and reporting compliance.

- **Data availability:** Interviews revealed significant concerns within the financial and commercial sectors regarding data availability and the crucial need for easily accessible and usable climate data for effective climate risk assessments. Interviewees stressed the critical role of data and climate information in addressing climate risks, but numerous challenges exist, including limited standardisation, accessibility issues, skill requirements, low data granularity, and inconsistency in data sets released by European states. This emphasis on accessibility is seen as essential for informed cross-sectoral decision-making, regulatory reporting, and careful planning to avoid over-specification in adaptation and asset design. The absence of standardised guidance for incorporating data into risk assessments was also highlighted as a potential risk, reinforcing the importance of clear criteria and guidance requirements.
- **Data standardisation:** The imperative for standardised and accessible criteria in utilizing climate data for risk assessment emerges as a pivotal and overarching theme, underlining the fundamental role of robust frameworks and collaborative initiatives in enhancing the resilience of financial and commercial organisations. Interviewees from these sectors stress not only the necessity for standardised data but also the need for standardised criteria governing the incorporation of data into risk assessments. This valuable insight, gathered from extensive conversations with various sectors, including public, private, financial, and governmental bodies, underscores a shared concern for information standardisation. Concerns were raised about the need for standardised data tailored to users' skill levels, to facilitate informed decision-making across sectors. This step is seen as crucial for informed cross-sectoral decision-making and for meeting regulatory reporting requirements.
- **Risk assessment criteria:** All sectors, including smaller financial institutions and commercial businesses, use a diverse range of external sources for climate data, utilizing providers like NASA, Copernicus, ECMWF, Met Offices, NOAA, EPA or OPW with some employing Cordex or CMIP datasets. Outsourcing data-related tasks in risk assessments is common among smaller entities with limited internal resources. While the commercial sector collects internal data, they often outsource tasks like carbon emissions calculation and risk assessments. An important theme derived from interviewees extends beyond the provision of standardised climate data to encompass the establishment of standardised risk assessment criteria that facilitate user-friendly applications. The interviewees emphasize the importance of standardised criteria to ensure not just accessibility but also the appropriate tailoring of information based on the user's skill level.

  Climate scenarios, such as Representative Concentration Pathways (RCPs), play a significant

role in climate risk assessments for many of the financial companies and one of the commercial companies. Scenario analysis was viewed as essential for understanding potential impacts and building future resilience. All financial institutions pointed out that they employ climate scenarios in their risk assessments. The most common RCPs employed are RCP8.5, and RCP6.0 but RCP4.5 with RCP2.6 being used primarily for transition risk and for reference. Several organisations commit to developing science-based targets around the science-based targets initiative, aligning their actions with international and national climate goals, such as limiting global warming to 1.5 degrees Celsius. The commercial sector is more inclined to look at scenarios related to a 1.5 and 4-degree warmer world.

- **Preference for guidance over additional reporting obligations:** Interviewees conveyed an explicit preference within the financial and commercial sectors for technical guidance and support rather than an increase in legislative or regulatory measures. The focus should be on clear guidance to facilitate effective risk assessment and reporting practices.
- **Information and guidance:** Institutions employ third-party vendors for climate assessments, data gathering, and risk analysis, with larger ones conducting most analyses internally. The commercial sector emphasizes meeting science-based targets, often with support from providers. The financial and science sectors prioritize established frameworks such as the IPCC and EU Taxonomy for climate risk assessment, underscoring their role in environmental management. The commercial sector is aware of the Climate Action Plan, aiming for a 51% emission reduction by 2030, and aligns with the SBTi for emissions targets. Collaboration with external groups like the NetZero Banking Alliance is valued for sharing insights and adopting best practices from different jurisdictions and international banks.
- **Collaboration and expertise:** Organizations in both financial and commercial sectors emphasize the importance of collaboration with external experts. This collaboration is viewed as a valuable approach for sharing best practices, adopting international lessons, and addressing climate challenges effectively. Leveraging external expertise is deemed crucial for well-informed climate analysis and strategy development, allowing organizations to tap into specialized resources when needed.
- **Biodiversity:** Three companies across the financial and commercial sectors mentioned the importance of biodiversity. One company mentioned that it adheres to science-based targets for nature and the Nature Restoration Act. It was mentioned that more research is needed on biodiversity as well as greater access to biodiversity data.
- **Cross-sectoral impact:** There is a shared recognition of the cross-sectoral impact of climate-related physical and transitional risks. Climate events that impact one sector can affect others, highlighting the need for coordinated strategies and cross-sectoral collaboration. There is a strong willingness to engage in cross-sectoral work and some organisations have begun working in this space.

4.2 Recommendations

This section of the document offers generalisable lessons that can be applied broadly to enhance the effectiveness and resilience of climate risk assessments across sectors in Ireland. Generalisable lessons which have been distilled from the key findings are as follows:

- **Enhance data accessibility:** Ensure policies, regulations, and guidance prioritise access to relevant standardised data and address data gaps, emphasising user-friendly formats for non-experts across all sectors. Standardised data under the coordination of the National Framework for Climate Services is now available and should be promoted for use in physical climate risk assessments across sectors.
- **Apply standardised national data in risk assessment across sectors:** Leveraging newly available standardised national data is crucial for integrated risk assessments. Coordinated through the National Framework for Climate Services, this standardised data is now accessible and should be actively advocated for use in comprehensive physical climate risk assessments across various sectors. Climate Ireland serves as the national platform for adaptation, providing a centralised and accessible resource to support informed decision-making and enhance the resilience of sectors to climate-related challenges.
- **Standardised risk assessment approaches and criteria:** Standardisation and consistency in climate-related risk assessment approaches and criteria should be encouraged across organisations and sectors. Common approaches to data use and risk assessment should be encouraged through the provision of national and sectoral guidance, the first iteration of which is being provided as part of the National Climate Change Risk Assessment.
- **Promote collaboration and knowledge sharing:** Promote mechanisms for collaboration amongst experts, practitioners, industry peers, and government agencies both within and across sectors. Encourage knowledge sharing to align with evolving standards and enhance communication between sectors. The Climate Ireland Adaptation Network (CIAN) and events held under the auspices of the National Framework for Climate Services are examples of mechanisms for this capacity building and knowledge sharing.
- **Implement scenario analysis with guidance:** Encourage organisations to integrate scenario analysis into risk assessment practices. Provide increased guidance on choosing appropriate climate scenarios, considering their impact and relevance.
- **Embrace adaptive risk management:** Promote adaptive risk management strategies into decision making that allow flexibility in response to evolving climate data. Implement adaptive strategies based on thresholds and triggering events, avoiding rigid adherence to specific scenarios.
- **Integrate biodiversity research and data with climate services:** Conduct research on climate risks to biodiversity and sectoral impacts on biodiversity. Ensure biodiversity data and guidance is produced in alignment with climate services to facilitate coherent reporting on the impact of sectoral activities. The lessons can be drawn for Biodiversity reporting development from how climate change specialists respond to CSRD which underscores the importance of identifying and establishing appropriate links between biodiversity and climate action within the Bio- development context.

5. References

Copernicus (2023). "High-resolution climate projections". Accessed: 06/02/2014. Available at: *https://climate.copernicus.eu/high-resolution-climate-projections*

Department of Enterprise, Trade and Employment (2023). "Preparing your business for the Corporate Sustainability Reporting Directive (CSRD)". Accessed: 31/01/2024. Available at: *https://enterprise.gov.ie/en/what-we-do/the-business-environment/corporate-sustainability-reporting/*

European Council (2022). "Council gives final green light to corporate sustainability reporting directive". Accessed: 31/01/2024. Available at: *https://www.consilium.europa.eu/en/press/press-releases/2022/11/28/council-gives-final-green-light-to-corporate-sustainability-reporting-directive/*

European Parliament (2022). "Sustainable economy: Parliament adopts new reporting rules for multinationals". Accessed: 31/01/2024. Available at: *https://www.europarl.europa.eu/news/en/press-room/20221107IPR49611/sustainable-economy-parliament-adopts-new-reporting-rules-for-multinationals*

IPCC (2014). "Future Climate Changes, Risks and Impacts". Accessed: 02/11/2023. Available at: *https://ar5-syr.ipcc.ch/topic_futurechanges.php*

IPCC (2021). "Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change", [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, In press, doi:10.1017/9781009157896.

KPMG (2022). "Sustainability Reporting". Accessed:02/11/2023. Available at: *Sustainability reporting - EU's CSRD - KPMG Ireland*

KPMG (2023). "Corporate Sustainability Reporting Directive". Accessed: 31/01/2024. Available at: *https://kpmg.com/ie/en/home/insights/2023/11/corporate-sustainability-reporting-directive.html*

Mett Office (2018). "UKCP18 Guidance: Representative Concentration Pathways". Accessed:02/11/2023. Available at: *ukcp18-guidance---representative-concentration-pathways.pdf (metoffice.gov.uk)*

Thomson, A.M., Calvin, K.V., Smith, S.J. et al. (2011). RCP4.5: a pathway for stabilization of radiative forcing by 2100. Climatic Change, 109, 77. *https://doi.org/10.1007/s10584-011-0151-4*

Vikolainen (2021). "Improving corporate sustainability reporting, European Parliamentary Research Service". Accessed: 31/01/2024. Available at: *https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/694219/EPRS_BRI(2021)694219_EN.pdf*

Annex 1

Interview Guide

Research title: Climate risk assessment in the financial and commercial sectors

Current practices

1. Can you tell me about your **role in your organisation** and how it is connected with (or influenced by) climate adaptation or risk assessment?
2. What are the **biggest concerns** of 1) your organisation, and/or 2) the finance/ commercial sector (as relevant) for managing climate risk and adapting?
3. Are your organisation/representatives conducting *climate risk assessments?* If yes, please share more details on:
    - Representative Concentration Pathway (RCP) scenarios
    - Data (sources, resolution, accessibility, geographical scale)
    - Models (hazard type, source, accuracy)
    - Tools (decision-support, visualisation)
4. How and where does your organisation/ representatives **access the information/ knowledge** for your assessments? E.g., outsourced vs. in-house, climate services (e.g., Climate Ireland, Met Eireann, EPA)
5. Do you experience any issues around **data standardisation, open-access, and data granularity** in climate risk assessments? Is the (open)data available useful enough for your assessments or do you need to pay to access sufficient quality data?
6. Are there any other challenges or opportunities that should be considered for climate adaptation of the Irish financial and commercial sectors?

Policy and regulation

7. What **regulations/ legislation** is your institution/ representatives following for climate adaptation/ risk management? E.g., Sustainable Finance Disclosure Regulation, EU taxonomy
8. What **guidance** is your institution/ representatives following for climate adaptation/ risk management at:
    - International/ European level e.g., Network for Greening the Financial System (NGFS), ISO 14090, IFRS Sustainability Disclosure Standard
    - National level: National Sustainable Finance Roadmap
9. Are you/your organisation familiar with or part of the Task Force on Climate-Related Financial Disclosures (TFCD) in Ireland? If so, how useful its implementation to date? [extending from the international TCFD]
10. Are you familiar with any additional international practices/ guidance's/ regulations that are informing or would be useful for Ireland to learn from?

11. What policy or regulatory level **improvements** could be made in Ireland to improve the integration of climate adaptation and risk assessment into financial and commercial sector practices?
12. Who are the **key actors** in the financial and commercial sectors with a specific interest and/ or power to adapt to climate change?
13. How does your organisation/ representatives **exchange good-practice information/ learning** around climate adaptation in the finance/commercial sector? What support is needed? E.g., training, forums via Skillnet Ireland, Sustainable Finance Ireland.

Climate Adaptation Actions

14. What is the level of acceptance of risk/ expected standards of protection and drivers for climate risk management in the finance/ commercial sector?
15. What type of measures does your organisation or representatives implement climate adaptation measures to manage the risk? E.g., reinsurance, property level protection, hard infrastructure, nature-based
16. What policy/ regulation/ guidance is needed to support your climate adaptation measures/ actions?

Follow up

17. Are there any reports, documentation or supplementary information you can share with us through email?
18. Do you have anything further you would like to share before we finish?

Do you have any recommendations for other people we should interview as part of this research?

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Headquarters

PO Box 3000,
Johnstown Castle Estate
County Wexford, Ireland

T: +353 53 916 0600
F: +353 53 916 0699
E: **info@epa.ie**
W: **www.epa.ie**
LoCall: 1890 33 55 99

Regional Inspectorate
McCumiskey House,
Richview, Clonskeagh Road,
Dublin 14, Ireland

T: +353 1 268 0100
F: +353 1 268 0199

Regional Inspectorate
Inniscarra, County Cork,
Ireland

T: +353 21 487 5540
F: +353 21 487 5545

Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny, Ireland

T +353 56 779 6700
F +353 56 779 6798

Regional Inspectorate

John Moore Road, Castlebar

County Mayo, Ireland

T +353 94 904 8400
F +353 94 902 1934

Regional Inspectorate

The Glen, Monaghan, Ireland

T +353 47 77600
F +353 47 84987

Regional Offices

The Civic Centre
Church St., Athlone
Co. Westmeath, Ireland
T +353 906 475722

Room 3, Raheen Conference Centre,
Pearse House, Pearse Road
Raheen Business Park, Limerick,
Ireland
T +353 61 224764

Printed on environmentally friendly paper stock