

Handbook on Implementing Environmental Risk Management

for Asset Managers, Banks and Insurers

TABLE OF CONTENTS

1	FOREWORD	4
2	INTRODUCTION	6
2.1	Background.....	6
2.2	Synopsis.....	7
3	SCOPE	9
3.1	Environmental Risk.....	9
3.2	Implementation of the Handbook in Line with Guidelines	9
3.3	Environmental Change as a Source of Economic and Financial Risks	10
3.3.1	Physical Risks	10
3.3.2	Transition Risks.....	11
3.3.3	Interdependence of Physical Risks and Transition Risks	13
3.4	Distinctive Elements of the Financial Risks from Environmental and Climate Change.....	13
3.5	Transmission Channels	14
3.5.1	Direct Transmission Channels	15
3.5.2	Indirect Transmission Channels.....	16
3.5.3	Credit/Counterparty Default Risk.....	16
3.5.4	Market Risk.....	17
3.5.5	Liquidity Risk.....	17
3.5.6	Operational Risk	18
3.5.7	Reputational Risk.....	18
3.5.8	Insurance Risk.....	19
3.5.9	Portfolio-Level Environmental Risks.....	20
3.6	Taxonomy	20
4	GOVERNANCE AND STRATEGY	21
5	RISK MANAGEMENT.....	24
5.1	Risk Policies, Procedures and Risk Appetite.....	24
5.2	Risk Identification and Assessment.....	31
5.2.1	Lending	32
5.2.2	Underwriting	35
5.2.3	Investment/Asset Management.....	37
5.3	Risk Management and Monitoring.....	44
5.3.1	Lending	44
5.3.2	Underwriting	47
5.3.3	Investment/Asset Management.....	48
5.4	Scenario Analysis and Stress Testing.....	51

5.5	Capacity Building	58
6	DISCLOSURE	62
6.1	Disclosures on Governance	63
6.2	Disclosures on Strategy	64
6.3	Disclosures on Risk Management.....	66
6.4	Disclosures on Metrics and Targets	68
6.5	Data Gaps and Limitations	70
7	ANNEX: RESOURCES.....	71

ABBREVIATIONS AND ACRONYMS

ABS	Association of Banks in Singapore
D&O	Directors and Officers
EI	Emissions intensity
ENRM Guidelines	Guidelines on Environmental Risk Management
ESG	Environmental, Social and Governance
FCAP	Financial Centre Advisory Panel
FI/FIs	Financial institution/s (asset managers, banks, insurers)
FSB	Financial Stability Board
GHG	Greenhouse gas
IBF	Institute of Banking and Finance
IEA	International Energy Agency
IMAS	Investment Management Association of Singapore
IPCC	Intergovernmental Panel on Climate Change
LGD	Loss-given-default
MAS	Monetary Authority of Singapore
NDC	Nationally Determined Contribution
NDPE	No Deforestation, No Peat, No Exploitation
NGFS	Network of Central Banks and Supervisors for Greening the Financial System
PACTA	Paris Agreement Capital Transition Assessment
PD	Probability of default
PSI	Principles for Sustainable Insurance
RCP	Representative Concentration Pathways
SBR	Sustainable Business Risk
SME	Small and Medium-sized Enterprises
SSP	Shared Socioeconomic Pathways
TCFD	Task Force on Climate-related Financial Disclosures
tCO ₂ e	Tonne of carbon dioxide equivalent
UN PRI	United Nations Principles for Responsible Investment
UNFCCC	United Nations Framework Convention on Climate Change

1 FOREWORD

Environmental risk is increasingly recognised as a key risk globally, with climate change at the forefront of concerns. The Intergovernmental Panel on Climate Change has highlighted that we must act now to limit global warming to 1.5 °C to avoid unprecedented global warming, loss of ecosystems and other irreversible changes¹. Other environmental issues could further compound the risks arising from climate change. For example, there has been a rapid decline in biodiversity worldwide, alongside a significant alteration of three-quarters of the land and more than 60 percent of the marine environment².

Environmental risk not only poses reputational concerns, but also has potential financial impact on financial institutions' portfolios and activities through physical and transition risk channels. On physical risk, climate and weather-related events have intensified in recent years and are likely to continue to do so due to climate change. Transition risk arising from policy changes, technological advances, or shifts in consumer preferences could devalue loans and investments that are exposed to sectors affected. These risks are not trivial and could threaten the safety and soundness of the financial sector.

The Monetary Authority of Singapore (MAS) launched the Green Finance Action Plan in 2019 to support a sustainable Singapore and facilitate Asia's transition to a sustainable future. A key thrust of the Action Plan is to strengthen the financial sector's resilience to environmental risk. To this end, MAS has issued the Guidelines on Environmental Risk Management for banks, insurers and asset managers, setting out MAS' supervisory expectations for financial institutions to assess, monitor, mitigate and disclose environmental risk.

This handbook, produced by the Green Finance Industry Taskforce (GFIT), complements MAS' efforts. Written by industry practitioners for industry practitioners, it shares practical implementation guidance and good practices on environmental risk management. The handbook demonstrates the industry's efforts to deepen knowledge and capabilities in this space.

Implementation of environmental risk management practices will be an iterative process as methodologies evolve and mature over time. MAS will continue to work closely with the industry to identify and promote good practices.

I hope this handbook will serve as a useful guide for financial institutions as they seek to build resilience to environmental risk as part of their business and risk management strategies.

Wong Zeng Yi
Executive Director
Monetary Authority of Singapore

¹ Intergovernmental Panel on Climate Change, (2018), *Global Warming of 1.5 degrees, Summary for Policymakers*.

² Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, (2019), *Global Assessment Report on Biodiversity and Ecosystem Services*.

Acknowledgements

The Green Finance Industry Taskforce is an industry-led initiative convened by the MAS. The GFIT comprises representatives from financial institutions, corporates, non-governmental organisations and financial industry associations. Its mandate is to ideate and implement initiatives to accelerate green finance across four focus areas: (i) develop a taxonomy, (ii) enhance environmental risk management practices of financial institutions, (iii) improve disclosures and (iv) foster green finance solutions.

In December 2020, the MAS issued a set of environmental risk management guidelines for banks, asset managers and insurers (referred to below as ENRM Guidelines), outlining MAS' expectations to the sector in governance and strategy, risk management practices, and disclosure of environmental risk information.

The work stream on environmental risk management developed this handbook to facilitate the operationalisation of these three key areas. The topics covered in the handbook mirror the scope of the Guidelines and serve as foundation for more in-depth capacity building to be carried out by industry associations.

The handbook draws on best practice from the industry as well as guidelines established by relevant industry bodies. Financial institutions (FIs) should use these if relevant and applicable, as environmental risks will potentially impact them in different ways. Best practice in relation to managing environmental and climate-related risks is still evolving, but we hope this handbook will promote better understanding of these risks in the meantime. The contents of the handbook do not constitute supervisory guidance.

Special thanks go to the core drafting team members from BNP Paribas, DBS, Deutsche Bank, Great Eastern, The Hongkong and Shanghai Banking Corporation Ltd (HSBC), Singapore (HSBC), Standard Chartered Bank Singapore and ASEAN, and Swiss Re. We also received invaluable contributions from work stream members comprising the Association of Banks in Singapore (ABS), BlackRock, Citi, the General Insurance Association of Singapore (GIA), GIC Private Limited, Investment Management Association of Singapore (IMAS), Life Insurance Association (LIA), the Ministry of Sustainability and the Environment, MAS, Singapore Reinsurers' Association (SRA), SG Reinsurers, Temasek, Vickers Venture, UBS, and UOB.

Appreciation goes to DBS, which served as project manager for development of the handbook, and ABS as project manager for design. Sponsorship was received from DBS and the following industry associations ABS, GIA, IMAS, LIA and SRA.

The handbook has been written by the industry, for the industry. We welcome your feedback and look forward to achieving the GFIT objectives together.

Gautam Mukharya
Chief Risk Officer, Singapore
The Hongkong & Shanghai Banking
Corporation Limited (HSBC)

Vincent Loh
Chief Risk Officer, Singapore & ASEAN
Standard Chartered Bank (Singapore) Limited

Co-Chairs of the Work Stream 4, Environmental Risk Management

2 INTRODUCTION

Environmental issues are a global challenge and require a global response. In Singapore, there is an impetus to build a financial landscape conducive to environmentally sustainable growth, contributing to global efforts in the transition to a low-carbon, climate resilient economy.

MAS, Singapore's central bank and integrated financial regulator, is playing a leading role and has introduced Guidelines on Environmental Risk Management (ENRM Guidelines)³. These set out sound practices for banks, insurers and asset managers (collectively known as Financial Institutions, or FIs) supervised by MAS, in relation to governance, risk management and disclosure of environmental risks.

FIs are encouraged to integrate environmental risks into business and investment decisions and disclose meaningful information that would enable stakeholders to evaluate their performance in addressing environmental issues as a risk and an opportunity. This handbook provides practical guidance to implement the ENRM Guidelines and shares best practices.

The handbook is intended to be useful to FIs of all sizes. It applies across sectors, and implementation should reflect relevant sector-specific and business-specific characteristics (for example, what applies to banks may not necessarily apply to asset managers). Implementation should also be commensurate to the scale and complexity of a firm's activities as well its risk profile. It is for individual firms to determine the best approach, based on the information in this handbook and other sources of information. Approaches to managing and disclosing environmental risks are expected to mature as methodologies of measuring, reporting and managing these risks evolve. The contents of the handbook do not constitute supervisory guidance.

The Guidelines apply on a group basis for locally incorporated FIs⁴. FIs that are branches or subsidiaries of global groups may take guidance from their group's environmental risk management frameworks, as long as the frameworks meet the expectations set out in the Guidelines.

2.1 Background

The strong political and regulatory will to develop ENRM has its roots in the Paris Agreement of 2015, under which the parties to the United Nations Framework Convention on Climate Change (UNFCCC) agreed to adopt a universal and legally binding agreement on post-2020 climate action. The target is to limit global warming to significantly below 2° Celsius, and to pursue efforts to limit global warming to 1.5° Celsius above pre-industrial levels. Singapore ratified the agreement in September 2016.

³ MAS, (2020), [Guidelines on Environmental Risk Management](#)

⁴ For example, for a locally incorporated bank that is headquartered in Singapore, this refers to the group including the holding company in Singapore, as well as the bank's subsidiaries and branches in Singapore and overseas, where applicable. For a locally incorporated subsidiary of a foreign bank, this refers to the subsidiary's operations in Singapore and its downstream subsidiaries and branches in Singapore and overseas, where applicable.

On 31 March 2020, Singapore submitted its enhanced 2030 Nationally Determined Contribution (NDC) and Long-Term Low-Emissions Development Strategy (LEDS) document to the UNFCCC. Singapore's enhanced NDC is to peak emissions at 65MtCO₂e⁵ around 2030. Singapore also aspires to halve its emissions from its peak to 33MtCO₂e by 2050, with a view to achieving net zero emissions as soon as viable in the second half of the century⁶. However, achieving these objectives will require dramatic changes to the economy and will pose challenges to some sectors. There will also be a need for significant investments to support a low carbon economy.

This is essential for Singapore, which is a small, low-lying city-state with one of the world's most open economies and is particularly vulnerable to the impacts of environmental change. Although Singapore accounts for around 0.11 percent of global carbon emissions, it has made significant efforts domestically to reduce emissions.

Singapore is committed to a multilateral, rules-based solution to address this challenge, and supports international efforts on this front including, importantly, those focused on facilitating Article 2.1(c)⁷ of the Paris Agreement, which aims at "... making finance flows consistent with a pathway towards low GHG emissions and climate-resilient development." In December 2017 at the Paris One Planet Summit, the MAS, along with seven other central banks and supervisors, volunteered to establish a Network of Central Banks and Supervisors for Greening the Financial System⁸ (NGFS). Its role, among others, is to mobilise mainstream finance to support the transition toward a sustainable economy. This network will help to define and promote best practices for strengthening the global response required to meet the goals of the Paris Agreement. It will also enhance the role of the financial sector in managing risks and mobilising mainstream finance in the broader context of environmental and climate risk management, to support the transition toward a sustainable economy.

2.2 Synopsis

The handbook offers guidance on approaches to manage environmental risks. It cites several existing frameworks and initiatives, such as the Financial Stability Board (FSB)'s Taskforce for Climate related Financial Disclosures (TCFD), UN-supported Principles for Responsible Investment (UN PRI), Principles for Responsible Banking and Principles for Sustainable Insurance (PSI) which are complementary and contain practical advice on implementation at the time this handbook is being produced.

Chapter three outlines the financial risks arising from environmental risks, the various transmission channels and the need for a green taxonomy to help FIs play a key role in directing capital flows towards sustainable economic activities. The two main risks mentioned are typically associated with climate change: physical and transition risks.

⁵ MtCO₂e = million tonnes of carbon dioxide equivalent

⁶ National Climate Change Secretariat, (2020), *Submission of Singapore's Enhanced Nationally Determined Contribution and Long-Term Low-Emissions Development Strategy to the United Nations Framework Convention on Climate Change*

⁷ UNFCCC, (2015), *Paris Agreement*

⁸ In Asia, several regulators and central banks, including MAS, are part of the NGFS and are working to identify what measures are needed to manage financial risks related to environmental and climate risks. The network, at January 2021 has grown to 72 members and 13 observers.

Chapter four on governance and strategy focuses on effective integration and implementation of environmental risks into the governance framework for FIs. Good practice in environmental risk governance includes board accountability and oversight, clear delineation of roles and responsibilities for senior management, integration of environmental risk into risk frameworks and policies, board approved risk appetite and reporting metrics and capacity building.

Chapter five on risk management outlines the steps which FIs can take to embed environmental and climate-related financial risk into their risk management processes, make informed decisions and improve their resilience. The understanding of, and practices around, climate-related financial risk are fast evolving so the information and examples in this chapter should be considered alongside market and regulatory developments.

Chapter six showcases case studies of effective environmental and climate-related financial disclosures. Effective disclosures allow FIs to provide greater transparency around the impact of financially material environmental risk on their business.

The handbook is written with a view of prevailing good practice in mind. Embedding effective environmental risk management is a multi-year endeavour, and some of these approaches may take years to develop and refine.

3 SCOPE

3.1 Environmental Risk

Environmental risk arises from the potential adverse impact of changes in the environment on economic activity and human well-being⁹. Such changes may come about as a result of climate change, loss of biodiversity, pollution and degradation of water supplies. Climate change is the most pressing of these, with the Intergovernmental Panel on Climate Change (IPCC) estimating that, if carbon emissions continue in line with historical rates, it will not be possible to limit global warming to 1.5°C or well below 2°C, resulting in unprecedented global warming, loss of ecosystems and other irreversible changes between 2030 and 2052¹⁰. Biodiversity loss also has significant implications for human health and well-being, with growing recognition of its importance for provision of food, clean water and other ‘ecosystem services’¹¹. Biodiversity has been in significant decline worldwide, involving significant alteration of three quarters of the land and more than 60 percent of the marine environment, thanks to human actions¹².

3.2 Implementation of the Handbook in Line with Guidelines

Environmental risks are a potential source of financial and reputational risk. MAS has published the ENRM Guidelines to build and enhance the resilience of the financial system, and to enable the financial sector to support the transition to an environmentally sustainable economy. This handbook has been produced as a useful reference, in line with the ENRM Guidelines, with the aim of supporting implementation for all FIs. MAS recognises that the scale, scope and business models of banks, asset managers and re/insurers can be different.

MAS expects that FIs’ approach to managing and disclosing environmental risk will mature as the methodologies for assessing, monitoring and reporting such risk evolve. MAS also acknowledges that within the wider category of environmental risks, the approach towards climate risk is more developed and quantifiable, and would expect approach towards other areas to evolve over a period of time. The examples of environmental risk management practices featured in the handbook are meant to be illustrative as a best practice to be considered for adoption and are neither prescriptive nor exhaustive for FIs to adopt.

⁹ Based on the concept of natural capital, nature is made up of a stock of resources (e.g. water, forest, air), which provides ecosystem services (e.g. food, coastal protection, absorption of pollution) that in turn underpin economic activities and human well-being. Drivers of environmental changes can adversely impact natural capital and disrupt the provision of ecosystem services, leading to reduced flow of benefits to the economy and people.

¹⁰ IPCC, (2018), *Global Warming of 1.5 degrees, Summary for Policymakers*

¹¹ OECD, (2019), *Biodiversity: Finance and the Economic and Business Case for Action*

¹² Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, (2019), *Global Assessment Report on Biodiversity and Ecosystem Services*

3.3 Environmental Change as a Source of Economic and Financial Risks

Environmental risks are translated into risk factors that may result in financial instability. The interplay between these risks should also be factored in since developments in one can affect the timing and magnitude of the other. The following sections focus on climate change, being the most developed area, but can similarly be applied to other types of environmental risk, especially around non-financial/ reputational related risks associated with them.

3.3.1 Physical Risks

Physical risks from environmental/climate change stem from various factors. These include (i) extreme weather events and their consequences, happening with increasing severity and frequency (e.g. heatwaves, drought, floods, storms, hail, wildfires and avalanches), and (ii) longer term, progressive shifts in climatic and environmental conditions (e.g. changes in rainfall frequency and volume, extreme weather variability, rising sea levels, changes in sea currents and winds, ocean acidification, and global warming). The former grouping is known as “acute” risks while the latter is known as “chronic” risks.

In practice, the two effects are often commingled, are highly interrelated and may be difficult to differentiate. For instance, rising sea levels (chronic) aggravate flooding from storm surges (acute), and more intense heatwaves (acute) are intertwined with increasing average temperature levels and global warming (chronic). Increasing evaporation rates from warming ocean surfaces (chronic) strongly contribute to higher probabilities for extreme precipitation and flooding associated with tropical cyclones (acute), or with severe convective storms (acute) which are fuelled by high levels of atmospheric moisture. Figure 1 shows examples of acute and chronic physical climate risks.

Figure 1

ACUTE PHYSICAL RISKS	Tropical cyclones, storms, tornadoes
	River floods, flash floods, storm surges
	Wildfires
CHRONIC PHYSICAL RISKS	Sea level rise
	Drought stress
	Heat stress
	Precipitation stress
	Fire/weather stress

Physical risks turn into economic costs and financial losses when the increased frequency, severity or volatility of extreme weather events leads to physical damage. This can result in the devaluation and repricing of financial assets or collateral held by banks, such as commercial or residential property, potentially leading to increased credit risks.

As the frequency and severity of natural catastrophes increases, this can lead to non-insured losses which, in turn, can threaten the solvency of households, businesses and governments, and therefore also FIs. Insured losses may place re/insurers in a situation of fragility as the increased frequency and severity of extreme weather events leads to high pay-outs. Further, some knock-on and “cascading effects” of climate change that are more complex to model accurately may build up over a long period without any visible impact until severe loss events are finally triggered. The scale of economic losses is exacerbated by so-called “economic accumulation” which results from a combination of greater urban density (more than half of the world’s population now lives in cities) and growth in per capita wealth.

Physical risks may also have knock-on effects such as abandonment of water-intensive operations, disruption of global supply chains, climate-induced mass migration and increased social conflicts.

For instance, water is an important natural input for mining, because extractive operations rely heavily on it to process ore. However, the impacts of climate change (higher temperatures and more extreme, less predictable weather conditions) are jeopardising the availability of water resources globally. Extractive companies may face water scarcity in the jurisdictions in which they have assets, while competition for resources in the same water basin with local communities may lead to loss of social licence to operate.

Similar to extreme weather events, increasing frequency and severity of flooding may also lead to physical damage to assets such as residential and commercial property held as collateral by asset owners and banks. This may lead to increased credit risks, particularly for banks, or to underwriting risks for re/insurers if there are greater than anticipated insurance or legal claims.

3.3.2 Transition Risks

According to the 2018 Special Report by IPCC, net carbon dioxide (CO₂) emissions must be reduced by 45 percent relative to 2010 levels by 2030, and the world must reach net zero CO₂ emissions around 2050, in order to keep warming below 1.5°C relative to pre-industrial levels at the end of the 21st century. This requires “rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems”¹³.

As such efforts are made, transition risks arise. Transition risks are associated with economic dislocation (such as large-scale job losses) and the financial losses that could result from the process of adjustment towards a low-carbon economy. The sources of transition risk include:

(a) Climate-related developments in policy and regulation:

- (i) Regulatory measures that make fossil fuel use or the pricing of emissions more expensive, such as fossil fuel phase-out and introduction of carbon taxes;
- (ii) Tightened energy efficiency standards for domestic and commercial buildings that may affect risk in banks’ buy-to-let lending portfolios and increase investment costs due to the retrofitting of commercial buildings and manufacturing plants.

Uncertainty and uncoordinated policy changes in the shift to a low-carbon economy may also increase transition risk.

¹³ IPCC, (2018), *Global Warming of 1.5 degrees, Summary for Policymakers – Headline Statements*

(b) Emergence of technological breakthroughs or limitations to business models.

For instance, with the emergence of electric vehicles and greater affordability of battery technologies, an increasing number of governments have announced their intention to phase out internal combustion engine-powered vehicles. Car manufacturers that fail to shift their product mix away from combustion engines will face transition risk.

Addressing these types of transition risks involves anticipating the nature of the technologies and financing practices that will replace current systems. For example, energy production will be transformed into a much more capital-intensive system, with high upfront capital costs for renewable infrastructure but low operating costs (due to there being no fuel cost involved).

(c) Shifts in consumer preferences, driven by a desire for more ethical or sustainable supply chains or products.

Companies that innovate and develop new, low-carbon emission products and services may improve their competitive advantage and benefit from shifting consumer and producer preferences towards more sustainable choices. These goods and services help reduce emissions (for example, adoption of energy-efficiency measures along supply chains), and place greater emphasis on a product's carbon footprint. Companies that fail to adapt to changing consumer demand may see their revenue, profitability, and creditworthiness suffer.

One of the key risks in the transition to a low-carbon economy is the potential emergence of "stranded assets". These are assets that lose their economic value either partially or fully before the end of their economic life as a result of changes associated with this transition. Examples include infrastructure being retired to meet emissions reduction targets, or previously productive commercial property becoming vulnerable to sea level rises, or new policy measures such as a carbon tax that reduces the economic viability of companies that are involved in, or rely on, carbon-intensive activities such as steel or cement production.

Stranded assets have potentially serious consequences for the financial system, given the scale of lending or other financial exposure to businesses whose assets may become vulnerable. For example, since the risk related to stranded assets is not yet fully reflected in the value of the companies that extract, distribute and rely on fossil fuels (e.g. in infrastructure and project financing) these assets may suffer from unanticipated and sudden write-downs as they are retired early. As assets fall in value, this leads to losses in terms of both capital and income for owners, as well as increased credit (especially relevant for long-tenor loans) and market risk for lenders and investors. See cost estimates of stranded assets in Figure 2.

Figure 2 - Varying widely: stranded asset cost estimates

Estimates of the current value and scope of stranded assets vary greatly from one study to another. For instance, Mercure et al (2018) estimates that the discounted loss in global wealth resulting from stranded fossil fuel assets may range from USD 1 trillion to USD 4 trillion. Carbon Tracker (2018) approximates the amount at USD 1.6 trillion, far below the International Renewable Energy Agency's (IRENA) (2017) estimate of USD 18 trillion, but the scope and definitions used by each of them differ.

Source: Bolton, P., Despres, M., Awazu, L., Da Silva, P., Samama, F., Svartzman, R., (2020), "The Green Swan: Central banking and financial stability in the age of climate change"

3.3.3 Interdependence of Physical Risks and Transition Risks

Physical and transition risks are usually assessed separately, given the complexity involved in each case, but they are nonetheless interconnected. Certain clients may be impacted by both physical and transition risks, as in the case of a coal plant operating on or near a flood plain. While the features and implications of the interconnectedness of physical and transition risk may only become apparent over a long period, lack of early action to address both risks could exacerbate risk overall. A sharp increase in physical risks may result in the need for rapid remedial and policy action, leading to higher transition risks. Similarly, delays in introducing policy changes to address climate change may exacerbate physical risks, requiring more abrupt and dramatic policy interventions. For example, extreme and increasingly erratic climate events as a result of long delays in making an energy transition may eventually force radical changes in a country or region's power generation and transportation policies.

As physical impacts become more obvious and disasters more common, there will be shifts in market preferences and social norms which may endanger entities that have failed to adjust. Companies that are seen as having contributed to climate change, or fail to mitigate, adapt, or disclose financial risks from climate change may find themselves exposed to risks of litigation for failure to take sufficient action, which in turn affect their market value or leading to higher claims against re/insurers that provide liability cover to those companies.

For re/insurers, parties that suffer losses and/or damages from climate change may seek to recover losses from those they feel are responsible, who may in turn look to seek recovery from their re/insurers. This could result in higher than anticipated losses for unprepared re/insurers, where valuation of the liabilities (reserving) and pricing may not be adequate, particularly affecting General Liability and Directors and Officers (D&O) cover due to climate related litigation.

3.4 Distinctive Elements of the Financial Risks from Environmental and Climate Change

The financial risks from environmental and climate change have a number of distinctive elements which present unique challenges and require a strategic approach to environmental risk management. These elements include:

(a) Far-reaching impact: The financial risks from physical and transition risk factors are relevant to multiple lines of business, sectors, and geographies. The risks are potentially correlated and may be aggravated by tipping points in a non-linear fashion, which means they could be widespread and diverse, with the full impact on the financial system potentially larger than for other types of risks.

(b) Uncertain and extended time horizons: The time horizons over which financial risks may be realised are uncertain, and their full impact may only be felt beyond current business planning horizons. Past data may not be a good predictor of future risks. Transition risk issues are more likely to be short-term, with technology, country and regulatory dependencies. Conversely, physical risk is more long-term, and requires a better understanding of the correlation between the rise in temperature and the frequency and severity of natural perils. The severity and manifestation of both these risks will depend on the climate pathway.

(c) Foreseeable nature: While the timing and magnitude of climate change impact is uncertain, there is a high degree of certainty that financial risks from some combination of physical and transition risk factors will materialise.

(d) Dependency on short-term actions: The magnitude and future impact of climate change will, at least in part, be determined by the actions taken today. This includes actions by governments, companies, and a range of other actors.

3.5 Transmission Channels

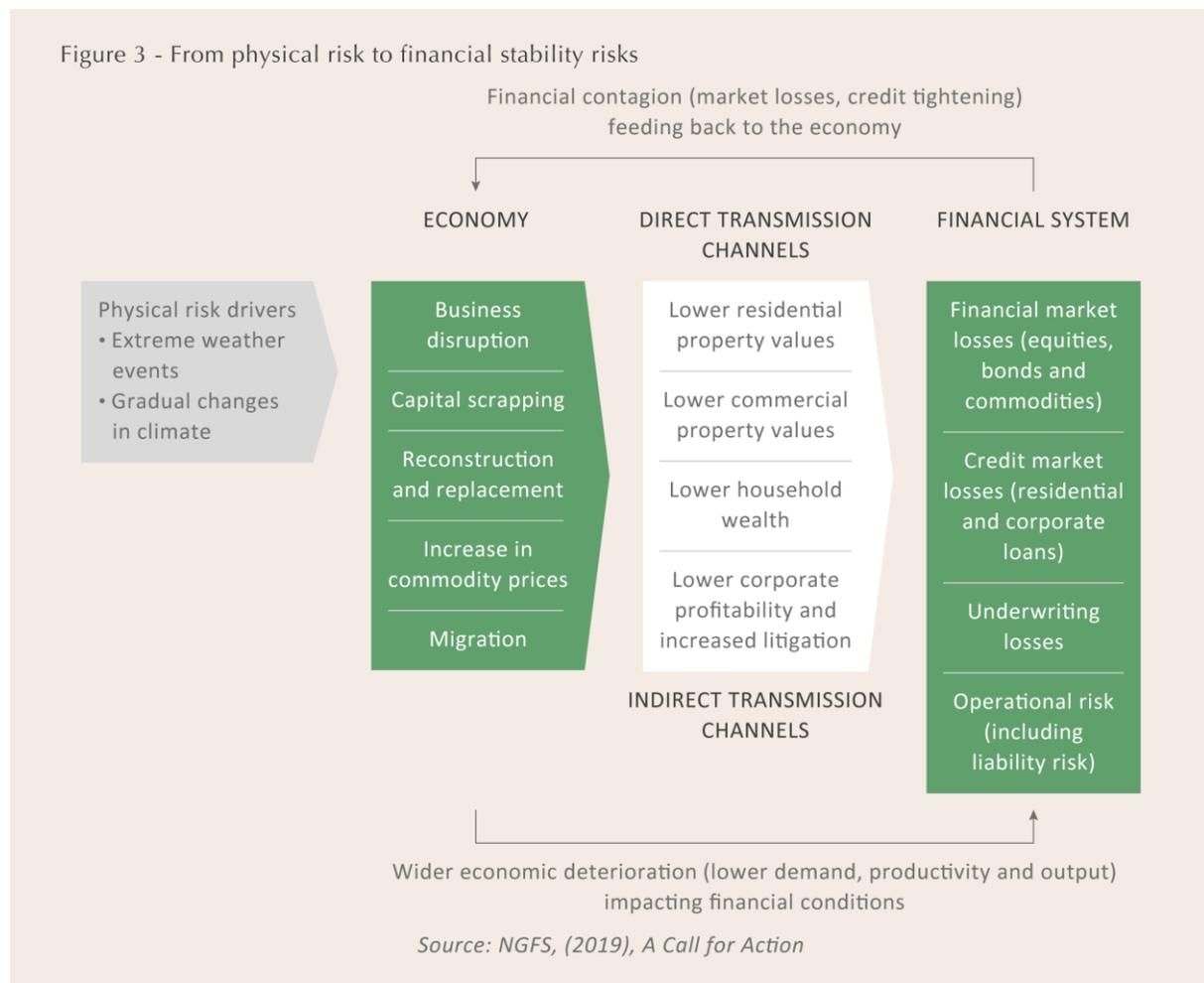
Financial risks from environmental and climate change will most likely be minimised if there is an orderly market transition to a low-carbon world, but the window for an orderly transition is limited. A scenario in which significant action is taken but happens too late to achieve climate goals may pose the most severe risks to the financial sector and by extension, the economy more broadly.

Physical and transition risks can materialise with second-round and spill-over effects mixed in. These are illustrated by the following transmission channels and highlighted with examples of the varying risks types (credit, market, liquidity, reputational). For the purpose of this handbook, the scope of the risk types for each financial sector aligns with the ENRM Guidelines.

3.5.1 Direct Transmission Channels

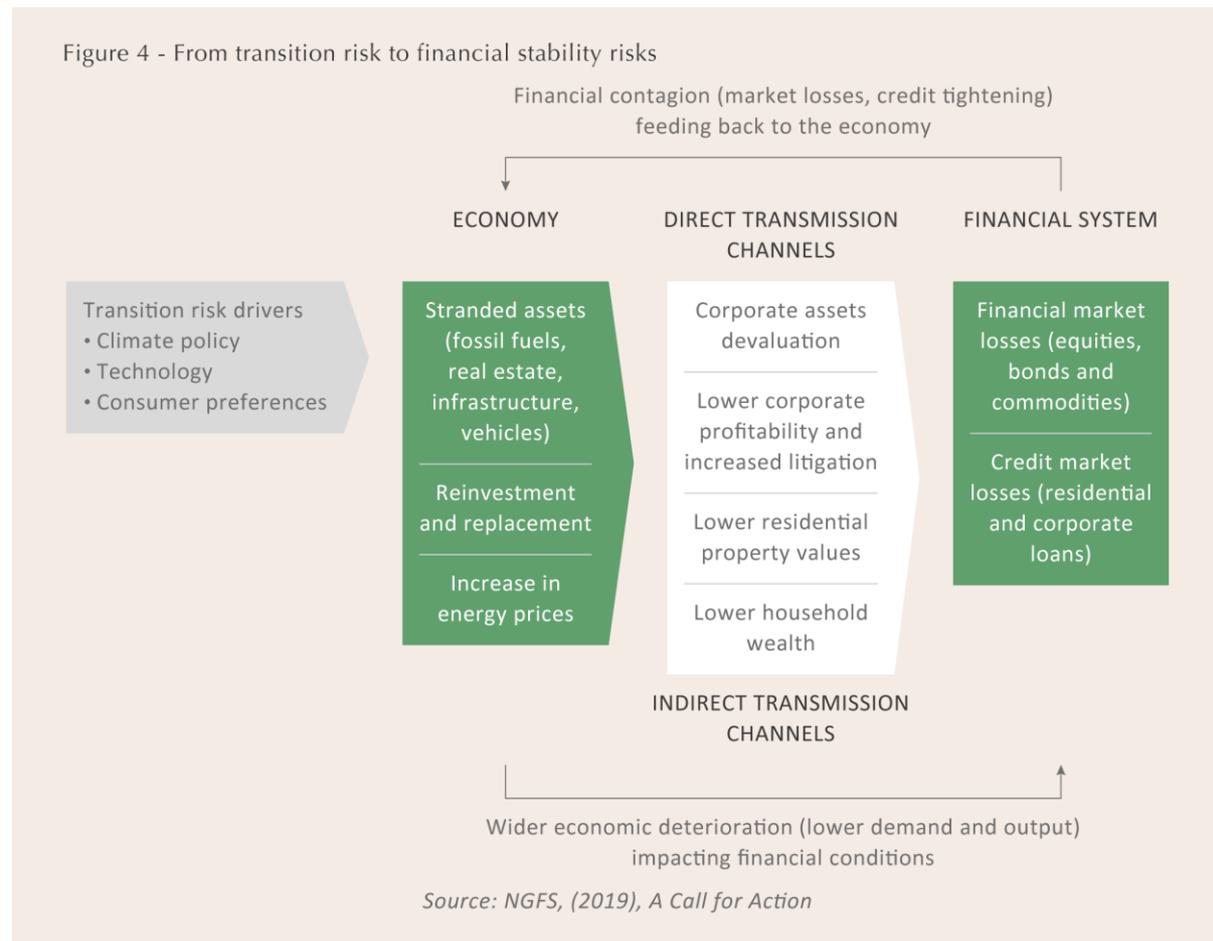
Extreme weather events can have profound impacts, for example by damaging infrastructure and property, reducing well-being and decreasing productivity. They can disrupt economic activity and trade, creating resource shortages and diverting capital from more productive uses (e.g. technology and innovation) to reconstruction and replacement efforts. Uncertainty about future losses could lead to varying impacts for FIs.

For banks, damage to assets serving as collateral could generate losses that prompt banks to restrict their lending in certain high-risk regions, reducing the overall financing available in affected areas. Any reduction in the debt repayment capacity of borrowers or fall in collateral values can increase credit risks for banks. For re/insurers, such weather events will have a direct effect through higher claims, while policyholders will be affected by higher premiums. For asset managers, a change in companies' projected earnings would also be reflected in their valuations, impacting investors and asset owners.



3.5.2 Indirect Transmission Channels

The risks to the financial system from the transition to a low carbon economy are potentially greatest in scenarios where low carbon technologies replace fossil fuel-reliant ones and policy measures, such as a carbon tax, are introduced in an unexpected or disorderly manner. The impacts remain very uncertain, with many studies on the transition risks of climate change often focusing on the energy sector. Figure 4 shows the interlinkages between transition risk and financial stability risks.



3.5.3 Credit/Counterparty Default Risk

Environmental and climate related risks can result in a deterioration in borrowers' ability to repay loans, leading to higher probability of default (PD) and higher loss given default (LGD). For instance, if losses from severe weather events are uninsured, the burden falls on households, companies and ultimately government budgets, hampering their ability to repay loans. The potential depreciation of assets used for collateral can also contribute to increasing credit risks. This could also be problematic in terms of a FIs' capital requirements, which are typically calculated through an estimated PD and LGD and based on credit ratings that largely rely on historical performance records for counterparties.

With respect to physical risks, the rising frequency and severity of extreme weather events could impair the value of assets held by banks' customers, or indirectly impact supply chains affecting customers' operations and profitability, and potentially, their viability. Water risk (e.g. water scarcity, pollution and drought) may increase the operating cost of companies in water-intensive sectors.

In relation to transition risks, the shift to a low-carbon economy could impair the profitability of customers in carbon-intensive businesses. In addition, punitive action taken against customers that pollute the environment (e.g. revocation of permits for entities involved in slash-and-burn agricultural practices) could result in a material financial impact on these customers.

Ongoing exchange of feedback between the financial system and the wider economy could further exacerbate these impacts and risks. For example, damage to assets serving as collateral could create losses that prompt banks to restrict their lending in certain regions, reducing the financing available for reconstruction in affected areas. At the same time, these losses could weaken household wealth, in turn reducing consumption.

FIs should pay particular attention to risk concentration as environmental and climate risk may aggregate over time across portfolios. For example, lending towards the automotive sector may combine wholesale exposure to original equipment manufacturers, distributors, captive finance companies, fleet leasing, and retail car loans.

Second-order risk is also important. This refers to changes that have an indirect impact on companies. For example, auto manufacturing exposure may become even more at risk when considered in conjunction with upstream exposure to oil producers, refiners and marketers, which may reprice their products, in turn affecting demand for internal combustion engine vehicles.

3.5.4 Market Risk

Under an abrupt transition scenario, or as a result of shifts in market preferences or social norms, assets could be subject to a change in investor perception of profitability and a consequent revaluation. This could lead to a market sell-off, potentially triggering a financial crisis.

Re/insurers are exposed to market risk on the asset side of their balance sheets resulting from any decline in valuation and increased volatility in their investments (particularly in carbon-intensive sectors and from companies that have contributed to significant environmental degradation).

An asset manager invested in companies that do not demonstrate sustainable management or do not use funds invested for a transition towards sustainability may face an abrupt change in market sentiment (as a result of having to reflect the cost of regulatory measures, for example), in turn negatively affecting portfolio value.

3.5.5 Liquidity Risk

Liquidity risk could emerge in situations where FIs' balance sheets are hit by credit and market risks, rendering them unable to refinance themselves in the short term, potentially leading in turn to tension in the interbank lending market. Liquidity stresses at FIs could also be triggered by natural disasters, such as catastrophic floods that have caused widespread property damage that requires significant repair - leading to a surge in client fund withdrawals and demands for emergency loans.

FIs may also experience difficulty in liquidating assets impacted by weather events, or those that are stranded in the transition towards an environmentally sustainable economy. Depositors and investors, who are increasingly environmentally conscious, may also cut back on sources of funding for banks (and re/insurers) that finance (and underwrite) activities with a negative impact on the environment.

3.5.6 Operational Risk

Banks, asset managers and re/insurers can be affected through their direct exposure to environmental-related risks. For instance, FIs whose infrastructure (offices, data centres) are impacted by physical risks could see their operations affected by failure of systems and processes and manpower redistribution. In addition, FIs may face liability claims from parties who have suffered environmental related losses and seek to recover those losses from those they deem responsible. This may include legal challenges from shareholders, who are increasingly active regarding the adequacy of environmental related financial disclosure. Shareholders/claimants argue that this disclosure forms an important basis of their investment decisions.

3.5.7 Reputational Risk

Reputational risk can arise from banks transacting with customers whose business activities have negative environmental impacts. Negative perceptions around such transactions could adversely affect FIs' ability to maintain or establish business relationships and/or to attract and retain talent. FIs may also suffer reputational impacts due to failures to address customer demands for greater transparency, such as producing climate-related disclosures as required/expected by the market.

This could also be an issue for asset managers that make investments in such companies, or for insurance companies providing insurance coverage. It could lead to negative perceptions of asset managers' business practices, or of a re/insurer's underwriting policies, impacting their ability to maintain or grow assets under management and/or establish new relationships.

In extreme global warming scenarios, severe damage and disruption could become very frequent to the point that many risks may no longer be insurable. Some risks may exceed re/insurance¹⁴ capacity or become unaffordable to insure. The inability of re/insurers to provide capacity would undermine the social role of the re/insurance industry, posing reputational risk. It is therefore important for re/insurers to support the transition to a low-carbon economy to help avoid an "insurability gap" in the future¹⁵.

¹⁴ Reinsurance is also known as insurance for re/insurers or stop-loss insurance and is the practice whereby re/insurers transfer portions of their risk portfolios to other parties by some form of agreement to reduce the likelihood of paying a large obligation resulting from an insurance claim.

¹⁵ CRO Forum, (2019), [The Heat is On: Insurability and Resilience in a Changing Climate – Emerging Risk Initiative Position Paper](#)

3.5.8 Insurance Risk

For the re/insurance sector, more frequent and severe physical events could result in higher-than-expected insurance pay-outs in sectors such as property and agriculture, as premium pricing models based on historical data may not be able to capture the full extent of risk. There is already a lack of information on perils such as flash floods and wildfires, which tend to be highly location-specific and difficult to predict.

The move to a low carbon economy presents both opportunities and new risks to re/insurers. The shift to renewable energy creates demand for re/insurance solutions that facilitate innovation and meet infrastructure and operational needs. For example, there has been an increase in demand for engineering insurance coverage due to the shift to renewable energy.

However, re/insurers need to exercise caution to avoid an accumulation of risks from various sources, including those from outside the renewable energy sector - such as blackouts caused by the shutting-down of an unstable power grid¹⁶. Power grid stability is itself increasingly being affected by the rising complexity of grid management. This is the result of the expansion of decentralised power production systems with their own demand and supply matching dynamics; the need for electricity storage capacity in the grid management system; changing weather patterns; and a lack of experience in some quarters with certain forms of renewable energy, such as offshore wind.

Re/insurers will also need to guard against the accumulation of risks linked to natural disasters in single geographical areas. Renewable energy is growing in Asia, for example, but it is also particularly susceptible to natural disasters, which means that careful management of exposure is needed when underwriting renewable energy projects in the region¹⁷. Fast deployment of new emissions reduction technologies at scale in the construction and manufacturing industries may also lead to the accumulation of yet-to-be-discovered risks associated with these technologies.

Lack of historical data and knowledge on innovations that can reduce carbon emissions presents a challenge for underwriting. For example, in the transport sector, new insurance products covering sustainable technologies could be under-priced given lack of available data on factors such as access to charging infrastructure and safety concerns around fire risk.

Insurance risks can also stem from liability risks. The legal risks from climate-related liabilities could particularly impact re/insurers where coverage may be extended under general liability, D&O and professional indemnity insurance. An increase in the number of litigation cases has been observed outside Singapore, such as in Australia, where lawsuits have been brought against big industry polluters and governments for allegedly failing to mitigate and incorporate climate change risks in business plans and disclosures. This development could have an impact on re/insurance companies based in Singapore given their regional coverage.

Finally, given that high quality information about changing perils such as flash floods does not yet exist as public information, re/insurers may be susceptible to large claims due to information asymmetry under which certain local actors may knowingly develop uninsurable areas for short-term profit, taking advantage of regulations mandating homeowner insurance provision¹⁸.

¹⁶ See for example, in Germany, where grid operators increasingly need to intervene in the power grid - rbb24, (2020), [Zu viel Wind: Mitnetz greift 357 Mal ins Stromnetz ein](#)

¹⁷ Swiss Re Corporate Solutions, (2020), [Managing offshore wind project risk in nat cat-prone APAC](#)

¹⁸ CRO Forum, (2019), [The Heat is On: Insurability and Resilience in a Changing Climate – Emerging Risk Initiative Position Paper](#)

3.5.9 Portfolio-Level Environmental Risks

Understanding the ways in which environmental-related risks influence risks and return at a portfolio-level for any FI, particularly asset managers is important.

The asset management business model is predicated on a fiduciary commitment to enhancing the financial outcomes of clients, chiefly through investment portfolio performance. Partially driven by the cognitive biases of having long-time horizons, investors have consistently underestimated the significance of climate risk - both physical and transition risk - and its implications for portfolio risk and return. For example, research and big data analytics have revealed¹⁹ that investors are not fully pricing in physical climate risks in municipal bonds, mortgage-backed securities, and equity investments in the utilities sector. Similarly, recent research suggests that 60 percent of a sample of 84,000 global Real Estate Investment Trust (REIT) properties will experience high water stress by 2030, driven by increased urbanisation and the effects of climate change, with limited valuation adjustments being made across portfolios²⁰.

Asset managers are encouraged to use tools to measure, price and allocate risk based on climate-related and broader environmental factors. Failing to do so could have negative consequences for portfolio performance, as concentrated exposure to unpriced or underpriced climate and broader environmental risk could produce unanticipated and precipitous drops in asset valuations.

3.6 Taxonomy

A taxonomy is a classification system that defines activities or investments into distinct groups, such as green or transitional. Taxonomies of this nature exist to support an overarching set of goals, in this instance, environmental objectives. They determine whether activities are consistent with environmental goals with reference to a threshold. There are several advantages in having a clear definition against which all assets, products, investments and services can be clearly assessed. A taxonomy would:

- (a) establish clear criteria for determining activities as environmentally sustainable,
- (b) remove uncertainty as to whether certain activities are environmentally sustainable,
- (c) bring clarity to discussions around green and sustainable products, and
- (d) alleviate concerns on green-washing.

The end-goal of a taxonomy would be to provide a common framework for classification upon which financial products and services could be built. This common language should lead to growth in products and services if the ambiguity and uncertainty discussed above are alleviated, while facilitating comparability with global products. A taxonomy would also facilitate reporting and classification of portfolios by FIs, which in turn may further stimulate demand for financial products and services.

¹⁹ BlackRock Investment Institute, (2019), *Getting physical: Scenario analysis for assessing climate-related risks*

²⁰ BlackRock Investment Institute, (2020), *Troubled Waters: Water stress risks to portfolios*

4 GOVERNANCE AND STRATEGY

Effective governance and strategy should ensure that there is sound understanding, oversight and accountability for environmental risks throughout the FI, including at board and senior management level. Depending on the FI's legal and corporate governance structure, the board²¹ - which can be at the group level - has ultimate accountability for the long-term health and resilience of the FI. Therefore, as is the case with established financial and non-financial risks, the board's understanding and oversight of the FI's approach to management of environmental risks is key to embedding effective governance.

There is a need for board-level governance to be cascaded down into the FI through sufficiently senior governance committees and individuals. Governance arrangements should promote strong understanding of the risks and integration of such risks into the FI's enterprise risk management. Individuals in the relevant business functions require a strong understanding of the FI's approach, tools and approval authorities to ensure environmental risks are identified, assessed and managed at the right levels, and consistently, throughout the FI and its value chain. Some key issues in this context are addressed below.

The TCFD emphasises governance as a foundational element of effective climate risk and opportunity management. The board, or a board committee, provides direction in setting the FI's risk appetite, strategies and business plans. In order to ensure board oversight of environmental matters, senior management of relevant functions (depending on the FI's organisational structure) should provide periodic updates to the board on (among other items) environment-related matters faced by business and operational units, new opportunities, and progress on implementing environmental risk management. The aim is to ensure environmental considerations are incorporated into overall strategy, business plans, risk appetite and annual budget of the FI.

One of the ways to ensure board ownership of the environment risk management agenda, and its capability and accountability in performing oversight of environmental risk management, is to include a training programme for the board on environmental risk. External experts in physical and transition risks, and other environmental matters, may also be enlisted to provide regular briefings to the board. Board committee terms of reference can also be updated to include environmental risk management.

Board consideration of short and long term planning horizons for environmental issues

The board should consider environmental risks that affect near-term financial results as well as longer term risks. Some environmental issues are expected to have effects over a longer time span than those of FIs' annual budgets and reporting cycles. For example, while FIs tend to measure and manage risks within a fairly short time frame or, at most, the current economic cycle, certain impacts from climate change may materialise over a five to ten years' time horizon or beyond.

²¹ As per the MAS ENRM Guidelines, for a bank incorporated in Singapore, the committee should be a board-level committee. For a bank incorporated outside Singapore, the committee could be a board-level committee, or a management committee or body responsible for the oversight of the institution in Singapore. Oversight of environmental risk management could be performed by a combination of local and global committees.

If FIs fail to take these risks into account, the viability of their long-term strategy may be jeopardised. Capital markets may also force the bringing forward of the assessment of future environmental risks. For example, a bank may be forced to treat as immediately stranded an exposure involving technology that was set to become obsolete in five years' time but whose obsolescence has been accelerated as a result of a climate-related factor. FIs may face credit or liquidity risks before positive changes to the climate or biodiversity are seen.

Given that data relating to environmental issues is rapidly evolving, the scale and long-term nature of environmental issues — and understanding of an FI's financial exposure to these — is challenging. As a first step, FIs should determine how to define its own time frames according to the nature of its business, the profile of the environmental risks it faces, and the sectors and geographies in which it operates. For example, one large European bank considers short- and medium-term for credit horizons that range between one and five years. It considers longer-term horizons as typically extending out to 2040, and sometimes to 2050, when assessing climate-related risks and opportunities. Even if these horizons do not match the bank's immediate decision-making priorities, they may still influence its long-term strategy.

Board approval in assessing environmental risks and opportunities

Since the board is the highest governing body, its role in considering environmental risk management frameworks and approving key material issues for the FI is important. Boards are expected to be accountable for environmental issues in relation to the long-term resilience of the organisation. The role and responsibility of the board, as well as range of environmental issues determined by it, should be disclosed to stakeholders in a transparent manner (for example, at annual general meetings) and to regulators.

Senior management's assessment and management of environmental risks and opportunities

Once the board delegates primary ownership and responsibility for environmental risk management and control to the Chief Executive and senior management, the latter are required to respond appropriately to these risks. When assigning senior management responsibility for environmental risk, it is important to consider where responsibility for other financial risks is managed within the first line of defence as well as the second line and to align as appropriate. Examples include the heads of businesses, Chief Risk Officer (CRO), Chief Financial Officer or Chief Sustainability Officer or a combination of senior management. It is the senior management's remit to develop and review policies that provide guidance to business units with respect to risk appetite. This may include considering trends such as transitioning to a lower carbon economy, or establishing a qualitative/quantitative risk threshold for environmentally sensitive industries (e.g. fossil fuels, aviation, shipping or agri-commodities) or customers who have less adaptive capacities (such as inability to pass on costs to customers), rendering them more vulnerable.

Senior management responsibilities should include assessing and updating environmental policies regularly, obtaining progress updates from internal teams on portfolios, and ensuring the robustness of internal processes by which stakeholders are informed about environment related matters. A possible path is qualitative measures (such as a commitment to a phased exit from specific industries) and quantitative measures (such as limits to financing certain economic activities over a specific time horizon) could be established as appropriate.

The board can support senior management by providing review and challenges on:

- (a) Undue or unexpected environmental risk concentrations through risk appetite and management reporting metrics;
- (b) The firm's strategy/corporate plan, considering environmental risk profile, through a short, medium and long term lens, both for redirecting funds into sustainable business and reducing/avoiding assets in environmentally harmful areas;
- (c) Materiality assessments and scenario analysis under various outcomes and time horizons (for example, whether the frequency and reporting of climate scenarios is aligned to the firm's credit risk exposure); and
- (d) Emerging regulatory, reputational and legal obligations.

Integrating environmental considerations into existing committee agendas

Existing risk, audit and other senior management level committees can add consideration of environmental risks and opportunities to their responsibilities. Some firms have established a dedicated sustainability or environmental risk management committee to consider environmental issues and advise senior management, including the Chief Executive, in relation to strategic planning.

5 RISK MANAGEMENT

This section of the handbook covers risk management, which refers to the processes by which FIs identify, assess, and manage environmental and climate-related risks. The activities covered under each sub-section are as follows:

Figure 5

SUBSECTION	ACTIVITIES
Lending	Extending credit to corporate customers, underwriting capital market transactions, and other activities
Underwriting	Underwriting activities of insurance companies
Investment	Managing investment portfolios, either on behalf of clients (asset management) or FIs' balance sheet investment

5.1 Risk Policies, Procedures and Risk Appetite

As with other types of risks, FIs should first design processes for identifying environmental risks within their existing enterprise risk framework²². They should also define how they determine the significance of environmental risks in relation to other risks. There could be different approaches to establishing environmental risks, by treating them as (a) a standalone, principal, risk type using the firm's established practice in deciding and managing principal risk types; (b) a risk within other existing risk types (i.e. a "cross-cutting" risk); or (c) a risk both within existing risk types, and as a principal. Effective linkage to the firm's enterprise risk management frameworks will help in steering management teams and boards in the short and long term.

²² Guidance can be sought by existing guidance, such as 'Applying Enterprise Risk Management to Environmental, Social and Governance-related Risks' report for applying enterprise risk management to sustainability-related risks with the aim of helping companies leverage and enhance existing management of environmental issues such as climate risk, by the World Business Council on Sustainable Development (WBCSD), in conjunction with the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

To ensure the effectiveness of an FI's approach towards establishing an environmental risk management framework, the board and senior management need to be able to rely on monitoring and assurance functions. Where environmental risk is defined as a standalone risk, firms may use the "three lines of defence" model to oversee environmental risk management - that is: (i) functions that own and manage risk; (ii) functions that oversee or specialise in risk management, compliance and; (iii) functions that provide independent assurance (above all, internal audit). In case environmental risk is defined as a cross-cutting risk, firms will need to bolster existing responsibilities of three lines of defence to consider environmental risk related responsibilities too. Figure 6 shows how a bank in Singapore uses the three lines of defence approach to ensure compliance with environmental standards.

Figure 6 - "Three lines of defence" in a bank

Consistent with its internal risk management framework, a bank in Singapore uses the three lines of defence concept to manage its ESG risk. Relationship managers conduct ESG risk assessments for each borrower as part of the credit application process, forming the first line of defence. They escalate high-risk cases to the institutional banking group's sustainability team to conduct additional environmental due diligence. Enhanced due diligence may take the form of site visits, independent reviews or certification requirements. As the second line of defence, credit risk managers also review these ESG assessments as part of the credit approval process. Group audit provides the third line of defence through periodic audit evaluation on the effectiveness of their ESG risk management.

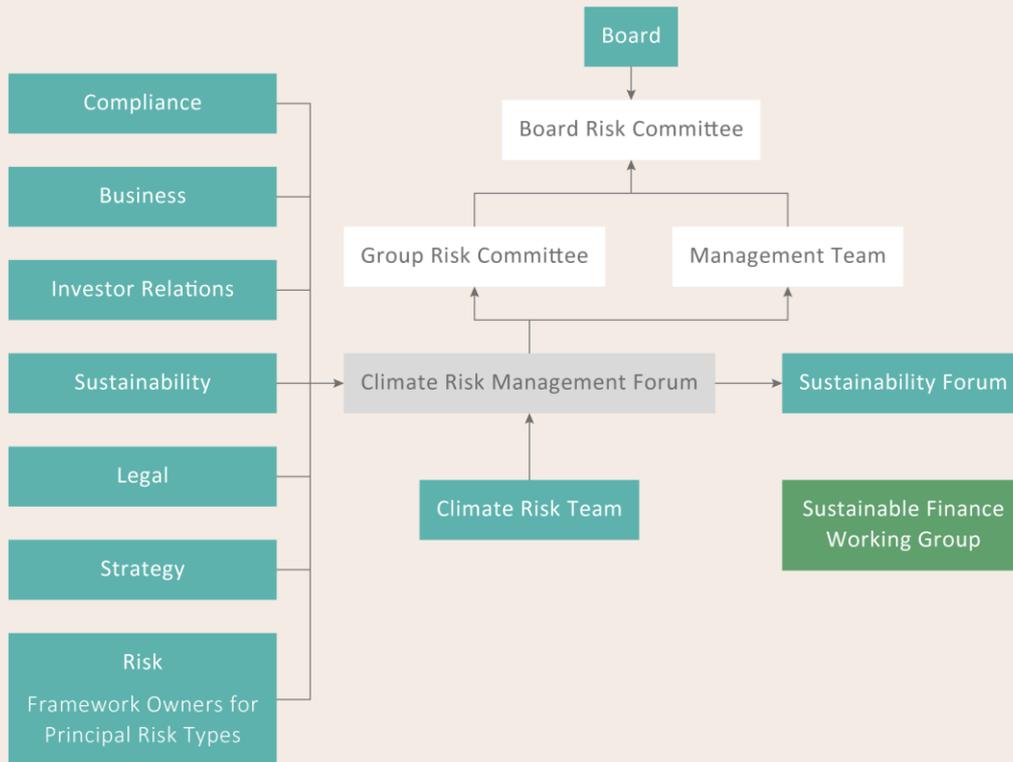
FIs are encouraged to undertake a materiality assessment of environmental risk, including the firm's exposure to both physical and transition risks. Exposure could be associated with the firm's own property and its business model, including concentrations of risk at portfolio, sector, product and transaction level, and by geographical footprint.

Based on materiality and interlinkages between business models, existing frameworks and policies should be updated or created to incorporate environmental risk considerations. FIs may also define their environmental risk terminology or use references to existing risk classification frameworks. For effective implementation in business activities, FIs may embed the environmental risk management framework as part of their underwriting guidelines.

Environmental risks should be strategically aligned with board-level risk appetite, and FIs should evaluate how these relate to their core values and long-term strategy. Risk appetite should reflect and communicate the level of environmental risk FIs are willing to take, tailored to their specific business models.

Figure 7 - Providing oversight on climate risk

A UK based FI illustrates how its board provides oversight on climate risk as it relates to the business. This includes using a board approved risk appetite statement, which also details how climate risk is integrated into the existing enterprise risk management framework as a material cross-cutting risk, recognising its importance and relevance to the business model and to the communities and clients that the FI serves. The bank has delegated senior management responsibility for climate related risks to a Group Chief Risk Officer (CRO), supported by the formation of a dedicated climate risk team within a “second line of defence”. To further support the CRO, reporting lines highlight the creation of a Climate Risk Management Forum which consists of senior business, risk and strategy leaders and is tasked with overseeing the development and implementation of the climate risk framework through the organisation.



The bank’s board approved the following Climate Risk Appetite Statement for the institution in November 2019: “The Group aims to measure and manage financial and non-financial risks from climate change, and reduce the emissions related to our own activities and those related to the financing of clients in alignment with the Paris Agreement”.

From a reputational perspective, FIs might wish to guard against a perception (however generated, and whether justified or not) that it is not effectively managing its environmental risks. This danger is more pronounced when companies do businesses in sensitive sectors where there is a relatively high level of investor and consumer scrutiny. There is also the potential for this to affect employee morale and investor perception of the organisation.

Establish risk appetite in the FI's risk management framework

FIs should be able to monitor environmental risks that are material to them, via quantitative and/or qualitative approaches depending on the nature of the risk and its materiality. Where a quantitative approach is chosen, the firm may identify metrics that can be used to determine appropriate appetite or tolerance thresholds. These thresholds, proposed by the business and set by the firm's board, can allow clear monitoring and provide for an early warning system that can prompt action as required. Alternatively, a firm may choose qualitative approaches for monitoring these risks include avoidance through exclusions, addressing the risks when they arise, or using a "red-amber-green" risk matrix.

For example, banks may set thresholds on sectors that may be more vulnerable to transition risks, especially for long-dated facilities for clients in high emitting sectors. General insurers or the retail mortgage portfolio of banks may be more susceptible to physical risks if their underwriting exposures are particularly concentrated. Risk appetite should reflect this.

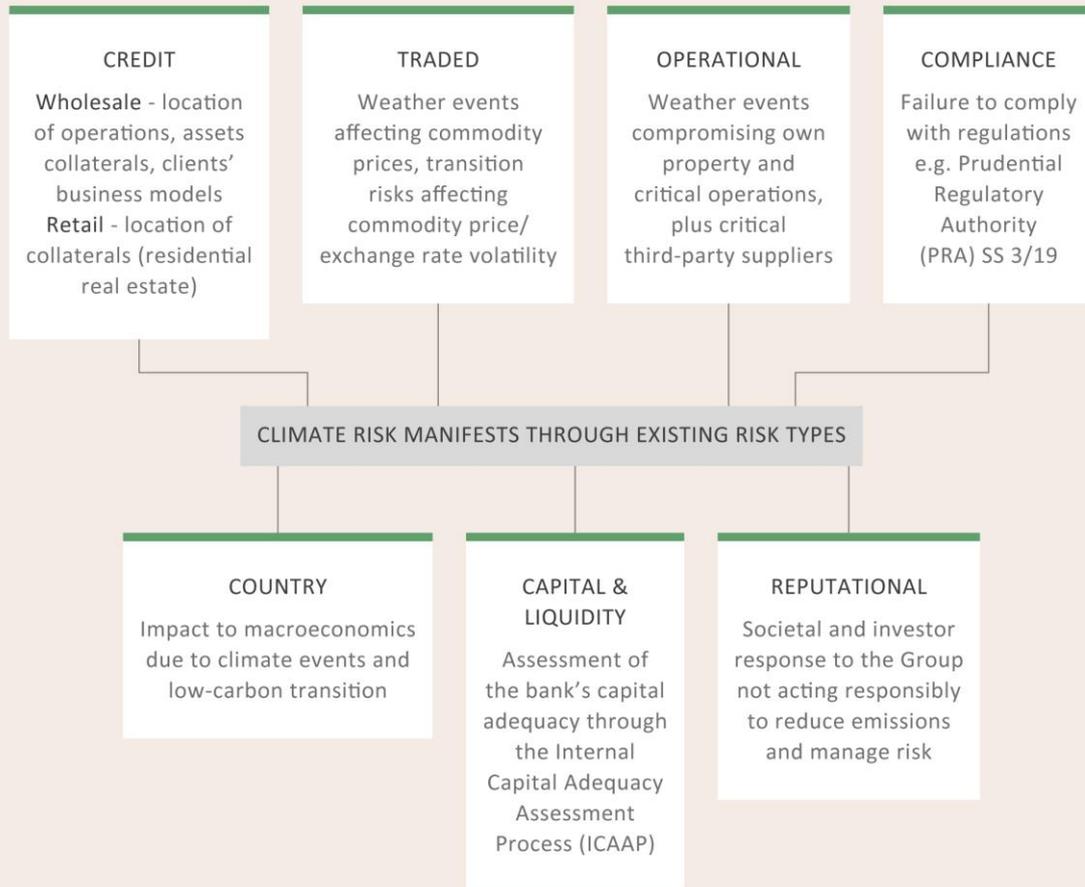
To monitor climate risk associated with vulnerable sectors, FIs may consider quantitative metrics such as credit exposures broken down by industry (based on the Industry Classification Standard aligned with its financial filing requirements), credit quality (based on internal rating systems), tenor or geography.

FIs may also consider setting a risk appetite statement for environmental risks given that financial risks from environmental risk may not materialise within a short time frame. The statement could try and measure the potential financial impact on customers under various climate scenarios and what this would mean for their portfolios.

The example of a UK-headquartered bank in Figure 8 illustrates one approach for how to define risk types most affected by climate change.

Figure 8 - Channels through which climate risk can be felt

An example of one UK-headquartered bank's risk management framework, which has identified these seven areas as most impacted by climate risk

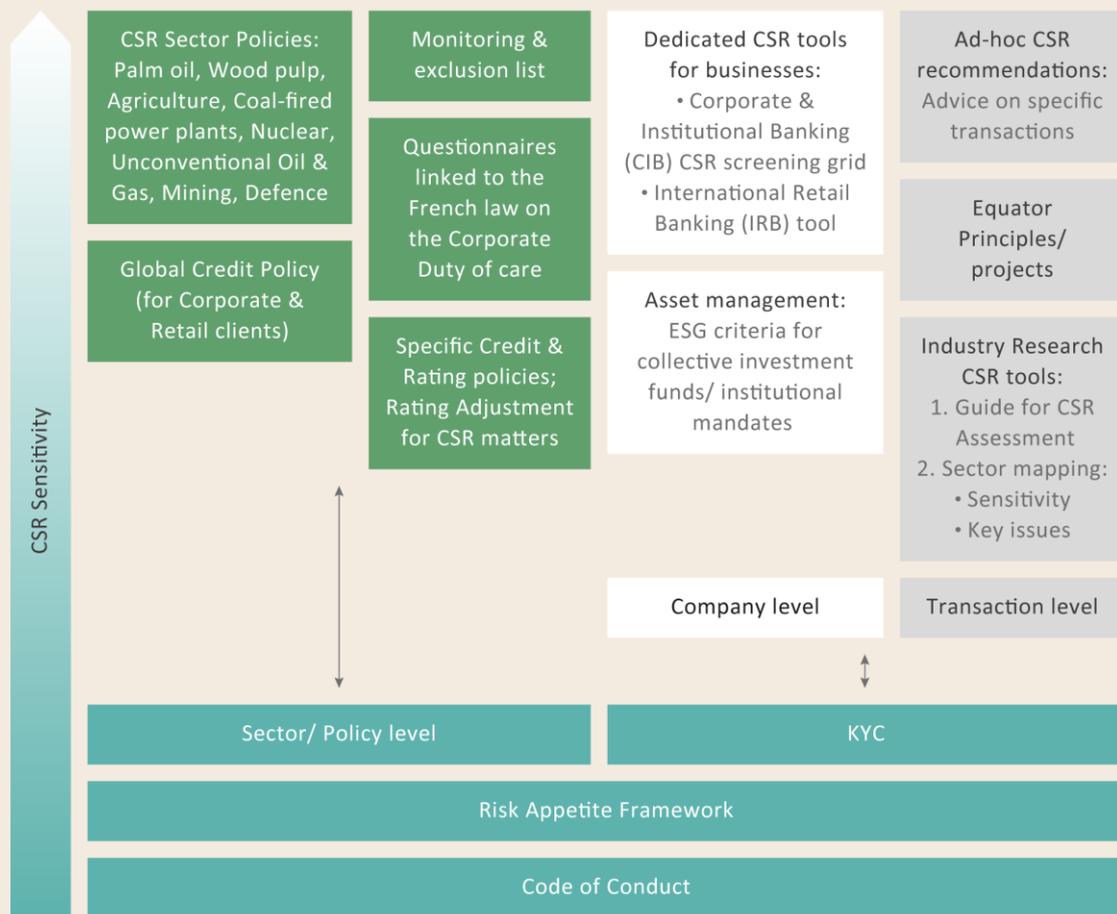


The example below shows another approach in which an FI incorporates ESG and climate risks into risk management systems, covering both its lending and investment business.

Figure 9 - ESG risks, including climate-related risks, have been incorporated into all of a European bank's risk management systems

The group's environmental and climate-related risk management system is part of its overall risk supervision approach and is centred on:

- the general credit policy;
- 22 specific credit and rating policies containing ESG criteria, including some climate-related criteria;
- establishment of finance and investment policies ("sectoral policies") governing its businesses in sectors involving major energy and climate-related issues such as coal-based electricity generation; mining; palm oil production; paper pulp production; agriculture and unconventional hydrocarbons



A comprehensive ESG risk management system for products and services provided by the Group

The following example illustrates one way in which material Environmental, Social & Governance (ESG) insights can be identified and integrated into investment decisions:

Figure 10 - Identifying material ESG insights at a US asset manager

In order to practice ESG integration effectively, investment teams need to be empowered to generate and use unique, material insights to strengthen investment conviction and deepen understanding of the ways in which ESG issues do (and do not) affect long-term return.

For many firms, ESG scores and ratings sourced from third-party providers are the primary source for generating sustainability-related insights. But it is also important to access raw data on key performance indicators (such as GHG emissions, waste production and energy consumption) in order to develop bespoke insights, or to conduct in-house due diligence on what a third-party aggregator is providing. Aggregated summary ratings may not be granular enough when asset managers are using data for portfolio management purposes.

When it comes to making investment decisions, the US asset manager believes that a key focus should be financial materiality on the basis that asset managers have a fiduciary duty to protect and enhance the value of managed assets. The financial materiality of sustainability analysis should be supported by research that combines ESG and traditional financial variables, with a focus on investment implications.

Materiality frameworks should consider and be corroborated by the shifting macro context and industry-specific forces. When considering the materiality of any ESG information, macro and policy factors are important - especially for long term investors - since they can imply changes to climate policy, sometimes at short notice.

Bespoke sustainability assessments for identifying material ESG signals should be done across asset classes and be dynamic and should also take into account momentum considerations as well as past performance.

A dedicated focus on generating insights from multiple sources and establishing a network of researchers - coming from different parts of the investments business - can feed the investment conviction of an in-house portfolio manager.

The US asset manager believes that sustainability issues should be considered in the same light. This involves having discussions and building collective views on macro considerations. Analysts in fundamental research teams can help refine forward-looking views on sector specific issues that could materially impact portfolio outcomes.

Environmental policy and procedures development

The principles below can underpin sound processes and systems for monitoring, assessing and managing the potential and actual impact of environmental risk on individual transactions and portfolios:

- **Transparency:** Anyone using the relevant processes and systems should know how the assessment was performed, including key assumptions, limitations, and rationale;
- **Clarity:** Descriptions of processes and systems should not use obscure language;
- **Consistency:** Processes and frameworks should be in harmony with industry standards, relevant policies, and scientific rationales.

FIs can develop risk management policies covering:

- **Responsible business conduct expectations and exclusion policies**, which may include:
 - **Minimum standards**, such as excluding companies that are in breach of widely-recognised global standards including the UN Global Compact (<https://www.unglobalcompact.org/>) and the OECD Guidelines for Multinational Enterprises (<https://www.oecd.org/corporate/mne/>).
 - **Exclusion criteria for certain activities** or companies with more than a certain exposure in certain activities (e.g. minimum percentage or absolute revenue exposure to thermal coal mining).
 - **Conditions for financing certain sensitive industry sectors** (sometimes described as sector policies by FIs), for instance required conditions that an issuer active in the palm oil sector should meet, such as requiring a No Deforestation, No Peat, No Exploitation (“NDPE”) commitment.
- **Environmental risk integration policy**: Detailing the common standards used by FIs to integrate environmental risks (or broader ESG risks) into their credit/ underwriting/ investment processes, covering steps such as the rationale, and research in relation to existing policies.

For investment managers:

- **Stewardship and voting policy**: Such a policy aims at clearly setting out the FI’s priorities and principles for engagement with portfolio companies and on public policy. Such principles can, for instance, advocate that sustainable finance becomes standard practice, promoting greater integration of environmental risks by portfolio companies. For investors in equities voting at shareholder meetings, is another example. It aims to promote good corporate governance standards and greater integration of environmental risks by the company, such as by supporting resolutions supporting the integration of climate risks in the company’s strategy.

5.2 Risk Identification and Assessment

Firms can develop tools to identify and assess physical and transition risks. It may be useful to collaborate with external experts to fill internal knowledge and expertise gaps. The NGFS recently published a paper, “Case Studies of Environmental Risk Analysis Methodologies”²³ which includes examples of environmental risk analysis in practice, with chapters written by research providers and practitioners. The publication is useful for a wide range of financial institutions, including banks, asset managers and re/insurers.

In section 7, a list of resources are referenced to help FIs identify, assess, manage and monitor environmental risks. Refer to this for resources that are available publicly or through paid subscription.

²³ NGFS, (2020), [Case studies of environmental risk analysis methodologies](#)

5.2.1 Lending

Banks should identify material environmental risks at both customer and portfolio levels.

At the customer level, banks should take into consideration the sector of the client's operations, the geographic location of its assets, as well as its commitment, capability and track record of managing climate-related and environmental risks. A scoring or rating system may be developed to allow banks to identify high-risk customers and transactions. Banks may also consider a client's transition readiness, based on the client's intent, progress on the transition, and the capability of the client in mitigating the risks in transitioning to a low carbon economy. Banks may also measure the emissions intensity trajectories of their clients' warming potential, to assess the alignment of clients to bank risk appetite and long term strategic plans. These assessments may also be linked into account level or client level plans to support the overall linkage of risk assessment and the account planning exercise.

A bank's environmental risk assessment of a counterparty may entail evaluating its environmental data collection and monitoring mechanism, data trends, publicly disclosed policies, sustainability reports, internal standard operating procedures, news reports and Non-Governmental Organisation ("NGO") campaign reports, among other elements. Banks may also refer to ESG ratings²⁴ to help with risk identification and assessment. Such ratings provide an overview of a company's performance across a spectrum of metrics beyond environmental indicators. It is worth noting that ESG rating methodologies vary, so it is recommended that banks understand these differences and limitations if they are to be incorporated in the decision-making process.

Banks are encouraged, where the risks justify enhanced due diligence, to conduct an assessment of a counterparty's parent or group, where applicable. There may be counterparties under a holding company or a conglomerate's ownership that adhere to environmental standards, but other parts of the company may be engaged in sectors with higher environmental risks. Banks could be exposed to reputational risk in potential cases where investors or NGOs suspect a "leakage" of financing to another arm of the business which is not compliant with the bank's environmental standards.

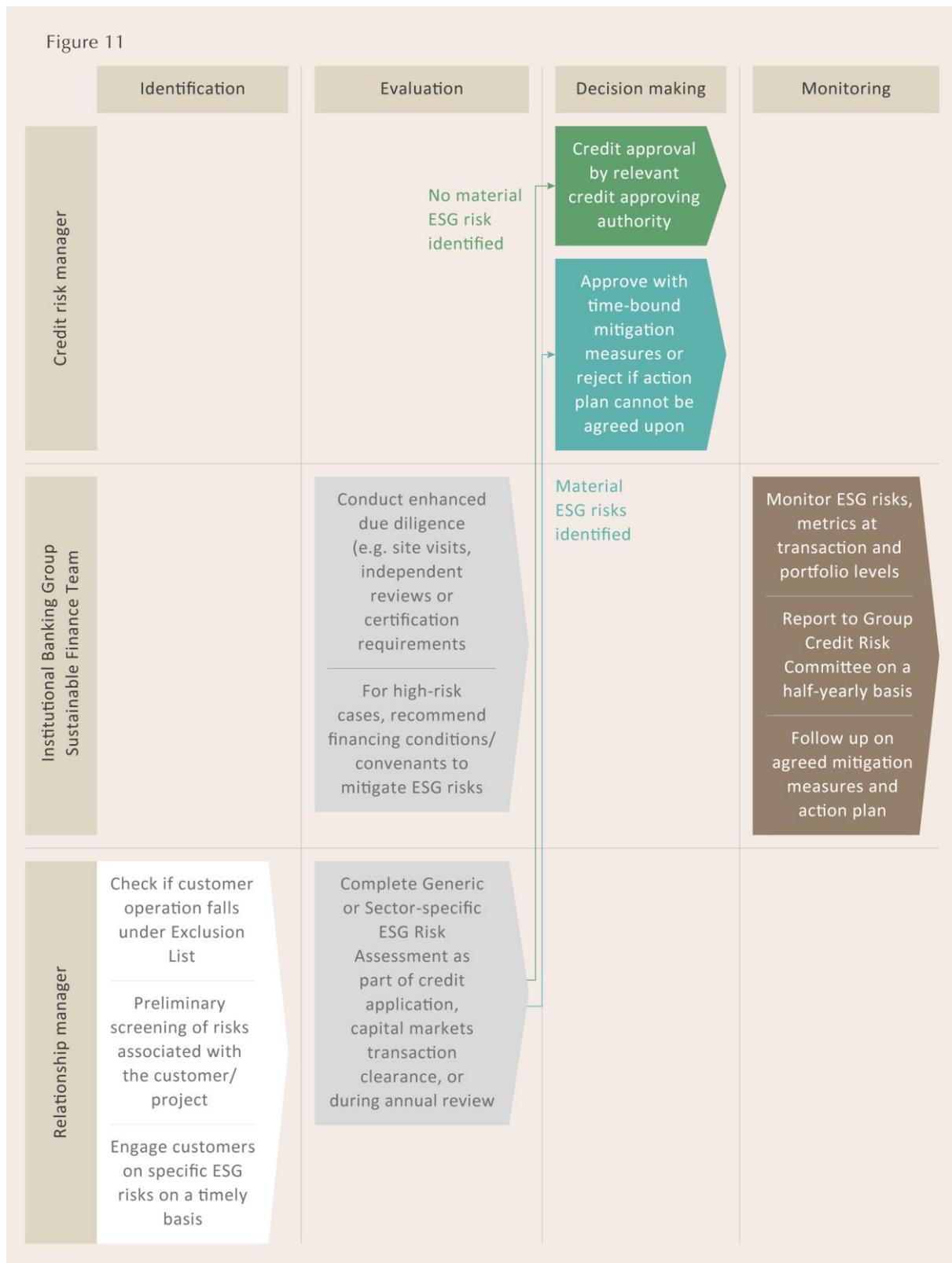
Differences between the environmental risk assessment of a client/project or transaction

The depth of environmental risk assessment of a project, especially one that is located in ecologically sensitive areas with potentially significant adverse environmental impacts, can differ from that of a client/ corporate and may involve a two-tier approach. An assessment is first conducted of the client's overall environmental performance. If the proceeds of a loan are directed to a specific project or economic activity, banks should review the potential environmental risks associated with this, as it could present potential liability, reputational or credit risk to the bank.

Banks are encouraged to adopt the Equator Principles, a risk management framework for determining, assessing and managing environmental and social risk in financing projects, and run by an association of 111 financial institutions in 37 countries. For large-scale projects, input from external environmental consultants should be sought.

²⁴ The methodologies for ESG rating can vary. It is recommended that banks understand these differences and limitations if they are to be incorporated in the decision-making process.

Below is a Singaporean bank's ESG risk identification and assessment process, detailed in Figure 11, showing how roles and responsibilities are assigned.



Prioritising environmental risks

While banks should establish a process for assessing the environmental risks arising from all new and existing customers/transactions, a degree of prioritisation is needed to determine the level of due diligence required and proportional to the risk identified.

High-impact sectors, such as agriculture, forestry, chemicals, infrastructure, mining and metals, as highlighted in the Association of Banks in Singapore (“ABS”)’s Guidelines on Responsible Financing²⁵, require enhanced due diligence. Certain geographies with less robust governance should be subject to increased scrutiny by environmental risk assessment and credit risk teams. As the impacts of climate change become apparent and the impacts of physical risk more pronounced, environmental risk assessments for geographic jurisdictions vulnerable to increased frequency and intensity of erratic weather events will become increasingly important.

Small and medium-sized enterprises (SMEs) tend to have less capacity and fewer resources at their disposal to manage and disclose their environmental risk and performance. Environmental risk management may be less of a priority given the relatively smaller scale of this business segment. Yet at the same time, SMEs in certain industries (e.g. garment manufacturing) sometimes form clusters and can generate considerable cumulative impacts.

Further research and analysis needs to be carried out to demonstrate the relationship, if any, between a company’s environmental risk profile and mitigating performance on the one hand, and its credit quality on the other. Regulators consider the risk of stranded assets to be material enough to urge banks to disclose their exposure to carbon intensive sectors so that stakeholders can evaluate the possible impact on balance sheets.

Identification of environmental risks and relationship with credit quality

How climate-related and environmental risks affect a borrower’s default risk should be studied further. According to the European Central Bank²⁶, “one bank is developing climate-informed shadow PDs to be reported alongside the regular PDs. The climate-informed shadow PDs would take into consideration a detailed analysis of physical and transition risks for higher risk counterparties identified in a screening process. A big differential between the two would then trigger the need to consider mitigating action.”

Considering environmental risks of the collateral offered to banks

Banks are also encouraged to consider environmental risks in their collateral valuations. For instance, the location and the energy efficiency of commercial and residential real estate affect ability to mitigate and adapt to environmental risk.

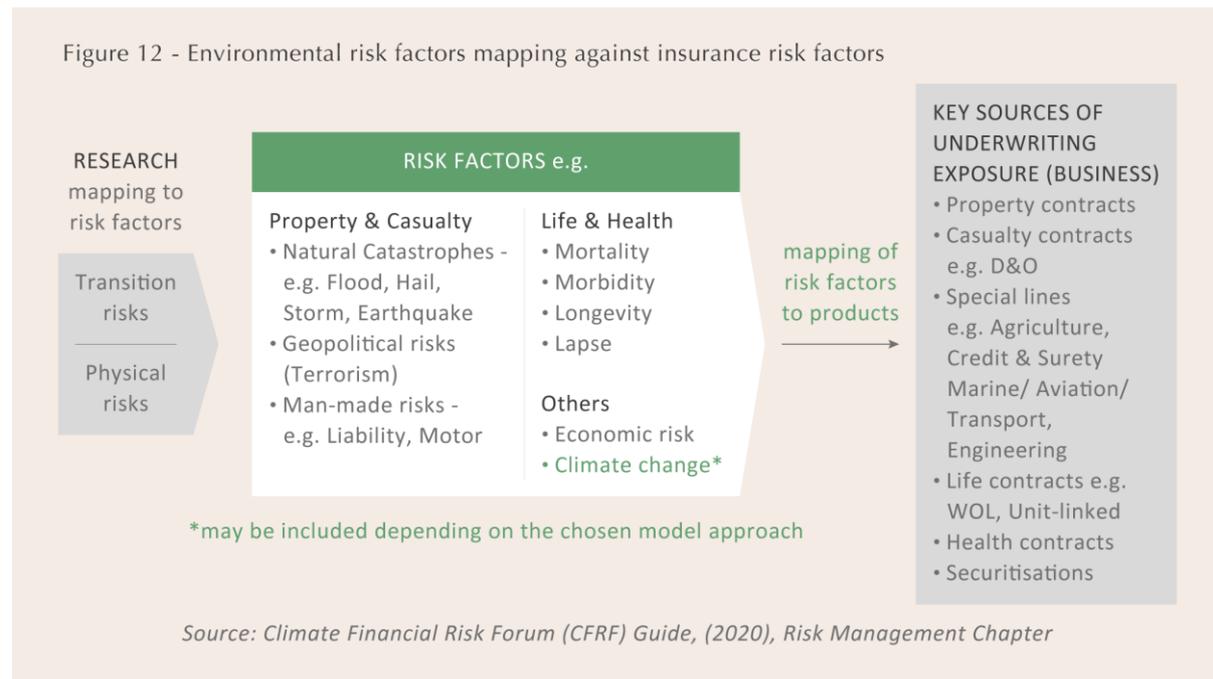
²⁵ Association of Banks in Singapore, (2018), *Guidelines on Responsible Financing*

²⁶ European Central Bank, (2020), *Guide on climate-related and environmental risks - Supervisory expectations relating to risk management and disclosure*

5.2.2 Underwriting

Re/insurers should identify material environmental risks to different lines of business by mapping environmental risk factors against re/insurance risk factors, to enable risk assessment.

For example, climate change could lead to increasing frequency or severity of certain perils. The approach shown in Figure 12 can complement the use of footprint and hazard maps.



A large European reinsurer has identified natural catastrophes as one of the core risks modelled in its risk landscape arising from the coverage provided to clients for property, liability, motor, and accident as well as specialty risks. The firm has an internal property risk modelling team to build, maintain and update models for all relevant natural catastrophe risks (floods, tropical cyclones, windstorms, earthquakes). It uses an integrated risk model to determine the economic capital required to support the risks on its books, and to allocate risk-taking capacity to different lines of business.

Heat-maps can indicate the potential impact from environmental factors for certain lines of business and economic sectors. Firms may develop their own maps or refer to industry wide assessments. For example, the UNEP Principles for Sustainable Insurance project has developed a heat-map that provides an indication of potential environmental risks for non-life business in certain lines of business and economic sectors (for heat-map examples, see the PSI's "Underwriting environmental, social and governance risks in non-life insurance business"²⁷).

²⁷ PSI, (2020), Managing environmental, social and governance risks in non-life insurance business

Decision-making on environmental risk as part of underwriting assessment

When analysing an environmental risk, it is important to consider how severe that risk is and if it is a regularly occurring issue. It is possible that a one-off issue can occur and is therefore arguably not indicative of systemic behaviour of a client. Part of decision-making on environmental risks is to consider whether a client or project has taken action to remedy or mitigate the risk, which might make it acceptable. A client's or project's performance history in managing environmental risks may facilitate the assessment of the effectiveness of planned mitigation measures. Some companies may publish information on what actions they have taken with regard to environmental risks, and this can help re/insurers in their decision-making process.

Firms can provide conditional acceptance of business, subject to further engagement with the client/business partner, or review of information prior to renewal. This might provide the reassurance that an issue was a one-off or may allow more time for a more informed decision-making to judge the profile of the business that has just been accepted.

All parties should be clear that business could be declined in certain cases. Pathways on decision-making could take these forms:

- (1) Accept
- (2) Accept, subject to further monitoring/information prior to renewal
- (3) Accept, subject to engagement with client/business partner prior to renewal
- (4) Decline

Seeking further information from the client/ intermediary/ business partner can be part of a wider client engagement strategy that is approached in a spirit of positive partnership. While raising environmental issues can be sensitive, many companies are willing to share their views. The information exchange between a client and an insurance company happens on a strictly confidential basis. This can benefit client relationships and support wider risk mitigation on the transaction and open up risk consulting opportunities.

Escalating environmental risks to decision makers

Establishing roles and responsibilities for assessing environmental issues can vary greatly between firms due to size, organisational set-up and internal culture. Two features are generally common to many insurance firms: a desire to empower insurance professionals to make decisions, and a tendency at the same time to want to minimise the impact on the business of adding new processes.

Underwriters play a vital role in detecting environmental risks and should be provided with the means to check the potential impact of the proposed transaction on the environment, from both publicly available and proprietary sources, and work with external experts to enhance the quality of data collected to better understand a customer's environmental risk profile.

It is important to define the escalation route to where decision-making resides. Environmental risks detected may require senior-level management review. Such risks may seem ambiguous or relate to strategic clients. In such cases, senior management will need to make a balanced decision and be responsible for it. A committee approach (e.g. risk committee) can be an alternative approach to decision-making.

It is critical that escalation should result in a quick process since transactions often depend on fast turnaround times. It is also important to set internal thresholds by focusing on material risks and issues, or by setting an alternative threshold (e.g. risks over a certain premium or sum insured).

5.2.3 Investment/ Asset Management

As a fiduciary, an asset manager has a duty to protect and grow the value of its clients' assets. This means taking into account risks that are material to the specific portfolio in question, including environmental risks and, more broadly, sustainability-related risks, in making investment decisions and/or engaging with portfolio companies.

For asset managers that are starting to think about sustainability, the emphasis should be on integrating sustainability considerations into existing investment research, portfolio construction, risk management and stewardship processes. This can be done by expanding access to data, insights and learning on material ESG risks and opportunities in the asset manager's established investment processes. This helps ensure that sustainability-related risks are not viewed in isolation but are viewed alongside all other relevant and material investment risks. The case study in Figure 13 illustrates how this integration can be done.

Figure 13 - Using a robust framework supported by an escalation mechanism to manage sustainability-related risks

A Swiss reinsurer uses an overarching risk management framework which applies to both its investment and underwriting activities to identify, assess and mitigate the potential social, environmental and ethical reputation risks of its proposed transactions. The framework consists of human rights and environmental protection, and specific guidelines on sensitive sectors or issues. Each policy and guideline defines precisely when a transaction may present a sustainability-related risk.

Business practitioners need to put each proposed transaction through a sustainability check via an online assessment tool. This provides risk scores and recommended next steps based on expert analysis of relevant internal and external materials including news, public data, data providers and NGO interactions. The reinsurer has been able to avoid exposure to reputational risk linked to some projects which the assessment tool had flagged as highly sensitive at the proposal stage. The most critical transactions are referred to sustainability experts who make binding recommendations: proceed, proceed with conditions, or abstain. If there is disagreement about the recommendation, the case is escalated - if necessary, to the group's top management committee. Compliance with the framework is regularly audited. Non-compliance outside the audit cycle is raised through operational risk management processes.

This framework also allows for effective client engagement. Where appropriate and feasible, the sustainability risk experts engage with the client on the development of its sustainability strategy. In such cases, the reinsurer has been able to meet the client's needs and improve the relationship with the client.

Investment managers should develop a set of rules to identify, avoid and mitigate environmental risks and capture opportunities from ESG trends. These can include discussion of environmental risks and opportunities at individual investments and portfolio level that form part of the regular performance review meetings of portfolios managed by the firm, and part of investment committee meetings.

Research and portfolio construction

Portfolio investments may be exposed to a wide range of environmental risks, which can be linked to both transition and physical risks. In order to be effective, asset managers must understand the ways in which environmental issues, among other issues, affect long-term return. A body of investment research and market practice demonstrates that companies which effectively manage material sustainability risks and opportunities outperform their counterparts over time. Still, significant questions remain about causation, timeframe and the availability and consistency of sustainability-related data.

Asset managers may use the scale of their investment platform and technology, their proprietary research and investment views, and their direct, private and collaborative engagement with companies through investment stewardship, to create sophisticated approaches to measuring and assessing sustainability-related risks and opportunities.

Environmental risks typically vary from one sector to the other, which means it is important to take a sector-specific approach to assessing environmental risks. For instance, real estate companies are exposed to increasingly serious physical risks affecting the value of their property portfolios. These risks can be acute (e.g. natural disasters such as floods, fires, hurricanes) and progressive (e.g. sea-level rise, growing water scarcity, increasing frequency of heatwaves). These risks can lead to higher operational costs to maintain or repair properties, but also to increased insurance premiums.

Managers can develop tools that improve investor access to environment-related information and increase the accessibility of environmental risk related investment insights. In some cases, it may make sense for an asset manager to leverage a dedicated sustainable investing team to help analyse sustainability-related data, raise questions about causation and performance, and glean insights for portfolios firm-wide. Such a team would need to work closely with global investment teams to conduct sustainability-related research relevant to the various asset classes and investment styles that are managed. In the long run, however, it may be desirable for all investment teams to deepen their own capabilities with regard to environmental risk identification and assessment, given that they are ultimately responsible for security-level investment research and decision-making. The example in Figure 14 illustrates the integration of ESG factors in investment decisions.

Figure 14 - Integration of ESG factors in investment decisions at a Swiss asset manager

The integration of sustainability is oriented around an ESG “material issues” framework developed by the firm’s sustainable and impact research team to facilitate the integration process.

By combining scores and data points from a proprietary ESG database with those from external research providers, companies with elevated sustainability risks are identified. Although the methodologies of ESG ratings providers vary, consistently low scores across providers can be an efficient way to identify companies with severe ESG risks. It is also important to consider not only performance scores but also underlying absolute signals of ESG risk - for example, poor corporate governance and elevated ESG controversy levels. This can help identify companies with significant ESG risks across portfolios.

After companies with elevated sustainability risks are flagged for attention, the actual assessment of these risks is conducted by the fundamental equity analyst or portfolio manager working with members of the sustainable investment research team. For companies where the equity analyst or portfolio manager disagrees with the risk signal, a second level of analysis is conducted by the sustainable investment research analysts, as well as the potential to actively engage management to mitigate the risk.

The portfolio manager may still choose to invest in a stock flagged for severe ESG risks, but only if they believe the upside potential outweighs the risks identified. If potential for improvement through engagement has been highlighted, the portfolio manager may decide that engaging with management represents the best strategy and could be linked to potential upside in the share price if those risks are mitigated.

The approach of this Swiss asset manager varies between asset classes to reflect the characteristics of each respective asset type. For fixed income, material ESG factors are best assessed as part of the company research process and are an integral part of the due diligence process included in estimations of cash flows and valuation metrics.

Asset managers can also embed environmental considerations in a passive strategy. Given that passive investments, by definition, replicate an index, and that the construction rules of the underlying index represent a form of active decision, indices can be tilted towards better environmental metrics than a standard market-capitalised index. In cases where the construction of the index pays no specific attention to environmental considerations (e.g. a standard market capitalisation-weighted index), managers can employ sampling techniques rather than full replication methods, with environmental considerations built into the sampling approach. In all cases, engagement with investee companies is essential.

Embedding environmental considerations into portfolio construction is relevant for all asset classes. There are well-established resources such as PRI guidance and principles for developing comprehensive policies for long-only equities and fixed income. Investor organisations are now addressing policy development in alternative investment areas, including hedge funds. Asset managers can seek to integrate environmental risk considerations into alternative asset classes on a “best effort” basis as the industry approach evolves. An example of how material ESG insights can be integrated for both active and passive strategies from an asset manager’s perspective is described in Figure 15.

Figure 15 - Integration of material ESG insights into the investment process across active and passive portfolios at a US manager

To the US manager, if material insights are the “what” of ESG integration, investment process is the “how”. The manager believes that perhaps the most important indicator of how meaningful a firm’s commitment to ESG integration will be is how well ESG integration is aligned and embedded in an investment process. A strong and consistent investment process provides guide rails and accountability to help ensure the programme’s objectives are met, especially in a principles-based programme that supports portfolio manager-led decision-making.

A strong ESG integration investment process will focus on both the generation of market-beating returns, or alpha, and ESG risk management - with appropriate leadership, alignment to investment conviction, investment tools and governance to support each.

Alpha generation is the responsibility of active investment teams, and identifying, testing and integrating material sustainability related insights as a source of alpha is no different. Because the challenges and opportunities of this process will vary widely by asset class, investment style, geography and investment objective, building local expertise in each investment team is essential. Integration leadership across an investment platform with a deep understanding of investment process can work in tandem with sustainable investing experts to develop research insights, tools and approaches as appropriate within the context of the existing resources and practices of their respective platforms.

Risk management is embedded in the investment process with the portfolio manager as the first line of defence. Dedicated risk managers help identify, review and engage to address sources of risk to long-term portfolio value. In active strategies, portfolio managers will partner with an investment risk manager to understand exposure to material ESG risk. For both active and index strategies, an investment stewardship team can engage with portfolio companies on material ESG considerations. These functions partner closely with investment groups, maintaining a dynamic feedback loop on issues of materiality and investment conviction.

Stewardship

Based on the environmental risks identified in the research and portfolio construction phase, investors are expected to exercise stewardship and engage with portfolio companies in order to raise awareness and encourage better management and mitigation of the identified risks. It is therefore crucial for asset managers to ensure the resilience of their customers’ assets in the face of environmental risks.

Asset managers are encouraged to formalise their commitment to integrating environmental risks - and more broadly to sustainable investment - by joining initiatives such as the UN PRI (see Figure 16 for details of the principles involved).

Figure 16 - What does it mean to become a signatory to the Principles for Responsible Investment (PRI)?

Launched in 2006, the UN-backed PRI had over 3,000 signatories as of April 2020, together representing around USD 90 trillion in assets.

Signatories to the PRI, which include asset owners, asset managers and service providers, commit to making progress towards the following six principles:

- Principle 1: We will incorporate ESG issues into investment analysis and decision-making processes.
- Principle 2: We will be active owners and incorporate ESG issues into our ownership policies and practices.
- Principle 3: We will seek appropriate disclosure on ESG issues by the entities in which we invest.
- Principle 4: We will promote acceptance and implementation of the Principles within the investment industry.
- Principle 5: We will work together to enhance our effectiveness in implementing the Principles.
- Principle 6: We will each report on our activities and progress towards implementing the Principles.

Signatories are required to publicly report on their responsible investment activities on an annual basis through the UNPRI reporting framework, which since 2020 includes a mandatory reporting against Task Force on Climate Related Financial Disclosures (TCFD)-based indicators.

Source: UN PRI, (2006)

Asset managers can proactively contribute to addressing environmental risks and play a key role in the transition towards a low-carbon and environmentally sustainable economy by:

- Investing in low-carbon and green investment activities, insofar as such activities are consistent with the investment objective of the funds/mandates they manage.
- Exercising sound stewardship, including:
 - For equity investors, using shareholder rights to address climate change and environmental risks in voting at shareholder meetings.
 - Engaging in a dialogue with issuers on environmental risks, whether through individual or collective engagement initiatives (for instance, Climate Action 100+, a collaborative engagement initiative coordinated by five partner organisations and whose aim is to engage with high GHG emitters, together with other companies that have significant opportunities to drive the clean energy transition and help achieve the goals of the Paris Agreement).
 - Engaging on public policy with regulators, industry groups, rating agencies and civil society to promote mutual understanding on environmental issues and harmonisation of disclosure and reporting standards across sectors and geographies.

The examples below illustrate approaches that asset managers can draw reference from in order to consider climate change risks.

Figure 17 - A Swiss asset manager's stewardship approach

In 2017 the asset manager launched an investment strategy designed to capitalise on the long-term transition to a low carbon economy. By combining environmental data from several sources, the asset manager developed a portfolio optimisation model which tries to reduce exposure to climate risk, while maintaining the target objectives on tracking error. Rather than simply reducing exposure to companies with higher GHG emissions through an exclusion strategy, the firm seeks to align the strategy towards companies that it believes are better prepared for a low carbon future and the 2° Celsius reduction scenario.

Central to the success of this strategy is a strong and effective stewardship approach, via a strategic engagement programme. This engagement programme covers the firm's full exposure to a company. It allows the asset manager to deliver a message to those companies it is invested in, while helping it better understand and influence companies' climate commitments. The companies with which the FI believes engagements are beneficial, are chosen based on three elements (see below) that guide the selection process.

1. Sector and reporting: The asset manager picks companies in the lower half of its rating methodology in sensitive sectors, such as oil and gas and utilities.
2. Companies with a low score in the asset manager's rating process: The asset manager uses a quantitative and qualitative model that scores each company based upon their existing carbon footprint (measured by intensity levels), fossil fuel reserves and energy production from coal-fired power stations.
3. Glide path probability: The asset manager picks those companies within the firm's quantitative model that compares a company's carbon footprint with the required emission reduction implied by the 2° Celsius scenario. This approach allows the FI to select those companies that do not appear to be in a strong position to achieve those glide path targets.

Analysis on the companies is done to assess:

- Alignment with the TCFD recommendations
- Evidence of the board's oversight of climate related risks and opportunities and integration into remuneration packages and board selection processes
- Evidence of integration of climate change in risk management
- Existence of scenario analysis and reflections on impact on the business model
- Disclosures on strategy and initiatives for reducing GHG emissions
- Disclosure of goals to reduce normalised GHG emissions, and progress on this
- Consistency of in/direct lobbying on climate change in relation to the Paris Agreement.

The progress of the asset manager's engagement programme is linked to its voting decisions. The asset manager has decided to include a new provision in its firm-wide proxy voting policy which from 2020, allows it to vote against company boards as a result of poor progress on climate change risks and opportunities.

Underpinning this voting process is advocacy with policy makers, including:

- Providing feedback on the Sustainable Development Scenario for the International Energy Agency (IEA)'s flagship annual World Energy Outlook and supporting the content of an Institutional Investors Group on Climate Change-written letter to the IEA.
- Submitting a case study on the energy sector for the report on progress of the TCFD.
- Participating in the Institutional Investors Group in Climate Change (IIGCC)'s Paris Aligned Investment Initiative.

Engagement with investee companies should have clear objectives, including improving the understanding of a company's business and strategy, monitoring performance against realistic goals and milestones, signalling support or raising concerns about company management, performance or direction, and promoting good practice.

The engagement process needs to be adapted to the local context. Topics tend to vary by region, sector and company, but the key is to focus on issues that are material, either in the near-term or in the longer term. Example topics for engagement can include climate change, water stress, pollution and waste.

Additionally, asset managers may engage with companies collaboratively through initiatives such as Climate Action 100+ and the PRI, as well as the CDP Non-Disclosure Campaign. Collaborative efforts are particularly important when investee companies have low willingness to engage with individual investors, particularly on ESG issues and, sometimes, this is the only available option for engagement. Asset managers must be mindful of complying with anti-competitive regulations, and for ultimate voting decisions to remain confidential from competitors. Refer to the example in figure 18 below.

Figure 18 - The Climate Action 100+ initiative

Climate Action 100+ is an investor initiative to ensure the world's largest corporate greenhouse gas (GHG) emitters take action on climate change. As of June 2020, the initiative had gathered together over 450 investors, representing over USD 40tn in assets under management.

By joining, investors commit to engaging with top GHG emitters to help drive the low carbon energy transition and help achieve the goals of the Paris Agreement. For each company, there are designated lead and supporting investors among signatories which, as investors in these companies, demand that they improve governance on climate change, curb emissions and strengthen climate-related financial disclosures. The initiative has already yielded encouraging results, for instance with oil companies such as Shell, BP, Total and Repsol committing to carbon neutrality, and with mining group Glencore committing not to grow its coal production.

Net Zero By 2050 initiative

Recognising the need to accelerate transformation needed to meet the goals of the Paris Agreement on climate change and stabilise the global average temperature rise at 1.5°C above pre-industrial levels, more than 70 countries and 398 cities as well as more than 750 businesses and 16 investors have signed up to the Net Zero By 2050 initiative, which is part of an enhanced climate action plan within the Climate Ambition Alliance. The pledge is about firstly reducing emissions and then proceeding to carbon removal. This initiative is useful for managing transition risks. transition risks.transition risks.transition risks.

Where voting is not available (e.g. in fixed income), engagement is the primary stewardship activity. Asset managers may also engage with policymakers/regulators in local markets to advocate enhanced ESG standards.

5.3 Risk Management and Monitoring

5.3.1 Lending

Environmental risk management at the customer level

A sound understanding of customers and their behaviours is critical to managing and monitoring the broad range of risks that come with a lending relationship. This should extend to a customer's environmental risk profile and will require direct engagement with customers.

The example below illustrates how a bank engages customers on their exposure to and management of environmental risk. Banks are encouraged to ask a similar set of questions to ensure a consistent approach across both the banking industry and their individual portfolios.

Figure 19 - A large global bank's guidance questions for discussion with clients

a. Engagement with customers on transition risk

- Has the customer experienced any impact from environmental change and how did this arise?
- What is management's view of the risks that the company may face over the next few years, in terms of policy/legal risk, technology risk, market risk and reputation risk?
- Does the customer have internal governance processes regarding risks arising from environmental change? Are there adequate disclosures by the customer? Does the customer have a formal policy to reduce its CO2 emissions (or manage other environment-related risks) to remain in compliance with the requisite regulatory and other anticipated requirements? What are the targets under the policy and how has the progress been so far?
- What is the customer's strategy to adapt and manage risks (in so far as it could impact its credit profile in the immediate or long term)?
- How does the customer identify and manage reputational risks to the organization due to its activities?

b. Engagement with customers around physical risk

- Have the customer's operations been impacted by acute physical risks or chronic physical risks and what actions has the customer taken in this regard?
- Does the customer have a formal policy to regularly review (including stress testing) and mitigate the impact of physical risk on assets and other resources due to climate change? Does the customer disclose this policy?
- What is the likely impact of environmental change on the customer's assets and other resources and the customer's strategy, including insurance cover, to manage such risk?

c. Engagement with customers around reputational risk

- Does the customer have activities in sensitive sectors that have an adverse impact on the environment which are a reputational risk to the bank?
- Does the customer operate within the reputational appetite set by the bank? How can ongoing performance be measured?

Figure 20

A leading UK based bank introduced a credit risk materiality matrix, which it called a credit climate lens, in 2019 to understand, assess and manage how climate change may impact the group's credit risk exposures. The lens is a series of questions which are applied to a counterparty to which the group is exposed in order to assess its climate change risk. It also considers transition factors such as a counterparty's sensitivity to policy changes, reliance on fossil fuels and climate change adaptation, as well as exposure to acute and chronic physical risks. Where a counterparty is rated as medium or high, the details are referred to the environmental risk management team, who conduct enhanced due diligence.

Environmental risk management and monitoring as part of loan documentation

As the impacts from environmental issues have increased, banks have moved towards having more stringent ESG requirements for lending. They are routinely building into their legal agreements elements that ensure compliance with ESG requirements or milestones in environmental action plans. The Equator Principles also state that for project finance deals, borrowers must comply with the relevant environmental management plan throughout the lifetime of the loan.

The Guidance for Equator Principles, FIs on Incorporating Environmental and Social Considerations into Loan Documentation²⁸, provides direction on effective environmental clauses. These include definitions on environmental terms; representations and warranties on compliance with environmental laws; conditions precedent with regards to progress on environmental issues; covenants on environmental actions borrowers will and will not undertake; and events of default linked to specific environmental events. Where customers do not meet requirements and standards, banks can impose mitigation action plans that are to be achieved within a stipulated time period.

Environmental risk management at the portfolio level

At the portfolio level, banks are encouraged to dedicate management attention towards risk concentration as environmental risk may aggregate across portfolios over time. For example, the automotive sector combines wholesale exposure to manufacturers, distributors, captive finance companies, as well as retail exposure to fleet leasing and car loans. Second-order risk is also important, as seen in exposure to sectors upstream of automotive like oil producers, refiners and marketers.

Environmental risk metrics and evaluation are increasingly included as part of monitoring of a portfolio. This attempts to take a step away from asset-level monitoring and provides a view of the portfolio as a whole.

Portfolio sensitivity to climate-related risks can be used as part of a risk identification process. Banks should try to understand what aligning their portfolios to the goals of the Paris Agreement mean in terms of the sectoral or regional composition of their portfolios and the clients to which they lend.

²⁸ Equator Principles, (2014), *Guidance for Equator Principles Financial Institutions on Incorporating Environmental and Social Considerations into Loan Documentation*

Quantitative metrics which are frequently used to evaluate a portfolio’s carbon involvement and risk include portfolio level Scope 1, 2 and 3 emissions standards proposed by the Greenhouse Gas Protocol²⁹ or portfolio carbon intensity measured as GHG emissions per dollar of revenue earned. Banks can also take steps to measure their portfolio’s temperature alignment or warming potential compared with the goals of the Paris Agreement.

Strategic portfolio management can incorporate consideration of the climate risks faced by different sectors and the associated exposure at the FI. Figure 21 provides an example of a template to display the portfolio exposure of carbon intensive sectors.

Figure 21 - Carbon-related assets relative to total assets

A Swiss bank, together with UNEP FI and peer banks, are leading an effort to define an inventory of climate-sensitive activities based on TCFD, as well as regulators’ and rating agencies’ climate risk definitions. The current inventory is summarised in the table below at the sector level.
Banking products across Personal & Corporate Banking and the Investment Bank

USD million, except where indicated	GROSS EXPOSURE	SHARE OF TOTAL EXPOSURE TO ALL SECTORS (%)
Climate-sensitive sector		
Aerospace and defence		
Automotive		
Chemicals		
Construction and materials		
Food and beverage		
Industrial materials		
Machinery and equipment		
Mining		
Oil and gas		
Plastic and rubber		
Primary materials		
Real estate		
Transportation		
Utilities		
Total exposure to climate-sensitive sectors		
Total exposure to all sectors		

²⁹ GHG Protocol supplies the world's most widely used greenhouse gas accounting standards. It enables companies to develop comprehensive and reliable inventories of their GHG emissions.

5.3.2 Underwriting

Measuring and monitoring of underwriting exposures

There are several aspects related to the measuring and monitoring of underwriting exposures, such as quantitative and qualitative approaches, use of standard formulae or internal/external models, as well as metrics and reporting to support the monitoring.

Various methodologies are available, or have been recently developed, to allow measurement of environmental risks in a geographical location, which are useful for specific lines of business. Re/insurers that have yet to fully digitalise their underwriting processes can tap into a wide range of environmental and reputation-related company screening tools in the market, some of which are solutions provided by reinsurers to better support their clients.

For example, in the area of climate risk, one resource is the quantitative decision-making framework developed by the Economics of Climate Adaptation Working Group³⁰. The framework is built around two sets of tools to quantify a location's "total climate risk" and to enable cost-benefit analysis for the evaluation of a selection of feasible and applicable measures to adapt to the expected risk. The Working Group has developed a detailed methodology to underpin this framework. The methodology has been applied in eight on-the-ground test cases including in Bangladesh, China and India, to help decision makers include risk mitigation and risk transfer into a holistic risk management framework³¹.

Beyond climate risk, biodiversity is an important aspect of environmental risk management. Natural ecosystems contribute to the health and stability of communities and economies, through services such as food provision, water security, regulation of air quality and resilience against damage from perils such as floods. The state of biodiversity in a location should be included in a holistic assessment of environmental risk.

The CRO Forum³² is working on a carbon foot-printing methodology to quantify carbon emissions in re/insurance portfolios. The idea is to use average carbon intensity (tonnes CO₂e per \$M of revenue) of a portfolio of re/insurance transactions which would be most consistent with TCFD metrics. It can help re/insurers to work towards understanding the challenges and eventually disclosing the carbon intensity of their underwriting portfolios. The report does not recommend a standard for the insurance industry but instead is an exploration of the different carbon foot-printing methodologies that may be applied to underwriting portfolios and the barriers to applying them. This includes the important topic of data quality and availability.

While these tools and methodologies can support the detection of environmental risks to limit the burden on the underwriting process, there will be cases which require discretionary decision-making, which could be addressed through a well-established escalation process.

It is important to set thresholds for escalation to make ESG risk management impacts on resources acceptable and to avoid overburdening underwriters. Risk appetite and thresholds can be adjusted over time as organisational knowledge develops further.

³⁰ This is a partnership between the Global Environment Facility, McKinsey & Company, Swiss Re, the Rockefeller Foundation, ClimateWorks Foundation, the European Commission, and Standard Chartered Bank.

³¹ Economics of Climate Adaptation Working Group, (2009), *Shaping Climate-Resilient Development: a framework for decision-making*

³² <https://www.thecroforum.org/>

5.3.3 Investment/Asset Management

Investors should monitor the environmental risks in their portfolios, and when possible, disclose such risks and how they are being integrated and mitigated in the portfolio.

For effective risk management and monitoring, portfolio managers must have access to research, data, tools, and analytics to integrate sustainability insights into their investment process. Environmental impacts arising from investee companies vary by the type of industry these companies are in. For example, the environmental impacts in the food and beverage sector are different from those in the chemicals industry. The following should be considered when determining what indicators to be used:

- Asset class – equity, fixed income, physical assets
- Nature of business
- Location of business
- Emphasis of environmental risk management in the organisation

Examples of environmental risk monitoring indicators include:

- Climate indicators:
 - Carbon footprint
 - Portfolio “temperature”
 - Physical risk indicators (e.g. exposure to high flood risks area)
- Other environmental indicators:
 - Water footprint (e.g. portfolio exposure to water-stressed areas)
 - Forest footprint (e.g. portfolio exposure to deforestation)

Investors may also report on their stewardship activities in relation to addressing environmental risks, through regular stewardship/engagement and proxy voting reports highlighting their actions and progress.

Focus on carbon footprint

Portfolio carbon footprint is currently the most widely disclosed portfolio environmental indicator.

A portfolio’s carbon footprint is the sum of a proportional amount of each portfolio company’s emissions. Attribution (allocating a portion of investee’s emissions as the investor’s) using the proportion of investment made in relation to the market capitalisation can be useful for equity investors, while using enterprise value as the base (the sum of a company’s market capitalisation and total debt) enables investors to attribute emissions to both equity and debt issued, therefore calculating carbon footprint for both equity and fixed income portfolios. The resulting indicator measures emissions generated for each dollar invested in the fund.

The GHG Protocol sets the standards for measuring GHG emissions and is widely used by corporates. In 2016, 92 percent of Fortune 500 companies that responded to the CDP, a not-for-profit charity that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts, applied the GHG Protocol to measure and report on their GHG emissions. However, disclosure rates are much lower for smaller companies, and companies' carbon emissions used for calculating a portfolio's carbon footprint are often estimates based on the company's activities. This is even more true for scope 3 emissions, for which data availability is very low, with limited levels of consistency and standardisation in both calculations and estimates.

According to the IPCC, GHG emissions are concentrated in a limited number of sectors:

- Electricity and heat production (25 percent)
- Agriculture and forestry (24 percent)
- Industry (21 percent)
- Transport (14 percent)
- Buildings (6.4 percent)

These sectors are critical in achieving near zero carbon emissions by 2050. Contributing to this objective not only requires investing in low carbon sectors, but also in companies in the sectors listed above that are the most innovative and ambitious in terms of GHG emission reductions.

Internal research

In addition to leveraging a broad and ever-expanding set of third-party sustainability metrics, asset managers should consider developing sustainability insights powered by internal research models to inform risk management and oversight. Internal research managers should routinely meet with portfolio managers to review the sustainability risks present in their portfolios, with the same rigor and attention they would provide to any other traditional risk measure.

The examples below illustrate environmental risk management and monitoring practices at FIs.

Figure 22 - A European insurer and financial services group's climate-related risk management and monitoring

The FI's board oversees climate-related issues through an approach focused on the integration of climate-related risks into long-term strategy, and on setting and monitoring climate-related performance objectives. Climate issues are mainly integrated through the following mechanisms.

1. Strategy

The FI's compensation and governance committee examines the group's strategy on corporate responsibility, including climate change and environment, since these two are key pillars of it. In addition, the management committee is updated twice a year on climate-related issues and strategy developments, including ESG and climate-related risks and opportunities. Based on this, the board also oversees the integration and implementation of ESG issues into the firm's global business strategy.

2. Performance and objectives

The FI's board sets climate-related performance objectives, particularly regarding operations and investments, as part of its responsible investment policy. The Group Chief Sustainability Officer is in charge of reporting to the board on the progress on climate-related KPIs and other sustainability objectives.

Figure 23 - A European insurer and financial services group's diversity of climate-related metrics

SECTOR-SPECIFIC LISTED EQUITY PORTFOLIO INDICATORS		
INDICATOR		UNIT
Total AuM in 5 sectors with highest owned absolute emissions in equities portfolio		€ bn
Absolute Emissions of 5 sectors with highest owned absolute emissions in equities portfolio		mn t CO ₂
Number of issuers in 5 sectors with highest owned absolute emissions in equities portfolio		
Of these:		
Science Based Targets initiative (SBTi) Signatories		
SBTi Targets Set		
Under engagement by Climate Action 100+		
Split of sectors with highest owned absolute emissions in equities portfolio		
Oil & Gas Producers	Sector AuM	€ bn
	Share of equity AuM	%
	Absolute Emissions	mn t CO ₂
	Relative Emissions	t CO ₂ /€ mn invested
Chemicals	Sector AuM	€ bn
	Share of equity AuM	%
	Absolute Emissions	mn t CO ₂
	Relative Emissions	t CO ₂ /€ mn invested
Construction & Materials	Sector AuM	€ bn
	Share of equity AuM	%
	Absolute Emissions	mn t CO ₂
	Relative Emissions	t CO ₂ /€ mn invested
Industrial Metals & Mining	Sector AuM	€ bn
	Share of equity AuM	%
	Absolute Emissions	mn t CO ₂
	Relative Emissions	t CO ₂ /€ mn invested
Electricity	Sector AuM	€ bn
	Share of equity AuM	%
	Absolute Emissions	mn t CO ₂
	Relative Emissions	t CO ₂ /€ mn invested

5.4 Scenario Analysis and Stress Testing

Scenario analysis and stress tests for environmental risks, including climate risks, are still at the early stages of development and need to be further worked on to understand how they can be used to systematically assess risks for FIs. Further development is expected in this area, informed by scientific findings, with various national and international initiatives engaging on the topic, such as the NGFS and IPCC, as well as cross-sectoral collaborations such as the TCFD, the Sustainable Insurance Forum (SIF), and the UNEP Finance Initiative insurance pilot on TCFD.

It should be recognised that the projection of business processes beyond typical planning periods introduces considerable uncertainty. FIs should bear in mind that the outputs of mid- to long-term scenario analysis should be analysed in view of other possible factors that were not considered in the scenario but could be relevant in the future.

As recommended in the MAS Guidelines, FIs have the flexibility to tailor how they identify, assess, manage and disclose environmental risks on the basis of forward-looking scenarios, based on the materiality of the risks to their business over different time horizons. FIs should approach the guidance in this section based on its purpose, its relevance to the nature of their business and their risk profile.

Figure 24 - Scenario analysis and stress testing are not the same

Often referred to together as if they are a single concept, scenario analysis and stress testing are not the same thing.

Stress tests consider the impact of a specific set of severely adverse conditions on the financial condition of an FI. They often focus on unlikely events which may occur as instantaneous shocks, such as financial market stresses or a catastrophic event.

Stress testing could be useful for assessing the impact of transition risks over the shorter term, such as using financial market or liquidity stresses that may be caused by sudden policy actions or technology shifts. However, the scope for application of conventional stress tests may be limited in the context of assessing physical risks, as they may not produce meaningful results for the medium-and long-term perspectives required to capture these evolving risks. For these longer time horizons, additional assumptions (such as on management actions) are required, as well as consideration of interdependencies with other factors, including socioeconomic factors. While such assumptions and considerations have been incorporated in exploratory climate stress tests recently proposed by some central banks and regulators, the relevant methodological work remains at a nascent stage and will continue to evolve over time.

It is important to distinguish between the application of stress tests and scenario analysis, which are typically used for different purposes. In contrast to the case with stress tests, multi-year scenarios may consider a broad range of baseline, pessimistic and more optimistic assumptions, allowing climate risk analysis to provide information that is most relevant to the eventual decisions being taken.

Having clear objectives for conducting scenario analysis and/or stress testing

There are various objectives that FIs may wish to achieve with stress testing and scenario analysis, including identification of material risks (vulnerabilities to physical and transition risks), impact assessment, testing of strategy and establishment of risk appetite. Each objective will have an impact on which type of approach will be taken and how elaborate the exercise will be.

In designing scenarios, FIs are encouraged to first have a clear understanding of the exercise and where it may be useful. The goal is not to have more sophisticated scenario analyses but rather finding appropriate tools to address specific organisational needs based on risk profile, the nature of the business, and the purpose of conducting the exercise.

Taking a phased approach, focusing on material risk as a starting point

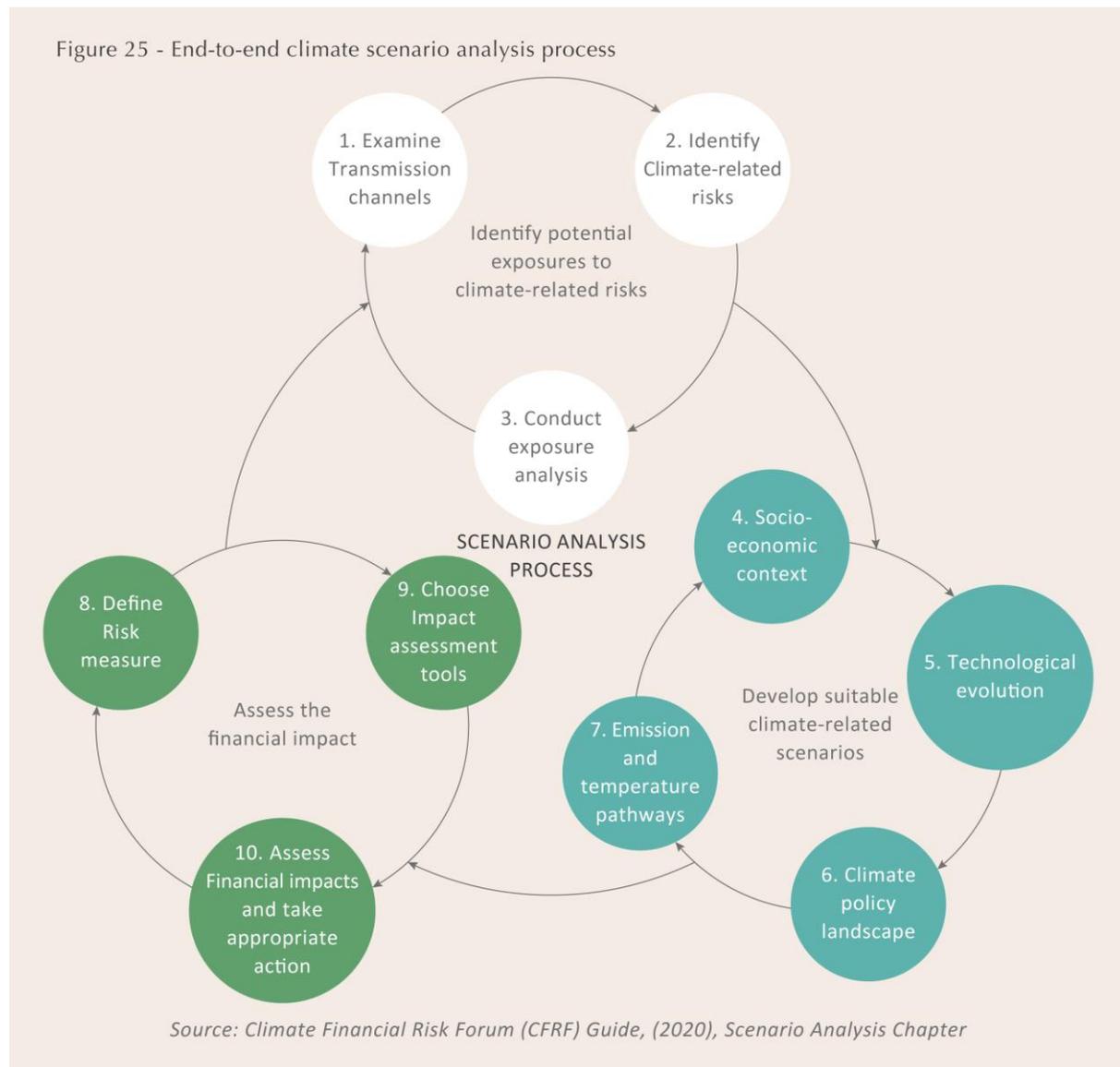
A phased approach may help to break down the scope and process into smaller, more achievable tasks. FIs can expand the scope or increase the complexity of the exercise over time if these are needed to serve their objectives for scenario analysis and/or stress testing exercises.

"What if" questions may be helpful when conducting material risk assessments to determine where the most significant exposures to environmental risks may be. FIs can start by focusing on a small set of risks first, based on their materiality and severity. Where material exposure is identified, firms can proceed to assess financial impact.

The exercise will be iterative: insights gained from each stage of the process are fed back in for further refinement to support the development of scenarios and, where relevant, identify new risks and potential exposures that were not previously noted.

The Climate Financial Risk Forum (CFRF) published a guide in June 2020 which includes a chapter on scenario analysis. The first section of the chapter provides a practical three-stage approach which may be helpful for FIs new to the implementation of scenario analysis, specifically on climate risks.

Below in Figure 25 is an end-to-end climate scenario analysis process recommended by the CFRF Guide 2020:



Choosing a qualitative or quantitative approach for environmental risk related scenario analysis

Qualitative scenario analysis explores relationships and trends for which little or no statistical data is available, while quantitative scenario analysis is used to assess measurable trends and relationships using models and other analytical techniques. Whether a qualitative or a quantitative approach is appropriate depends on the time horizons chosen for the scenario analysis and the type of risk being assessed (a qualitative approach may be used for assessing reputational risk, for instance).

Traditionally, there is an inclination for quantitative approaches to measure the impact of a risk factor and to conduct a stress test. However, in the context of environmental risk, such as climate risk, there are multiple uncertainties that could undermine the credibility and decision-usefulness of data. Qualitative stress and scenario analysis might be particularly useful for dealing with uncertainties that come with long-term projections. Qualitative approaches are also important given the challenges in obtaining all the required underlying data at the required level of granularity, especially with regard to forward-looking aspects. Qualitative approaches allow firms to raise risk awareness and steer high-level strategic business and investment decisions despite uncertainties (such as socio-economic conditions) and lack of data.

Quantitative scenario approaches may be accomplished by using existing external scenarios and models (such as those from third-party providers) or by FIs developing their own in-house modelling capabilities. When deploying external scenarios, caution should be exercised to ensure their relevance and suitability for the organisation's risk profile. The results of such an analysis may not come with precise values or results but, depending on the objectives of the exercise, can lead to a deeper understanding of sensitivities to environmental risks and opportunities, and of the range of possible outcomes for risk management.

Building scenarios

Environmental and/or climate related scenarios are driven by (i) transition risks (policy, technology and consumer preferences); (ii) physical risks (chronic and acute); and (iii) market pricing-in of these risks (orderly or disorderly). These drivers affect macroeconomic variables such as GDP growth, inflation, commodity prices, and discount rates across different asset classes.

FIs should first attempt to identify and understand the key drivers of their business performance and build these into their scenarios. Each FI should design scenarios that are relevant to its business and risk profile and use them in a way that is most meaningful for the FI's objectives, rather than being used prescriptively.

Publicly available climate-related scenarios from the IEA, the IPCC and others can provide useful context and a basis for developing company, industry or sector scenarios. FIs should aim to define scenarios that are consistent with those for climate change policy – such as scenarios used by the IPCC, which are at the heart of international climate policy and define scenario routes to be taken by policymakers. The IPCC's Sixth Assessment Report due to be published in 2021 will present a more expanded scenario concept. This will include the "Shared Socio-economic Pathways" (SSPs) as part of scenario definition. The NGFS Climate Scenarios, published in June 2020, and which are also based on the IPCC scenarios, provide a common starting point for analysing climate risks to the economy and financial system. While developed primarily for use by central banks and supervisors the NGFS suggests they "may also be useful to the broader financial, academic and corporate communities³³".

NGFS Climate Scenarios Framework has three representative scenarios, with each covering one of the following dimensions:

- Orderly: Early, ambitious action to a net zero CO₂ emissions economy
- Disorderly: Action that is late, disruptive, sudden and/or unanticipated
- Hot house world: Limited action leads to a hot house world with significant global warming and, as a result, strongly increased exposure to physical risks.

³³ NGFS, (2020), *NGFS Climate Scenarios for central banks and supervisors*

Conducting scenario analysis

When conducting scenario analysis and stress-testing with respect to climate-related and environmental risks, FIs should first consider which drivers are relevant to them, such as typhoons, wildfires, sea level rise, heat stress and change in carbon tax, among others. FIs should evaluate how they might be affected by physical and transition risks and how these could evolve under various scenarios and over different time horizons.

FIs need to allow for the fact that these climate risks may not be reflected in historical data, which means it is not necessarily possible to extrapolate from that data for the purpose of making projections. For example, to assess physical risk, FIs may need to enhance their current hazard models or refer to enhanced models to account for the future impact of climate change. Scenarios should take into account factors that may have an impact on the forward projection of the impact of hazards on an investment, such as the fact that local governments may be able to implement physical adaptation measures that end up reducing physical risk over time.

Some general principles for conducting scenario analysis:

- Use a number of different scenarios, and have at least two scenarios for comparison
- Define parameters for projection of the future scenario depending on their relevance to the business model, such as:
 - a set of economic parameters similar to what is used for developing the business plan and assessment of demand;
 - specific risk-related metrics that would impact exposures; and
 - assumptions about potential emerging risks, such as conditions for and timing of their manifestations
- Aim for consistency of key parameters underlying scenario definitions over time to enable tracking. Note that resetting of parameters may be required subject to certain trigger points being exceeded
- Define trigger points at which action should be taken, such as
 - review of scenario or parameters. For example, adjust the scenario by updating its parameters after observing deviations of frequency and severity of a specific type of hurricane from projected parameters, or consider fundamentally changing or replacing the scenario following new insights from science-based research
 - review of management action for risks mitigation
- Recognise that scenario analysis is an ongoing, dynamic exercise, and
 - Incorporate likely risk mitigation actions back into the scenarios as they may change the frequency and/or severity of the impact of the risk in question. These include not just risk mitigation actions by FIs themselves, but those taken by other stakeholders. For example, in the context of physical risk, FIs may consider the possibility that governments may require new facilities or buildings built in future flood prone areas to adhere to building codes (such as minimum elevation above ground) that provide some defence against increased flooding in future.

- Consider secondary effects. For example:
 - In the context of physical risk to mortgage portfolios, a bank may need to consider the withdrawal of insurance from mortgage portfolios and an increase in morbidity or mortality rates due to temperature increases, which may further impact the collateral value of such portfolios.
 - For transition risk, FIs may consider the impact on credit risk of certain companies/holdings in their portfolio and the direct and indirect impact of factors such as policy implementation as it relates to the carbon price.
 - A significant impact on GDP growth for countries which are more vulnerable to extreme climate change impacts. For assessment of the impact of transition risk, FIs may consider estimating the possibility of drivers such as the imposition of carbon taxes and higher oil prices, as well as their impact on growth due to their effect on supply and demand.

Various tools may be used to support scenario analysis:

- Horizon scanning/emerging risk maps: These allow a systematic and proactive approach to risk identification based on available information.
- Use of expert information based on qualitative questionnaires, such as those used for forecasting, risk identification and identification of trends.
- Economic scenario generators, such as simulation of future possible states of economies and financial markets based to identify unexpected but plausible outcomes.
- Catastrophe models based on deep understanding of the physical parameters that define a natural hazard, such as wind speeds, and characteristics of the exposures, such as their locations.
- Hazard maps, which provide location-level information on the extent or severity of perils using assumptions on the frequency, severity, and locations of primary events and dependencies with secondary perils.
- Footprints showing the impact of a single event on a geographical map, such as areas that have been significantly physically affected by an event. For example, a tropical hurricane footprint would show wind speeds and the path of the hurricane.

Once impacts are identified through scenario analysis, they will need to be turned into financial metrics that are useful for decision-making. The way in which this is done will differ according to financial sector. For banks, this may include an increase in default rate of mortgage portfolios, or an increase in non-performing loans. For asset managers, this may translate into slower growth in traded values of the stocks of affected companies. For life re/insurers, changes in mortality and morbidity assumptions may have a direct impact on reserving, as well as on the value of new business. These changes could also affect asset portfolios due to transition risk. For non-life re/insurers, what may be relevant is the cost of increased claims due to physical impact.

Recognising current challenges with data and methods

While environmental/climate scenario analysis is becoming an increasingly important tool for FIs in their risk management frameworks, it is important to bear in mind that the development of climate scenario analysis is still nascent. Scenario analytics require access to underlying data. They also require modelling capabilities to make use of the underlying data. Finally, they require technological infrastructure to embed the analytics alongside existing information to inform processes and decision-making.

These ingredients require resources as well as expertise so that the data can be used. There are still significant gaps that need to be filled in terms of availability, quality and consistency of both data and methodologies before such sophisticated analytics can become meaningful and reliable across a broad range of portfolios. These gaps will continue to narrow as policymakers, industry and academia work to address them, but in the meantime FIs should take a cautious approach towards using, and relying on, scenario analysis in relation to climate change.

Specific features of scenario analysis implementation for different types of FIs

There is no one-size-fits-all approach that can be taken to scenario analysis implementation given the different business models among FIs. There will also be differences in the potential mitigating actions at their disposal that can be fed back into the scenarios, and this will affect the final resulting impact arising from specific climate related risk on the FI's portfolios.

For instance, banks may be locked into a particular scenario — such as the risk of property flooding as a result of sea level rises — given the duration of mortgage portfolios. Meanwhile, re/insurers renew their contracts on an annual basis such that the mitigating actions they take in the interim can alter their exposure to climate risks from year to year.

Banks

Banks with exposure to higher GHG emissions in areas such as fossil fuel-based industries and energy-intensive manufacturing activities, could consider a more in-depth application of scenario analysis. The TCFD has developed a technical paper on scenario analysis (“The Use of Scenario Analysis in Disclosure of Climate Related Risks and Opportunities”³⁴) which could be referred to for further guidance.

For example, in scenarios focusing on transition risk in alignment with the Paris Agreement, carbon price trajectories are likely to vary across various temperature pathways and be dependent on assumptions such as the cost of new technologies and the extent to which they are deployed. The impact on companies and financial markets could be significant. Companies' costs will rise in proportion to the total emissions they generate, and those generated by their suppliers, while selling prices are likely to rise to offset cost increases at an industry level. At the same time, demand is likely to fall, reflecting the sensitivity of customers to prices in each market affected, shrinking companies' sales and costs. This in turn might impact client performance and eventual PD assessment frameworks over various stress case scenarios.

³⁴ <https://www.tcfithub.org/scenario-analysis/>

Opportunities related to resilience may be especially relevant for banks with exposure to long-lived fixed assets or companies with extensive supply or distribution networks, especially those that depend on utility and infrastructure networks or natural resources in their value chain, and those that may require longer-term financing and investment. These analyses can be used as tools to consider different potential future outcomes.

Re/insurers

For re/insurance firms, assessment of climate risk can be challenging as climate risks manifest differently depending on the time horizons and across the business lines that re/insurers underwrite. As the impact of climate change risk varies across the re/insurance industry and by line of business, re/insurance firms can refer to industry publications on the impact of climate change on various lines of business and emerging risks³⁵, and participate in industry-wide and cross-industry collaboration to establish better understanding of the potential implications of climate risk and define consistent scenarios applicable for different time horizons.

Re/insurers may follow developments with the PSI TCFD Insurance Pilot Group, which will be working to develop a new generation of tools and approaches to help re/insurers to incorporate the latest scenario analysis to assess climate-related physical, transition and litigation risks in re/insurance portfolios. Given the uncertainties in relation to climate risk assessment and the need for forward-looking assessments, the focus of FIs when they conduct scenario analysis should be on ensuring any methodologies selected to assess climate risk are able to provide insights that are genuinely useful for decision-making, over longer time horizons. For example, as discussed in section 5.3.2, the Economics of Climate Adaptation Working Group, has developed a practical quantitative decision-making framework for climate risk which aims to support policymakers and leaders in making decisions on the most cost-effective investments in climate adaptation measures to be adopted in a particular national or local economy.

Asset managers

For asset managers, scenarios analysis is the process of estimating the expected value of a portfolio after a period of time. Its purpose is to assess the potential earnings impairment of companies (as a result of transition policies, demand changes, physical impacts and other factors) and how this might translate into investment returns in a portfolio. It is important to test reference scenarios that involve a broad spectrum of temperature outcomes.

5.5 Capacity Building

Building internal expertise and resources to tackle environmental issues at FIs

FIs should consider how the importance of environmental risks is understood and established in the organisation. Each FI will have its own strategy directing its approach to generating awareness of environmental risks at management level, depending on, among other things, the FI's ethos, risk appetite and ESG principles in general. Senior management can help link the FI's ENRM strategy to the overall purpose of the organisation.

³⁵ As an example, the SONAR 2019 report by Swiss Re on '[New emerging risk insights](#)' which outlines potential impact of climate change on various lines of insurance business.

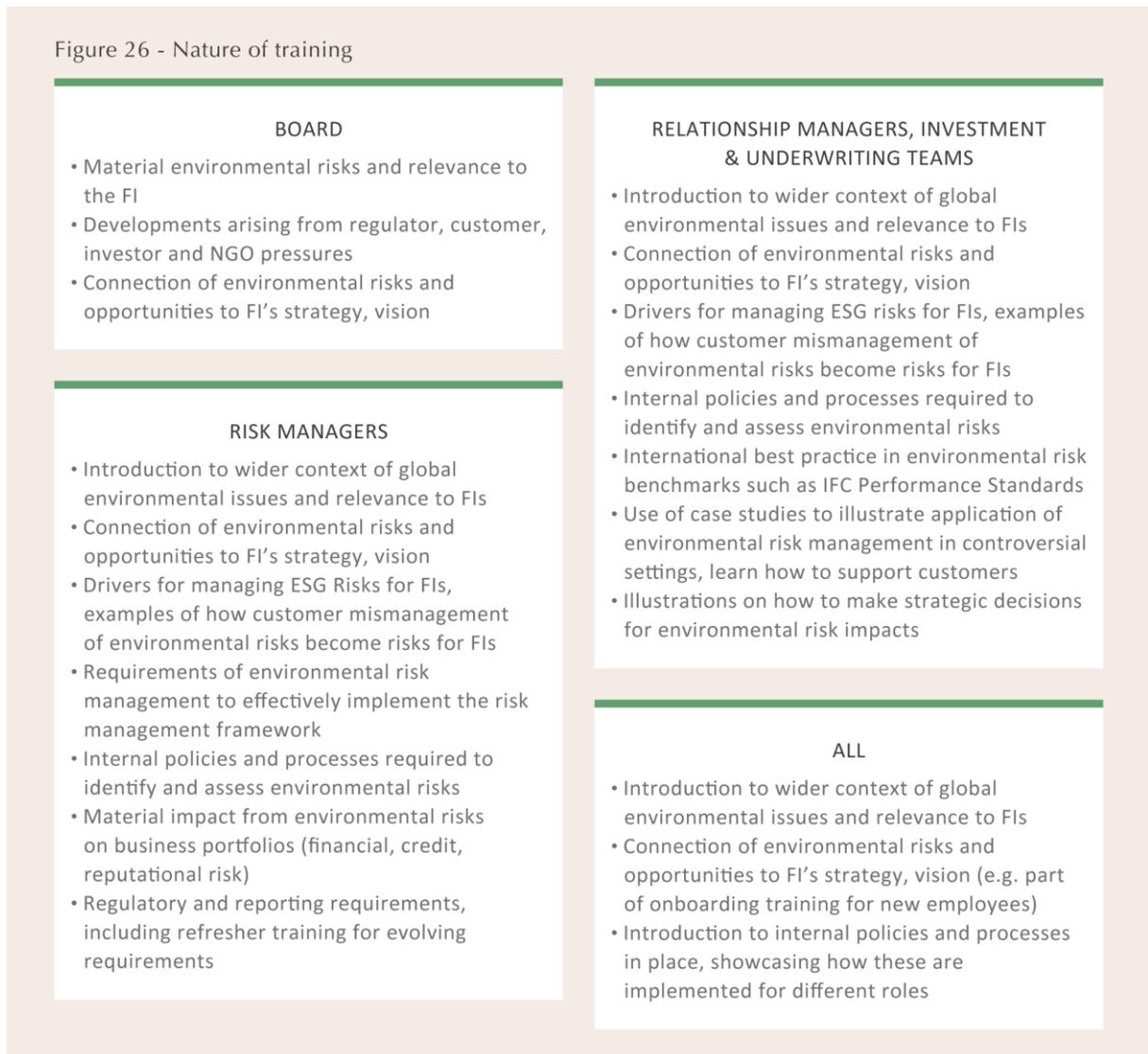
A top-down approach, in which senior management sets the tone on environmental risk management, provides guidance on opportunities and the wider context. A bottom-up approach is equally important, so that all employees are engaged in order to drive an effective culture of environmental risk management. The success of a risk management framework depends on implementation by engaged employees across all levels, linked to their understanding of the importance of environmental risk management.

The FI's ENRM strategy will form the underlying basis for the approach to build awareness and enhance training and internal capacity for employees. All FIs can benefit from providing training on environmental issues, including for the board, senior management, business or investment teams and risk practitioners as they are required to make decisions on environmental issues.

The training can range from generating general awareness to detailed, tailored training for risk practitioners who will be implementing the FI's risk management framework. Raising awareness of environmental issues might also be beneficial for functions such as internal audit, legal, marketing and communications. Training is also beneficial in helping employees detect, monitor and mitigate environmental risk in a rigorous and timely manner, as well as to know when to escalate a risk. Refer to Figure 26 for suggestions on what the training may entail.

Training should be tailored to employee roles, so staff are able to understand how environmental risks impact their roles, the business and customers over time. As far as possible, training content should adequately cover the FI's environmental risk management policies and procedures, key priorities, and should also reflect changing regulatory requirements and developing trends. In order to stay relevant, training content should be regularly reviewed and refreshed. An assessment will be needed as to whether some training should be mandatory for certain roles (such as risk management and decision makers who help implement the risk management framework).

Figure 26 - Nature of training



FIs should evaluate whether they have the appropriate capacity and resources for training their employees in effective environmental risk management. A clear understanding of the impacts of environmental risks on the business and its customers will help inform the relevant topics for training.

FIs should also expand their knowledge by participating in discussion forums, multi-stakeholder events or platforms established locally or globally, webinars, and workshops.

Industry associations, such as the Investment Management Association of Singapore (IMAS), The Association of Banks in Singapore (ABS) and the Institute of Banking and Finance Singapore (IBF) are developing training to support FIs in improving their environmental risk management capabilities.

Figure 27 shows the levels of technical competency requirements at a European insurer.

Figure 27 - Responsible investment technical competency

The insurer applies a systematic process to define technical and managerial competency requirements for standardised position profiles used for recruiting and to determine training and development actions.

The technical competency requirements below have been assigned by the insurer to all investment professionals (level depending on respective functions).

1. Basic

- Understands the relevance of environmental risks on the insurer's value creation.
- Has a basic understanding of the insurer's overall responsible investment approach.
- Is familiar with the basic terminology of responsible investment.
- Understands the commitment the insurer has made as a signatory to various commitments and international standards.

2. Intermediate

- Has a good understanding of, and can explain, the insurer's overall responsible investment approach.
- Understands the concept of 'impact investing' and 'ESG integration' and the principles underpinning it.
- Understands where and how ESG factors can be integrated into the investment process for relevant asset classes.

3. Advanced

- Has an excellent understanding of the concept of 'ESG integration', the principles underpinning it, and how ESG factors drive investment risk and return. Uses ESG data and research.
- Assesses ESG factors and reflects them in investment analysis, recommendations and decisions.
- Is able to discuss ESG-related issues with investee companies, or, where relevant, fund managers.
- Evaluates fund managers on all aspects of the responsible investment approach.

4. Expert

- Monitors and analyses the marketplace and demonstrates deep knowledge of responsible investment practices, leading the design and implementation of the insurer's responsible investment strategy.
- Has a good understanding of corporate responsibility concepts, and excellent understanding of responsible investment in the context of the insurer's corporate responsibility strategy.
- Builds a network with peers, industry participants and represents the insurer in relevant industry initiatives with the objective to advance responsible investment practices. Sets the agenda in terms of responsible investment for the industry.
- Communicates and advocates the insurer's responsible investment approach to internal and external audiences.
- Uses contacts and networks to source potential impact investments; supports the implementation of impact investment mandates.

Active Engagement: responsible investment champions

Responsible investment has the buy-in from the investment teams so that it becomes part of everyday investment decision making.

Each investment management team has appointed a responsible investment champion who:

- Supports teams in implementing and improving responsible investment processes.
- Engages in collaborative initiatives, sharing relevant research or other information related to responsible investment practices with teams, and
- Forms part of a global network of over 20 responsible investment champions who exchange views and their experiences in regular conference calls.

6 DISCLOSURE

Note: Best practices on disclosing broader environmental risk are still evolving. The focus of this section is on climate change based on TCFD recommendations³⁶. Communicating climate impact effectively to stakeholders is important. This handbook sets out some illustrations, while further dedicated guidance on climate reporting is being prepared. This chapter provides guidance on what FIs could be doing to strengthen their climate-related financial disclosures, keeping in mind that it takes time to develop this over time.

Background

FIs have a role to play in making environment-related disclosures that can enable the financial services ecosystem to better understand the concentrations of carbon related assets in the financial sector, as well as their exposure to environment-related risks. This could promote more informed investment, lending, and insurance underwriting decisions.

FIs have a major role to play because they drive capital allocation decisions on lending to individual assets, companies and sectors. Re/insurers facilitate this through underwriting projects and business risks and asset managers have a key influencing role in how that capital is deployed as shareholders of corporates and banks and as providers of capital.

Information disclosed by clients is an essential prerequisite for FIs' ability to assess and manage environment-related financial risk. Firms are reliant on disclosures from the wide range of corporates in which they invest, to which they lend, or which they insure. As part of their increased consideration of environment-related risks, several FIs have started to obtain more detailed information from their clients. This can come in the form of questionnaires, requests for facility emissions data, locations of their material operating plants or other key metrics required for banks to assess vulnerabilities of their own portfolio to various transition pathways.

The ultimate audience for environmental-related disclosures is likely to use this information in order to understand how firms are identifying, assessing and managing their risks to better inform decision making. These disclosures can be a tool both for an FI's management team to understand, measure and mitigate risks, as well as serve as an input for the investor community and clients who are considering these issues. These disclosures can help inform the firms' identification, assessment and management of their own environmental related risks and/or the environmental -related risks of the financial products that they manage on behalf of clients.

The ENRM guidelines clearly and helpfully set out an approach for reporting of environmental risk information for stakeholders. They suggest disclosures in accordance with well-regarded international reporting frameworks, such as the recommendations of the TCFD - increasingly the global framework for climate disclosures.

³⁶ TCFD, (2017), *Recommendations of the Task Force on Climate-related Financial Disclosures*

The TCFD has developed a widely accepted global voluntary set of recommendations for consistent, comparable, comprehensive and decision-useful climate-related disclosures. Currently only partial disclosure across all four TCFD categories of governance, strategy, risk management and metrics/targets are the norm, with limited disclosure on potential financial impacts and little detail provided on the resilience of business strategies to different plausible future climate states. Firms should be prepared to start with qualitative disclosures with specific focus on integration with existing strategy and governance frameworks, and add complexity over time, signalling their intention to broaden and deepen the decision-useful information they provide as the organisation's understanding of climate change risk evolves and new inputs and processes are developed. Over time, increasing amounts of quantitative information should be added to disclosures to complement qualitative disclosures.

6.1 Disclosures on Governance

Governance disclosures are useful in enabling audiences to assess board and/or senior management's role in the oversight and management of climate-related risks and opportunities. As a starting point, FIs should describe the governance and operational arrangements in place to manage climate change risks. Firms should showcase how the climate risk and opportunity governance structure exists within the institution, including roles and responsibilities, frequency of reporting/discussing climate related issues, integration into existing strategy and risk management processes, as well as periodic monitoring of progress against climate related metrics and targets. Firms may want to spell out where responsibility for environmental-related risks and opportunities lie within the organisation below board level. This can include responsibilities for day-to-day management of these risks, reporting lines, broad timelines for end-to-end integration of climate related risks, training plans, linkages to remuneration, as well as support from external data providers (if any).

Board oversight of sustainability-related matters

At a leading US-based asset management firm, the board engages with senior leaders on near- and long-term business strategy and reviews management's performance in delivering on the firm's framework for long-term value creation, including with respect to climate and other environmental related issues. A board risk committee reviews and discusses with management levels of risk, risk assessment, risk management, and related policies, including those related to climate and other sustainability risks, where material. A Nominating & Governance Committee of the Board of Directors ("NGC") was established in 2020, formalising board-level oversight of investment stewardship and corporate sustainability. As appropriate, it makes recommendations on stewardship-related matters that should be reviewed by the full board. In addition, the NGC periodically reviews public policy and advocacy activities, including lobbying priorities, political contributions, and memberships in trade associations.

Figure 28

GOVERNING BODY	SUSTAINABILITY-RELATED RESPONSIBILITIES	2020 SUSTAINABILITY RELATED DISCUSSIONS
Board	Engages with senior leaders on near-and-long-term business strategy and reviews management's performance in delivering on its framework for long-term value creation, including as it relates to sustainability.	3 meetings
Risk committee	Reviews and discusses with management the levels of risk, risk assessment, risk management and related policies including those related to ESG risks.	3 meetings
Nominating & Governance Committee	Periodically reviews corporate and investment stewardship-related policies, programs, and significant publications relating to environmental (including climate change), social, and other sustainability matters.	4 meetings

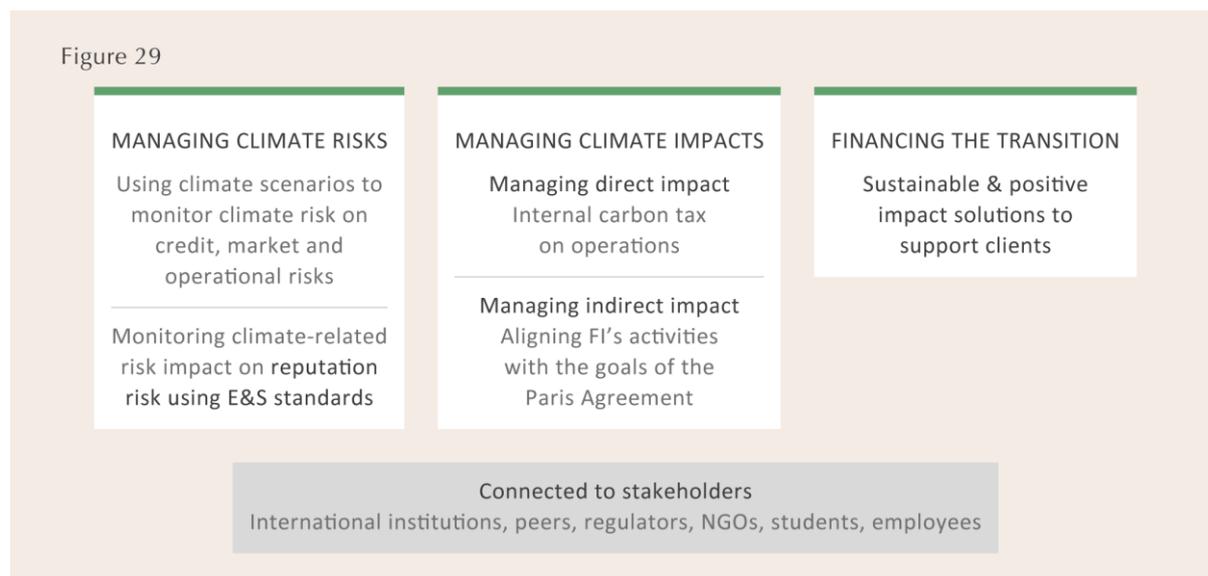
The asset manager also discloses the roles and responsibilities of various teams for integrating ESG risks. For example, a global leadership team oversees sustainability strategy; an investment sub-committee oversees investment process consistency (including ESG integration); and a risk and quantitative management function is responsible for evaluating investment, counterparty, operational, technology, and regulatory risks (including consideration of ESG factors relevant for each).

6.2 Disclosures on Strategy

Through their disclosures, FIs should articulate how their strategy framework is designed to identify, assess and manage climate-related risks and opportunities. This could include information about environmental -related risks and opportunities identified over the short, medium and long term (clearly highlighting what is meant by these different time horizons). The resilience of the firm's strategy should be informed by the results of scenario analysis which explores the potential impact on the firm's portfolio through a range of climate-related scenarios. A firm may develop its strategy for tackling environmental-related risks either before undertaking its risk assessment and management processes (to inform the approach) or after, once the initial risk assessment is complete. Once the strategy has been developed and risk management processes are in place, details should be provided on the impact which the risk assessment process has had on business decision-making at the firm level. The approach should be periodically refreshed with changing climate scenarios over the short and medium term.

Disclosing a clearly defined climate strategy

A leading European Union-based financial services group has disclosed that it has defined a climate strategy articulated around three axes: managing climate-related risks (transition and physical); managing the group’s impact on climate (via its own operations and those of its clients); and supporting the transformation of its clients with its financing and investment products and services.

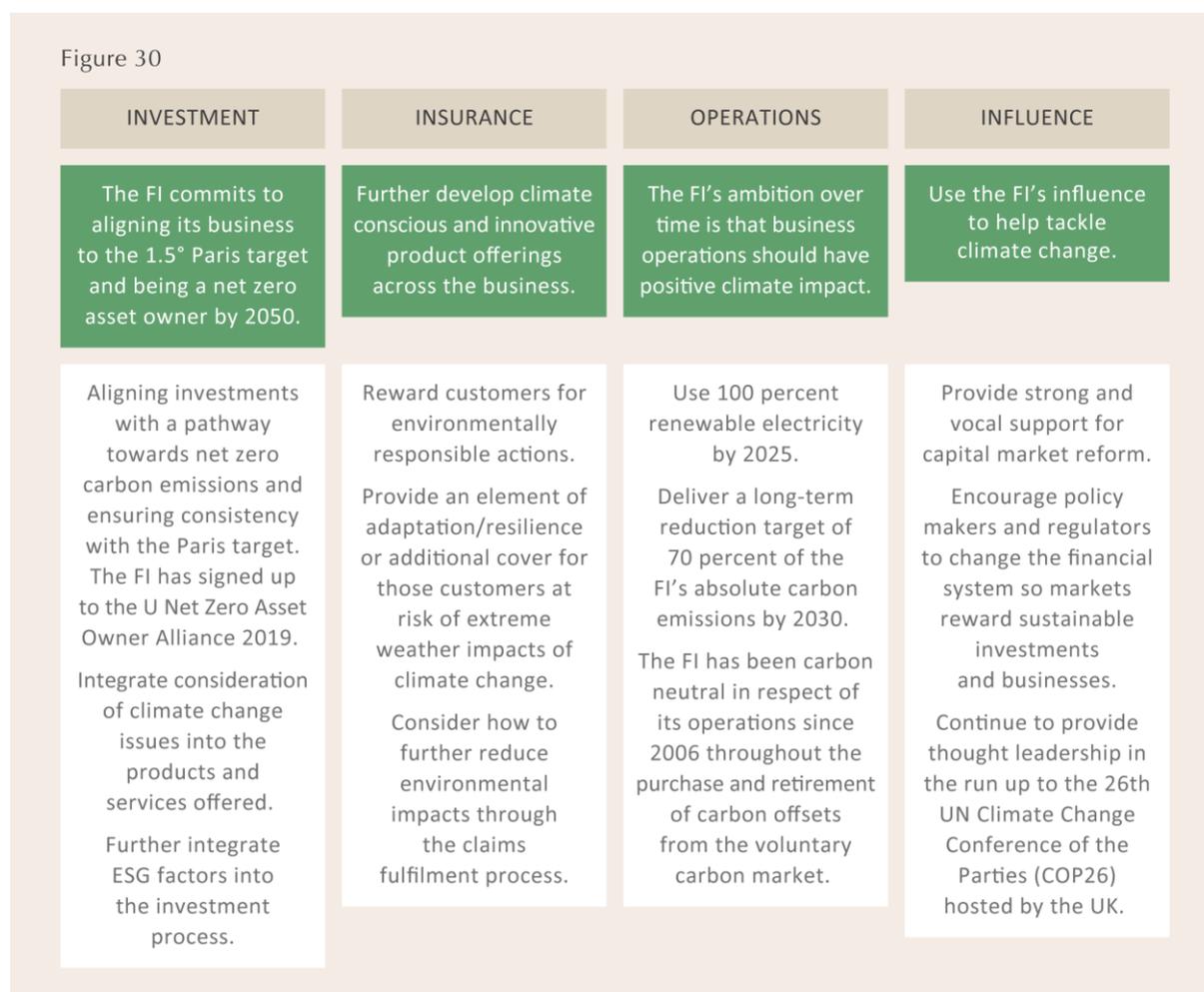


The group details the steps being taken across each of the axes both historically and from a forward-looking perspective. It also details commitments made by the phasing out of thermal coal extraction and power financing (by 2030 for the OECD and by 2040 for the rest of the world).

Expanding the way in which environmental risks can be tackled

Rewarding customers for engaging in environmentally responsible actions is one way in which a leading UK headquartered international insurance group has transformed its business approach towards one that places a premium on reaching the goals of the Paris Agreement. The firm in 2019 developed a joined-up, four-pillar strategy covering investments, insurance, its own operations, and influence, as part of its commitment to aligning the business to the 1.5°C target under Paris, and to being a net zero asset owner by 2050. The re/insurer has since developed “climate conscious” products which reward customers for environmentally responsible actions, while providing additional cover for those customers at risk of the extreme weather impacts of climate change. The firm has also committed to stop underwriting fossil fuel power generation worldwide and recently launched a “whole lifecycle” insurance policy for renewable energy companies. The re/insurer has also said it will continue to reduce the environmental impact of its claims process and minimise the amount of waste sent to landfill. As an asset owner, the insurer has disclosed that by the start of 2020 it had disclosed that it had divested from 18 thermal coal mining and power generation companies, and is prepared to add further companies to an “Investment Stoplist” to limit exposure to carbon intensive sectors.

A summary of the insurer’s actions is presented below:



6.3 Disclosures on Risk Management

Users of disclosures will want firms to disclose the process by which they have identified, assessed and managed climate-related financial risks and opportunities, as well as the extent to which these processes are integrated in mainstream risk management practice and processes. This includes information on risk identification and assessment and how the firm assesses opportunities and risks. The disclosures should highlight how environmental risks have embedded climate risk into material risk inventory, enterprise risk frameworks, and risk governance frameworks. Disclosures should include a description of actions taken to mitigate material risks which, for example, could be new exclusion policies, an updated statement of risk appetite, new lending targets and client engagement efforts.

Dealing with the marginal impact of climate scenarios at a portfolio level

A European-based financial services group has developed an approach that aims to assess transition risks by quantifying the marginal impact of climate scenarios on the credit rating of borrowers for a set of priority sectors, under the assumption that the borrower does not adapt to this scenario.

Figure 31 - Methodology for assessing transition risks on the credit portfolio

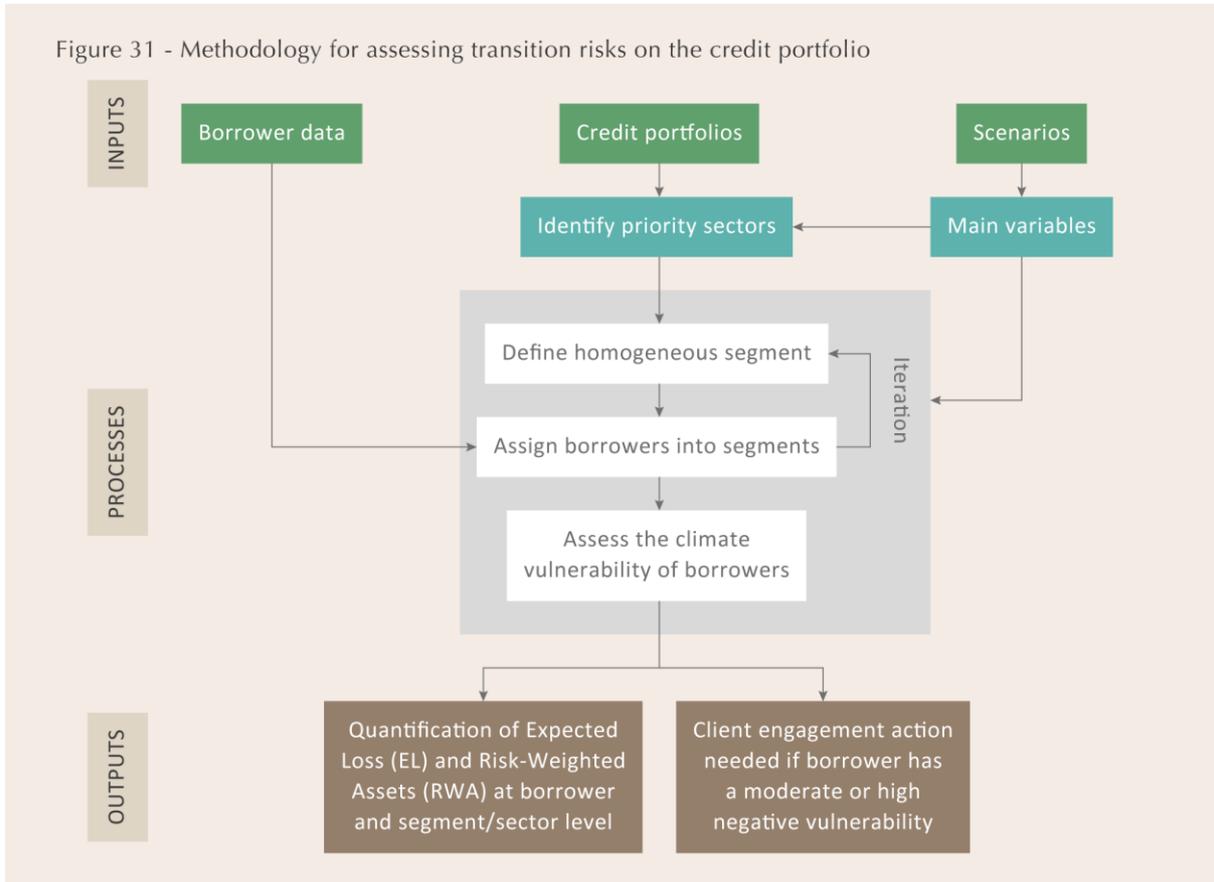


Figure 32 - Measuring carbon price impact on portfolios

A leading US based financial group assessed a sample of its clients in the upstream segment of the oil and gas sector and evaluated how the introduction or expansion of a uniform global carbon price would affect key drivers of their financial statements, including revenue, cost, capital expenditure, reserve valuations and their impact on PD and internal risk ratings. The bank tested the impact of four carbon prices - \$25, \$50, \$75 and \$100 per ton of CO₂ - on these clients from 2019-2021. The bank’s analysis showed that the adjusted PD and the credit rating impacts of these global carbon prices varied significantly across the companies they assessed, including a downgrade in a range of up to nine notches at \$50 per tonne of carbon dioxide. While investment grade companies demonstrated a larger downgrade than those with lower initial ratings, the absolute change in the probability of default was much more significant for lower-rated firms. This provided useful insights to support the group’s efforts to integrate climate risk considerations into credit analysis, portfolio risk management, and conversations with clients. It also enabled the group to differentiate between the level of transition risk faced by companies within the same portfolio.

6.4 Disclosures on Metrics and Targets

FIs evaluating risks on a sector by-sector basis should select and disclose the metrics that reflect relevant climate-related financial risks for a given portfolio and sector - and state why. Those with large and complex assets, as well as those operating in less diverse markets, should adopt a risk-based approach to focus first on the most relevant risk types, asset classes, industry sectors and geographies.

For example, the FI might develop or use metrics for one sector such as oil and gas, and add others over time. It is useful to explain the rationale for choosing where to start. A “green/brown” division of assets can be used to show how important high-carbon sectors are to an FI, but a green asset is not necessarily low risk. The definition of “green” and “brown” used by the FI should be transparent.

FIs may also disclose the details of the scope of scenario analysis conducted, and what percentage of portfolios has been assessed using quantitative, scenario-based impairment metrics (e.g. using forward looking, location specific models describing environmental hazard) including potential impact on revenues, costs and asset values. FIs may use heat maps showing areas of high, medium or low risk. A materiality matrix can be a useful representation of a bank’s assessment of identified risks. Over time FIs will be encouraged to disclose the resilience of the balance sheet and strategy in the face of a range of climate scenarios, including a 2°C/1.5°C warming scenario, reported in quantitative metrics and in terms of key material risks identified. This could include reporting on the proportion of business with corporate clients with science-based targets.

FIs may use the metrics and targets in the examples 33, 34 and 35 below to inform long-term strategy and integration with their enterprise-wide risk appetite:

Figure 33

CONCENTRATION METRICS
Proportion of portfolios with exposure to high-carbon sectors
Proportion of portfolio with exposure to companies with high fossil fuel revenues
Proportion of portfolio highly exposed to key indicators of physical risks, by geography/sector
Actions and targets in place to facilitate the shift to a net zero economy
Sector-specific targets and reduction of exposures to highly vulnerable sectors

MEASURING EXTENT OF RISK ASSESSMENT
Proportion of portfolios that have been assessed in depth for physical and transition risks
Proportion of underwriting activities that incorporate climate-related risks into the underwriting and/or lending process
Proportion of portfolios/number of clients that have been engaged to discuss their vulnerabilities and risks that they face from climate change and what steps are they taking to adapt and mitigate
Proportion of portfolios/number of clients reporting against disclosure good-practice e.g. CDP, TCFD
Proportion of portfolios/number of clients (lending/securities underwriting) with explicit and credible climate change risk mitigation plans, e.g. alignment with a transition pathway or committed to science-based targets

Figure 34 - Measuring the extent of risk assessment

A leading UK based bank with a strong emerging market presence disclosed in its 2019 ESG update that to better understand its exposure to transition risk, it had identified six higher transition risk sectors in 2018, based on their contribution to global carbon dioxide emissions and other factors. The bank in 2019 conducted over 3,000 engagements with clients, either in person or over the phone, to discuss their approach to climate change to better understand how they managed transition risk. The bank also said it had developed a questionnaire to improve its understanding of clients' climate transition strategies, receiving responses from over 750 customers within the six sectors, which represented 34 percent of its exposure. This information would be used to inform the bank's decision making and strategy and to help it understand which clients need to adapt their readiness to change and identify business opportunities to support the transition to net zero. This information is also being used to supplement management of transition risk in the bank's credit risk management processes.

Figure 35 - Providing sector-specific targets

A leading insurer disclosed that, in 2019, it took another important step in its carbon steering mechanism and developed a policy to shift away from the most carbon-intensive oil and gas production. From July 2021, the insurer will no longer provide individual insurance cover for the world's top five percent of the most carbon-intensive oil and gas production companies. Further, from July 2023, it will no longer provide individual insurance cover for the top 10 percent of the most carbon-intensive oil and gas production companies in the world.

6.5 Data Gaps and Limitations

Data availability and confidence in available data remain a challenge. There is limited reliability and coverage of input data relating to both physical and transition risk. For example, across FIs' clients, scope 3 greenhouse gas data (i.e. indirect emissions that occur in a company's value chain) are not comprehensive and yet are essential for FIs to be able to understand the climate-related financial risks that they may be exposed to in sectors such as oil and gas. Disclosure by private companies and by companies in emerging markets often lags or is absent. It is hoped that strengthened guidance on climate-related financial reporting will address this in due course.

Firms should highlight in disclosures their methodologies and assumptions, along with any limitations and potential inaccuracies in input data and the potentially indicative nature of any forward-looking analysis. Where data is missing, other methods such as portfolio extrapolation can be used. Reasonable efforts could include estimating emissions (and disclosing where such estimations have been used and the methodology used for calculation) and/or using client questionnaires to obtain the data needed to input into risk assessments. This is an especially useful approach for investment/lending/underwriting to private companies, where disclosure can be limited or non-existent.

7 ANNEX: RESOURCES

You can refer to the list of resources below to find out tools/databases/vendors which help FIs identify and assess environmental risks. It includes resources that are publicly available and paid subscriptions. The handbook does not endorse or recommend any particular product or service.

Principles for Responsible Investment (<https://www.unpri.org/>) - The PRI is the world's leading proponent of responsible investment. It works to understand the investment implications of environmental, social and governance (ESG) factors; to support its international network of investor signatories in incorporating these factors into their investment and ownership decisions. The PRI now has over 3,300 signatories who collectively manage USD 100 trillion in AUM.

CDP (www.cdp.net/) - CDP is a not-for-profit charity that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts. Each year CDP supports thousands of companies, cities, states and regions to measure and manage their risks and opportunities on climate change, water security and deforestation.

UN Global Compact (www.unglobalcompact.org) - The UN Global Compact aims to mobilise a global movement of sustainable companies and stakeholders by supporting companies to do business responsibly by aligning their strategies and operations with Ten Principles on human rights, labour, environment and anti-corruption; and take strategic actions to advance broader societal goals, such as the UN Sustainable Development Goals, with an emphasis on collaboration and innovation.

TCFD framework (<https://www.fsb-tcf.org/>) - The Financial Stability Board created the Task Force on Climate-related Financial Disclosures (TCFD) to improve and increase reporting of climate-related financial information. TCFD Report on Disclosure serves as a useful resource for disclosing information.

Global Reporting Initiative (GRI) environmental indicators (<https://www.globalreporting.org/>) - The GRI Standards create a common language for organisations - large or small, private or public - to report on their sustainability impacts in a consistent and credible way. This enhances global comparability and enables organisations to be transparent and accountable. The Standards help organisations understand and disclose their impacts in a way that meets the needs of multiple stakeholders. The GRI Standards include eight environmental topic standards covering emissions, biodiversity, and water and effluents, among others.

Sustainability Accounting Standards Board (SASB) environmental accounting metrics and materiality map (<https://www.sasb.org/standards-overview/materiality-map/>) - The SASB Standards provide industry specific standards identifying likely financially material issues per industry sector. These are summarised in the SASB materiality map. SASB provides standards for 77 industries. Each standard has six disclosure topics and 13 accounting metrics. Environmental topic areas include GHG emissions, air quality and ecological impacts, among others.

Some resources are based on paid subscriptions, including from the following ESG data providers (non-exhaustive list in alphabetical order):

- Bloomberg
- Four Twenty Seven (climate risk data)
- MSCI
- Refinitiv
- RepRisk
- Sustainalytics
- S&P Global, which also includes Trucost, focusing on carbon and environmental data and risk analysis
- Swiss Re's online natural hazard information and mapping system, CatNet[®], has integrated a Biodiversity and Ecosystem Services Index which is provided at a resolution of 1km² across the world.

