NORGES BANK
INVESTMENT MANAGEMENT

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ADDRESSING CLIMATE-RELATED RISKS AND OPPORTUNITIES AS A FINANCIAL INVESTOR

ASSET MANAGER PERSPECTIVE

Climate change poses a financial risk to investors. Understanding when, where and how the effects of climate change will materialise is an important but complex exercise. Although the timing and magnitude of the consequences of climate change are uncertain, investors can address climate change risks and opportunities through their investment and ownership decisions.

Norges Bank Investment Management (NBIM) initiated its climate ownership work in 2006 and published its first expectations on how companies should address climate change in 2009, making us an early mover among investors. We work to improve long-term returns and manage climate-related risks. The three pillars of our responsible investment strategy provide the foundation for this work: i) establishing principles; ii) exercising ownership; and iii) investing sustainably.

This paper provides an asset manager's perspective on how climate change risks and opportunities can be addressed in investment portfolios. First, we outline the financial risks stemming from climate change, regulatory responses addressing climate risks and emerging exposure assessment methods. Next, we provide an overview of strategies and tools used by institutional investors. Finally, we describe NBIM's approach to and experience of using these tools.

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The Asset Manager Perspective series articulates Norges Bank Investment Management's views and reflections on issues topical for the financial industry. They are not meant to be definitive; rather they are intended as timely contributions for the benefit of all market participants. The series is written by employees and is informed by our investment research and our experience as a large, long-term asset manager.

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Financial risks and opportunities from climate change

Climate outcomes have long-term and uncertain macroeconomic implications. The climate-related risks for the Government Pension Fund Global (GPFG) are derived from the impact climate change may have on the assets the fund invests in, and the steps companies and governments take to mitigate and adapt to these.

Due to its potential significance for financial and macroeconomic stability, there has been an effort by various public institutions to analyse different risks arising from climate change. The Task Force on Climate-related Financial Disclosures[1] (TCFD) classifies climate-related risks into two main categories: risks related to the transition to a lower-carbon economy and risks related to the physical effects of climate change.[2] Climate risks can impact companies' assets and business prospects. For example, companies could face: i) regulatory risks; ii) economic losses from stranded assets[3] or physical impacts to companies' assets; iii) market risks stemming from changes in consumer behaviour; iv) legal risks related to climate litigation;[4] and v) reputational risks. An example illustrating the potential severity of these risks is the bankruptcy of Pacific Gas and Electric, which has been labelled the first "climate change bankruptcy", caused by liabilities of more than 30 billion US dollars as a result of wildfires.[5]

Despite posing risks to companies and investors, climate change also presents economic opportunities. Some companies are exploring ways to strengthen their competitive position versus their peers, or developing products or services to access untapped market opportunities. Companies can also realise efficiency gains and cost reductions by increasing resource productivity, reducing energy consumption and strengthening supply chains to minimise climate-related disruptions. Companies may also have opportunities to invest in adaptation measures to strengthen their resilience against the effects of climate change.

According to the Financial Stability Board (FSB), "the impact of physical risks on asset prices appear relatively contained but may be subject to considerable tail risk". The FSB also notes that a disorderly transition to a low-carbon economy could have a destabilising effect on the financial system.[6] Although the economic and financial impacts of climate-related events are becoming more evident, opinions differ on the extent to which

1 The TCFD was established by the Financial Stability Board to improve and increase reporting of climate-related financial information.

2 Task Force on Climate-Related Financial Disclosures (2017). Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures

3 The International Energy Agency defines stranded assets as "those investments which have already been made, though at a point in time prior to the end of their economic life, are no longer able to earn an economic return".

4 Liability risks could arise from parties seeking compensation for losses they may have experienced from physical or transition climate risks.

5 MacWilliams, J. Lamonaca, S. Kobus, James. (2019). PG&E: Market and Policy Perspectives on the First Climate Change Bankruptcy. Retrieved from https://www.energypolicy.columbia.edu/

6 Financial Stability Board (2020). The Implications of Climate Change for Financial Stability. Retrieved from www.fsb.org

markets are already pricing climate risks and under what conditions they can be expected to do so. For example, the expected time horizon for some of the climate risks to materialise may be longer than the investment horizon of market participants, resulting in minor impacts on companies' valuations today. Another hurdle is the lack of public information and uncertainty about companies' forward-looking climate exposure, making it challenging to integrate into investment decisions. A study of the impact of droughts on stock prices of food companies found that markets are inefficient at pricing physical climate risks.[7] Other studies show some evidence that physical climate risks affect the pricing of financial assets.[8,9,10] There is also some indication that transition risks affect stock returns; for example, investors seek a carbon premium for companies with higher levels of emissions.[11] We have examined the potential effects of climate change on asset pricing and returns in a separate discussion note and in a recent letter to the Ministry of Finance.[12,13] The combination of a lack of data and a limited number of academic studies means it is challenging to draw firm conclusions about the degree to which climate risk is reflected in prices. We do not believe there is sufficient evidence to claim that climate risk is systematically mispriced.

Regulatory developments and climate risk assessment

Faced with climate-related financial risk of uncertain implications, regulators are increasingly setting expectations and prescribing requirements for the disclosure of climate-related financial information.[14] This has driven increased investor attention to corporate climate-related disclosures and contributed to improved corporate reporting.[15] Alongside regulatory changes and initiatives for increased corporate disclosure, investors are developing methods to identify, measure and disclose climate risk.

Regulatory developments in climate-related disclosure

Corporate climate-related disclosures contribute to well-functioning markets and promote financial stability. The information is central to investors' ability to understand and adequately price climate-related risks and opportunities to inform their investment decisions. Moreover, there is some evidence

7 Hong, H. Weikai Li, F. Xu, J. (2019) Climate risks and market efficiency. Journal of Econometrics Vol. 208, Issue 1, 265-281

8 Painter, M. (2020). An inconvenient cost: The effects of climate change on municipal bonds. Journal of Financial Economics 135(2), 468–482.

9 Bernstein, A., M. Gustafson, and R. Lewis (2019). Disaster on the horizon: The price effect of sea level rise. Journal of Financial Economics 134, 253–272.

10 Giglio, S., M. Maggiori, K. Rao, J. Stroebel, and A. Weber (2021). Climate Change and Long-Run Discount Rates: Evidence from Real Estate. Review of Financial Studies forthcoming, 1–45.

11 Bolton, P. Kacperczyk, M. (2021). Global pricing of carbon-transition risk. NBER Working Papers 28510, National Bureau of Economic Research, Inc.

12 Norges Bank Investment Management (2021). Discussion note: The Asset Pricing Effects of ESG Investing.

13 Norges Bank (2021). Letter to Ministry of Finance: Climate risk in the Government Pension Fund Global.

14 This section describes key regulatory developments related to the disclosure of climate-related financial information. Wider climate policies seeking to address transition and physical risks are not discussed.

15 Ilhan, E. Krueger, P. Sautner, Z. Starks, L. (2021) Climate Risk Disclosure and Institutional Investors. Swiss Finance Institute Research Paper No. 19-66, European Corporate Governance Institute – Finance Working Paper No. 661/2020.

that mandatory disclosure may lead firms to reduce their greenhouse gas emissions.[16,17]

An important initiative to promote more effective corporate climate disclosure to support investment decisions is the TCFD.[1,18] The TCFD encourages disclosure on how companies consider climate change factors in their governance, strategy, risk management, metrics and targets. It has played a pivotal role in promoting more standardised corporate climate disclosure and has led to a series of regulatory developments at a global scale. In 2020, New Zealand became the first country to implement mandatory disclosures by financial institutions in line with the TCFD recommendations.[19] The UK government has announced its intention to make TCFD-aligned disclosures mandatory across the economy by 2025.[20] More recently, the G7 nations reached an agreement to mandate climate reporting in line with the TCFD.[21]

The Sustainability Accounting Standards Board (SASB) and CDP, two standard-setting organisations, have aligned their reporting standards and frameworks with the TCFD recommendations.[22,23] In 2021, the International Financial Reporting Standards (IFRS) Foundation announced its intention to establish a new board for setting international sustainability reporting standards.[24,25]

Regulators and supervisors are also developing standards and policies to support financial institutions' identification and management of climate risks. Adopted in 2015, Article 173 of France's Energy Transition and Green Growth Law introduced mandatory climate-reporting requirements for institutional investors. In 2017, the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) was set up to increase co-operation and to promote best-practice climate risk management in the financial sector.[26] In 2021, the European Union's Sustainable Finance Disclosure Regulation (SFDR) came into force. This imposes disclosure requirements on financial market participants in relation to sustainability risks, the consideration of adverse sustainability impacts in investment processes and the provision of sustainability-related information of financial products.[27]

16 Jouvenot, V. Krueger, P. (2021). Mandatory Corporate Carbon Disclosure: Evidence from a Natural Experiment.

17 Tomar, S. (2021). Greenhouse Gas Disclosure and Emissions Benchmarking. SMU Cox School of Business Research Paper No. 19-17.

18 NBIM publicly supported the TCFD recommendations in 2017.

19 New Zealand Ministry for the Environment (2020). Mandatory climate-related financial disclosures. Available at https://environment.govt.nz/

20 HM Treasury (2020). UK joint regulator and government TCFD Taskforce: Interim Report and Roadmap.

21 G7 Summit (2021). G7 Finance Ministers and Central Bank Governors Communiqué.

22 SASB (2020). Why Companies Use SASB Standards. Available at https://www.sasb.org/company-use/

23 CDP (2021). Environmental transparency and accountability. Available at https://www.cdp.net/

24 IFRS Foundation (2021), Sustainability reporting. Available at https://www.ifrs.org/projects/work-plan/sustainability-reporting/

25 NBIM supports this IFRS' initiative.

26 Norges Bank is a member of the NGFS.

27 Regulation (EU) 2019/2088 of the European Parliament and of the Council on sustainability- related disclosures in the financial services sector.

Emerging methods for climate risk assessment

Understanding the potential impact of climate-related risks and opportunities on the value of investment portfolios across sectors, asset classes and timeframes is a complex exercise. The lack of high-quality data remains a key challenge in assessing climate exposures. Despite increased regulatory efforts and investor interest in companies' climate disclosures, comprehensive reporting is not yet the norm across most sectors and geographies. According to the TCFD's 2020 Status Report, only 42 percent of companies with a market capitalisation greater than 10 billion dollars disclosed some information in line with the TCFD recommendations.[28] Moreover, asset-specific data and forward-looking metrics are not widely reported.

Climate scenario analysis is an emerging tool used by investors. Climate models integrate climate science and economic data to provide quantitative projections of possible future scenarios. Some third-party models allow users to assess transition and/or physical risks under specific assumptions. They can contribute to a better understanding of climate risk in the longer term but cannot be taken as a prediction of the future. Although various climate scenario tools are available on the market, their underlying frameworks and methodologies differ, reducing comparability. Limitations of these models include that they often do not consider companies' plans or actions to reduce emissions, or that they only consider one harmonised global carbon price. There are also questions about the quality of physical risk data; for example, as global climate models are downscaled to provide sub-regional information.[29] In addition, transition and physical climate risks present interdependencies, which are challenging to model; for example, a delay in the adoption of climate policies could result in increased physical risks. We provide a more comprehensive description of the use of climate scenario models by investors in a separate Asset Manager Perspective.[30]

Investors are also exploring alternative approaches to analysing their climate-related exposures. Efforts to benchmark companies on their corporate climate action include the tool from the Transition Pathway Initiative (TPI). TPI provides information on companies' carbon management practices and carbon performance metrics. TPI finds that most companies have basic carbon management practices but are not taking a robust strategic approach to addressing climate change. Their modelling shows that only 15 percent of companies' emissions trajectories are aligned with a well-below 2-degrees Celsius benchmark by 2050.[31]

28 Task Force on Climate-related Financial Disclosures (2020). 2020 Status Report.

29 Fiedler, T. Pitman, A.J. Mackenzie, K. (2021). Business risk and the emergence of climate analytics. Nat. Clim. Chang. 11, 87–94.

30 Norges Bank Investment Management. (2021). Asset Manager Perspective: Climate Change as a Financial Risk to the Fund.

31 Transition Pathway Initiative (2021). State of Transition Report 2021.

Tools and strategies to address climate risks and opportunities

Building on more information and emerging assessments of climate-related risks, some investors are collaborating to establish common principles and standards, engaging with companies to promote long-term value creation and adjusting their portfolios and investment decisions. Investors have different objectives, mandates and characteristics. These will influence the tools and strategies investors can adopt to manage climate-related risks. An important concern of investors is the lack of information on companies' climate-related exposures and potential financial impacts. This is particularly relevant for highly diversified institutional investors whose returns reflect broad market developments. In Appendix 1, we present a non-exhaustive list of investor climate initiatives and industry groups.

Setting standards and active ownership

An effective tool to promote consistency and improve market practices is to contribute to the development of regulatory standards. Investors are collaborating to develop common principles or expectations of how companies should address and report on climate change matters. This helps to communicate a consistent message to companies. For example, investors are working with standard-setting institutions such as CDP and SASB on more effective climate reporting. The Institutional Investor Group on Climate Change (IIGCC), Ceres and the Principles for Responsible Investment (PRI) have published investor expectations on various topics, including on corporate climate lobbying and deforestation.[32] Investors may also work with policymakers at various levels; for example, to influence mandatory corporate sustainability reporting requirements or climate policy.

Active ownership is another strategy employed by investors to influence companies' behaviour and promote sustainable business practices. Climate Action 100+ is an example of an initiative where investors engage with large emitters to ensure they take necessary action on climate change.[33] Research shows that institutional investors can positively influence the climate disclosures of companies.[34] Many investors take a collaborative approach to their ownership efforts. This can take various forms; for example, investors can co-file shareholder proposals, write joint public letters and conduct joint engagements with companies.

Investments

The use of climate benchmarks is another tool that is gaining momentum amongst some investors. Driven by investor demand, index providers and credit rating agencies are expanding their climate data offering. Climate-related criteria are introduced to construct climate benchmarks. Investors may move to a climate benchmark if they believe that climate risk is mispriced and that this mispricing will be corrected, generating excess

32 Institutional Investor Group on Climate Change (2018). Investor expectations on corporate lobbying.

33 Climate Action 100+ (2020). How we work. Available at https://www.climateaction100.org/

34 Ilhan, E. Krueger, P. Sautner, Z. Starks, L. (2021) Climate Risk Disclosure and Institutional Investors. Swiss Finance Institute Research Paper No. 19-66, European Corporate Governance Institute – Finance Working Paper No. 661/20208.

returns. They may also use a climate benchmark to meet a climate objective. The lack of standardised practices and transparency in methodologies to construct climate indices poses a challenge to investors. Climate benchmarks are less representative of the global equity market and less diversified.[35] They may also exclude companies or sectors that currently fail to meet specific climate-related criteria, but that could play an important role in the climate transition. Investors' ability and motivation to use a climate benchmark will be dependent on their mandate and other characteristics. The EU Low-Carbon Benchmark Regulation aims to improve transparency and comparability between the benchmarks by laying down minimum requirements for the labelling of such benchmarks.[36]

Another strategy followed by some investors to reduce climate-related risks is to divest from certain companies, either from specific sectors or from companies or assets that present elevated risks. Investors may also choose to divest from the highest emitters at a sector or portfolio level, or from companies whose climate plans are not aligned with the goals of the Paris Agreement. Investors' motivation for conducting divestments may vary; for example, the motivation could be financial, normative or related to a climate objective. Research indicates that investors tend to divest from the most emissions-intensive companies within the oil and gas, utilities and automotive industries.[37] This strategy may not capture the climate risks that companies could be exposed to through their value chains. It can also limit investors' ability to invest in companies transitioning from fossil-intensive to lower-carbon business models. Overall, institutional investors tend to prefer engagement over divestment as a tool to address climate risk.[38]

Metrics and targets

Investors can measure and communicate information about their climate-related exposures, risk management and investment processes. Forward-looking climate-related metrics and methods for investors to set targets and assess progress are emerging. The Global Carbon Accounting Standard (GCAS), launched in November 2020, was developed by the Partnership for Carbon Accounting Financials (PCAF) to measure financed emissions, one of the metrics recommended by the TCFD.[39] Figure 1 illustrates various metrics that financial institutions can disclose related to their climate exposure, ownership activities and investment processes. Some of these metrics, such as portfolio value-at-risk or implied temperature rise, rely on extensive modelling assumptions and are therefore uncertain.

35 We explore this question in more detail in our recent letter to the Ministry of Finance (July 2021). Our view is that we should not replace the fund's broad, global equity index with a climate-adjusted index.

36 Regulation EU 2019/2089 of the European parliament and of the council of 27 November 2019 amending Regulation (EU) 2016/1011 as regards EU Climate Transition Benchmarks, EU Paris-aligned Benchmarks and sustainability-related disclosures for benchmarks.

37 Bolton, P. Kacperczyk, M. (2021). Do investors care about climate risk. Journal of Financial Economics.

38 Kreuger, P. Sautner, Z. Starks, L. (2020). The importance of climate risks for institutional investors. The Review of Financial Studies, Volume 33, Issue 3, Pg. 1067–1111.

39 Partnership for Carbon Accounting Financials (2020). Global Carbon Accounting Standard.

Figure 1. Examples of climate-related metrics relevant for investors

Climate-related exposure	Ownership	Investments
• Portfolio carbon footprint and intensity • Exposure to low-carbon solutions / green assets • Exposure to carbon-related assets • Percentage of assets in companies that have set Paris-aligned targets • Portfolio climate value-at-risk • Portfolio implied temperature rise	• Voting decisions on climate-related shareholder proposals disclosed • Number of companies subject to engagements on climate change • Percentage of owned emissions that are subject to assessments and engagements	• Number of companies subject to climate-related divestments • Return of low-carbon investments and climate-related divestments • Shadow carbon price used in investment cases

To support their climate ambitions, investors can define actions and set targets related to their standard-setting efforts, ownership activities and investments. An increasing number of financial institutions are making high-level commitments to align their investment portfolios with the goals of the Paris Agreement. Examples of investor initiatives with this climate objective include the United Nations-convened Net-Zero Asset Owners Alliance, the Net Zero Asset Managers Initiative and the Paris Aligned Investment Initiative launched by the IIGCC, Ceres, AIGCC and IGCC.

NBIM's perspective on climate risks and opportunities

NBIM's mission is to safeguard and build financial wealth for future generations. Our objective is to generate the highest possible return within the framework of the mandate set by the Ministry of Finance.[40] The mandate includes requirements on responsible investment. We address climate risk within the general framework of the mandate. The fund's mandate enables us to invest in public equities, fixed income, real estate and unlisted renewable energy infrastructure. The GPFG's exposure to climate risk is derived from the climate-related risks our companies and assets are exposed to. The Ministry of Finance is conducting a broader assessment of the importance of climate-related risks and opportunities for the fund.[41]

The Norwegian Ministry of Finance sets our benchmark index based on indices from FTSE Russell and Bloomberg Barclays.[40] The composition of NBIM's benchmark differs somewhat from a broad market index. For example, we have regional distribution adjustment factors. In addition, the coal companies excluded under the guidelines for observation and exclusion[42] are also removed from the fund's benchmark index. More recently, upstream oil and gas companies were excluded from the fund's benchmark and investment universe. This follows the Ministry of Finance's decision to omit this sector to reduce the total oil price risk for the Norwegian

40 Norwegian Ministry of Finance (2019). Management mandate for the Government Pension Fund Global.

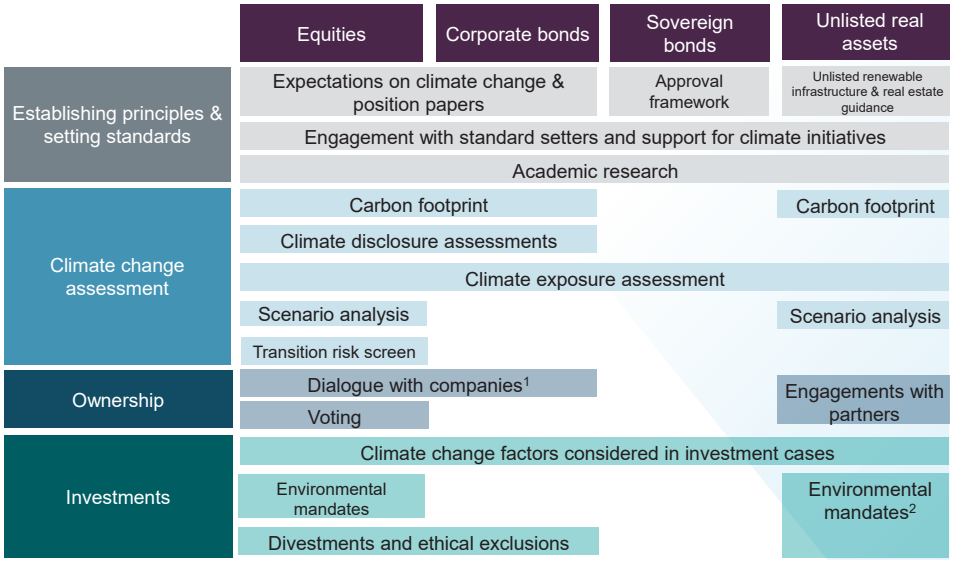
41 The findings of this review are expected to be presented in the white paper on the GPFG in 2022.

42 Norwegian Ministry of Finance. (2019). Guidelines for observation and exclusion from the Government Pension Fund Global.

economy.[43] these factors mean that our starting point is a benchmark that has a significantly lower carbon footprint than the investable universe it is based on.

Our climate strategy has evolved over the last 15 years. We have established responsible investment principles to guide this work. Our approach to addressing climate change across the asset classes we invest in is illustrated in Figure 2. We utilise most of the tools available to investors to mitigate financial climate risk and promote sustainable value creation. These are described in the following sections.

Figure 2. NBIM tools to address climate change



[1] *Includes thematic dialogues, follow-up of risk incidents, disclosure assessments and ad-hoc company interaction*
[2] *Renewable infrastructure*

We disclose climate information for the fund in our regular reporting.[44] This includes some of the climate metrics recommended by the TCFD, such as the carbon footprint of our portfolio. We also report metrics related to our company dialogues, outcomes of our assessments of investee companies' climate disclosures, as well as the number of companies subject to climate-related divestments and ethical exclusions. In addition, we report the return on environmental investments and the return impact of exclusions and divestments.

Establishing principles

As a globally diversified investor, we have an interest in an orderly climate transition in line with the goals of the Paris Agreement. Modelling from the International Institute for Applied Systems Analysis (IIASA) using NGFS scenarios shows the benefits of acting early and having an orderly climate transition. For example, under an orderly transition scenario, the cumulative

43 Norwegian Ministry of Finance (2019). Decision on the definition of upstream oil and gas companies in the GPFG.

44 Norges Bank Investment Management (2021). Responsible investment 2020.

GDP impact by the end of the century is estimated to be a 4 percent loss. However, a disorderly transition could result in more than double the losses.[45]

An important way we can contribute to the climate transition is through standard setting. This helps to address macroeconomic risks related to climate change with the potential to influence global economic growth. We do not engage with policymakers to influence the development of climate policy. However, we support and promote well-functioning carbon markets. We believe this to be in our interest as an investor. For example, pricing carbon is one of the most effective and lowest-cost means of achieving emissions reductions and reaching global climate ambitions.[46]

We support the development of standards that improve climate disclosures. In 2020, we published our perspective on corporate sustainability reporting.[47] We highlight the need for improved corporate disclosures and further standardisation to obtain financially material climate-related information that is comparable. We welcome climate reporting in line with the TCFD recommendations. As a starting point, we encourage companies to consider SASB metrics and base broader disclosures on the Global Reporting Initiative (GRI) standards. We believe boards are responsible for such disclosures.

We value collaboration with other investors to exchange views and develop a common understanding of shared challenges and explore opportunities to address these. As shown in Table 2 in the Appendix, we participate in various investor groups to promote common standards and principles, as well as to further the integration of climate considerations into investment processes. For example, we are members of SASB's Investor Advisory Group and the TPI. However, there are some initiatives whose objectives go beyond our remit; for example, those that seek to influence climate regulation more broadly or that require investors to set specific climate objectives for their portfolios. We discuss these initiatives and some of their implications in more detail in a recent letter to the Ministry of Finance.[13,48]

Expectations

Public expectations of companies allow us to reach them at scale and enable us to be a principled and predictable shareholder. In 2009, we established our first expectations on climate change. Our starting point is that boards should have oversight of the climate-related risks and opportunities faced by their companies and account for associated outcomes. Our expectations have evolved over time to reflect changes in market practices; for example, to incorporate the recommendations of the TCFD. We expect companies to report on their climate-related exposures and risk management processes. We also expect them to carry out climate scenario analysis to understand how their long-term profitability and resilience could be impacted.

45 Network for Greening the Financial System (2020). NGFS Climate Scenarios for central banks and supervisors.

46 The World Bank (2021). Pricing Carbon. Available at https://www.worldbank.org/en/programs/pricing-carbon.

47 Norges Bank Investment Management. (2020). Corporate Sustainability Reporting, Asset Management Perspective.

48 One implication is that a target related to the greenhouse gas emissions of the portfolio would have to draw on our limit for relative volatility. This deviation from the index would not necessarily improve the fund's return and risk characteristics.

Companies should factor climate change implications into their investment planning. In line with global climate ambitions, we expect companies to disclose climate plans that take into account the goals of the Paris Agreement.

Deforestation and land use change are topics addressed in our climate expectations. We have also set expectations of companies related to how they should manage and account for other environmental issues, such as water management and ocean sustainability.[49] These are relevant for managing climate risks. To date, the effects of climate change have been primarily water-related; for example, through extreme weather events and changes in water cycle patterns. The ocean plays a fundamental role in regulating the climate, as it acts as a heat and carbon sink. At the same time, the effects of climate change are affecting the health of the ocean through acidification and temperature changes.

Our guidance documents for the responsible management of real assets serve as a starting point for our interaction with investment partners and asset managers that we co-invest or contract with.[50,51] We expect our partners to integrate environmental considerations into their policies and to address material environmental issues across the life cycle of assets.

Academic research

There are still many unknowns about the implications of climate change for financial markets. Since 2015, we have supported a number of financial economics research projects in this area to contribute to more efficient market practices. Through these projects, more researchers are studying the potential asset pricing consequences of climate change. As an example, a research grant to Columbia University under the supervision of Professor Harrison Hong resulted in a special issue of the Review of Financial Studies dedicated to climate finance.[52] Some of the topics addressed include investor beliefs regarding climate change risk and capital market efficiency, climate hedging, pricing and governance implications.

Assessing climate-related exposures

We use various methods to assess climate risk exposures across different asset classes. While various third-party climate scenario tools are available, we are also developing internal tools to conduct portfolio climate scenario analyses to better understand the implications of climate risk for our investments.[53]

49 Norges Bank Investment Management (2021). Expectations on Water Management and Oceans Sustainability.

50 Norges Bank Investment Management. (2021). Responsible management of unlisted real estate.

51 Norges Bank Investment Management. (2021). Responsible management of renewable energy infrastructure.

52 Hong, H. Karolyi A. Scheinkman, J. (2020) Climate Finance. The Review of Financial Studies. Vol. 33, Issue 3. Pages 1011–1023.

53 Our separate Asset Manager Perspective gives a more detailed description of our climate risk work. See Norges Bank Investment Management. (2021). Asset Manager Perspective: Climate Change as a Financial Risk to the Fund.

Climate risk analysis

We use climate data to inform our ownership and investment activities and to monitor our portfolio's climate risk exposure. An important step in identifying exposure to climate transition risk is to estimate the carbon footprint of our portfolio. This can serve as a starting point to identify the most significant sources of greenhouse gas emissions and to understand how these vary across companies and sectors. We measure and report the Scope 1 and 2 emissions of our equity and corporate bond portfolios following the TCFD guidance.[54] Based on our estimates, the fund's carbon footprint in 2020 was 12 percent lower than the benchmark's.[55] We also analyse Scope 3 emissions to gather additional insights into sectors that could be indirectly exposed to climate risk through their value chains. However, the carbon footprint of the portfolio provides an incomplete picture of climate transition exposure.[56] We complement our analysis with additional data points, including information about companies' climate management practices, targets, exposure to regulatory risks, deforestation risk, revenues from low-carbon activities or operations, and risk incidents.

We also include environmental factors in our framework for analysing the investment risk and operational risk associated with sovereign bond issuers; for example, their exposure to climate change and carbon intensity from energy consumption. Moreover, assessment of climate risk is important in the due diligence process for our unlisted real estate portfolio. We consider factors related to a property's location and its environmental impact that could expose the fund to physical or transition risks. For example, we assess risks related to extreme weather events and flooding prior to investment. We estimate that around 4 percent of the value of the unlisted real estate portfolio is in locations that have experienced flooding at least once in the last century. Furthermore, local regulators in the cities we invest in have enacted legislation with ambitious emissions reduction requirements. These represent credible long-term market signals and trends that we expect to accelerate in the coming years. Therefore, we assess potential regulatory risks as part of our due diligence; for example, related to building energy efficiency and emissions performance requirements.

Climate disclosure assessments

We monitor our equity portfolio to identify companies with transition risk exposure that lack robust climate management practices. We assess portfolio companies' climate disclosures on an annual basis to understand how they are managing climate-related risks and opportunities. Our starting point for these assessments is our expectation document on climate change. Based on our proprietary model, we track more than 30 indicators across the four pillars of the TCFD framework. We began conducting the assessments in 2010 and have since expanded the coverage and depth of our analysis. In 2020, we assessed over 1,500 companies across 19 sectors. As shown in

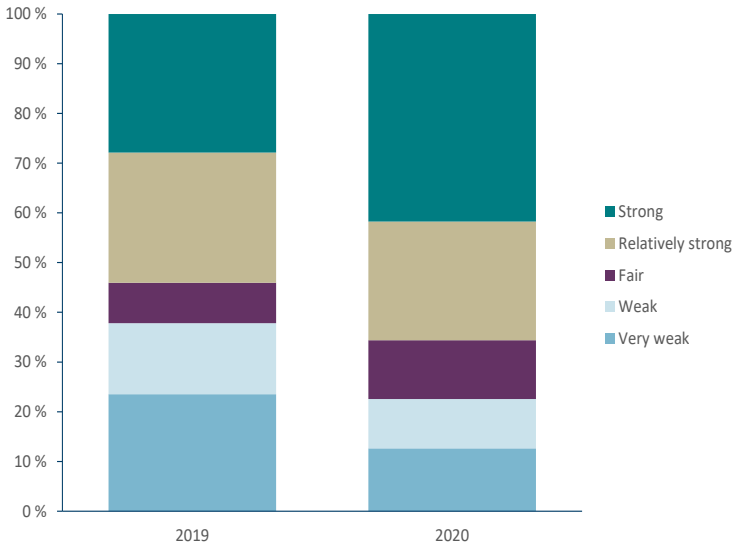
54 As defined by the GHG Protocol Corporate Standard, Scope 1 emissions are direct emissions from owned or controlled resources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in Scope 2) that occur in the value chain.

55 Absolute (owned) emissions of carbon dioxide equivalents.

56 The limitations include the backward-looking nature of the data, lack of data availability and reliance on estimates, exclusion of some sources of emissions from companies' value chains and market price fluctuations.

Figure 3, we have seen a significant improvement in companies' reporting in recent years; however, there is still variation in the quality of disclosure between companies, sectors and markets. We provide more information about these assessments in our annual reporting. There continues to be a need for more consistent and standardised reporting enabling comparisons across markets and over time.

Figure 3. Distribution of companies' climate change disclosures assessed by NBIM



Exercising ownership

Our climate data helps inform and prioritise our ownership activities. Given our investment objective and mandate, we are invested in thousands of companies that are exposed to climate change risks and opportunities to various degrees. Active ownership is therefore a key tool for us to mitigate financial risk and promote value creation through the climate transition. Ultimately, we seek to ensure that company boards account for material climate-related issues.

Company dialogues

We engage with companies to gain a deeper understanding of their approach to climate change, communicate our expectations and encourage them to strengthen their climate-related strategies and disclosures. We initiated our first climate engagements in 2006 on the topic of corporate climate lobbying. In recent years, this topic has moved higher up investors' agenda. In 2020, we raised climate-related issues in 536 company meetings, representing 26 percent of our equity portfolio by value and about 50 percent of our portfolio carbon footprint. In addition to promoting our expectations, these dialogues are useful for our investment analysis, as we gain additional insights to help identify companies that are likely to succeed in the climate transition and those which are more exposed to climate risks.

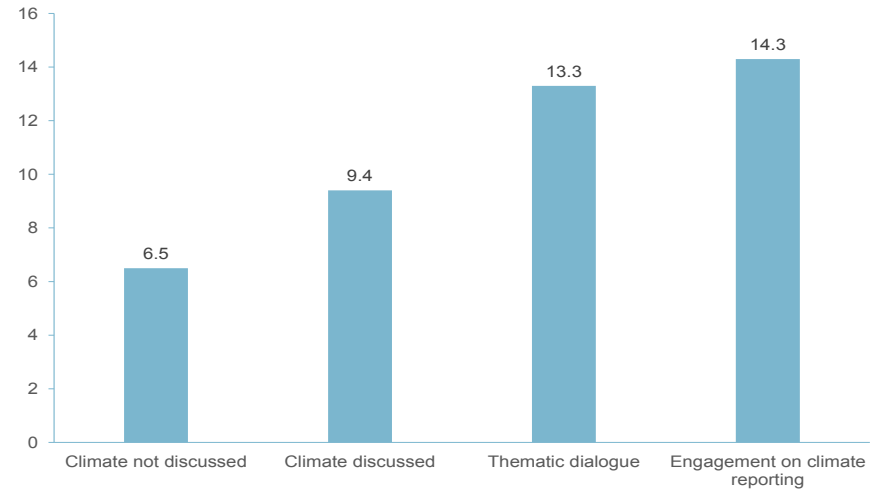
Alongside our regular dialogue with companies, we also conduct so-called thematic engagements with companies in a specific sector or value chain on topics we believe to be particularly relevant to their long-term value creation. Companies are prioritised by exposure and materiality. For example, we

engage with companies with emissions-intensive operations or value chains (e.g. basic materials, heavy industry, oil and gas, power utilities, consumer goods, automotive), as these present a source of inherent climate risk for the fund. We also engage with companies in sectors that are indirectly exposed to the effects of climate change, such as banks and insurance. We define company-specific objectives and key performance indicators to track progress and engagement outcomes.

Over time, our ambition is that companies move in the direction of our expectations. For example, we ask companies to disclose a plan to address climate risks and opportunities. These plans are important for us to understand how companies are positioning themselves through the climate transition. Boards should approve and oversee the implementation of their companies' plans. A robust plan describes the company's climate strategy and establishes short-, medium- and long-term emissions reduction targets that take into account the goals of the Paris Agreement, as well as other metrics and actions in support of the company's climate ambitions. Performance against climate targets and other metrics should be disclosed annually.

As shown in Figure 4, we saw better reporting in 2020 from companies we engaged with throughout 2019 than from companies we did not engage with. The largest improvement was from companies we engaged with due to their weak climate disclosures, followed by those that were part of climate-related thematic dialogues. We have also seen more direct improvements in companies' climate management practices; for example, five of the 12 cement companies we engaged with have now established science-based targets. However, we recognise there are many factors that may influence company practices, and that it is challenging to attribute changes to the dialogues we initiate.

Figure 4. Average change in climate change score in 2020 vs 2019



We exercise our ownership according to our mandate and the fund's characteristics. Our objective is to safeguard our long-term financial interests. Whilst we do not typically engage in collective investor engagements, we work with companies and peers in a collective manner

through our industry initiatives. The aims are to address a common challenge faced by the industry, promote knowledge sharing and identify practical solutions. These may take the form of workshops organised in collaboration with industry experts or other thought-leading organisations. Examples of recent thematic dialogues and industry initiatives are summarised in Table 1.

Table 1. Examples of climate change engagements and initiatives

Topic	Type of engagement	Objectives	Key questions
Low-carbon transition in the steel and cement industries	Thematic dialogue	Identify risks and opportunities in the low-carbon transition and companies' plans to address these	• How do companies' climate plans relate to the goals of the Paris Agreement? • How will companies succeed in the transition?
Sustainable automotive supply chains	Thematic dialogue	Understand plans to capture opportunities in the low-carbon transition whilst ensuring the sustainable sourcing of materials	• What is the strategy for low-emission vehicles? • How do companies ensure the responsible sourcing of critical materials such as cobalt?
Banks' financing of emissions-intensive industries	Thematic dialogue	Assess risks associated with financing emissions-intensive activities	• How are banks addressing climate risk in their loan and financing portfolios?
UNEP FI TCFD investor pilot project	Industry initiative	Collaborate with investors to develop scenario models for reporting in line with the TCFD recommendations	• What tools can investors use to conduct climate scenario analysis? • What are the limitations of existing models?

Exercising our voting rights

When company boards do not have oversight of the risks and opportunities that climate change presents to their business, it may limit our ability to engage and influence companies. In such scenarios, we may choose to use other tools such as voting or divestment. Shareholder voting allows us to hold boards accountable and influence companies. NBIM's voting guidelines outline our overarching principles and policies for voting at company meetings, including on climate-related shareholder proposals. In 2020, we published our perspective on voting on sustainability shareholder proposals.[57] We now publish all our votes online in advance of company meetings, and we provide the rationale when we vote against management.

Our voting decisions are anchored in our expectations on climate change, amongst other factors. We support climate-related shareholder proposals if they address a material issue that the company does not appear to be managing adequately, and if the proposal does not place an undue burden on the company or seek to micro-manage its strategy and operations. In 1H 2021, we voted in favour of 38 percent of climate-related shareholder proposals. We may also vote against board members in cases where we believe they have failed to adequately manage our interest as a shareholder, which could include material failures in the oversight, management or disclosure of climate-related risks. In this same period, we voted against the election of a board member at six companies.

57 Norges Bank Investment Management (2020) Asset Manager Perspective: Shareholder proposals on sustainability.

Investing sustainably

Climate change considerations are factored into our investment process through active management, our environmental-related mandates, risk-based divestments and ethical exclusions.

Integration in investment analysis

Our equity strategies portfolio managers have tailored sector mandates and invest mainly in large companies listed in developed markets. In addition to economic factors, portfolio managers investing in sectors exposed to climate change risks and opportunities systematically consider climate-related factors in their investment decisions. Our portfolio managers have in-depth knowledge of their companies and sectors. Their knowledge also informs the fund's ownership activities; for example, in the design and delivery of our thematic dialogues, industry initiatives and voting decisions.

Guided by our expectations on climate change, portfolio managers discuss with companies their strategies and processes to manage climate-related risks and opportunities. Thematic dialogues are conducted jointly by the ownership team and portfolio managers. This means that information feeds into investment decisions, and that dialogue is centred on financially material questions. Given the relevance of climate change to their respective sectors, there is close collaboration between portfolio managers covering basic industries and autos, energy, banks and insurance, industrials and consumer goods and the ownership team.

Our fixed-income portfolio managers invest in government and corporate bonds, including green bonds, mainly from developed-market issuers. We engage and influence a significant share of corporate bond issuers through our company dialogues and voting decisions. The characteristics of fixed-income securities mean that climate change can have different implications for these assets than for equities; for example, due to factors such as their time horizon, sensitivity to market sentiment and order of payment in the event of bankruptcy. We also consider climate factors in the assessment of investment risk associated with sovereign bond issuers. We primarily lend to governments in developed economies. These countries are considered to be the most resilient to climate change.[58]

We also rely on external managers to handle a small share of the fund's investments. The mandates typically cover investments in emerging markets and small-capitalisation companies in developed markets. External managers have in-depth knowledge of local markets, regulation and the companies they invest in. This knowledge is valuable when analysing climate-related risks and opportunities.

Environment-related investment mandates

We seek to capture climate change opportunities by investing in companies that develop technologies supporting the low-carbon transition. We have dedicated environmental investments in listed companies delivering environmental solutions and in unlisted renewable energy infrastructure.

58 Notre Dame University (2021). Notre Dame Global Adaptation Initiative Country Index. Available at https://gain.nd.edu/our-work/country-index/

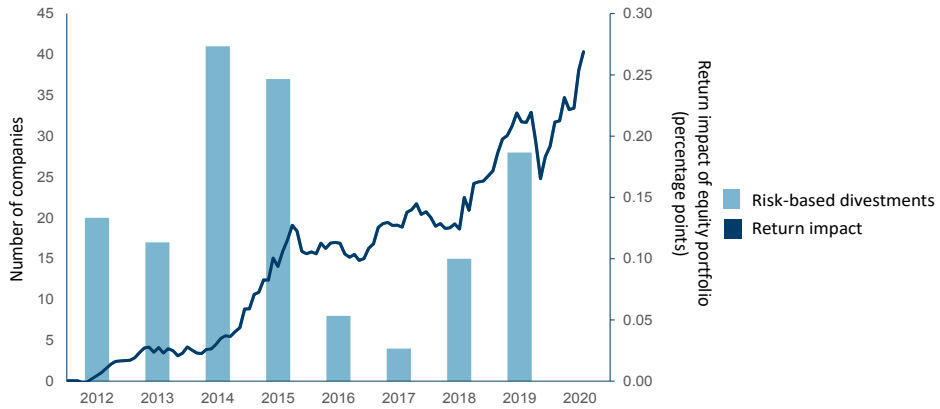
The management mandate requires us to invest between 30 and 120 billion kroner in dedicated environment-related mandates. At the end of 2020, we had 100 billion kroner invested in equities in 90 companies. The annualised return on the equity investments since inception in 2010 has been 9.5 percent. The fund is exploring opportunities in renewable energy infrastructure projects, focused on wind and solar power generation. In 2021, we made our first investment and acquired a 50 percent interest in the Borssele 1 & 2 offshore wind farm located in the Netherlands, the second-largest operational offshore wind farm in the world.

In addition to the dedicated allocation in the environmental mandates, our wider portfolio also has a meaningful exposure to companies that are supporting or contributing to the climate transition. At the end of 2020, around 9 percent of the equity portfolio was invested in stocks classified as environmental.[59]

Risk-based divestments

Following our risk assessments, we may divest from companies we believe to pose heightened financial climate risk. Divestment as a form of risk management is primarily used for relatively small investments where other actions are not suitable. Divestments are active investment decisions that result in deviations from the benchmark index. As illustrated in Figure 5, we have divested from 170 companies due to climate-related risks since 2012. We divested from many coal companies for financial reasons prior to this being an ethical exclusion criterion for the fund. Risk-based divestments linked to climate change have increased the cumulative return on the equity portfolio by 0.27 percentage points. When we divest from a company, we reinvest the capital received in the market of the company we divested from. The capital is allocated to the individual companies within that market on a pro-rata basis by market capitalisation. When the divested company underperforms or outperforms the local market return, this results in a relative gain or loss respectively.

Figure 5. Climate-related risk-based divestments from the GPFG



59 Either through the environment-related mandates or in companies included in FTSE Russell's broad environmental index (FTSE EO).

Ethical exclusions

Although the motivation is ethical rather than financial, our exposure to climate transition risk has been further reduced by the 77 climate-related ethical exclusions that have been made according to the guidelines for observation and exclusion of companies. The two climate-specific ethical exclusion criteria are the product-based coal criterion[60] and the conduct-based climate criterion. According to the latter, companies may be excluded for unacceptable levels of greenhouse gas emissions.

Real estate

We consider climate-related factors in the ongoing management of our properties. In cases where we invest with partners or have a third party managing our assets, we discuss our responsible investment approach prior to forming a partnership, to ensure alignment of interests and commitment. At a portfolio level, we manage our properties in an environmentally sustainable manner. We pursue green building certificates and track energy usage. We also incorporate measurable sustainability practices into annual business plans, construction and renovation projects. At the end of 2020, 82 percent of the buildings in our unlisted real estate portfolio had a green building certification.[61]

Conclusion

The magnitude and timing of the macroeconomic consequences of climate change are uncertain. Investors are making concerted efforts to improve their understanding and management of climate risk and opportunities. They are collaborating to establish common principles and standards, engaging with companies to promote long-term value creation and adjusting their portfolios and investment decisions.

Our mission is to safeguard and build financial wealth for future generations. Our approach to managing climate risk has evolved since our work began in 2006. The tools we use are tailored to our mandate and the risk to which our investments are exposed to. Through our contributions to standard setting, clear expectations and active ownership, we seek to ensure that the companies in our portfolio are well equipped for the low-carbon transition.

Over the last decade we have scaled up our risk assessments and dialogues with companies, in both depth and breadth. We have reduced our exposure to climate risk through our 170 climate-related divestments, and 77 ethical exclusions in line with guidelines set by the Ministry of Finance. In 2020, we estimate the fund's carbon footprint was 12 percent lower than the

60 The fund should not invest in mining companies that derive 30 percent or more of their revenue from the extraction of thermal coal, and power companies that derive 30 percent or more of their operations from thermal coal. Absolute thresholds for thermal coal mining and power generation capacity have also been set at 20 million tonnes of thermal coal per year and 10,000 MW, respectively.

61 Buildings with a lettable area of more than 2,000 square metres. Green building certification involves an independent third party assessing a property against a set of criteria, such as energy and water consumption, use of renewable energy, and proximity to public transport.

benchmark's.[62] In the past two years, we have engaged with companies that represent about 50 percent of our carbon footprint.

We will continue to develop our climate risk strategy within our financial objective as defined in our mandate. To inform our ownership and investment activities, we will increase our efforts to promote more meaningful, consistent and comparable climate-related reporting from companies. We will engage with priority companies in sensitive sectors that have not yet articulated their climate plans in line with our expectations. We will encourage the establishment of plans that incorporate the TCFD recommendations and promote the adoption of science-based emissions reduction targets as methodologies emerge. To help improve accountability and reduce climate risks for the fund, we will exercise our voting rights and may vote against company boards that fall significantly short of our expectations or are unresponsive to our engagements.

62 Absolute (owned) emissions of carbon dioxide equivalents.

Appendix I

Table 2. Examples of climate-related investor groups and initiatives

Organisation / Initiative	Description	Relevant activities
Principles for Responsible Investment (PRI)[63]	Network of investors working to promote sustainable investment through the incorporation of ESG factors	• Launch or support initiatives on climate action, including Climate Action 100+ and Net Zero Asset Owner Alliance • Promote climate scenario analysis and climate reporting
Task Force on Climate-related Financial Disclosures (TCFD)[2]	Industry-led initiative established by the Financial Stability Board to improve and increase reporting of climate-related financial information	• Develop recommendations for more effective climate-related disclosures to promote more informed investment decisions and to better understand the financial system's exposures to climate-related risk
UNEP Finance Initiative (UNEP FI)[64]	Partnership to mobilise private-sector finance for sustainable development	• Capacity building and sharing best practices in sustainable finance
Institutional Investor Group on Climate Change (IIGCC)[65,66]	European membership body for investor collaboration on climate change	• Work with business, policy makers and investors to help define the investment practices, policies and corporate behaviours required to address climate change • Launch of Paris Aligned Investment Initiative and Net Zero Investment Framework
Value Reporting Foundation / SASB Standards[20]	Non-profit organisation seeking to develop sustainability accounting standards that help public companies disclose material, decision-useful information to investors	• Develop and maintain sustainability standards • Collaborate with other standard setters
Transition Pathway Initiative (TPI)[67]	Asset owner initiative to assess companies' preparedness for the low-carbon transition	• Research and data on companies' carbon performance and carbon management practices
Global Real Estate Sustainability Benchmark (GRESB)[68]	Investor-led organisation seeking to assess and benchmark the ESG performance of real assets	• Develop real estate and infrastructure ESG benchmarks • Portfolio analytical tools

63 Principles for Responsible Investment (2020). About the PRI. Available at https://www.unpri.org/

64 UNEP Finance Initiative (2020). About UNEP Finance Initiative. Available at https://www.unepfi.org/

65 Institutional Investor Group on Climate Change (2020). Available at https://www.iigcc.org/

66 Similar bodies have been set-up in other regions like Asia (the Asia Investor Group on Climate Change - AIGCC), Australia and New Zealand (Investor Group on Climate Change - IGCC)

67 Transition Pathway Initiative (2020). Overview of the TPI. Available at https://www.transitionpathwayinitiative.org/overview

68 Global Real Estate Sustainability Benchmark (2021). Available at https://gresb.com/about/#do