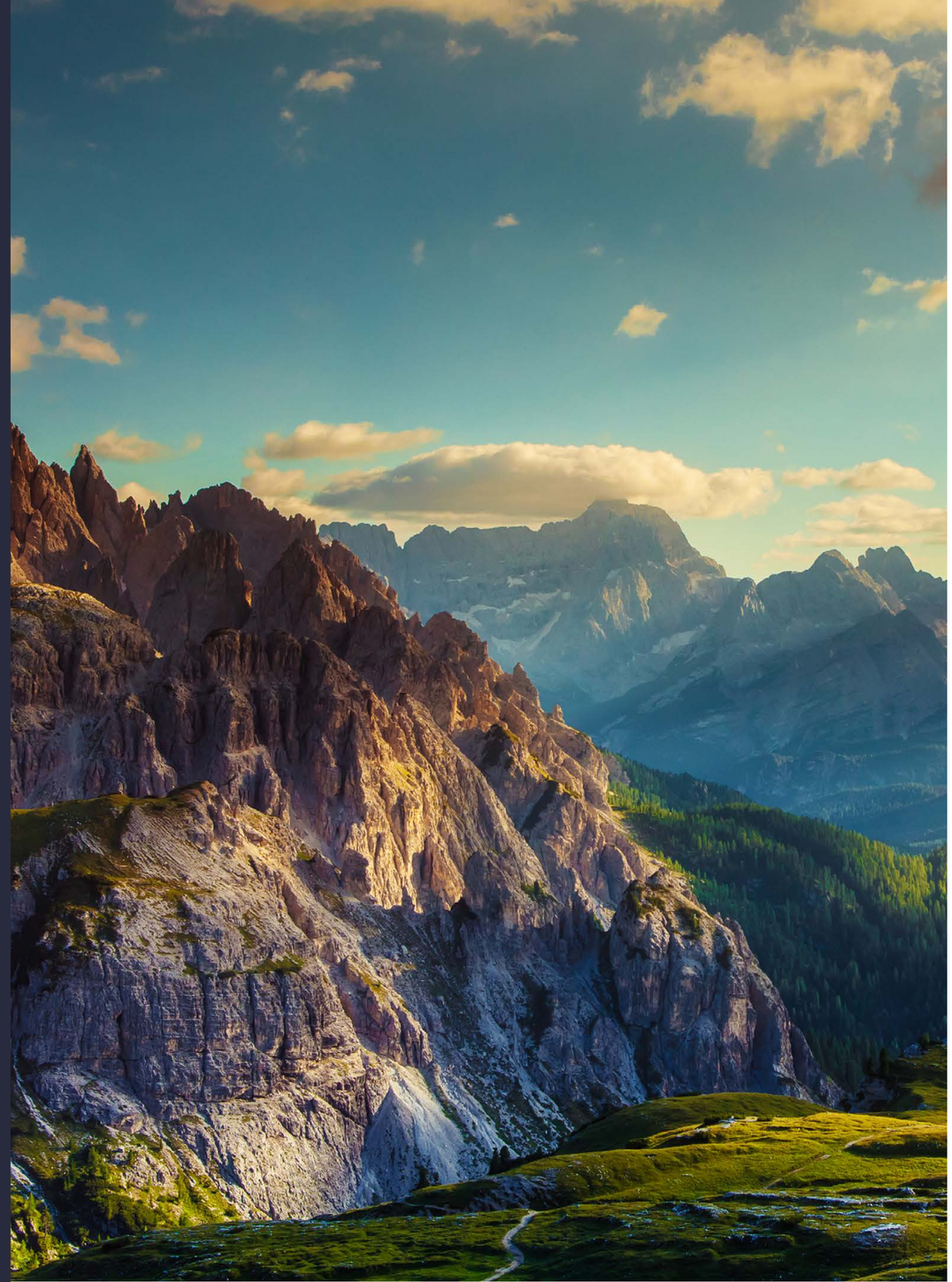
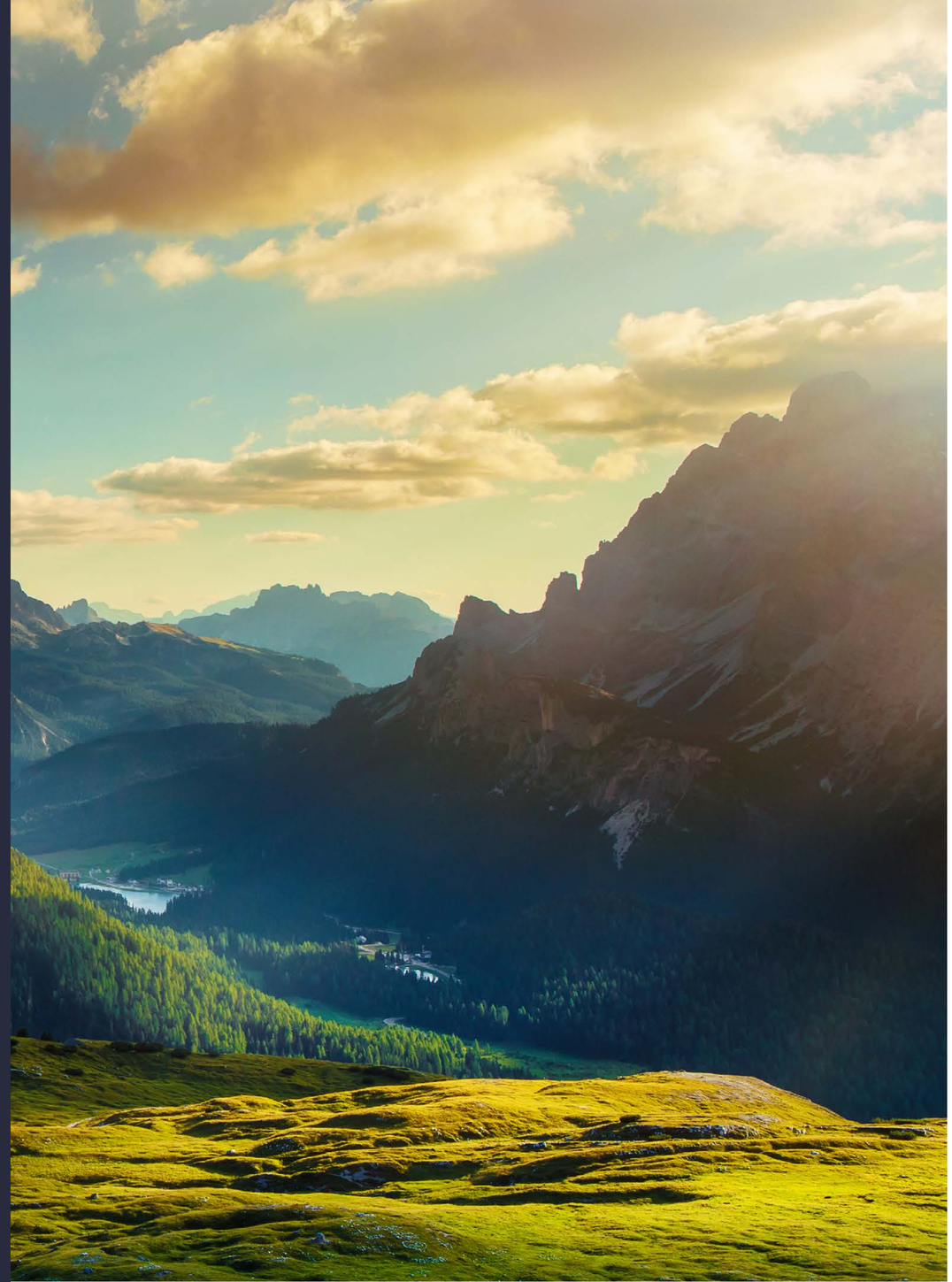


Manulife Investment Management

Climate-related financial disclosures

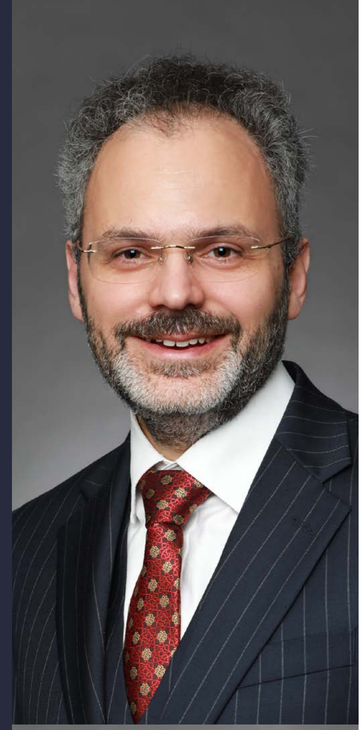
2022

Assembled in response to the Task Force on Climate-related Financial Disclosures



What you'll *find*

The disclosures in this report cover the activities of the investment management teams of Manulife Investment Management's public and private markets businesses. The report does not cover the activities of nonaffiliated investment managers who manage some client assets on our behalf. All information in this report is as of December 31, 2022, unless otherwise indicated. Report is published in December 2023.



A *letter* to stakeholders

We're pleased to present our 2022 climate-related financial disclosure, which we've developed in alignment with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). We consider the TCFD framework to be a vital tool for helping regulators, investors, and companies understand the scope of the physical and transition risks that climate change poses, as well as the presence of technological and other opportunities that may arise as companies seek to meet the challenges of climate change and the transition to a net zero economy.

In this year's report, we've updated our governance, risk management, and strategy-related disclosure, and we've enhanced our metrics and targets disclosure in several dimensions. With respect to metrics and targets, we've included all listed equity and fixed-income assets managed directly by Manulife Investment Management investment teams. We also describe our participation in an initiative to collect data directly from companies in infrastructure and private equity and credit (PE&C) portfolios. This activity is part of a larger industry-led initiative to standardize the reporting and collection of environmental, social, and governance (ESG) data in private markets, which we believe will help enable greater transparency and comparability of ESG data across the industry.

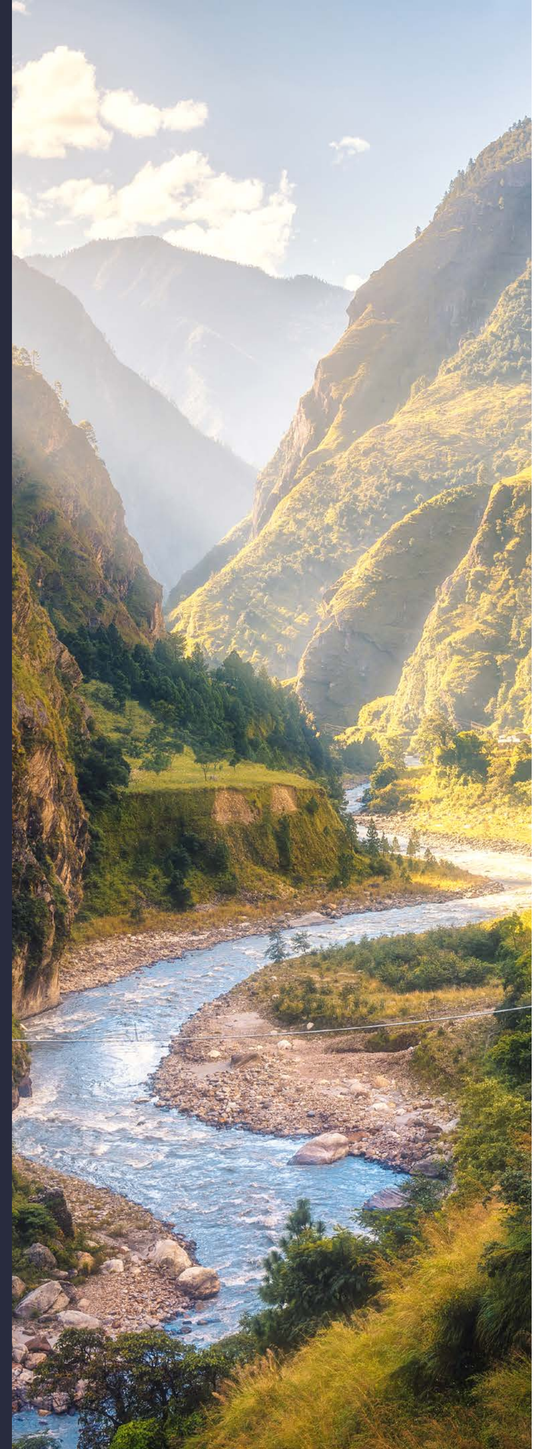
Collective action remains a focus for us as well. We remain deeply involved in a variety of global initiatives focused on climate change. For example, we signed on to statements to spur action from governments and issuers, including the Global Investor Statement to Governments on the Climate Crisis. We believe with the combined efforts of governments, regulators, industry, nongovernmental organizations, academic institutions, and other investors, we stand a better chance of fostering the behaviors and disclosures that can help make a meaningful impact. In addition, we recognize the close links between climate and biodiversity issues and so use this report to describe some of our activities in support of biological diversity in natural ecosystems. For example, we became a signatory to the Finance for Biodiversity Pledge, which commits to protecting and restoring biodiversity through finance activities and investments.

We believe the framework provided by the TCFD helps facilitate much of our collaborative work, and we eagerly continue in our efforts to work together with industry peers, regulators, and other entities toward nature-positive and climate-related goals over the long term.

Sincerely,

Peter Mennie
Chief Sustainable Investment Officer, Public Markets

Brian Kernohan
Chief Sustainability Officer, Private Markets



The *scope* of this report

Manulife Investment Management is the unified global organization that represents the global wealth and asset management arm of Manulife Financial Corporation (Manulife). This disclosure is Manulife Investment Management's fourth TCFD-aligned report. Accordingly, it sets out how we incorporate climate-related risks and opportunities into investment oversight through appropriate governance, strategy, risk management, and metrics and targets.

Manulife Investment Management functions as part of the broader Manulife group, not a stand-alone entity and, as such, parts of this report must necessarily refer to processes at a wider corporate level while other sections relate only to Manulife Investment Management. That said, this document doesn't purport to reflect Manulife's overall climate initiatives or to comprehensively disclose its approach to climate risks and opportunities. It seeks to holistically cover Manulife Investment Management's capabilities across asset classes and should be read in conjunction with Manulife's climate-related risks and opportunities (or TCFD) disclosure, which is published as part of Manulife's annual ESG report for a broader perspective.

Manulife has been a supporter of the TCFD since 2017 and published its first disclosure aligned with the TCFD in 2019.

Taking action on climate and biodiversity

Nature-positive ecosystem

In 2022, working in partnership with the Delphi Group, we mapped the landscape of opportunities for nature action and released the "Nature-positive ecosystem," a practical guide to major initiatives focused on protecting and restoring nature.

As members of the World Business Council for Sustainable Development (WBCSD), we collaborate with other members to advance sustainable development. Last year, we co-led a project with other forest sector companies to develop the Forest Sector Nature-Positive Roadmap.

82%

of our global real estate equity portfolio is certified to a green building standard, such as LEED, ENERGY STAR, or BOMA BEST.[1]

1.3M tCO_2e

is the estimated amount of CO_2e removed from the atmosphere by our managed forests and farms on a five-year rolling average.

As of December 31, 2022.

We adopted our own carbon principles for timberland assets

Published as a high-integrity climate benefit methodology, aligned with the Integrity Council for the Voluntary Carbon Market (IC-VCM), we integrate these principles into our acquisition screening for existing carbon projects and into our new carbon project development processes.

AIGCC
ASIA INVESTOR GROUP ON CLIMATE CHANGE

We joined the Asian Utilities Engagement Program, which, as part of the Asia Investor Group on Climate Change (AIGCC), focuses on some of the largest emitters in Asia that aren't currently covered by the Climate Action 100+ initiative.

We're currently leading several of these engagements to encourage issuers to make progress toward lowering emissions.

1 As of December 31, 2022. Based on square footage or building size of the gross floor area of properties in the global portfolio. Totals from different certification standards do not sum as properties with multiple certifications are only counted once. Certifications are provided by LEED, ENERGY STAR Certification, BOMA BEST, GBCA Green Star, BCA Green Mark, NABERS, CASBEE, BOMA 360, and Fitwel.

Global collaboration

To help inform our sustainable investing practices, we engage with sustainability-focused organizations, including:

30% Club Canada Investor Group—We're an active member and participant.

AIGCC—We're a member of the AIGCC working groups and chair the physical risk and adaptation working group. We helped develop the Expectations on National Adaptation Plans in Asia, which was brought to COP 27 in late 2022.

CDP Non-Disclosure Campaign—We supported the campaign to boost transparency and drive up rates of corporate disclosure of carbon emissions.

Ceres' Valuing Water Finance Initiative—We're a member of the Investor Water Hub, Private Equity Working Group, and founding member of the Valuing Water Investor Working Group.

Climate Action 100+—A founding member since 2017, we've continued to engage and encourage firms to improve climate-related governance and disclosures and reduce emissions across their value chains.

As of December 31, 2022. Logos are registered trademarks of the respective organizations/firms represented.

Finance for Biodiversity Pledge—We joined the advisory board of the Finance for Biodiversity Foundation.

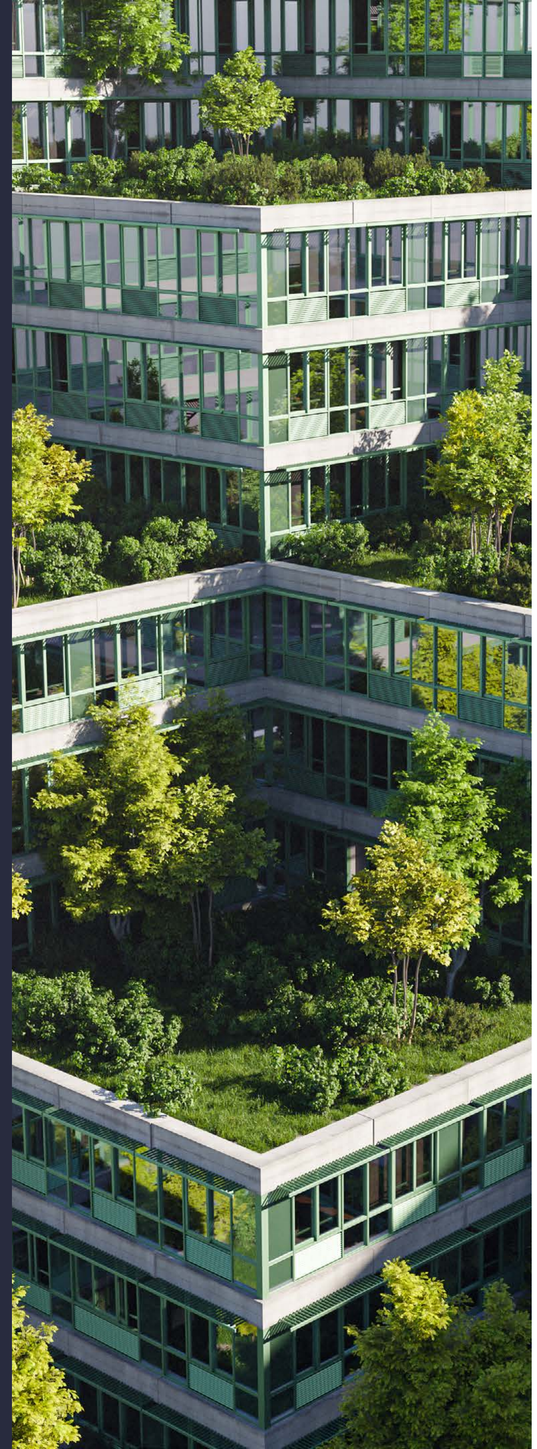
PRI—We're a member of several working groups:

- Infrastructure Advisory Committee (chair)
- Real Estate Advisory Committee (member)
- Sovereign and Sub-Sovereign Debt Advisory Committees (member)
- Listed Equity Advisory Committee (member)
- Stewardship Initiative on Nature Signatory Advisory Committee (member)

ULI—We're a member of the Mapping ESG Steering Committee for the Urban Land Institute (ULI).

WBCSD—We participate in the WBCSD's Forest Solutions Group and Nature Action projects.

As of December 31, 2022. Logos are registered trademarks of the respective organizations/firms represented.



Collaborative initiatives—additional insight

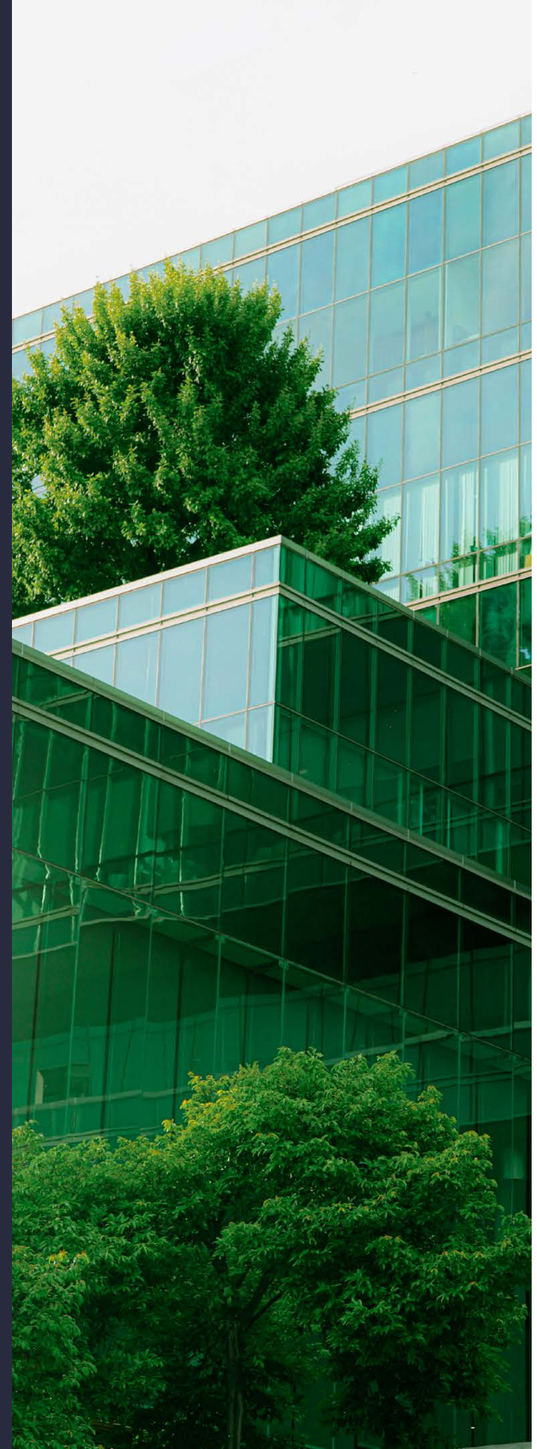
In 2022, Manulife Investment Management demonstrated support of the following responsible investment activities as investor cosigner with other asset managers and asset owners.

Global Investor Statement to Governments on Climate Change—The statement calls for governments to raise their climate ambition and take meaningful action by implementing policies that will attract capital to create significant investment opportunities in clean technologies, green infrastructure, and other assets, products, and services needed to accomplish the low-carbon transition. As an investor in corporate and sovereign credit, this statement aligns with our interest of reducing emissions.

AIGCC—We started a collaborative engagement initiative, the Asian Utilities Engagement Program, as part of AIGCC, focused on some of the largest emitters in Asia that aren't currently covered by the Climate Action 100+ initiative. We're currently leading several of those engagements to encourage these issuers to make progress toward lowering emissions.

Finance for Biodiversity Pledge—We continued our work on the Finance for Biodiversity Pledge through the advisory board and on several working groups looking to set the direction for collaborative efforts, including engagement, metrics, and target setting related to biodiversity risk and exposure across and beyond the financials sector.

Signatory to the Ceres' Canadian Oil and Gas Working Group to the Canadian Ministry of Environment—The Ministry of Environment in Canada solicited feedback on proposed regulatory action to reduce the scope 1 and scope 2 emissions of Canadian oil and gas producers. The Ministry is considering either a new cap-and-trade system or a higher carbon price. Our involvement with the working group convened by Ceres aligns with our activities and commitments with organizations, including Climate Action 100+, Climate Engagement Canada, and the AIGCC. The communications sponsored by Ceres reflect our shared concern around the current path of industry emissions levels and that meeting Canada's 2030 and 2050 climate goals will be challenging without more aggressive and urgent actions by the Government of Canada.



Summary of our climate approach aligned with the TCFD recommendations

Governance

- **Board oversight—**Manulife's climate strategy is overseen by Manulife's executive sustainability council (ESC), which is in turn overseen by the corporate governance and nominating committee (CGNC) of the Manulife board. The CEO and president of Manulife Investment Management, Paul R. Lorentz, is a member of the ESC. This council brings together representatives from multiple businesses and functional areas across Manulife to drive the development of the firm's overall climate strategy, risk management activities on climate-related matters, performance tracking, and disclosures.
- **Management's role—**Manulife Investment Management's climate strategy for third-party clients is set by our two sustainable investing committees (SICs), one for public markets and the other for private markets. The two SICs are chaired by the applicable group CEO with membership drawn from Manulife Investment Management's leadership team. The SICs oversee our teams' sustainable investing activities and support the implementation of our sustainable investing and sustainability risk statement.
- **Accountability—**Sustainability-related key performance indicators (KPIs) are factored into our annual employee performance review and remuneration metrics. Accordingly, each team is expected to contribute to the firm's advancement in sustainable investing overall and adhere to research processes that integrate sustainability considerations.

Strategy

- **Accurately measuring climate risks and opportunities—**We aim to identify climate risks and opportunities over various timeframes and reflect their financial or other impact in our investment analysis while mitigating the impact through our stewardship approach.
- **Sustainability integration—**We take a variety of actions to appropriately account for climate-related factors in each asset class according to its internal, technical, and market dynamics along with its regional expression. This work occurs throughout our sustainability integration process, engagement strategies, and the development of climate-focused investment frameworks.
- **Building resilience—**We conduct scenario analysis across uncertain future pathways and seek to understand the potential impact of different climate scenarios on our investment strategies and assets we manage and operate. We engage with regulators and policymakers, civil society, investee companies, and our peers in financial markets to address climate change systematically. We believe this builds resilience into our portfolios and for all our stakeholders, from our employees to our clients and the communities in which we operate.

We take an active approach to sustainable investing

We take a variety of actions to appropriately account for climate-related factors throughout our ESG integration processes, engagement strategies, and the development of climate-focused investment frameworks.

Risk management

- **Identifying climate risks—**Our processes for identifying climate risks are supported by our policies and engagement practices. Manulife's environmental risk policy, updated in 2023, sets out an enterprisewide framework for the management of environmental risks within our operating business activities. In parallel with this framework, Manulife Investment Management identifies and assesses climate risks in our clients' investment portfolios through public disclosure and third-party sources, as well as through our own research, company engagement, and collaborative initiatives. As a component of risk management, we conduct climate scenario analyses.
- **Managing climate risks—**As stated in Manulife Investment Management's climate change statement, we may take a variety of actions toward managing climate-related risks and opportunities across our investments. Broadly summarized, our available actions relate to asset allocation and selection, investment analysis and research, proxy voting, mitigating direct greenhouse gas (GHG) emissions, deploying sustainability management best practices for operated assets, and participating in collaborative engagements focused on climate initiatives.
- **Integrating climate risks—**Climate risks are integrated into our overall approach to risk management, with overlapping lines of defense. We believe this approach helps ensure that we understand the extent of these risks in our clients' portfolios and for the assets we manage and operate.

We're committed to identifying and managing climate-related risks and opportunities

We engage with investee companies to encourage best practices in climate-related disclosure.

Material climate-related risks are managed taking into account the asset class, geography, and underlying investment strategy.

Metrics and targets

- **A range of useful metrics—**We use a variety of metrics to manage climate alignment, including green investments, corporate carbon footprinting and emissions reduction targets, climate value at risk (climate VaR) and portfolio warming potential, sovereign climate risks, and monitoring strategy-level emissions.
- **Emissions and risks—**For our third-party managed portfolios, we use various tools to manage physical and transition risk, such as scenario analysis and carbon footprinting and metrics such as fossil fuel reserves, forward-looking company carbon reduction targets, green revenues, and sectoral reduction pathways.

  As an asset owner, operator, and investor, we assess climate risk and seek to reduce our emissions or use our influence to encourage the companies we invest in to reduce their GHG emissions and align their business models with the realities of a changing climate. We also partner with other investors and industry experts to tackle climate change on a broader scale. By working collaboratively with peer investors, we're strengthening our potential ability to reduce systemic climate change risks and realize the economic benefits of the low-carbon transition.
- **Targets—**Manulife Investment Management will continue building on our sustainable investing capabilities, increasing the number and variety of sustainable investing options available to our clients, including climate-focused strategies.

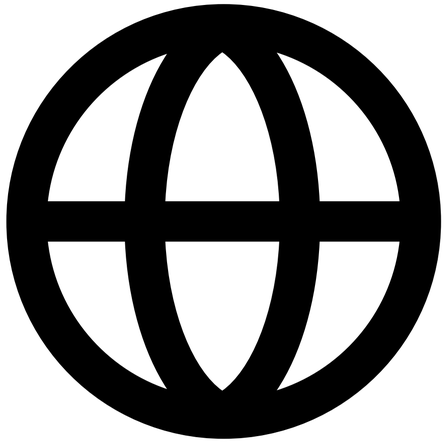
We seek to improve sustainability metrics

We're participating partners in some of the world's most innovative initiatives to help evolve the standard metrics for sustainable asset management.

We seek to standardize an approach using more forward-looking metrics, location-specific data, and scope 3 emissions.

We continue to build out carbon footprinting, such as weighted average carbon intensity (WACI), as well as a variety of other climate-related metrics.

Our climate-related financial disclosure



Governance

Board oversight

Manulife's climate strategy is overseen by Manulife's ESC, which is in turn overseen by the CGNC of the Manulife board. The CEO and president of Manulife Investment Management, Paul R. Lorentz, is a member of the ESC. This council brings together representatives from multiple businesses and functional areas across Manulife to drive the development of the firm's overall climate strategy, risk management activities on climate-related matters, performance tracking, and disclosures.

The president and CEO of Manulife Investment Management is joined by other senior Manulife leaders on the Manulife ESC, and the leaders of our sustainable investing teams in Manulife Investment Management work closely with Manulife's chief sustainability officer. In this way, Manulife Investment Management's governance structure is well connected to the broader sustainability community and leadership across Manulife.

The ESC is responsible for the climate strategy, risk management, and disclosures for Manulife, and Manulife Investment Management's policies and governance practices are aligned with the ESC's guidance. This extends to Manulife Investment Management's climate change statement, which applies to our third-party investment management activity and was developed within the context of appropriate risk management.

Our sustainability governance

Manulife **Manulife Investment Management**

Corporate governance and nominating committee	Audit committee	Management resources and compensation committee	Risk committee

Executive sustainability council

General counsel	Chief marketing officer—chair	Chief human resources officer	Chief executive officer	President and CEO, Manulife Investment Management	Chief sustainability officer	Chief financial officer	Chief operations officer	Chief investment officer	Chief risk officer

Sustainability center of expertise

- Composed of sustainability professionals across public markets, private markets, the general account, and the Manulife organization
- Provides a forum for information sharing and consultation on sustainability initiatives, performance, and reporting

Legal and compliance center of expertise

- Composed of legal and compliance members from each business unit and region
- Legal, compliance, and regulatory affairs consultation
- Provides a forum for information sharing and consultation on legal and compliance related to Manulife sustainability matters

Our committees and working groups are convened to enable regular decision-making oversight

ESG regulatory committee

- Composed of functional department heads from public markets sustainable investment, private markets sustainable investment, product, operational risk, legal, compliance, and manager research
- Monitors regulatory implementation
- Provides advice and guidance to sustainability regulatory change initiatives across the global organization

Public markets sustainable investing committee

- Integral to public markets strategic oversight
- Focuses on key sustainability initiatives and strategy
- Comprises senior cross-functional leads and sustainability team members; meets monthly

Proxy voting working group

- Members include cross-functional business heads in public markets
- Reviews escalated voting decisions

Private markets sustainable investing committee

- Supports sustainability integration across private markets
- Led by the global head of private markets
- Includes global heads of private asset classes, sustainability specialists, and representatives from strategy, risk, distribution, legal, and marketing

Source: Manulife Investment Management, as of December 2022. For illustrative purposes only.

Our governance structure includes SICs and working groups that provide oversight, conduct ongoing risk assessments, and help steer our sustainability initiatives across global capital markets.

We view the involvement of leaders in all asset classes, as well as representatives from functional areas such as operations, legal, compliance, risk, and technology, to be crucial to supporting our sustainable investing activities across the organization and ensuring the buy-in and commitment required for success.

Our committees are convened to enable regular decision-making oversight. The heads of the public and private markets businesses chair their respective SICs, which enables regular decision-making oversight of the sustainable investing agenda that's appropriate to specific asset classes. In turn, chairs of these SICs communicate directly with other leaders of the global wealth and asset management arm of Manulife.

Related to proxy voting specifically, Manulife Investment Management has a proxy voting working group to act as a control against conflicts of interest in the proxy voting process and ensure alignment with the global proxy voting policy and procedures. This working group comprises functional experts from across the organization, including the legal, compliance, investment, and sustainable investing teams. Climate change-related topics are typically discussed on a weekly basis during the proxy season.

Our sustainable investing policies and statements

Our policies, statements, and governance practices guide our sustainable investment activities. We use our policy and statement framework below to guide our activities from ESG integration to investment stewardship. While our climate change statement outlines our approach to climate change in our investment practices, our full catalogue of policies and statements may also touch on aspects of our approach to the issue.

Global policies and statements

- Sustainable investing and sustainability risk statement
- Climate change statement
- Nature statement
- Cluster munitions policy
- ESG engagement policy
- Global proxy voting policy and procedures
- Executive compensation statement
- Responsible contracting statement

Asset class-specific frameworks

- Real estate sustainability framework
- Timberland and agriculture sustainable investing framework
- Infrastructure sustainable investing framework
- PE&C sustainable investing framework

Management's role

Management directs the firm's climate strategy

The governance structure established enables oversight of our teams' sustainable investing activities and supports the implementation of our sustainable investing policies; this governance structure also applies to the oversight of climate-related issues. The SICs of our public and private markets groups, respectively, are responsible for supervision and decision-making of the sustainable investing agenda at the appropriate levels of the firm. These committees, which meet at least quarterly, include representatives from across different business functions who are stakeholders in implementing the sustainable investing agenda.

Management stays informed with the support of dedicated sustainability teams

The SICs are supported by teams of sustainable investing professionals who facilitate the implementation of Manulife Investment Management's sustainable investing agenda. This occurs through a variety of activities and projects, including:

- Preparing annual business plans
- Identifying and developing sustainable investing leading practices
- Supporting investment teams to develop tools and methodologies to adopt these leading practices across the investment lifecycle
- Leading the participation in external initiatives or collaborative industry engagement
- Dissemination of new resources such as tools and data
- Research support for investment teams
- Engagement and stewardship research and support

We conduct regular sustainability training for our investment teams

Our sustainability professionals conduct periodic training sessions for investment personnel on thematic sustainability issues. For example, in 2022 we:

- Held training conducted by the Union of Concerned Scientists, with a focus on understanding climate change
- Received training from climate experts on use of quantitative scenario analysis tools
- Delivered internal webinars and prepared in-house educational materials about carbon markets
- Held training for property and asset management on GHG (GHG 101 webinar) as part of launching a new property standard on carbon management, including development of a property carbon management planning tool kit

Other climate-related training included climate disclosures and the Science Based Targets initiative (SBTi). Training was led either by our teams or by external experts, including leading academics. We also conducted or sponsored training sessions for specific investment teams as needed; investment analysts were expected to participate in these training sessions as part of their ongoing professional development.

Our investment teams have access to internal and external ESG data to assess the potential impact of material ESG factors on the valuation and risk/return profile of investee companies. In 2022, we enhanced this access and our datasets through the launch of an internal climate data dashboard on which we also provided training across investment teams. Given that we operate as a community of specialist investment teams, each team incorporates these ESG factors into the investment process in a manner that aligns best with the team's investment decision-making approach.

Our sustainability-focused professionals support our asset management teams globally[1]

27

dedicated sustainable investing professionals

400+

investment professionals are advised on sustainability

with expertise across regions and asset classes

- **Sustainability research and analysis**
- **Implementation of sustainability practices**
- **Training and education sessions**
- **Proxy voting research**
- **Stewardship practices for operation of real assets**

Investment teams

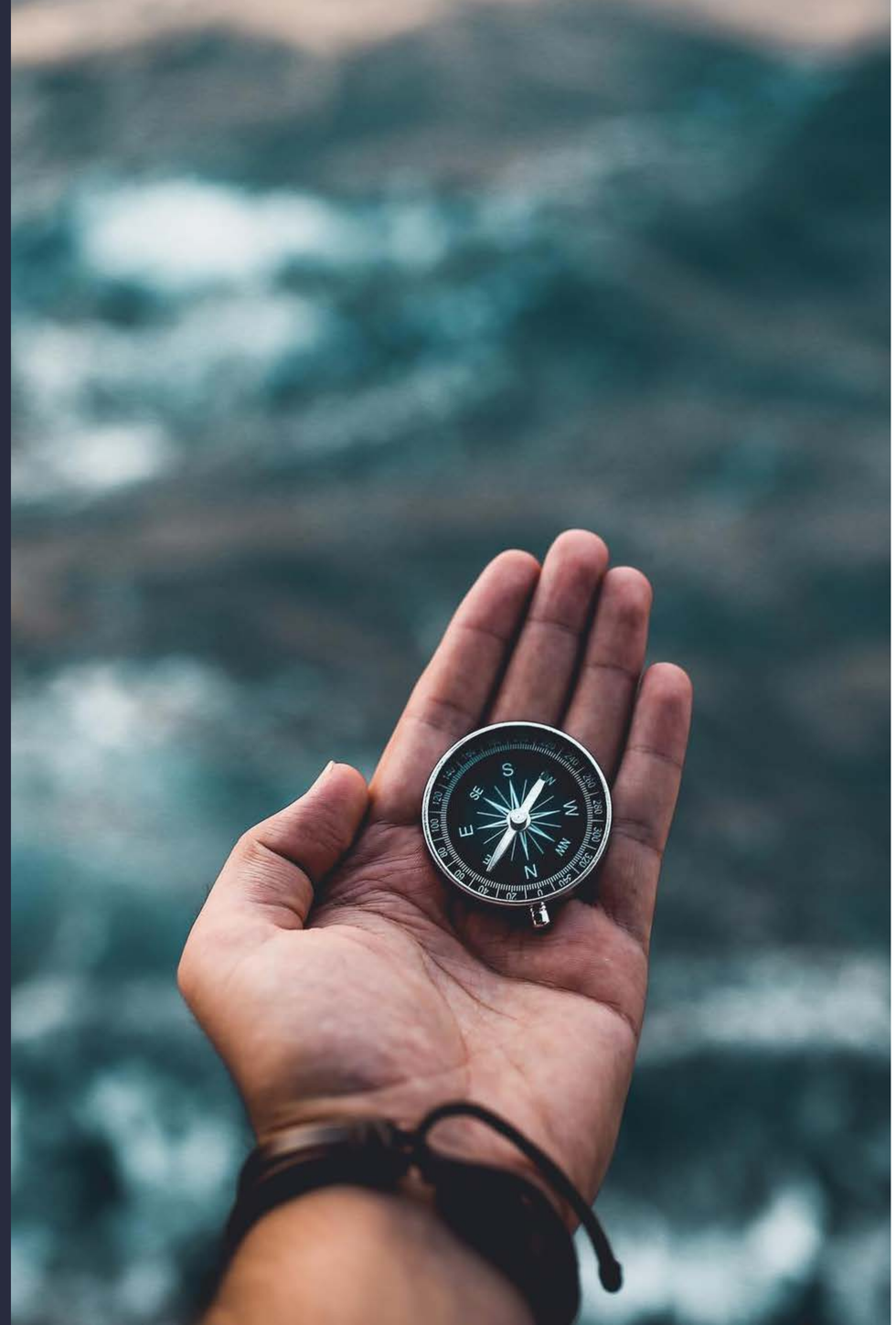
Integrating sustainability factors and stewardship in their investment activities[2]

- Listed equity
- Fixed income
- Multi-asset solutions
- Real estate
- Infrastructure
- PE&C
- Timberland
- Agriculture

Real asset operation teams

Integration of sustainable investing within asset classes such as real estate, timberland, and agriculture

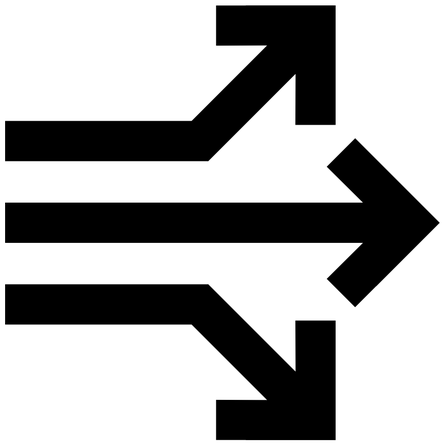
1 Manulife Investment Management, as of December 2022. **2** We seek to incorporate material sustainability considerations throughout the stages of our investment and asset ownership lifecycles, taking into account the characteristics of the asset class and investment process in question, as well as industry and geography, among other factors. Each investment team operates in different markets and with different nuances to its approach to investing. Accordingly, each team integrates sustainability factors into its investment process in a manner that best aligns with its investment approach. Exceptions to this are strategies in which a sustainability integrated investment approach is impractical or impossible; for example, in relation to certain instrument types in which sustainable comparable alternatives are unavailable, passive products, funds that invest in derivative instruments, products managed in accordance with specific client objectives, and delegation to third-party investment managers. Refer to Manulife Investment Management's sustainable investing and sustainability risk statement for more detail.



Sustainability-related KPIs are factored into our annual employee performance review and remuneration metrics

At Manulife Investment Management, we recognize that sustainable investing is rapidly becoming a critical driver of success within the asset management industry. We've set a clear target to be at the forefront of this industry evolution, further defining our value proposition and strengthening our competitive advantage.

Since 2022, across all public and private markets asset classes, the contribution of investment and property management professionals to sustainable investing and stewardship forms part of the discretionary bonus decision-making process each year. Accordingly, each team is expected to contribute to the firm's advancement in sustainable investing overall and adhere to research processes that integrate ESG considerations.



Strategy

We believe that unmitigated climate-related risks will present a systemic threat to societal and financial stability—and, therefore, to our business and our clients' financial objectives—over the coming decades.

It's too early to know what the decarbonization rate will be globally, which makes it imperative to assess the actual and potential material impacts of climate-related risks and opportunities in our portfolios and ensure that they're as climate resilient as we can make them.

We also believe that the understanding of climate change across capital markets remains varied, leading to potential mispricing of assets, and that many companies may be inadequately prepared to respond to the risks and opportunities that a low-carbon transition could present. A key element of our overall strategy is to identify and incorporate these risks and opportunities in our portfolios.

Our climate change statement explains that to understand the impact of climate change on investment decisions, asset managers should assess the transition risk, physical risk, and opportunities posed by climate change to the companies in which they're invested. We recognize that climate change could have an economic impact, which will vary from company to company and asset to asset. The varying degree will depend on the exposure level of each sector, industry, and geography.

Climate risks and opportunities over time

Accurately measuring climate risks and opportunities: We aim to identify climate risks and opportunities over various timeframes and to reflect their financial impact in our investment analysis.

Climate change is already occurring, and it's likely to intensify over the coming decades. In this context, we prioritize sustainability criteria when it comes to the assets we manage and operate. And we believe the companies we invest in must respond to the challenges of climate change by developing new technology, adapting to changing policy, being flexible in the face of changing consumer preferences, and preparing for the threat of physical consequences, both acute and chronic. These conditions and imperatives create risks and opportunities that have financial impacts that we need to act on today.

Although there's no set rule for short-, medium-, and long-term time horizons for climate-related issues, short term usually refers to 1 to 5 years, medium term refers to 5 to 10 years, and long term refers 10+ years.

The TCFD classifies climate-related risks relevant to investors over these timeframes as physical (associated with changes in weather patterns) and transition related (effects resulting from the transition to a low-carbon economy, including policy, legal, technological, and market changes to address mitigation and adaptation requirements). The TCFD framework also emphasizes that efforts to mitigate and adapt to climate change produce opportunities for companies, industries, and investors. We recognize that these risks and opportunities vary by sector and geography.

These risks and opportunities will have financial impacts over these short-, medium-, and long-term time horizons. Policy and legal risks can be short term, as they aim to help mitigate climate change before it happens; the promise of new technology can also sometimes be quickly recognized in the market. Reputational damage can have more lasting medium-term impacts, similar to the effects of changing customer behavior. The severity of physical risks tends to be more certain over the longer term, but acute weather events can be unpredictable and may happen in the near term. The prospect of stranded assets is also more predictable over the long term but is increasingly priced into financial markets today; examples of stranded assets could be due to GHG regulations, such as a carbon tax, innovation driving rapid technology switching, or physical risks (chronic and acute) that may render the operation of an asset uneconomical.

We aim to identify these risks in our research, which is reflected in our investment selection, valuation, and portfolio construction. We also believe that scenario analysis is a meaningful tool to understanding the impact of climate change. In those asset classes in which we've developed scenario analysis, most portfolios show that climate transition risk—or the general cost associated with moving from a current business-as-usual scenario in the direction of reduced emissions and toward a carbon-neutral future—represents a significant portfolio risk. Physical hazard risk, or the cost impact associated with extreme weather events, which we identified in our initial analysis as extreme heat, coastal flooding, and tropical cyclones, is also critical to assess at a portfolio level. Both types of risk can often be partially or fully offset by climate-related opportunities.

Impact of climate risks and opportunities

Sustainability integration: We aim to incorporate identified climate risks and opportunities throughout our investment processes.

The climate-related risks and opportunities that we identify are integrated into our investment process and managed in our business strategy and planning. In our integration process, we focus on attractive risk-adjusted returns and resiliency over the long term. We factor in differences across asset classes, industries, geographies, and operating models, and as climate science evolves, so too does our approach.

There's no single dataset that perfectly captures the risks of climate change effects. For this reason, we apply an active approach to internal and third-party data and use tools that we complement with our own industry knowledge and firsthand experience. This expertise is built through engagement to understand companies' vulnerabilities and strengths and through our own stewardship efforts in which we seek to understand the full spectrum of risks and opportunities related to the assets we manage and operate.

We develop differentiated analytical techniques, including scenario analysis, to inform our security selection and valuation; scenario analysis can also inform portfolio positioning. Within the firm, investment teams that use scenario analysis typically apply the 1.5˚C, 2˚C, 3˚C, and 4˚C scenarios; in many instances, these are complemented by the inclusion of carbon pricing and assessment in their analysis. However, we also go beyond buy and sell decisions to include engagement focused on climate action and active stewardship in our investment process.

We share sustainability goals with our clients. We've been building our sustainable investing capabilities to help clients guard against climate risks while seeking to invest in companies that we believe contribute to sustainable climate solutions. In addition, we continue to develop thematic products and investment strategies as potential options for investors. Because we view climate-related risks as systemic, we also contribute to external initiatives and collaborative industry engagements as appropriate.

We seek to communicate transparently with our clients about our climate-related investing strategy and process, and we believe this may help support our clients in responding to their own stakeholders. In 2020, we made our climate change statement publicly available, and since 2021, we've outlined our evolving climate-related efforts and activities in our annual stewardship report. For interested clients, we've developed a client-reporting template, which contains a variety of sustainability metrics, including portfolio carbon footprints, for equity and fixed-income investors.

Supplemental guidance for asset managers

We take a variety of actions to appropriately account for climate-related factors in each asset class according to its internal, technical, and market dynamics along with its regional expression. This work occurs throughout our sustainability integration process, engagement strategies, and the development of climate-focused investment frameworks.

Timberland and agriculture

Climate change presents risks and opportunities for our timberland and agriculture businesses, and both risks and opportunities inform our business strategy.

Climate-related risks to the biological assets we manage include wildfire, drought, high winds, flooding, pest outbreaks, and increased costs (transition risk associated with carbon pricing), among others. These risks may vary in prevalence and magnitude depending on location and asset type but may also be directly influenced by climate-related weather changes such as temperature or precipitation extremes or volatility. We have a variety of levers at our disposal to mitigate these risks, such as crop or tree genetics, species diversification, nursery practices, planting density, forest thinning, automation, fuel switching, and insurance. We account for such risks, as well as our ability to mitigate them, from investment due diligence all the way through asset management. Importantly, this also includes the imperative to reduce our contributions to climate change, which is why we launched our forest

climate strategy in 2022, which offers carbon-focused investments to investors and corporates to support their net zero objectives. We're also developing a similarly impact-focused decarbonization strategy for agriculture.

Climate-related opportunities also influence our timberland and agriculture business strategy. Forests and farms are both natural capital assets. They represent natural stocks of value that produce flows of benefits, or ecosystem services, to both their owners and society at large. In addition to the basic ecosystem services they provide in the form of food and fiber, they also provide a host of other services, such as climate change regulation, water filtration, and recreational opportunities. In particular, carbon sequestration is a key capability for trees (forests) and soils (farms). We see considerable opportunity to leverage the natural capital assets we manage to help our investors reduce their carbon footprints, and increasingly so as markets for carbon sequestration and other payments for ecosystem services develop and mature.

Infrastructure

As long-term infrastructure investors, we recognize that companies adhering to strong environmental standards can improve their financial performance as well as minimize risks to their businesses.

We see renewable energy as one of many opportunities in infrastructure. As an investor, we see the potential for attractive risk-adjusted returns, as portfolio revenues are generally generated from long-term contracts that offer customers an energy cost savings value proposition. But we also see this as an opportunity to support society's transition to cleaner energy.

Our infrastructure investment team is an active participant in the energy transition in the United States, with investments in industries such as solar, wind, and battery storage. We believe these and other renewable energy assets are the key components of a lower-carbon electricity system.

Real estate

As a manager of real estate investments, our business is exposed to risks and opportunities from the environment in which we operate, and we recognize that physical climate risk has progressively become a core real estate issue. As the effects of climate change are increasingly felt worldwide, it's vital for our investors, employees, and tenants to understand the importance of addressing this issue.

While we continue our efforts to mitigate climate change by transitioning our operations and supply chain to low carbon, we also recognize that we must build climate resilience within our real estate portfolios and across our management practices.

The nature and level of risk are dependent on structural forces that will shape the short and long term, and our business will be affected in both positive and negative ways by the climate transition. The opportunities that emerge will likely depend on our action and response. Reducing our carbon footprint is critical to our transition to a low-carbon economy and a sustainable future.

PE&C

Assessing the risks and opportunities related to climate change is an integral part of our sustainable investment approach for our PE&C businesses. Within PE&C, we assess climate-related risks primarily during our preinvestment due diligence process. On an annual basis, we update and monitor the ESG performance of our investments using our proprietary framework, which incorporates climate-related issues that may be deemed material for a particular investment. Profiling potential material risks and opportunities related to climate change across all assets is critical to preserving and enhancing the value of our investments.

Publicly listed asset classes—equity and fixed income

Climate change assessment is a critical part of our investment process and our corporate engagement program, which is particularly relevant in hard-to-abate

sectors. Our global presence enables us to track climate regulations, consumer sentiment related to technology innovation and climate action, and the decarbonization efforts of individual companies. We believe our global view is an important differentiator that sets us apart from many of our peers.

Within publicly listed asset classes, we assess transition risk by using a blend of qualitative analysis and quantitative ESG metrics such as climate VaR, which quantifies the estimated financial impact of climate change. The severity of physical risks tends to be more certain over the longer term (apart from acute weather events, which can be unpredictable) and typically depends on where an asset is physically located. Scenario analysis, in which the effect of climate change can be modeled through a range of possibilities, is one of the key tools we use to place a financial value on climate risk based on the rate of global decarbonization.

We've also developed climate change-themed investment strategies for both equity and fixed income, with a focus on portfolio resilience.

While climate risks exist, so do opportunities, including the promise of new technologies—green hydrogen, biofuels, and batteries are good examples of these opportunities. We attempt to identify issuers who are leveraged to these themes and track their competency to capture the opportunities. One way we measure this is by assessing the value of low-carbon technology patents filed by issuers, which we believe can provide useful insight in regard to innovation and progress.

Understandably, tackling climate change is an integral part of our corporate engagement program, particularly when it's a material factor for a firm or industry. We aim to share our knowledge and findings with investee companies in the hope that this can help them strengthen their sustainability footprint and reduce climate risk. Our collaborative approach with issuers enables mutual learning and the sharing of evolving best practices around climate-related disclosure and management.

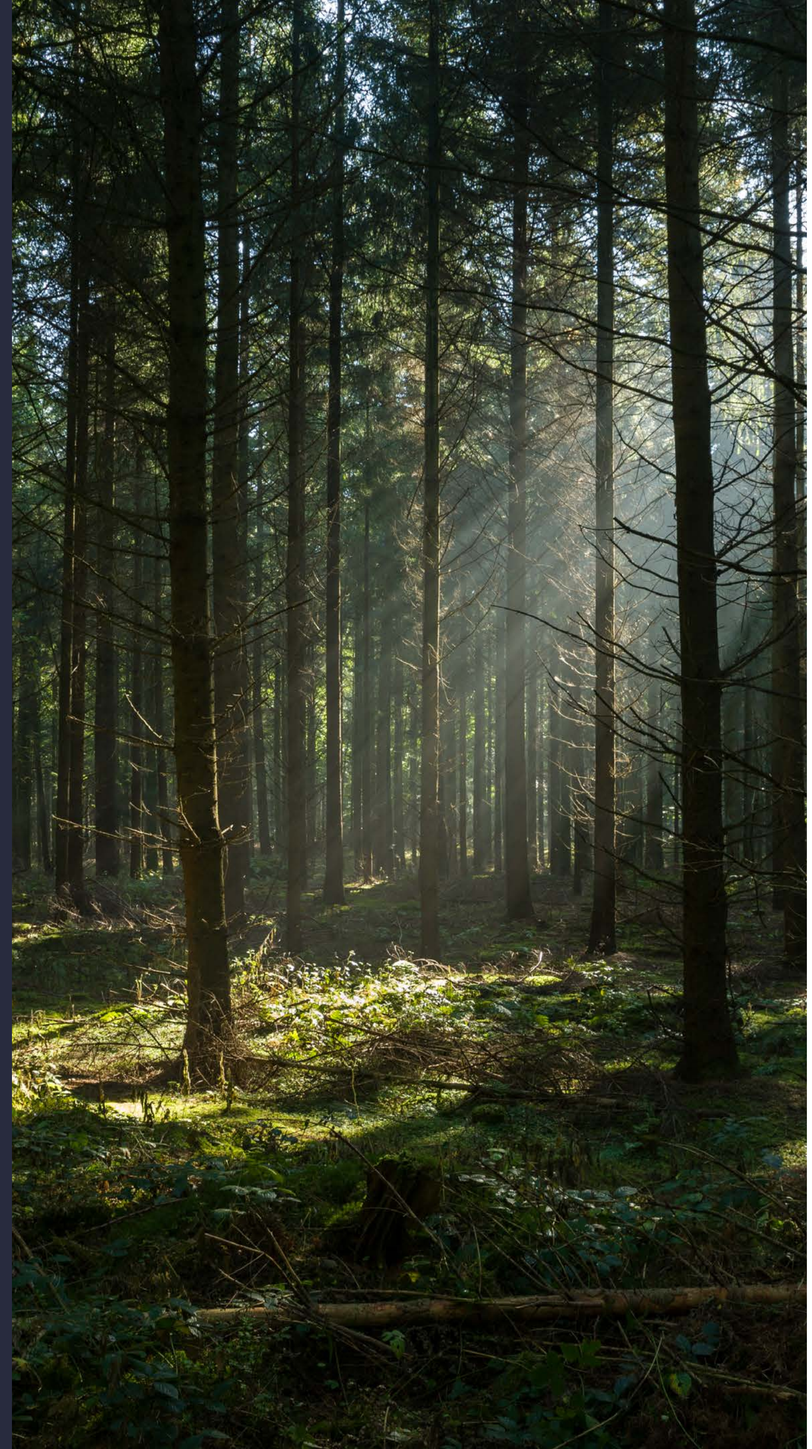
Building resilience

We conduct scenario analysis in an effort to understand the potential impact of different climate outcomes on our investment strategies and operated assets. We believe this will enhance our portfolios' resilience and is in the interest of all our stakeholders, from our employees to our clients and the communities in which we operate.

In 2020, we identified a number of areas in which we could be more effective in our efforts to address climate change. Since then, we've developed models and tools to assess the potential impact on our business of the four Intergovernmental Panel on Climate Change (IPCC) scenarios. In addition, we made progress in assessing climate risk and resilience in our real estate portfolio by enhancing our internal assessment process and through third-party portfolio review.

The third-party climate assessment tool that we use applies a multi-year time horizon to assess risks and opportunities based on direct emissions, covering both physical and transition risks and opportunities. Policy risk is calculated based on nationally determined contributions, while technology opportunities are based on the International Energy Agency's (IEA's) Energy Technology Perspectives model (which, in 2022, was superseded by the IEA's Global Energy and Climate Model). Several teams at Manulife Investment Management also apply other scenarios and carbon pricing estimates into their models, including the development of worst-case cost scenario assumptions. In 2022, we developed a proprietary model that allows investment teams to assess their climate exposure across their portfolios.

In 2021, we began working with peers on Phase II of the UN Environment Programme Finance Initiative (UNEP FI) climate scenario working group. This work builds on Phase I of the pilot program, which involved the development of an assessment tool for



investors to review climate risk across portfolios. During this stage of the program, we contributed to the "Changing Course" and "Changing Course: Real Estate" reports that were shared with the wider industry. Phase II of UNEP FI aims to introduce new methodologies and identify sector-specific risks and opportunities related to climate change.

Timberland and agriculture

We conducted a scenario analysis in 2020 involving our agriculture assets in California and timberland assets in New Zealand. Both analyses focused on downscaled high-carbon physical impacts and low-carbon transition elements. We selected our California agriculture assets and New Zealand timber assets because we believe our assets in these regions provide a reasonable approximation for the breadth of potential climate scenario impacts on our business until we're able to complete a full portfoliowide scenario analysis.

- These regions represent the highest concentration of assets under management (AUM) per square kilometer for each of the two asset classes.
- California and New Zealand allowed us to examine scenario analysis in two different countries and include both the northern and southern hemispheres in our assessment. This provided insight into national, regional, and global differences that are particularly relevant for transition scenarios.
- California agricultural assets enabled us to explore water risk under different scenarios, which is among the most significant climate-related risks facing our agricultural assets.

Case study scenario analysis insight: California agriculture

High-carbon scenario

Physical impacts	Business impacts
Increased average temperatures (global mean increase of 3.7°C by 2100)	• The impact of warmer winters on bee colonies needs to be monitored • Consideration of what may need to be moved northward
Increased wildfire risk	• Risk of smoke-tainted vineyards • Risk of smoke blocking out sunlight and affecting almond drying rates
Changes to natural areas and biome shift	Risk of biome shift is more likely to be felt by the ecosystem surrounding farmland, rather than directly on the assets; these impacts would need to be monitored
Changes in precipitation, water availability, and quality • Increased variability in availability • Earlier snowpack melt • Aquifer depletion • Increased precipitation • Increase in the intensity of rainfall	• Crops will require increased amounts of water; snowpack is an important natural water reservoir that may become depleted • More intense storms may result in precipitation being washed out to sea rather than seeping into the ground, preventing aquifer replenishment • Water stress is likely to increase; in severe cases, insufficient water may require transitioning some assets to areas with more water
Mean global sea level rise of 0.63 meters by 2100	Little to no impact on current assets; may increase salination of some aquifers—to be monitored
Transition impacts	**Business impacts**
Increased likelihood of regulatory developments affecting water use	Water regulation will likely become prevalent in California over the coming decades, which may increase operational costs but may also present water banking opportunities

Low-carbon scenario

Transition impacts	Business impacts
Carbon pricing ($100/$tCO_2$ by 2030 and $140/$tCO_2$ by 2040 in advanced economies)	• Risk of higher operational costs from carbon pricing, which may be passed on to consumers, depending on price pressures (e.g., substitution-related price ceilings) • Opportunity for monetizing soil carbon sequestration as carbon prices rise
Renewable energy (increased deployment, including bioenergy)	• Increased biofuels demand presents the opportunity to expand into new crops and serve a new market • Projected reduction in renewable energy prices could present the opportunity to install on-site microgrids to reduce energy costs

Case study scenario analysis insight: New Zealand timberland

High-carbon scenario

Physical impacts	Business impacts
Increased average temperatures • Global mean temperature increase of 3.7°C by 2100 • Higher elevation warming relatively more than lower elevation	• Opportunity for gaining increased share of Mainland China's timber market as European timber regions may be subject to more extreme climate changes with attendant impacts on their productivity • Increased average temperatures may extend the range for pine to higher altitudes should land ownership opportunities become available
Changes to natural areas • Rise in snowline • Biome shift	Most of Manulife Investment Management Timberland and Agriculture Inc's (MIMTA) New Zealand plantation forests are radiata pine, which is fairly resilient to biome shift
Changes in precipitation and storms • Increased flood damage • Increased risk from hurricanes/cyclones	Risk of heavy rainfall, wind, and cyclones, leading to forest loss and possible debris washout
Mean global sea level rise of 0.63 meters by 2100	Rising temperatures and sea levels are unlikely to affect New Zealand radiata pine

Low-carbon scenario

Transition impacts	Business impacts
Carbon pricing and growth of the carbon market (increasing carbon pricing to $\$100/tCO_2$ by 2030 and $\$140/tCO_2$ by 2040 in advanced economies)	• Higher carbon prices would increase shipping costs, which may be offset by a projected increase in global demand for lumber • MIMTA has monetized most carbon offsets available for its New Zealand properties and afforestation opportunities are currently scarce, making generation of new carbon offsets unlikely
Increased bioenergy (grows to 7% of power generation by 2050)	• Industrial shift toward biofuels may provide an opportunity if demand for wood pellets increases, although growing fiber demand for newer uses and in building materials may offer a higher price point • Carbon pricing may increase the costs for fossil fuels, making biofuels more attractive and potentially an opportunity for MIMTA
Renewable energy (increased deployment of wind and solar)	There's likely little opportunity to provide new renewable energy capacity due to the New Zealand energy grid's low emissions profile

Real estate

Identifying and understanding the climate risk to a company or portfolio enables the development of resources and tools to manage that risk and improve resilience effectively. We keep a record of our existing resilience practices and features and identify improvement opportunities for climate change management. Our approach includes conducting an evaluation at both the portfolio and asset levels.

We consider the following risks as having potential impacts on our business across either short-term (1–5 years), medium-term (5–10 years), or long-term (10+ years) time horizons.

Identified transition risks and opportunities[3]

Risk	Timeline	Mitigation and opportunity
Regulation—Climate-related regulations, including carbon pricing, regional efficiency, or emissions standards, and disclosure requirements are increasing. Regulation changes could lead to increasing operating and compliance costs.	Short to long term	We continue to monitor emerging regulations and incorporate assessment of building performance and efficiency in our due diligence to stay ahead of carbon pricing and minimum efficiency requirements.
Market—Shift in capital away from high-emitting products and services may potentially affect tenant demand, asset value, and fund-raising.	Short to long term	Improving portfolio efficiency could create new avenues for financing and increase investor and tenant demand. We continue to certify and build assets to green building standards such as LEED, ENERGY STAR, CASBEE, and BOMA BEST, implement energy and emissions reduction programs, and collaborate with tenants and clients on shared climate goals.
Technology—There's a cost to move to a low-carbon economy, including capital upgrades to retrofit assets, advanced technologies for buildings, demand for high-quality transactable ESG data, real-time metering, and shifting to renewable energy sources.	Short to long term	Short-term capital costs are expected to be offset from paybacks on lower operating costs and meeting tenant demand. Our ongoing energy, water, GHG, and waste programs support our team in allocating capital toward low-carbon technology and improving property performance.
Reputation—Failure to act or the perception of not acting on climate change could affect our reputation as a global real estate leader and risk our relationship with tenants, employees, communities, and investors.	Short to medium term	To communicate our climate change action and impact, we disclose our objectives and performance annually through several independent and industry frameworks, including the Principles for Responsible Investment (PRI), GRESB, our annual real estate sustainability report, and this climate disclosure report. We also support Manulife's disclosure to CDP.

3 This table is a nonexhaustive list of the main risks and opportunities currently identified across our real estate portfolio. Risks and opportunities are subject to change over time and are ultimately addressed on a case-by-case basis depending on the individual characteristics of each property.

Identified physical risks and opportunities[3] (continued)

Risk	Timeline	Mitigation and opportunity
Acute risks		
Flooding—Flooding can cause asset damage, downtime, and incurred costs through insurance premiums and deductibles. Flooding may affect our ability to obtain insurance in vulnerable markets.	Short to long term	Our insurance team reviews portfolio flood exposure annually to understand insurance implications. Properties have regular site assessments completed by our insurer, which include recommendations for protection measures.
Extreme storms—Climate change is expected to increase the frequency and severity of extreme storms, high winds from hurricanes, typhoons, snowfall, or ice storms from extreme temperature fluctuations. This can cause asset damage and downtime from power loss.	Short to long term	We prepare properties for storms through our emergency management planning and seek to minimize downtime by using on-site backup power generators.
Wildfires—Wildfires can not only cause asset damage, but may also affect occupant health through reduced air quality.	Short to long term	Our teams consider various resilience measures, including fire-resistant building materials, on-site emergency water supplies, and high-efficiency air filters to protect indoor air quality.
Chronic risks		
Heat stress—Rising global temperatures can affect employee and tenant productivity and increase operational costs to maintain safe and comfortable building conditions.	Short to long term	We seek to identify opportunities to improve cooling efficiency and costs through capital upgrades, building commissioning, and operating procedures.
Water stress—Water scarcity can affect water availability and increase operational costs.	Short to long term	We seek to maximize operational efficiencies while minimizing consumption through practices such as water audits and installing low-flow appliances and faucets, and minimizing landscaping water requirements where applicable throughout our portfolio.
Sea-level rise: Rising sea levels can present similar challenges to flooding while also risking failed development approvals and stranded assets in vulnerable areas.	Long term	We review and consider exposure to sea-level rise in acquisition and new development decisions as well as across our existing portfolio. We invest in preventative infrastructure and consider underwriting where applicable.

Risk management

Manulife Investment Management is committed to developing a risk management approach and framework that articulate how we identify and manage the climate-related risks and opportunities to which we're exposed. We integrate the consideration of ESG factors, including climate-related issues, into the investment process of the majority of our investment teams, as we seek to deliver long-term resiliency and sustainable investment outcomes for clients. As an asset manager, we operate and invest within the constraints of our client mandates.

Meanwhile, we bear responsibility toward shareholders, clients, and stakeholders to assess, report on, and manage climate-related risks, and we continue to assess climate-related risks and manage our own businesses' impact on climate change. We're developing strategies that support sustainability goals, including strategies oriented toward investors who wish to achieve structurally lower carbon emissions and want to identify with companies that are making strong progress on climate change goals.

For example, we currently have a global climate equity strategy and a global climate bond strategy that allow investors to align their portfolios with the overarching goal of curbing GHG emissions and achieving real-world decarbonization while investing in companies we expect to outperform through climate action. In 2022, we launched our forest climate strategy, which provides investors with the opportunity to promote climate change mitigation through sustainably managed forests where carbon sequestration is prioritized over timber production.

How we identify climate risks

Our process for identifying climate risks is supported by our policies and engagement practices. In addition, we identify climate risks through public disclosure and third-party sources, as well as through our own research, company engagement, and collaborative initiatives.

Manulife's environmental risk policy, updated in 2023, sets out an enterprisewide framework for the management of environmental risks within our business activities. In parallel with this framework, Manulife Investment Management identifies and assesses climate risks through public disclosure and third-party sources, as well as through our own research, company engagement, and collaborative initiatives.

To better identify and assess climate-related risks for our investee companies, as well as for assets we operate, we consider and incorporate external assessments and information from different sources. We apply tools designed to analyze carbon emissions, conduct scenario analysis, examine fossil fuel reserves, and formulate conclusions about physical and transition risks, along with other topics across the climate-related risk spectrum.

We also obtain climate risk data from companies' publicly disclosed documents. Meanwhile, we can engage with companies where we seek additional disclosure and in cases in which data providers have information gaps.

Manulife Investment Management has participated in a wide range of climate change-focused associations and organizations that contribute to more robust efforts at climate disclosure, including:

- AIGCC
- CDP
- Ceres Investor Network
- Ceres' Valuing Water Finance Initiative
- Climate Action 100+
- Climate Engagement Canada
- ESG Data Convergence Initiative
- Institutional Investors Group on Climate Change
- GRESB
- ISSB Investor Advisory Group (IIAG), formerly SASB Investor Advisory Group
- Sustainable Forestry Initiative (SFI)
- Sustainable Finance Action Council Taxonomy Technical Experts Group
- Taskforce on Nature-related Financial Disclosures (TNFD)
- TCFD Consortium (Japan)
- UN PRI

Supplemental guidance

We host sustainability education and training across the firm on a variety of sustainability issues, including climate-related topics. For all investment staff, the sustainable investing teams host periodic training on thematic sustainability issues for which the content and medium can vary. Training is either led by the internal sustainable investing teams or leveraged from external service providers and experts. Investment staff attendance at such training events is tracked. These meetings also include external speakers or training from the sustainable investing teams on topics relevant to their market or sector. For example, in 2022, we hosted a policy and practitioner expert session, "Climate science and policy response—a discussion with the Union of Concerned Scientists."

Another key example is the training that occurs in our global engagement research initiative (GERI) discussions. This program consists of bimonthly meetings with public markets equity, fixed-income, and sustainable investment professionals. Each GERI meeting has a sector theme with related internal professionals as well as outside speakers invited to present pertinent research for the given sector; in 2022, for example, one focus topic was dedicated to understanding the 15 categories of scope 3 emissions.

The sustainable investing teams also conduct training for specific investment teams on an as-needed basis. For example, training has been provided to the liability-driven investment team on broader topics such as climate change in addition to specific topics such as GHG emissions breakdown by sector, climate VaR, and climate scenarios. In portfolios of publicly listed asset classes, we engage with investee companies to encourage best practices associated with climate-related disclosure. We also use CDP data to assess the potential impact in terms of costs and benefits of climate change for our investee companies.

In fulfilling our duty as a fiduciary to protect our clients' assets and to act in their best interests, we believe that our stewardship responsibilities align with a long-term investment view. Our fundamental investment process goes beyond financial statement analysis and involves ongoing monitoring of the strategies, capital structure, and management of ESG risks and opportunities of a given company or entity. Within the daily risk report encompassing each strategy, climate metrics are provided to describe those issuers with a higher climate risk exposure; additional specifics are found in climate tools that are available to our public markets investment teams.

Climate tools (public markets asset classes)

1. **Portfolio carbon footprint—**We actively measure the portfolio carbon footprint that enables portfolio managers to comprehend portfolio carbon intensity and provides a baseline for benchmarking and decarbonization strategies.

2. **Robust transition company assessment—**A dedicated internal team uses various tools and data points to assess whether a company has a credible climate strategy and transitional plan. Those tools include the Transition Pathway Initiative, CDP, the SBTi, Trucost GHG emissions data, Bloomberg ESG tools, and IEA scenario analysis data.

3. **Climate scenario analysis—**In 2021, we began providing climate risk data aligned to multiple climate scenarios within our daily risk reports that encompass those investee companies with the highest climate risk exposure at an individual portfolio level.

4. **Climate risk tool kit—**In 2022, public markets sustainable investing professionals developed a tool to evaluate climate risk at a portfolio and issuer level. This tool is housed on a central global research platform to which all investment teams and professionals have access.

Linking climate exposure to active ownership, we seek to engage with companies/entities both before and after we invest in order to enhance the long-term value of our clients' investments. One topic we engage on is helping companies to provide effective disclosure, including climate-related information. We apply a materiality-based approach to our investment decision-making process, but we recognize that some factors can have material effects across industries and geographies; for example, we believe that climate change and biodiversity are near-universal topics for investments in all asset classes, geographies, and sectors.

We believe that investors can also play a strategic role, not only in the identification and analysis of the systemic risks from climate change, but by using our voice to improve outcomes for our clients, as well as for the economy, environment, and society. Through our sustainability analysis, we identify both the key barriers to effective stewardship and the immediate improvements we recommend to promote the smoother functioning of financial markets. This helps our own climate risk assessment, but it also advances the market overall and we believe can help reduce systemic risk.

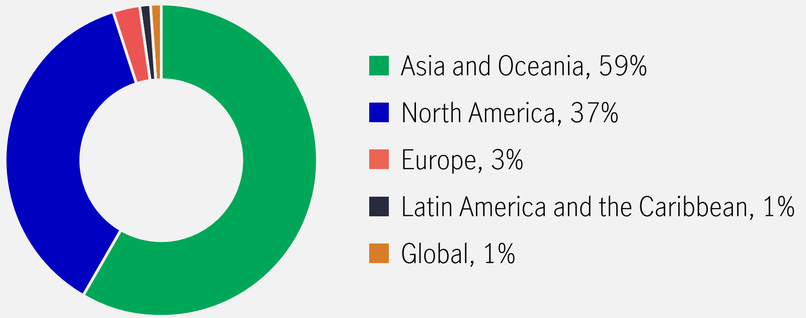
2022 engagements with investee companies and other entities

1,271 total engagements in 2022[1]

781 unique issuers engaged

38 unique influencers, regulators, NGOs, governments, and vendors engaged

All engagements by region[2]



NGO refers to nongovernmental organization.

1 May have multiple engagements with a single party. **2** The global category includes vendors, nongovernmental organizations (NGOs), and influencers with a worldwide focus and coverage. Mexico is included in the Latin America and Caribbean category. Percentages may not add up to 100% due to rounding.

Top engagement discussion topics in 2022

Discussion topics	Engagement
CEO/management team	33%
Board structure	31%
GHG emissions	26%
ESG disclosure	19%
Energy management	16%
Physical impacts of climate change	8%
Labor practices	7%
Executive compensation	6%
Material sourcing and efficiency	5%
Management of the legal and regulatory environment	5%
Employee engagement, diversity, and inclusion	4%
Human rights and community relations	4%
Product design, lifecycle management, and/or packaging	4%
Access and affordability	4%
Water and wastewater management	3%
Board diversity (gender/ethnicity)	3%
Employee health and safety	3%
Data security	3%
Biodiversity	3%
Product quality and safety	3%
Waste and hazardous materials management	3%

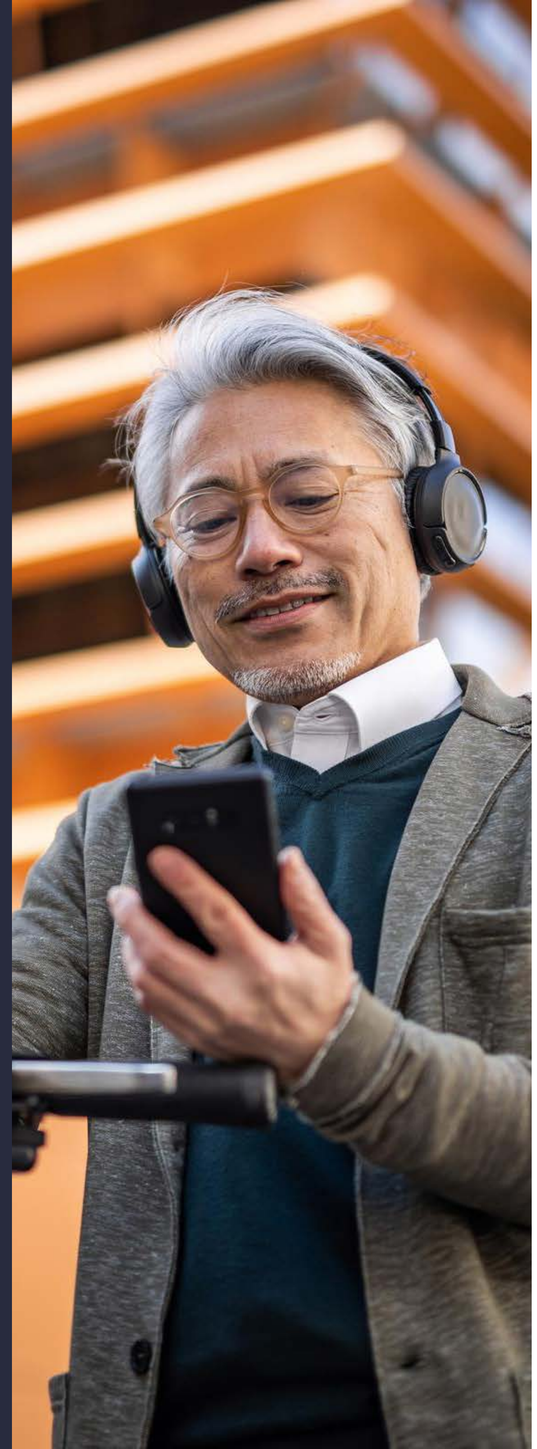
Source: This list relates to engagements with public markets issuers and was compiled using data from our proprietary engagement tracker, as of December 31, 2022. A single engagement may be represented across multiple topics as a single engagement often covers a range of issues. The list above reflects topics that we track that were discussed in at least 3% of our total engagements. GHG refers to greenhouse gas. ESG refers to environmental, social, and governance.

A key example of this activity is our involvement in the IIAG. The IIAG includes global asset owners, asset managers, and investment intermediaries who recognize investors' need for consistent, comparable, and reliable disclosure of financially material, decision-useful ESG information.

In our role as chair of the Exchanges Working Group for the IIAG, we work with exchanges to recognize the SASB Standards as globally applicable within a core set of corporate ESG disclosures. Furthermore, in our bilateral company engagements, we ask issuers to use SASB Standards in disclosures to investors. As a result of this collective effort, we're beginning to see greater adoption of SASB Standards as a reporting framework.

In June 2022, we provided a comment letter to the SEC in response to their draft disclosure recommendations related to emissions. We articulated how our investment professionals consider and integrate information that's available to them in their decision-making where they deem it material and relevant to their investment process and thesis, including climate disclosures and metrics such as quantities of GHG emissions and intensity levels. In addition, we expressed our support for disclosure of scope 3 emissions data and acknowledged how this data could be used as a leading indicator of exposure to revenue risk in the future as customer preferences for lower-carbon products and services change. Reporting scope 3 emissions could encourage industry participants to look at emissions risks across their entire value chain, moving beyond operations-only emissions. We also provided specific examples of how our investment teams have used climate data to:

- Conduct due diligence
- Factor in risk metrics and risk reports
- Build climate-themed investment products
- Assign a cost to carbon in financial models
- Re-weight portfolios based on emissions



Fostering the adoption of the TCFD framework in Japan

Issue—Soon after the release of the climate-reporting framework from the TCFD in 2017, we saw the potential for the framework to foster a better understanding of climate risk as both a global and a local issue. We believed that broadly communicating the importance of this dual significance, both for physical and transition (or policy-related) risks, could be a useful facet to emphasize—and be especially beneficial to foreign investors who are less familiar with the local context in Japan. We also believed it might help speed adoption of the disclosure framework by Japanese companies, which we've come to see as paramount for those companies issuing or planning to issue green and transition bonds.

Action—The Japan TCFD Consortium, backed by Japan's Ministry of Economy, Trade, and Industry, was convened in 2019 to help companies incorporate the analysis of climate risks into their business strategies. Manulife Investment Management's Japan credit research team, together with our sustainability professionals in public markets, has been a participant in the consortium since its inception. We're one of the few asset managers that have been a continuous participant from the start.

Our team has viewed the TCFD as a critical tool for better understanding climate risks and opportunities faced by bond issuers, their track records for addressing the same, and enhancing the credibility of various types of sustainability-labeled bonds. Through our participation in the forum, we also saw the opportunity to help make a broad market impact: Given that nearly a third of all Japanese bond issuers are in GHG-intensive sectors, we believe the proliferation of TCFD reporting among Japanese companies is a potentially powerful lever for improving the overall risk profile of the market and our clients' portfolios.

Outcome—In the four years since the consortium was convened, participation in consortium activities has grown more than fivefold, with approximately 25% of all listed companies in Japan currently participating. In addition, we've seen an increasing number of companies announcing their alignments with the SBTi. Among the 5,734 companies that have so far taken action by adopting specific targets or making net zero commitments, Japan-domiciled companies constitute 11% of the total.

Investors have come to expect issuers to be able to articulate how they structure climate governance, the level of ambition in their climate-related targets, and how they develop their sustainability strategy in relation to climate goals at the national level. In our view, many issuers are better able to meet these demands of the marketplace as a result of their participation in the TCFD Consortium, and we see many already preparing to release new disclosures under still-developing sustainability frameworks, such as that being finalized by the TNFD. Getting ahead of future regulatory requirements is one of the main benefits of participation in the consortium, and we expect an increasing number of Japanese issuers to realize this benefit by joining this sustainability-focused forum over time.

Managing climate risks

We manage climate risks throughout the different stages of our investment process

As put forth in our climate change statement, we may take a variety of actions toward managing climate-related risks and opportunities across our businesses and investments to appropriately price climate risk. Broadly summarized, our available actions relate to asset allocation and selection, investment analysis and research, proxy voting, mitigating direct GHG emissions, deploying sustainability management best practices for operated assets, and participating in collaborative industry climate initiatives.

In relation to publicly listed asset classes, our preferred position in most cases is to engage directly with companies to encourage effective implementation of climate risk mitigation and adaptation strategies, reserving the right to divest any investment.

Sustainability risks and factors throughout the investment lifecycle

Our investment teams are empowered to make decisions in line with their respective investment philosophies and client objectives. Each investment team has responsibility for its own investment process, from research through implementation. The integration of ESG factors into investment processes aligns with this approach, ensuring that our analysis is relevant and meaningful to each team's investment process. The heads or chief investment officers of each asset class have oversight of the investment processes of the individual investment teams, which includes the evolution of our sustainable investing approach.

We look to incorporate material sustainability risks and opportunities throughout the stages of our investment lifecycle, taking into account the characteristics of the asset class and investment capability in question as well as industry and geography, among other factors.

Climate change and risk management

We acknowledge that climate change is one of the most material long-term risks to our business model, and its effects are already being felt. We seek to remain abreast of the best available science on climate change and to understand its impact on our investments.

The IPCC urges action to limit global warming to 1.5°C in order to prevent the destabilization of the climate system and reduce the risk of impending extreme weather events, changes to global food systems, biodiversity loss, and greater poverty.

According to a previous IPCC report, "limiting global warming to 1.5°C would require rapid and far-reaching transitions in land, energy, industry, buildings, transport, and cities." Additionally, as noted by the World Resources Institute, "$5 trillion will be needed annually by 2030 to finance the systemwide transformations needed to limit global warming to 1.5°C. But to meet this target, annual increases in total funding from public and private sources must accelerate by a factor of 13." Such profound changes present significant risks and opportunities for all institutions, including those in the private sector.

This combination of sustainability-focused activities in assets we manage and operate, rigorous fundamental research, proprietary ESG assessments, use of third-party providers, and direct collection of climate-related data enables us to manage climate-related risks within the parameters of each specific product or investment strategy.

Partnering with clients on their climate-related goals

We aim to deliver long-term resiliency and sustainable investment outcomes for clients, including by partnering with them on their climate-related goals. We also aim to engage with our investee companies to accomplish these outcomes using a variety of internal initiatives.

- Training for investment staff on topics such as climate science, analysis, and available tools
- Engagement with companies in relation to their climate disclosure, business strategies, governance, and emissions reduction plans/progress
- Development of strategies that support sustainability goals
- Education and reporting for our clients on climate risks and opportunities
- Operations and emissions reduction targets within Manulife's real estate, timberland, and farmland assets

Supplemental guidance

Material climate-related risks are managed by considering asset class, geography, and underlying investment strategy.

As we have investment teams operating in varied markets, this results in different applications of sustainability analysis. Accordingly, a team integrates ESG factors into its investment process in a manner that best aligns with its investment approach. Each team bears responsibility for the evaluation of ESG factors throughout due diligence, decision-making processes, and ongoing stewardship. ESG integration within each asset class or investment strategy always focuses on material ESG risks, as we believe that identifying and assessing material sustainability issues help us protect and enhance the value of the assets we manage and operate.

The relative importance of E, S, and G depends on the industry, guided by an ESG materiality map for each sector to ensure consistency. Ultimately, determining this materiality also requires a certain level of judgment from the investment team based on its understanding of the asset or company and the industry in which it operates. We generally feel that it's unlikely that any asset or company will be unaffected by climate change; however, some industries may have a higher risk exposure than others, and the materiality map can identify those industries.

Integrating climate risks

Climate risks are integrated into our overall risk management framework.

Because we operate across numerous asset classes and markets, we've implemented overlapping processes to identify and respond to different types of risk. In turn, our investment teams are empowered to account for the market and systemic risks in their investment process, which are then monitored at an organizational level.

Manulife Investment Management deploys a risk management approach that comprises three layers, beginning with our investment professionals. This is followed by compliance and risk management teams acting as the second layer, with our internal audit team constituting the third. All three layers have entirely separate management structures and reporting authorities to ensure independence.

Across our investment capabilities, portfolio managers are ultimately responsible for managing risks in their portfolios. Our public markets teams are aided by an investment risk group and a dedicated sustainable investing team, together with models that assist in the monitoring of market risk. The sustainable investing team reports to a multidisciplinary risk committee and chief risk officer, and our sustainability professionals participate in collaborative engagements in connection with a variety of systemic risks related to ESG factors. The latter activity helps us amplify our impact across global capital markets.

We rely on both quantitative and qualitative risk management inputs

For illustrative purposes only.

Across our investment capabilities, portfolio managers are ultimately responsible for managing risks in their portfolios. Our public markets teams are aided by an investment risk group, an ESG team, and models that together help monitor market risk. In connection with a variety of systemic risks commonly defined in terms of ESG factors, we participate in collaborative engagements, which help us amplify our impact across the global capital markets.

Risk forums in public asset classes

Forum	Risk discussions	Responsibility
Portfolio risk monitoring	• Stock-specific risk • Tracking error as well as sources of common factor risks • Portfolio construction • Sector/regional allocation • Position size and liquidity	Investment risk team
North America and Asia fixed-income ESG task force	• Tracking implementation of ESG framework within research and portfolio management • Raising portfolio-specific ESG concerns and review of ESG fixed-income assessment • Sharing ESG engagement activities • Education sessions on key sustainability issues led by external experts	Chaired and overseen by portfolio managers and analysts
SICs	• Raising risks to senior management, including the CEO • Overseeing progress of the sustainable investing agenda	Public and private markets CEOs, senior cross-functional leads, and sustainable investing team members
ESG portfolio quarterly review	• Identifying portfolio- and stock-level ESG risks and opportunities • Performing and monitoring climate scenario analysis for each portfolio and discussing high-risk companies • Updating individual company ESG-related engagements	Portfolio manager

Does not represent all risk forums where climate-risk management is discussed.

Real estate

Manulife Investment Management's real estate platform has built a risk management approach and framework that lay out how we identify and manage the climate-related risks and opportunities to which we're exposed. Our three-step approach involves raising awareness, evaluating risk and opportunities, and integrating best practices.

1 Raise awareness

Raising awareness is vital to educating our property and asset management teams and stakeholders about the science of climate change and builds internal capacity to manage climate risk and improve resilience. We've implemented two approaches to improving climate risk and resilience awareness: training and access to climate data.

2 Evaluate risks and opportunities

Identifying and understanding the climate risks within portfolios enable the development of resources and tools for effectively managing those risks and improving resilience. We inventory our existing resilience practices and features and identify improvement opportunities for climate change management. Our approach includes an evaluation on both the organizational and portfolio levels.

3 Integrate best practices

Once opportunities for climate change management have been identified, it's necessary to develop operational standards to enhance the resilience of current practices. We seek to integrate best practices into each stage of the real estate investment lifecycle. We use a stepwise process to ensure that teams are putting into place essential measures to make our portfolios more resilient, which we supplement with training, guidance, and tools to support action while incorporating new initiatives to help teams to progress and improve.

Assessing both our physical climate risks and resilience aligns us with the recommendations of the TCFD and keeps us focused on delivering attractive risk-adjusted performance across our global portfolio.

Learn more about our approach to climate-related risk management in our sustainable investing real estate 2022 report.

Timberland and agriculture

Comprehensive, portfoliowide scenario analysis for our farmland and timberland assets requires accurate, long-term, site-specific data and sector-specific transition models. While globally recognized and peer-reviewed data for timberland and agriculture assets is still limited, we continue to explore ways to obtain or develop information tailored to sector-relevant scenarios to achieve fuller results both now and in future years.

Timberland scenario analysis

Ensuring the resilience of a climate strategy given the multiple possible climate outcomes requires various scenario analyses. These are challenging exercises because of significant uncertainties around the ability of biological assets to adapt to changing climate conditions. While standard scenarios and business responses exist in the energy industry, for example, to date, there's no equivalent for forestry.

As mentioned earlier in this report, in 2020 we conducted a pilot scenario analysis of our New Zealand timberland that we reported in our 2020 climate-related financial disclosure. In 2021, we built on the pilot and extended the analysis across our entire platform, engaging our forest operations professionals from the United States, Chile, Brazil, Australia, and New Zealand in workshops to better gauge our ability to prepare for the realities of climate change.

Last year, we began analyzing these risks across different regions and over varied timeframes and concluded that the types of climate impacts that could affect assets we manage are fairly constant and that the number of key risks is small. However, we also determined that these risks interact with and influence each other in ways that simple linear cause-and-effect relationships don't accurately capture.

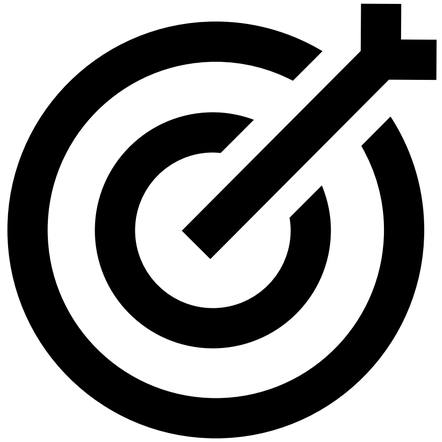
As part of our efforts to deepen our quantitative analysis of climate risks and opportunities, we invested in a third-party analytical platform that will enable us to systematically evaluate climate risks under various scenarios (Representative Concentration Pathways 2.6, 4.5, and 8.5) across all our major investment regions.

Learn more about our approach to climate-related risk management in our sustainable investing timberland 2022 report.

Agriculture: improving our capabilities

Integrating climate-related risk management into our farmland management requires high-quality data that enables an accurate quantification of our existing emissions and removals because decarbonization plans and progress monitoring require measurement against a reliable baseline. Straightforward and scalable methods for calculating emissions—and especially soil carbon sequestration—have historically been lacking, so we've spent the past three years progressively improving our capabilities in this area, and it's an essential supporting element of our decarbonization plan.

Learn more about our approach to climate-related risk management in our sustainable investing agriculture 2022 report.



Metrics and targets

Metrics used

Where appropriate, we use a variety of metrics to manage climate alignment, including green investments, corporate carbon footprinting, portfolio warming potential, sovereign climate risks, and strategy-level emissions.

Where appropriate, we use a variety of metrics to manage and monitor our alignment and that of our investee companies and assets with the Paris Agreement's goal of limiting the global average temperature rise to well below 2°C compared with preindustrial levels. We also use these metrics to manage and monitor the potential financial effects associated with climate change on our business. By understanding the benefits and limitations of the tools we use, we're better able to analyze the risks and opportunities available. Some of the metrics we use include:

- **Green investments—**We track our investments in certified green real estate, certified timberland and agriculture assets, and renewable energy infrastructure; our sustainable Asia bond strategy also has a dedicated allocation to green bonds.
- **Direct data collection—**In 2021, we launched a new initiative to collect data directly from companies in our infrastructure and PE&C portfolios to gain a better understanding of their ESG performance.
- **Carbon footprinting—**We calculate annual GHG and carbon inventories for invested timberland, farmland, and real estate properties. In addition, for some public markets portfolios, we may use exposure to fossil fuel reserves, emissions disclosure to assess exposure to a potential increase in carbon pricing or transition risk, or WACI data in metric tons of carbon dioxide equivalent (tCO_2e/$M sales) to assess the relative efficiency of emissions.
- **Implied portfolio warming potential—**We use the MSCI implied temperature rise metric to assess our public equity and fixed-income portfolio alignment with the Paris Agreement. This warming potential methodology captures all emissions of issuers (scope 1, scope 2, and scope 3) as well as revenues from low-carbon technology to provide an aggregate forward-looking perspective versus the carbon budget at 2°C warming to compute an implied temperature in the year 2100.

Use of these metrics may vary by investment team and strategy and may differ between clients.

- **Sovereign ESG model—**Our proprietary sovereign ESG model allows us to track climate-related risks—including the momentum of these risks—for around 200 countries and territories.
- **Strategy-level emissions monitoring—**We measure emissions at a strategy level to better understand and incorporate risks related to business disruptions, stranded or impaired assets, and regulatory risk, among other physical and transition risks that stem from climate change.

We're working closely with peers, academics, professional bodies, regulators, governments, and international agencies to further develop our tools and approaches. For example, we're a member of the UNEP FI investor Phase II pilot project and the Investment Leaders Group convened by the Cambridge Institute for Sustainability Leadership. We also have a close partnership with the MIT Joint Program on the Science and Policy of Global Change, which provides sponsors with access to historical information, analysis, projections, and modeling capabilities focused on climate change and its effects using economic and earth system models.

Supplemental guidance

As these metrics change over time, we expect to incorporate more forward-looking metrics, location-specific data, and scope 3 emissions data.

Another metric added to our thematic equity portfolio focusing on climate change is the tracking of portfolio companies that have set targets using the SBTi. Our global climate equity strategy specifically uses this data to assess forward-looking climate metrics in addition to current and past emissions.

This incorporation of forward-looking metrics is an area we expect to build on going forward; specifically, we expect to continue reviewing the high-emitting sector pathways needed to meet the goals of the Paris Agreement and net zero ambitions. Sector-level emissions intensity metrics at a unit level, rather than at a revenue level, will likely be one area of further development.

Physical climate risk is another area that we expect to continue evolving, and this is often dependent on location-specific data. We've therefore engaged with data providers by offering input and feedback as they develop these databases. Additionally, as more companies measure and report on their scope 3 emissions, we expect the quality of that data to improve.

Emissions and risks

We use a variety of tools and participate in an array of engagements to assess the spectrum of climate-related risk across public and private markets asset classes.

For our third-party managed portfolios, we use various tools to manage physical and transition risk across our portfolios. These tools include scenario analysis and carbon footprinting, as well as metrics such as fossil fuel reserves, forward-looking company carbon reduction targets, green revenues, and sectoral reduction pathways.

As an asset operator and investor, we assess climate risk and use our influence to encourage our assets and the companies we invest in to reduce their GHG emissions and align their business models with the realities of a changing climate. We also partner with other investors and industry experts to tackle climate change on a broader scale. By working collaboratively with peer investors, we're strengthening our potential ability to reduce systemic climate change risks and realize the economic benefits of the low-carbon transition.

Emissions and removals

We define our organizational boundary using the operational control approach for scope 1 and scope 2 emissions per the GHG Protocol. Under the operational control approach, a company accounts for 100% of the GHG emissions from entities over which it has operational control, regardless of financial ownership of the entity. It doesn't account for GHG emissions from operations in which the company owns an interest but has no operational control; therefore, Manulife Investment Management discloses emissions from real assets (timberland, agriculture, and real estate), as these are under our operational control.

Manulife's GHG-related disclosure

Manulife reports its GHG emissions in its annual ESG report and to CDP, a global database of corporate carbon emissions. This disclosure includes:

- Manulife scope 1 and scope 2 emissions from businesses in which Manulife has operational control
- Scope 3 emissions from business travel (air travel, rental car mileage, and personal car mileage), paper use, and waste generated in operations (municipal solid waste)

Manulife's emissions are calculated according to the GHG Protocol and are reviewed by a third party using a limited assurance procedure.

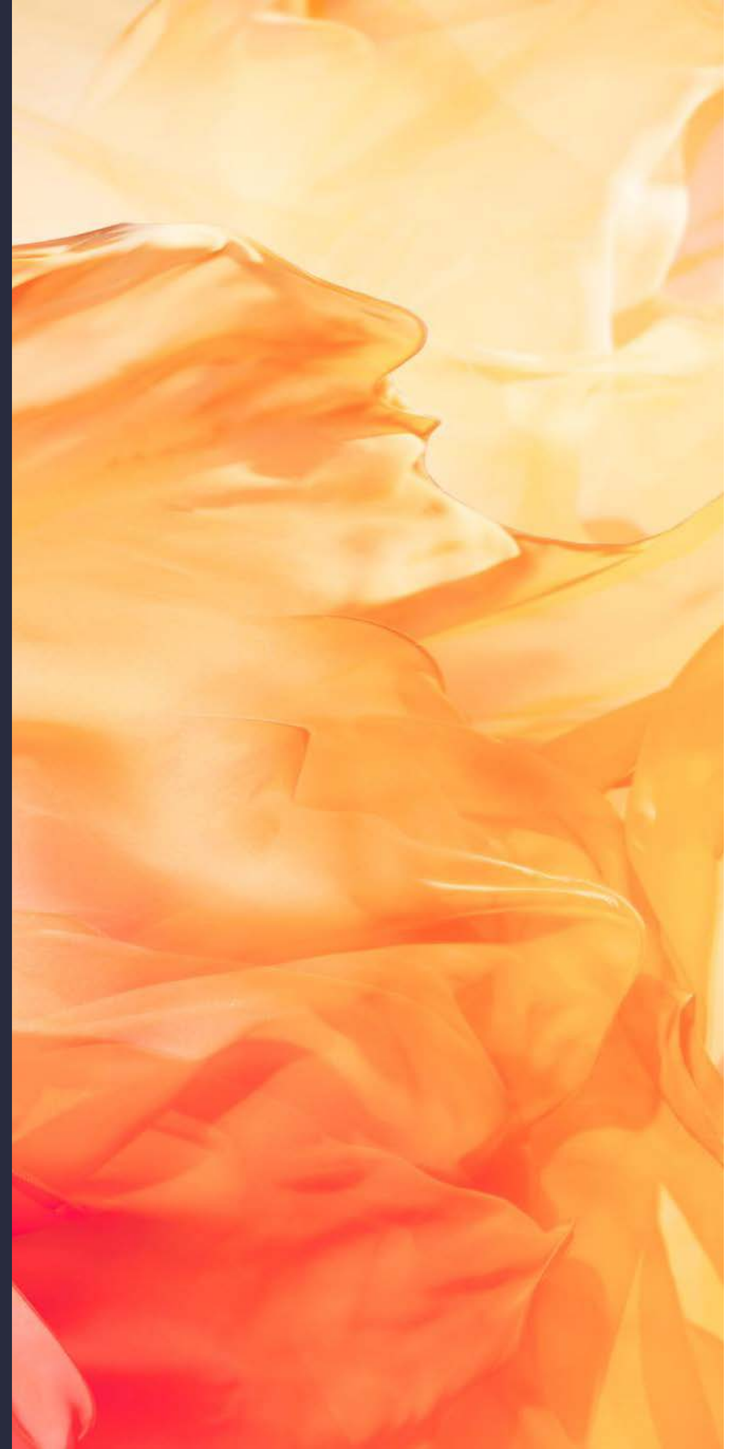
Private markets investments

Timberland emissions and carbon removal data

We provide a comprehensive suite of metrics illustrating our timberland portfolio's impact on the climate, including emissions, as well as carbon sequestration. For transparency, we also break down the individual components of the emissions and sequestration, as well as metrics relating to our tree planting and harvesting activities and the ultimate end uses of our harvested wood products.

Metric	2022	2021	GIIN
Total standing forest carbon stock (tCO_2e)	638,506,302	615,204,003	N/A
Scope 1 GHG emissions (tCO_2e)	49,233	80,035	OI4112
of which: managed fire emissions (tCO_2e)	37,489	52,318	OI4112
of which: fertilizer (N_2O) emissions (tCO_2e)	8,642	24,838	OI4112
of which: fuel combustion emissions	3,102	2,879	OI4112
Scope 2 GHG emissions (tCO_2e)	0	0	OI9604
Scope 3 GHG emissions (tCO_2e)	482,445	195,330	PD9427
Biogenic stock change (tCO_2; +ve = sequestration; -ve = emissions)	-1,339,974	3,179,520	PI9878
Carbon stored in harvested wood products (tCO_2e)	2,557,633	2,979,656	PI9878
Net sequestration (tCO_2; +ve = sequestration; -ve = emissions)	686,164	5,883,811	PI9878
5-year average sequestration (tCO_2; +ve = sequestration; -ve = emissions)	1,791,934	2,747,187	PI9878
Net productive area	82.3%	82.9%	N/A
Net productive area harvested	2.8%	2.9%	PI3468
Net productive area planted	2.7%	2.6%	N/A
Harvest to solid wood	63.4%	59.2%	PD8494
Harvest to fiber	35.6%	40.7%	PD8494
Harvest to biomass	1.1%	0.0%	PD8494
37-year history of number of trees planted	1,304,430,265	1,253,935,422	N/A

Source: Manulife Investment Management, 2022. GIIN refers to Global Impact Investing Network IRIS+ metric codes. According to the Greenhouse Gas (GHG) Protocol, scope 1 emissions are all direct GHG emissions, which are "emissions from sources that are owned or controlled by the reporting entity"; scope 2 emissions are "indirect GHG emissions from consumption of purchased electricity, heat or steam"; and scope 3 emissions are "other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc." Biogenic stick change is net change in total forest carbon stocks over calendar year 2022. Positive values indicate more forest grew than was harvested (net sequestration); negative values indicate more forest was harvested than grew (net emission). Quantity of carbon assumed to be stored in harvested wood products (from trees harvested over calendar year 2022) after 100 years. Represents long-term storage and is calculated using market-specific (geography/species) conversion factors. It is a fraction of biogenic stock change, as only some of the carbon transferred from forest carbon pool to wood products pool goes into long-lived wood products. Net sequestration is the biogenic stock change, plus carbon stored in harvested wood products, minus scope 1, scope 2, and scope 3 emissions. The net productive are is a fractional area of timberland under management that is managed for commercial production of wood products. Areas not managed for commercial production of wood products may include areas with high conservation value, old growth forest, buffer zones, conservation easements, threatened and endangered species habitat, or areas with historical or cultural significance.

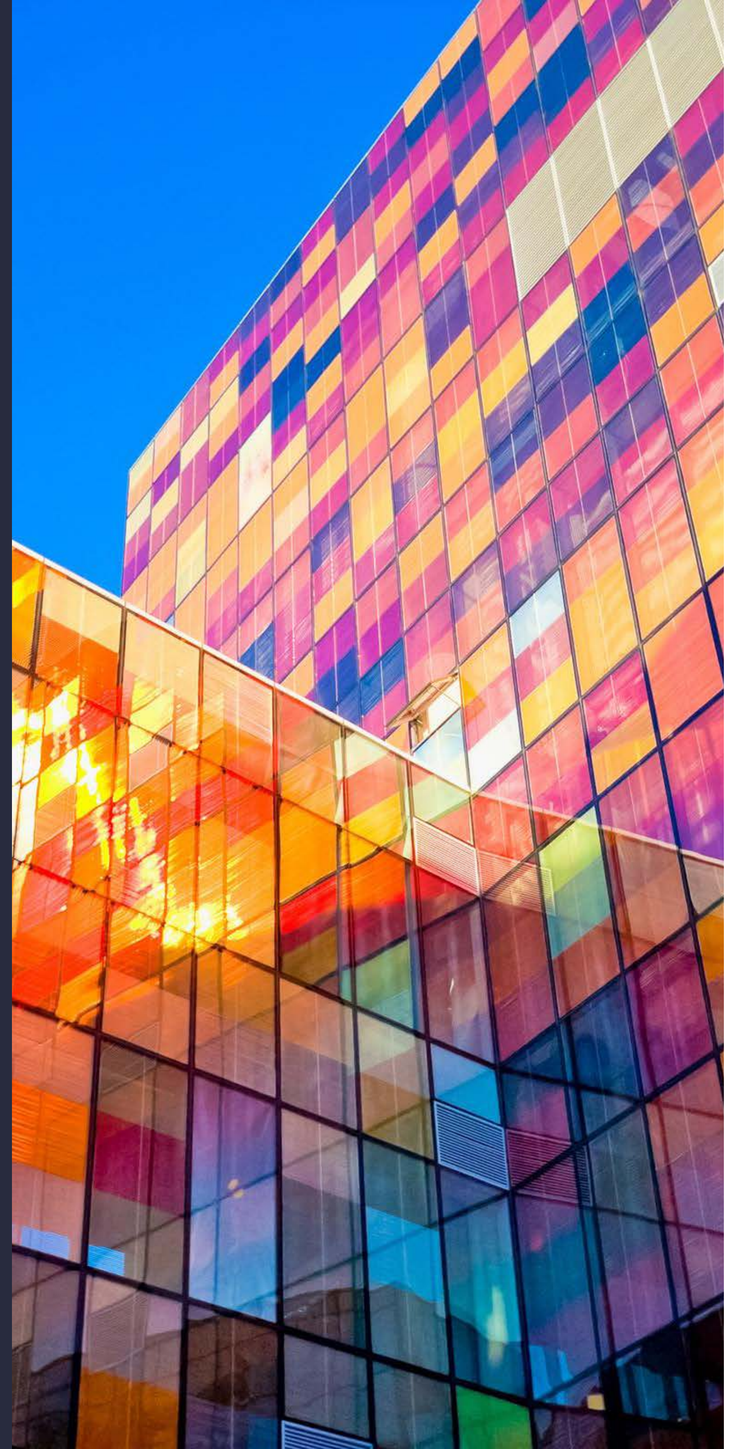


Agriculture emissions and carbon removal data

We aim for continuous improvement in both environmental performance and data quality, so some year-over-year fluctuations may be due to improved data quality (more primary data and fewer estimates) and should not yet be fully relied on to indicate decarbonization (or increasing emissions). We believe that 2022 data is of high enough quality (approximately 61% is primary data) that changes in future year performance can be reasonably attributed to actual changes in emissions and sequestration.

Metric	2022	2021	GIIN
Properties managed	263	269	OI1674
Scope 1 GHG emissions (tCO_2e)	33,131	47,072	OI4112
of which: fertilizer, urea, and lime emissions (tCO_2e)	12,469	20,073	OI4112
of which: fuel combustion emissions (tCO_2e)	17,724	26,999	OI4112
Scope 2 GHG emissions (tCO_2e)	18,935	17,922	OI9604
Scope 3 GHG emissions (tCO_2e)	193,092	195,684	PD9427
Biogenic removals (tCO_2)	329,853	293,046	PI9878
Net sequestration (tCO_2; +ve = sequestration; -ve = emissions)	84,681	32,368	PI9878
Number of crop types grown	24	25	N/A
Net productive area	87%	88%	N/A

Source: Manulife Investment Management, 2022. GIIN refers to Global Impact Investing Network IRIS+ metric codes. The 263 properties managed for 2022 are as of December 31, 2022. Reference to 220 farms excludes 43 properties belonging to one or more of the following categories: properties under management for less than the full 2022 calendar year, properties not in operation during the 2022 calendar year, properties managed by third parties other than tenants (e.g., management companies), and/or farmland plus assets. According to the Greenhouse Gas (GHG) Protocol, scope 1 emissions are all direct GHG emissions, which are "emissions from sources that are owned or controlled by the reporting entity"; scope 2 emissions are "indirect GHG emissions from consumption of purchased electricity, heat or steam"; and scope 3 emissions are "other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc." Estimated soil carbon sequestration over the reporting period (calendar year 2022) using publicly available crop-specific soil carbon sequestration rates.



Real estate GHG emissions

Metric	2022	2021	2020	2019	2018	2017
Scope 1 emissions (tCO_2e)	**39,645**	36,571	37,772	39,606	37,086	32,468
Scope 2 emissions (tCO_2e)	**103,602**	103,180	115,153	129,585	160,642	156,642
GHG intensity ($kgCO_2e$/SF)	**3.6**	3.8	3.9	4.6	4.9	5.0

Source: Manulife, as of December 31, 2022. GHG refers to greenhouse gas. SF refers to square feet. Location based emissions with 2021 to 2017 values restated due to data revisions and operational control updates. Scope 1 includes emissions from natural gas, diesel, and refrigerant emissions. Refrigerant and diesel emissions are only included in 2019 through 2022. Scope 2 includes emissions from purchased electricity and steam.

To help mitigate the impacts of climate change, Manulife is committed to reducing its GHG emissions and transitioning toward low-carbon energy sources. In 2022, total GHG emissions increased by 2.5%, likely in part due to the increase in occupancy. As we continue to decarbonize our portfolio through on-site building retrofits, procurement of renewable energy continues to grow, with more than 35,600 MWh purchased in 2022.

To lower GHG emissions and support meeting our 80% reduction target by 2050, we integrated GHG management and reduction into our Sustainable Building Standards program. This aims to facilitate education, opportunity identification, and planning to help property and asset management teams assess reduction pathways and financial implications to create realistic emissions reduction plans that have a financial benefit to our clients.

Energy, water, and waste reduction—We monitor property and portfolio energy, water, and waste performance through our proprietary Sustainable Building Standards twice each year. Properties we operationally control aim to conduct an energy audit to identify improvements every three years.

Asset-specific targets—We set asset-specific targets in our Sustainable Building Standards program, and performance against these targets is monitored semiannually. We also encourage teams to include both utility and Sustainable Building Standards targets in their annual performance objectives to drive improvement and encourage action to meet our goals.

Physical risk data—We track property resilience scores, which combine third-party physical risk data with property resilience survey results. We also track the number of properties located in 100-year flood zones and report in alignment with SASB through our insurance program.

PE&C and infrastructure

In 2021, we launched a new initiative to collect data directly from companies in our infrastructure and PE&C portfolios to gain a better understanding of their ESG performance.

We asked portfolio companies to provide data across key categories, including GHG emissions, renewable energy, and climate policy, in line with the framework established by the ESG Data Convergence Initiative. This initiative is an industry-led project launched in September 2021 to standardize the reporting and collection of ESG data in private markets, thereby enabling greater transparency and comparability of ESG data across the industry.

To complement these efforts, we also engaged an external consultant to support the estimation of financed emissions (i.e., scope 3 emissions) for our infrastructure and PE&C asset portfolios to obtain an initial view of the carbon footprint of these asset classes. We plan to provide initial results from our analysis across infrastructure and PE&C in our 2023 report, to be published in 2024.

Listed equity and fixed-income investments

Investment strategies are exposed to different ESG risks and opportunities based on geography, geopolitics, industry, issuer size, and thematic focus. For this reason, we believe ESG issues should be analyzed, managed, and prioritized in connection with the unique profile of each investment. An example of a risk and opportunity that may materially affect the enterprise value of an investment is exposure to climate change. The overwhelming consensus among scientists is that there's a limited amount of carbon dioxide that the world can afford to emit into the atmosphere if we're to limit the global average temperature rise to 1.5˚C.

Consequently, we live in a carbon-constrained world, so we believe it's important to analyze the emissions of the portfolios we manage on behalf of our clients. This will help us understand our current contribution to global climate change mitigation and where we have opportunities to do more.

Defining the scope of our analysis

This year, our portfolio carbon analysis includes all equity and fixed-income portfolios for which carbon emissions data is available for the underlying holdings.

Scope of the analysis and our approach to selecting key performance metrics

For the purposes of this report, we've chosen to use an array of emissions calculations. We believe this allows us to get at different facets of climate issues, including disclosure, and provide a more granular analysis when it comes to managing portfolio-level climate risks and opportunities.

Accordingly, we've calculated our portfolios' GHG emissions profile based on multiple calculation methods as well as different combinations of the emissions categories. We regard this as particularly important for two reasons: First, direct emissions are known to be more easily measured and are easier for companies to control and, second, indirect emissions are larger and involve a higher degree of estimation. As a result of their indirect nature, companies might argue that their ability to control these categories of emissions is more attenuated. For these reasons, we believe it's critical to employ several methods of measuring emissions and to use these in dialogue with investee companies.

How to measure responsibility for emissions within the capital structure

Carbon performance metrics have evolved from using market capitalization as a denominator for calculating and normalizing GHG emissions, which previously dominated industry practice, to using enterprise value, including cash (EVIC). The former methodology held only shareholders to account for all the emissions of a company while the latter enables accounting for issuer debt as part of the emissions allocation/apportioning practice. In effect, this means that those providing finance to companies through equity ownership or through lending are assigned emissions responsibility, but in subtly different ways. Equity is measured by current market value, whereas debt is measured based on book value.

Carbon footprint calculation methods

1 Equity ownership only

Total carbon emissions for a portofio normalized by the market value of the portfolio, expressed in tons CO_2e/$M invested.

$$\frac{\sum_{n}^{i}\left(\frac{\textit{Current value of investment}_i}{\textit{Issuer's market capitalization}_i} \times \textit{Issuer's scope 1 and scope 2 GHG emissions}_i\right)}{\textit{Current portfolio value (\$M)}}$$

2 Equity ownership and debt holder

Equity carbon footprint

$$\frac{\text{Current value of investment}}{\text{Issuer's enterprise value + cash}}$$

Debt holder carbon footprint

$$\frac{\text{Book value of investment}}{\text{Issuer's enterprise value + Cash}}$$

Source: tcfdhub.org, October 2022.

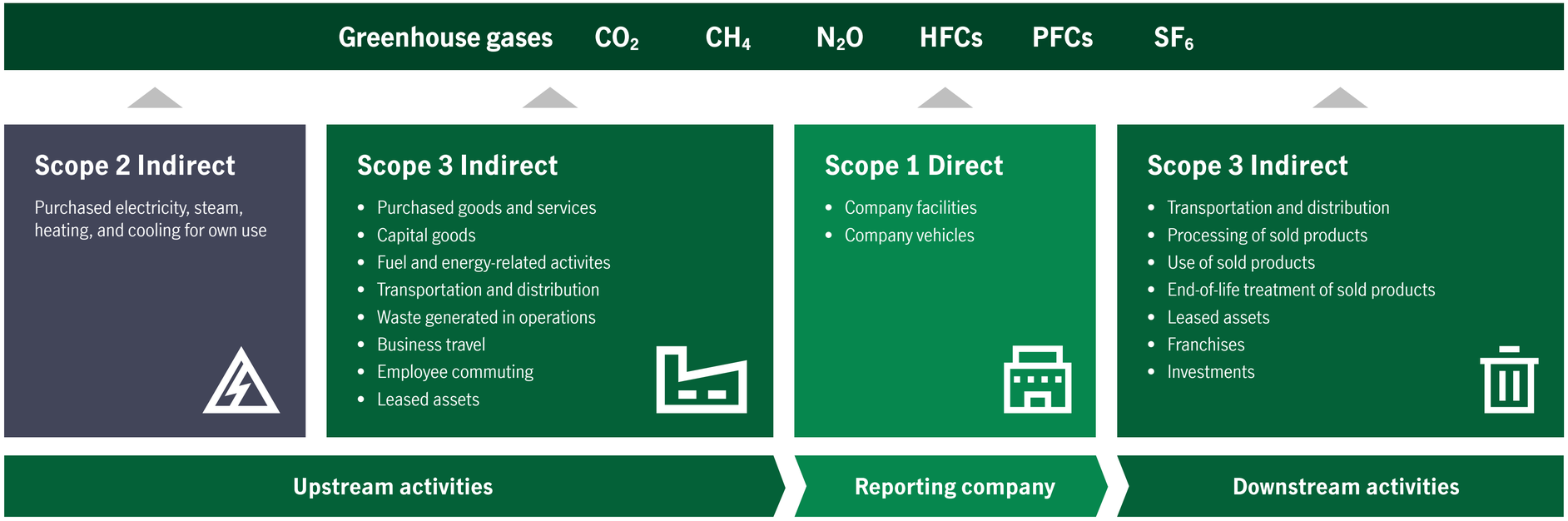
GHG emissions performance

As we increase the scope of GHG included in calculations—moving from scope 1 to scope 2 and scope 3 (both upstream and downstream indirect emissions)—emissions quantities increase, as do carbon footprints. Companies have widely adopted the GHG Protocol to report GHG emitted from their activities. The various scopes of emissions are defined by the protocol to explain the levels of control and ownership, whether the emissions are direct or indirect relative to the company.

Scope 1 is considered direct GHG emissions from sources that are owned by the entity; fuel used in owned/controlled assets such as combustion, furnaces, and company vehicles is included in scope 1.

Emissions associated with scope 2 are considered indirect and comprise the emissions that come from purchased electricity, steam, heat, and cooling. Based on the GHG Protocol, scope 3 is broken out into 15 categories of emissions across upstream and downstream activities. Upstream activities include category 1 purchased, while downstream emissions include category 11 use of sold products. These two categories represent the largest categories of scope 3 emissions for the vast majority of companies.

An overview of scope 1, scope 2, and scope 3 emissions



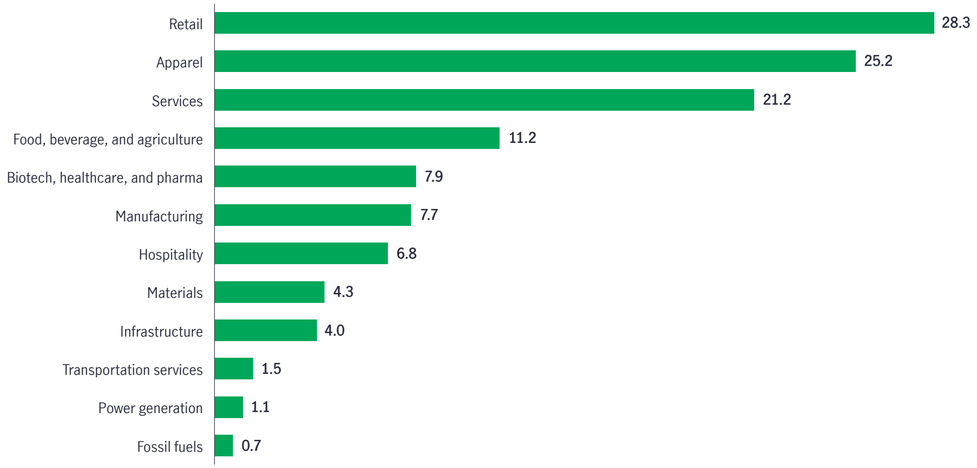
Source: GHG Protocol, 2016. SF refers to square feet.

Generally speaking, firms have the most control of—and therefore the greatest hope to make a short-term reduction impact on—scope 1 emissions, but for many companies these are the smallest part of total emissions. CDP found, for example, that upstream scope 3 emissions that suppliers reported for 2020 were, on average, 11.4 times greater than those produced through their direct operations.

Downstream scope 3 emissions are also particularly material across a variety of industries. Consider, for example, the combustion of gasoline by consumers within internal combustion engines as use of sold products for an oil and gas major. Or, to take an example from banking, consider the financed emissions implicit in a bank's total loan portfolio—also part of the investments category of downstream scope 3 emissions per the GHG Protocol. Under a holistic approach to emissions disclosure, scope 3 additions can indicate enormous carbon footprints, which is the primary reason scope 3 is such an important facet of emissions reduction. Indirect emissions such as scope 2, but particularly scope 3, are commonly the hardest elements for companies to influence in the short term; however, there's a variety of strategies companies can employ to manage these emissions.

For example, they can redesign their products to have a lower emissions profile, or they can collaborate with downstream companies to reduce their emissions profile, including advocating for a more efficient use of products. Of course, these efforts take time—and further investment—to support such innovation and emissions reduction efforts. This is one reason we believe it's important to adopt a balanced approach to engagement with companies, trading off easier but smaller shorter-term opportunities against larger but potentially more significant longer-term gains.

Upstream emissions: scope 3 emissions were on average 11.4 times higher than operational emissions



Source: CDP, 2020. The average of the final ratio of scope 3 supply chain emissions to scope 1 and scope 2 operational emissions and direct emissions.

Our carbon footprint and carbon exposures

We believe that engaging with companies on their most material sustainability issues can enhance their long-term competitiveness and profitability, generating collective prosperity for investors, companies, and society as a whole. Consequently, we engage with companies over a wide variety of ESG issues, including climate-related concerns. In this regard, we engage with issuers to understand their transition plans and help them set targets for emissions reductions across their operations as well as in their upstream and downstream indirect emissions. In looking closely at their carbon footprint, we're also looking at facets of our own scope 3 downstream emissions, which makes our engagement efforts work as a two-way street of potential improvement.

Total carbon emissions—In terms of absolute emissions by ownership, our clients' representative fixed-income and equity portfolios were collectively responsible for 10.0 million metric tons of CO_2e of scope 1 and scope 2 in 2022. As a percentage of the world's total absolute emissions of 36.8 gigatons in 2022, this equals a fraction of a single basis point. While this is obviously a small share of global emissions, it's important to recognize that whenever one of our investee companies reduces emissions, the impact applies across the total emissions of that firm, not just our portion of those emissions. Through engagement with investee companies, we can potentially have a stronger influence on emissions reduction than what's suggested by the size of our individual positions or by our public markets AUM.

Carbon intensity—We believe it's important to consider data on emissions intensity as well as total emissions. Clearly, it's unrealistic to expect two companies that are broadly identical but one being twice the size of the other to have the same amount of absolute emissions. But it's reasonable to measure their emissions per unit of sales or other standardized metric, as this provides insight into the emissions efficiency involved in each company's operations, product development, and/or service execution.

That said, we must remind ourselves that limiting total emissions is the real-world outcome we're trying to achieve; therefore, too much emphasis on intensity figures carries the risk of missing a critical sustainability objective. So while a company may indeed get more efficient in reducing carbon emissions per unit of production or per $1 million of sales it generates, its absolute emissions could be increasing at a faster rate than the rate of its intensity reduction. For this reason, we believe the rate of absolute emissions reduction should be considered alongside changes in carbon intensity.

We calculate our carbon footprint using the Partnership for Carbon Accounting Financials methodology, which has gained traction in the market and among standards-setting bodies. To achieve a more representative footprint, we removed securities that lack emissions data, such as cash, derivatives, and other noncorporate issues, and focused the calculation on securities that have underlying carbon and EVIC figures. This weight is then redistributed to the remaining investment holdings.

WACI—WACI is the standard metric used by investors to assess the emissions management efficiency of investee companies. We show our equity and fixed-income carbon intensity figures versus a general representative benchmark for each asset class. While these benchmarks aren't the applicable benchmarks for many of the strategies, they provide a barometer against which we measure our carbon exposure. We chose these benchmarks as we believe they provide an unbiased view of the carbon intensity for the companies globally. It also enables us to evaluate portfolio intensity in a global context and identify portfolios that may require closer monitoring, which tend to be Asia focused.

For our equity portfolios, we've presented information against the MSCI All Country World Index (MSCI ACWI). The WACI of our equity portfolios, based on AUM per portfolio, is marginally lower than that of the MSCI ACWI. The median carbon intensity of our equity portfolios is higher than that of the benchmark by less than 1%.

For our fixed-income portfolios, we've presented information against the Bloomberg Global Aggregate Corporate Index (BGACI). The WACI of our fixed-income portfolios is roughly 45% higher than that of the BGACI, with median carbon intensity remaining higher than the representative benchmark as well. There are three key reasons why our carbon intensity is higher. First, the financials sector weight in the benchmark is 37%; the diversification of our portfolios, by contrast, results in a lower weight in financials. Financial entities tend to have lower scope 1 and scope 2 emissions and are typically still in the process of building out their modeling capabilities to report scope 3, or financed, emissions. The second reason, which also speaks to diversification, is that our portfolios generally have larger weights in the energy sector. Third, the carbon intensity of our Canadian fixed-income funds is higher, as Canada has a higher exposure to natural resource companies, which operate with higher relative levels of carbon intensity.

In our view, it's important to acknowledge that comparing portfolios using a metric such as WACI isn't as straightforward as it may seem for the simple reason that underlying emissions estimation methodologies may differ. For example, some of the major index providers have proprietary ESG research and data capabilities; therefore, they source emissions and compute carbon estimates based on their own expertise and information access. By contrast, other index providers may rely on third-party providers that are dedicated to providing raw data and carbon estimates that use different methodologies.

The variation in output can be illustrated using actual data for an auto manufacturer whose emissions disclosure for 2021 highlights its differences relative to three separate index providers' estimated emissions data for the same company. Data omissions for indirect emissions are one problem encountered here, as are the underlying assumptions used to determine estimates—including for direct emissions.

Emissions estimates can vary substantially between corporate disclosures and index providers

As a result of these variances, comparing portfolios with each other and portfolios with an index using a seemingly simple figure such as WACI may not be a very meaningful exercise. Over time, we believe these comparison challenges will be reduced as more companies disclose the full scope of their carbon emissions. In the meantime, financial markets will continue to use available figures—preferably with caveats regarding missing, incomplete, or variable data, but realistically not always with a full appreciation of the underlying characteristics related to different industries and geographies.

Global automobile manufacturer

Metric	Company reported figures (reported for the first time in FY 2021)	Provider A's estimated data (FY 2020)	Provider B's estimated data (FY 2020)	Provider C's estimated data (FY 2020)
Scope 1	185,000	420,156	108,395	208,662
Scope 2	403,000	341,906	236,126	557,082
Scope 3—upstream	N/A	840,237	24,408,344	N/A
Scope 3—downstream	1,954,000	6,498,345	6,197,633	N/A
Scope 3—upstream and downstream	N/A	14,636,365	30,605,978	N/A

For illustrative purposes only. Estimated emissions are in absolute metric tons. FY refers to fiscal year.

Our listed equity and fixed-income portfolios' carbon exposures

Absolute carbon emissions and equivalents

The absolute quantity of emissions that our equity and fixed-income portfolios are responsible for, based on the amount invested (vs. EVIC) in the portfolio companies

Metric	Fixed income (millions $MtCO_2e$)	Equity (millions $MtCO_2e$)	Weighted average of fixed income and equity (millions $MtCO_2e$)
Scope 1 + Scope 2	4.5	2.5	3.7
Direct (scope 1) and tier 1 indirect (Scope 2+ Scope 3 from tier 1 supply chain)	6.2	3.5	5.1
Scope 1 + Scope 2 + Scope 3 (upstream)	8.3	5.0	7.0
Scope 1 + Scope 2 + Scope 3 (upstream and downstream)	23.8	22.1	23.1

Source: Manulife Investment Management, 2022. Figures in each column represent absolute emissions based on aggregate assets under management of all portfolios. EVIC refers to enterprise value, including cash.

Carbon footprint/EVIC

Carbon footprint normalized to value invested (apportioned by EVIC) enables us to compare carbon intensity across different portfolio sizes

Metric	Fixed income (millions $MtCO_2e$)	Equity (millions $MtCO_2e$)	Weighted average of fixed income and equity (millions $MtCO_2e$)
Reweighted based on data availability			
Scope 1 + Scope 2	129.3	47.9	97.1
Direct (scope 1) and tier 1 indirect (Scope 2 + Scope 3 from tier 1 supply chain)	181.6	65.4	135.6
Scope 1 + Scope 2 + Scope 3 (upstream)	248.7	93.6	187.3
Scope 1 + Scope 2 + Scope 3 (upstream and downstream)	681.8	409.6	574.1

Source: Manulife Investment Management, 2022. Figures in each column represent absolute emissions based on aggregate assets under management of all portfolios. EVIC refers to enterprise value, including cash.

Our listed equity and fixed-income portfolios' carbon exposures (continued)

WACI

Weighted average GHG intensity per $1M of sales that underlying securities generate enables us to conduct GHG attribution analysis

Metric	Fixed income ($MtCO_2e$/$1M sales)	Equity ($MtCO_2e$/$1M sales)	Weighted average of fixed income and equity ($MtCO_2e$/$1M sales)
Scope 1 + Scope 2	341.46	151.8	266.4
Direct (scope 1) and tier 1 indirect (Scope 2 + Scope 3 from tier 1 supply chain)	401.9	194.1	319.7
Scope 1 + Scope 2 + Scope 3 (upstream)	485.9	265.6	398.8
Scope 1 + Scope 2 + Scope 3 (upstream and downstream)	1,493.1	1,129.3	1,349.2

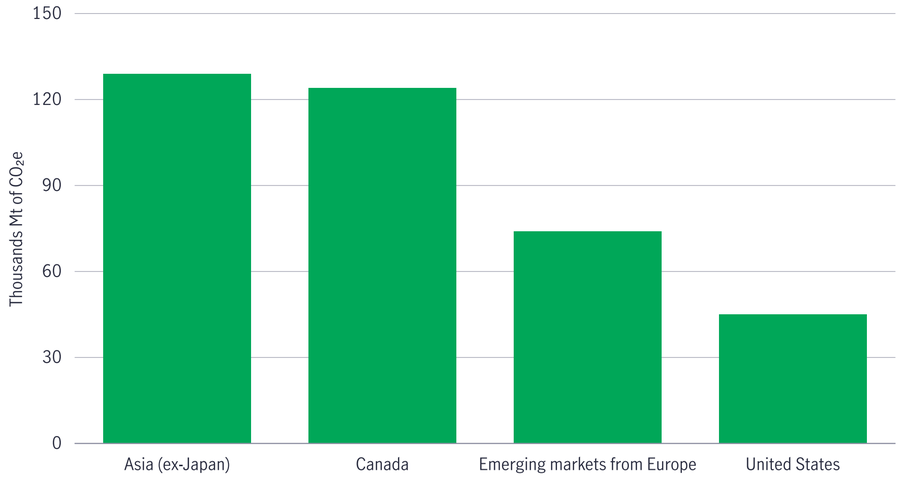
Source: Manulife Investment Management, 2022. Figures in each column represent weighted average carbon intensity (WACI) based on assets under management of all portfolios. GHG refers to greenhouse gas.

Geographical comparison

As a global investment manager, investing across different geographies gives us a perspective on emissions quantities across countries as well as sectors. Using our top 25 largest portfolios by AUM from both our equity and fixed-income businesses, we compared weighted average emissions across each of the climate metrics of absolute emissions, carbon footprint, and WACI.

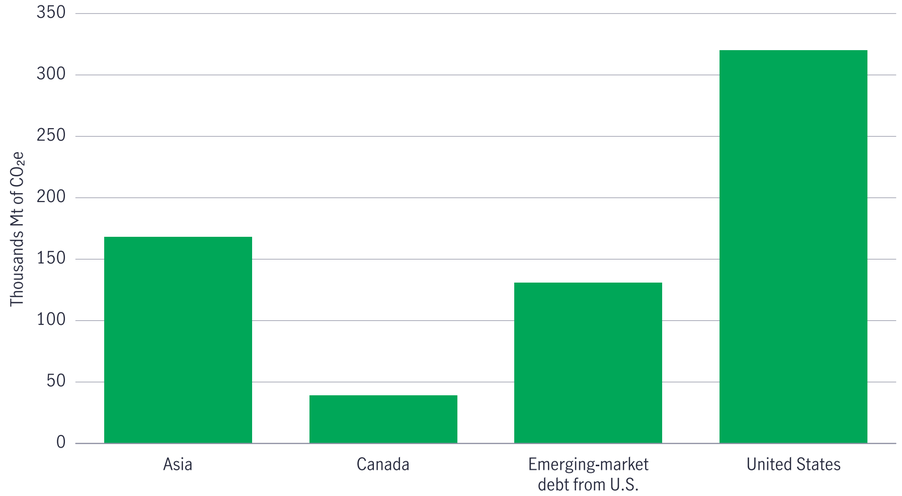
From an absolute financed emissions metric, we can see that there's a dichotomy for those assets based in the United States. From an equity perspective, the financed emissions are the lowest for any region, while for fixed income, the United States ranks as financing the highest level of emissions. A key reason for this is a larger allocation of assets to the utilities sector, which is a sector with high scope 1 and scope 2 emissions. In addition, in our portfolios we tend to have a larger weight in U.S. fixed-income AUM.

Financed emissions: 25 largest equity portfolios by domicile



Source: Manulife Investment Management, 2022.

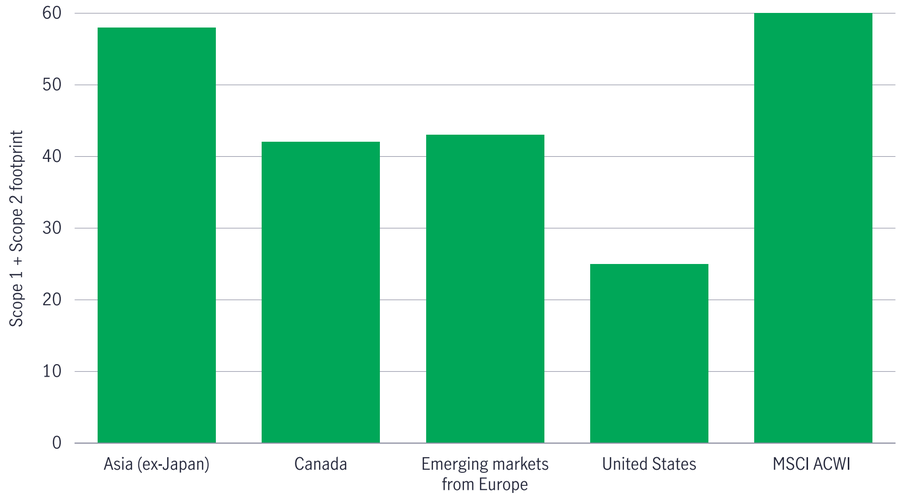
Financed emissions: 25 largest fixed-income portfolios by domicile



Source: Manulife Investment Management, 2022.

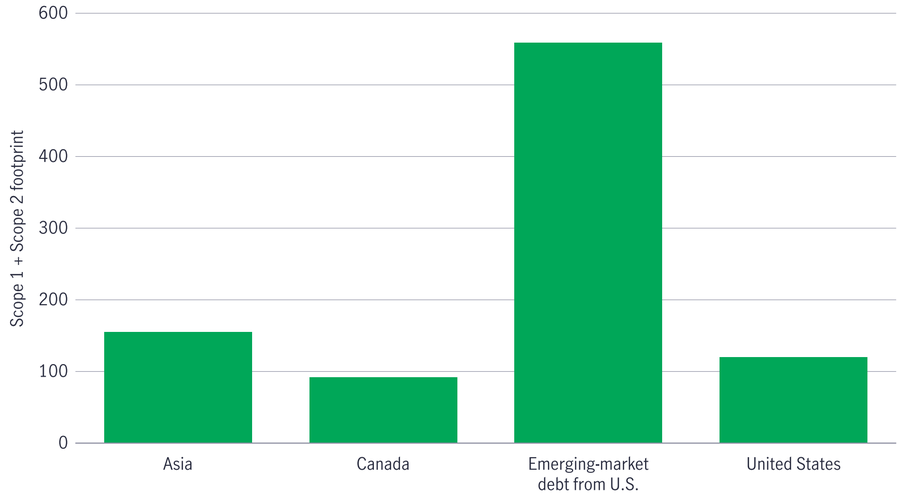
From a portfolio footprint perspective for equity, Asia ex-Japan has a higher carbon footprint on a regional basis but is lower than the MSCI ACWI benchmark. For fixed income, all regions are relatively close except for emerging markets, which possess a high carbon footprint. This exposure comes from hard-to-abate sectors such as utilities, materials, and chemicals. Additionally, we see that our portfolio footprint is relatively consistent between Canada, Asia, and the United States.

Absolute emissions/carbon footprint: 25 largest equity portfolios by domicile



Source: Manulife Investment Management, 2022. MSCI ACWI refers to the MSCI All Country World Index. It is not possible to invest directly in an index.

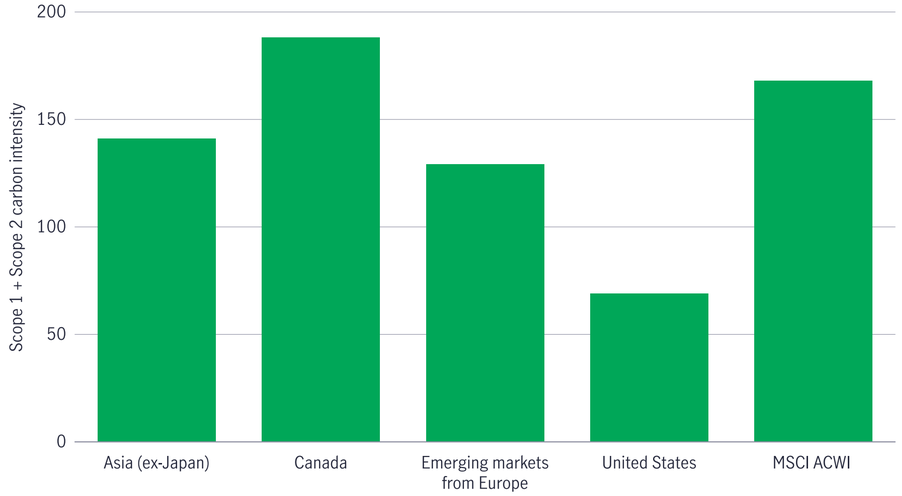
Absolute emissions/carbon footprint: 25 largest fixed-income portfolios by domicile



Source: Manulife Investment Management, 2022.

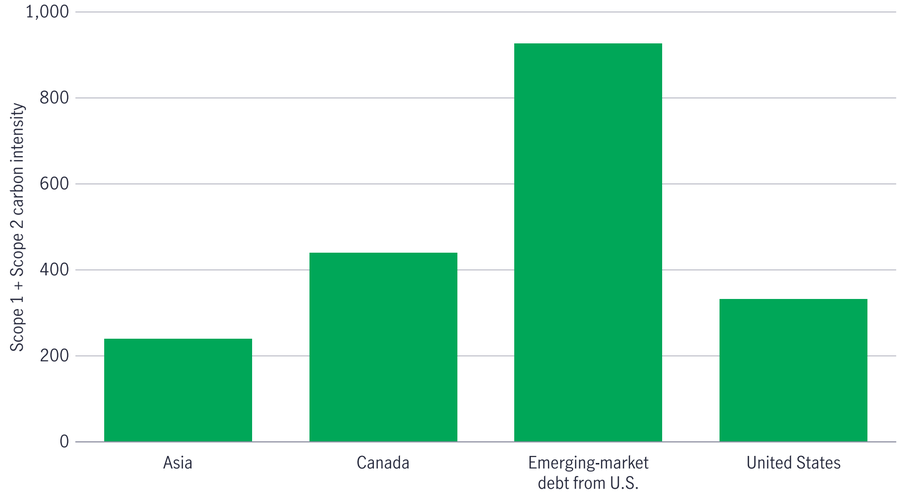
From a carbon intensity perspective, deviations between regions are greater with our U.S.-based strategies, which are on the lower end of WACI for both equity and fixed-income portfolios.

Weighted average carbon intensity: 25 largest equity portfolios by domicile



Source: Manulife Investment Management, 2022. MSCI ACWI refers to the MSCI All Country World Index. It is not possible to invest directly in an index.

Weighted average carbon intensity: 25 largest fixed-income portfolios by domicile

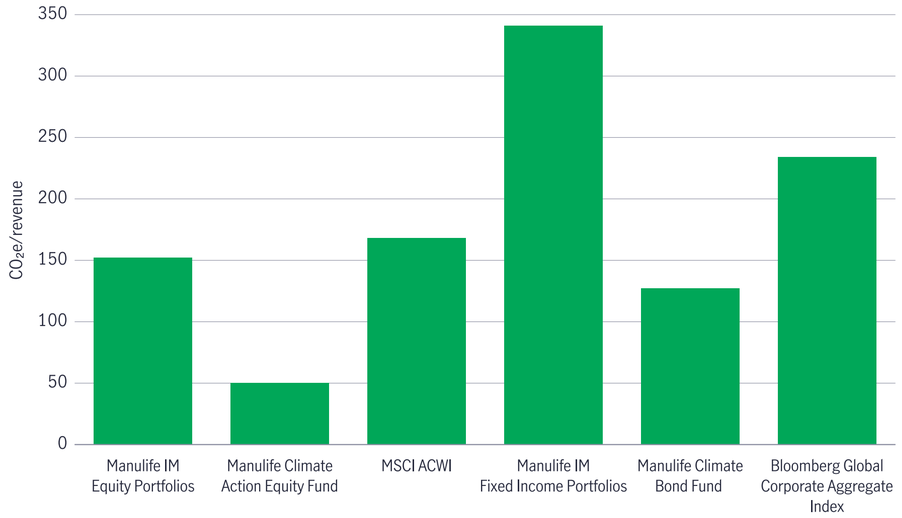


Source: Manulife Investment Management, 2022.

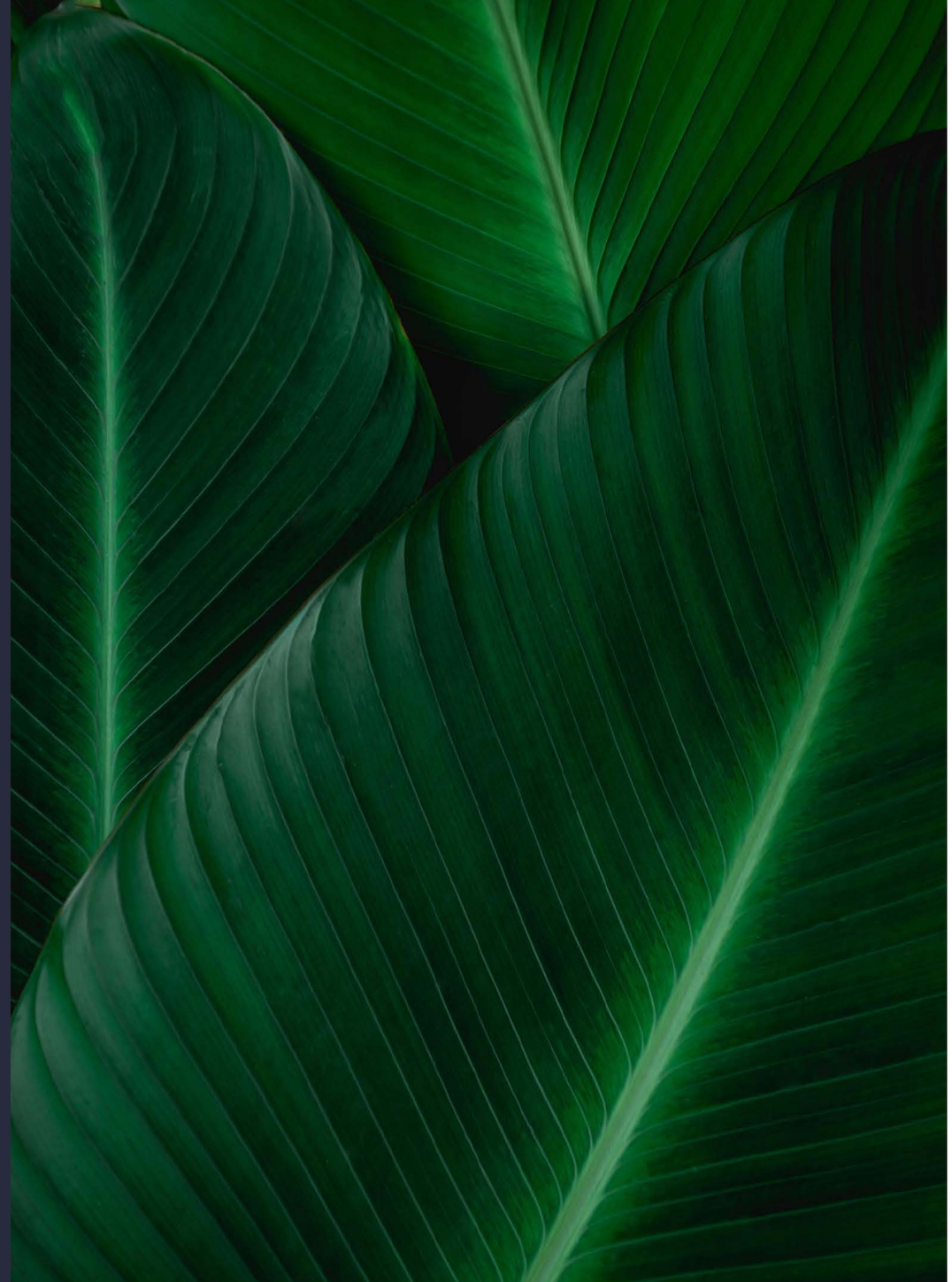
Climate-themed equity and fixed-income strategies

Over the last two years, Manulife Investment Management has launched equity and fixed-income climate strategies. We've presented an analysis of WACI for each asset class and industry benchmark, along with the carbon intensity of our climate-themed strategies. As evidenced, there's a significant reduction in the carbon intensity compared against the asset class representative benchmark and the overall average of the asset class we presented earlier in this report.

Weighted average carbon intensity: GHG scope 1 + Scope 2



Source: Manulife Investment Management, 2022. GHG refers to greenhouse gas. MSCI ACWI refers to the MSCI All Country World Index. It is not possible to invest directly in an index.



Supplemental guidance

Using data to address climate change risks and opportunities across asset classes, we continue to build out carbon footprinting, including WACI and a variety of other climate-related metrics.

The following case studies illustrate how we implement this across asset classes and geographies in our real asset, fixed-income, and equity strategies as well as in thematic and ESG-integrated strategies.

The case studies shown here are for illustrative purposes only; do not represent all of the investments made, sold, or recommended for client accounts; and should not be considered an indication of the ESG integration, performance, or characteristics of any current or future Manulife Investment Management product or investment strategy.

Manulife Investment Management conducts hundreds of ESG engagements each year but does not engage on all issues or with all issuers in our portfolios. We also frequently conduct collaborative engagements in which we do not set the terms of engagement but lend our support in order to achieve a desired outcome. Where we manage and operate physical assets, we seek to weave sustainability into our operational strategies and execution. The case studies shown are a sampling across issues and geographies. Our approach to ESG investing and incorporation of ESG principles into the investment process differs by investment strategy and investment team. It should not be assumed that an investment in the company discussed was or will be profitable. Actual investments will vary, and there is no guarantee that a particular fund or client account will hold the investments or reflect the characteristics identified. Please see our ESG policies for details

Real estate case study

Translating targets into action

In 2021, we saw carbon reduction targets being set across multiple industries and, for many organizations, 2022 was about implementation and action. In 2022, we undertook several initiatives toward executing on our carbon reduction targets that took shape across two focus areas: updating our internal procedures and standards and conducting a comprehensive GHG emissions inventory.

Updating our standards and policies

As part of our Sustainable Building Standards, we rolled out our GHG management workbook across our global portfolio. The workbook informs colleagues on:

- Educating teams on baseline emissions
- Modeling emissions out to 2035 and 2050
- Planning potential efficiency projects
- Supporting associate capital planning

Due to the technicalities of carbon transition planning, we also developed a standard scope of work for all properties to leverage when procuring consultants. We've also begun to execute net zero carbon transition audits with external consultants at priority assets: As we continue to identify the highest impact properties and opportunities across our portfolio, these audits will provide a list of reduction measures and associated costs that can potentially be capitalized on.

Our updated standards will also support asset managers' understanding of how these various initiatives align with our decarbonization strategy. For example, our recently developed renewable energy and carbon offset guidance document advises our teams that it's typically better to prioritize capital spending on building efficiency improvements before considering the purchase of renewable energy credits/carbon offsets.

Assessing scope and impact

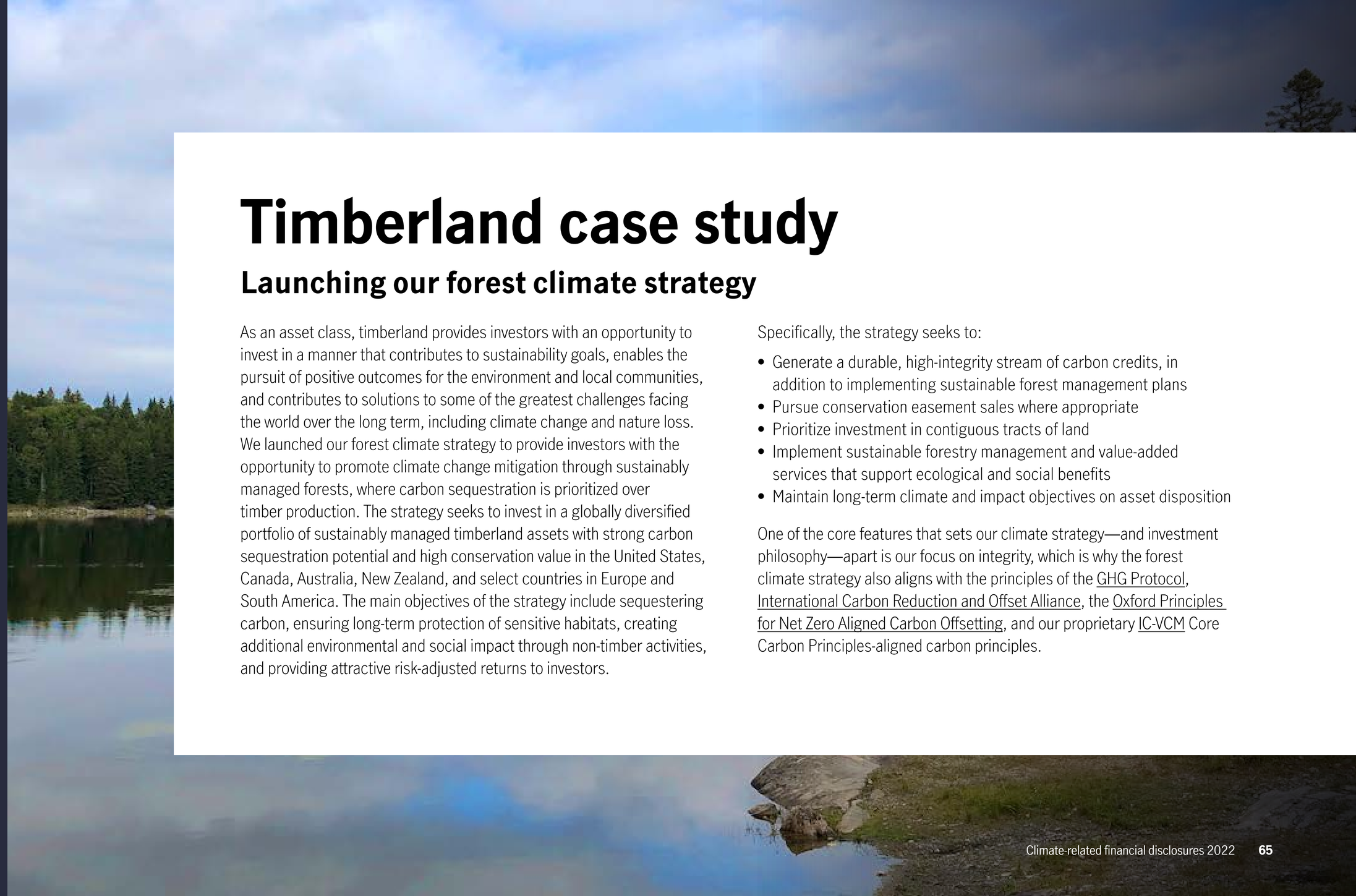
To better calculate our GHG footprint, we scanned emissions across our real estate business, including scope 1, scope 2, and scope 3 GHG emissions. This helped us to identify the business's largest sources of emissions and identified where we could prioritize our GHG reduction efforts to greatest effect. It's also allowed us to better understand our scope 3 GHG emissions, which provides a more complete picture of our emissions across both investment lifecycles and business operations.

Agriculture case study

Ecosystem services market consortium for Southern cotton farmers

Regenerative practices such as cover cropping or incorporating soil amendments can improve soil health and contribute to climate change mitigation (through soil carbon sequestration) and climate change adaptation (e.g., through resilience to drought and pests). However, these practices may also carry significant up-front costs.

In 2022, we joined the Ecosystem Services Market Consortium (ESMC) and partnered with ESMC as well as the U.S. Cotton Trust Protocol and Forum for the Future to launch the Eco-Harvest pilot project in Alabama, Arkansas, Texas, and Tennessee. The project will work with cotton farmers (including some of our own tenants) to generate high-quality carbon credits sought by corporate buyers. By providing training, information, and financial support through the generation of soil carbon credits, we can help our tenants incorporate more of the regenerative practices needed if the agriculture sector is to contribute to climate change mitigation and adaptation to its full potential.



Timberland case study

Launching our forest climate strategy

As an asset class, timberland provides investors with an opportunity to invest in a manner that contributes to sustainability goals, enables the pursuit of positive outcomes for the environment and local communities, and contributes to solutions to some of the greatest challenges facing the world over the long term, including climate change and nature loss. We launched our forest climate strategy to provide investors with the opportunity to promote climate change mitigation through sustainably managed forests, where carbon sequestration is prioritized over timber production. The strategy seeks to invest in a globally diversified portfolio of sustainably managed timberland assets with strong carbon sequestration potential and high conservation value in the United States, Canada, Australia, New Zealand, and select countries in Europe and South America. The main objectives of the strategy include sequestering carbon, ensuring long-term protection of sensitive habitats, creating additional environmental and social impact through non-timber activities, and providing attractive risk-adjusted returns to investors.

Specifically, the strategy seeks to:

- Generate a durable, high-integrity stream of carbon credits, in addition to implementing sustainable forest management plans
- Pursue conservation easement sales where appropriate
- Prioritize investment in contiguous tracts of land
- Implement sustainable forestry management and value-added services that support ecological and social benefits
- Maintain long-term climate and impact objectives on asset disposition

One of the core features that sets our climate strategy—and investment philosophy—apart is our focus on integrity, which is why the forest climate strategy also aligns with the principles of the GHG Protocol, International Carbon Reduction and Offset Alliance, the Oxford Principles for Net Zero Aligned Carbon Offsetting, and our proprietary IC-VCM Core Carbon Principles-aligned carbon principles.

Public markets case study

Advising on sustainability disclosures at a small-cap tech company

Issue—We initiated a position in a ~$1 billion market cap developer and manufacturer of semiconductor process equipment in August 2020. At that time, company management efforts on identifying, managing, and reporting on sustainability risks and opportunities were still nascent. The company provided limited disclosures and had yet to complete a materiality assessment. MSCI rated the company BB in October 2019.

Action—We engaged with company management as part of our due diligence to deepen our understanding of ESG issues that underpinned the company's strategy and valuation. The engagement also informed our assessment of the business's quality, as well as opportunities and risks. We also used the engagement to offer our own expertise and views on sustainability practices and disclosure. To that end, we provided an introduction to sustainability factors, walked management through a basic checklist of potential areas of improvement, and assisted in the development of pertinent sustainability information on the company's website.

Outcome—In 2021, the company released a robust corporate and social responsibility (CSR) report with pertinent data, including historical energy usage and gender makeup of the workforce. With continued engagement, the company released a more robust CSR report in 2022 with goals such as increasing renewable energy usage and the female employee count. The company now has one of the most detailed disclosure patterns of any small-cap company we follow.

The company has seen steady improvement in its ESG rating as well: MSCI rated them up three steps, from BB to AA, which places them in the top 20% of all semiconductor companies, regardless of market cap size.[1]

Our ESG journey with the company will continue through our ongoing support and perspectives on sustainability issues and disclosure.

1 MSCI, as of January 17, 2023.

Case study

Building a green bond framework with Canadian peers

Issue—Influence in fixed-income investing can largely be dependent on timing. Providing input to issuers before they issue debt can help ensure more sustainable terms. In 2021 and 2022, for example, we were part of a group of investors working with a structuring advisor on the green bond framework for the Government of Canada. The Canadian government was soliciting feedback on a green bond framework ahead of an issuance that would support environmental objectives, including reduction of GHG, enhancing climate resilience, and conservation efforts.

Action—With other peers, our fixed-income and sustainable investment professionals provided feedback to the structuring advisor on multiple points, including nature and biodiversity measures and projects eligible for expenditure from proceeds.

Outcome—The Government of Canada released its Green Bond Framework in March 2022, with several components focused on nature and biodiversity.

- Use of proceeds may include:
  - Reforestation/afforestation
  - Restoration of wetlands, peatlands, grasslands, and marine ecosystems
  - Protection of at-risk species
- Potential reporting impact indicators include:
  - Hectares of area improved or conserved
  - Number of species at risk benefiting from conservation action
  - Number of trees planted

Targets

By seeking to address climate change across our asset management activities, we move closer to fulfilling our ambition of giving our customers and broader stakeholders the confidence to plan for the future.

We're actively incorporating climate change considerations into our decision-making, including how we manage our operations, how we make investment decisions, and how we develop and offer financial products and services. As a business deeply rooted in long-term thinking, we're made stronger when our people and our planet thrive.

Sustainability targets and milestones

We've integrated ESG analysis into our investment process across the majority of our investment teams, and we continue to strengthen this year over year, recognizing that sustainable investing is a journey of ongoing improvements as our understanding of the underlying issues affecting our planet evolves.

In addition to ESG integration, we'll continue to expand our range of sustainable investing products and services, including building out our offerings for clients looking for net zero investment solutions.

Real estate

We use a variety of metrics and targets to manage and monitor progress in our real estate portfolio. These are also used to identify and monitor the potential financial effects associated with climate change on our business. Some of the metrics we use include GHG reduction; energy, water, and waste reduction; asset-specific targets; and physical risk data.

- **GHG reduction—**Our ambition to manage our carbon impact has never been more imperative, so we've set a long-term GHG reduction target of 80% for our real estate assets by 2050. This carbon reduction goal will help keep us accountable and help measure our GHG emissions reduction in line with our global targets.
- **Energy, water, and waste reduction—**We monitor property and portfolio energy, water, and waste performance through our proprietary Sustainable Building Standards twice each year. Properties we operationally control aim to conduct an energy audit to identify improvements every three years.
- **Physical risk data—**We track property resilience scores, which combine third-party physical risk data with property resilience survey results. We also track the number of properties located in 100-year flood zones and report in alignment with SASB through our insurance program.

Timberland and agriculture

We remain committed to third-party sustainable management certification and have accomplished the key short-term goals we set for ourselves through verification of our GHG inventories by a third party and the launch our forest climate strategy that's designed to respond to investors' growing needs to meet their own net zero targets.

The verification of our GHG inventories includes emissions and removals for timberland and only emissions from agriculture.

Timberland

The table below shows our climate targets, and our progress against them, over time. While we're tracking well on our 2021 commitments and have achieved what we set out to do, our work is just beginning. Our medium-term climate goals, documented in Manulife's 1t.org commitment, are designed to help us take the next steps toward reaching our climate ambitions.

Short-term target (set 2021)	2022 progress	Status (year-end 2022)
Decarbonization strategy launch	We began the process of mapping the decarbonization levers at our disposal and piloted new technologies designed to reduce emissions. We'll continue this process over the course of 2023 with the intent to begin to meaningfully reduce our timberland portfolio's emissions as soon as practicable.	Ongoing
Launch of forest climate strategy focused on carbon sequestration	On behalf of our Manulife general account, we acquired a contiguous 89,000-acre block of timberland in Maine with a diverse mix of naturally regenerated spruce fir and northern hardwood tree species. We launched our forest climate strategy centered primarily on storing carbon and generating high-integrity carbon credits and aiming to offer carbon-focused investments for investors and corporates working toward net zero.	Complete
Net zero commitment partnerships	We partnered with Manulife's five Australia and New Zealand timberland investment companies to support the net zero commitments that they made in 2021 on behalf of their investors.	Complete
	Manulife's Australia and New Zealand timberland investment companies drafted TCFD-aligned climate disclosures, including analysis of any modifications to forest management required to achieve these net zero commitments.	Ongoing

Medium-term objectives (2023–2027)	Supporting actions
Nature-based solutions	Building on Manulife's existing US$100 million commitment, we'll continue to grow our investments in nature-based climate solutions over the next five years.
Meeting investors' climate-related goals	We intend to grow the scale of the Manulife Investment Management carbon-focused forestry investments that we manage, offering innovative products that meet investors' climate-related goals.
Carbon sequestration	We'll increase our sequestration of CO_2 in the forests we manage in accordance with Manulife Investment Management's carbon principles and leading sustainability certification standards, including the SFI, Forest Stewardship Council, and PEFC.
Partnerships and scale	• Create additional financial opportunities and incentives for conservation, restoration, and afforestation or reforestation (e.g., blended financing vehicles) • Support scaling the market for sustainable timber in building construction • Further the development of high-quality forest-based carbon credit standards • Accelerate the development of sustainable investment strategies for companies interested in natural climate solutions to support their climate goals • Partner to pilot new programs and technologies to promote nature-based climate solutions

Agriculture

In 2021, our agriculture investment business set four short-term targets for the steps we need to take now in order for Manulife to accomplish its net zero targets. The following provides brief updates on our progress against these targets in the reporting year.

Short-term target (set 2021)	2022 progress	Status (year-end 2022)
Improve GHG quantification methods	We piloted the GHG Protocol *Land Sector and Removals Guidance* draft, greatly improved the proportion of primary data feeding into our GHG inventory, and green-lighted a project to quantify our soil carbon sequestration.	In progress
Launch our decarbonization strategy	We held a workshop with our North American operations leadership to discuss equipment and technology options for decarbonization and routes to implementation.	In progress
Scale regenerative agriculture	We surveyed property managers on all our agriculture properties to understand which regenerative practices they use (almost 98% use at least one regenerative practice, and the majority of farms use three or more).	In progress
Systematically understand climate risk	We contracted with a third-party climate risk data provider that will allow us to systematically analyze climate risk for all agriculture AUM, as well as potential acquisition opportunities.	In progress

Source: Manulife Investment Management, 2022.

As one of the world's largest institutional timberland and farmland investment managers, we're well positioned to provide and manage investments in nature-based solutions in the fight against climate change. We also recognize that emissions reductions are essential in order to meet the goals of the Paris Agreement. This is relevant to every asset class we invest in, and we're currently developing plans to further decarbonize our timberland and agriculture investments.

Listed equity and fixed income

We understand the crucial importance of reducing GHG emissions and recognizing our responsibility for the emissions associated with the portfolios we manage on behalf of our clients. However, we believe it's important not to oversimplify matters by measuring emissions with a single metric—or by targeting a single metric such as WACI—as that process may not move the dial toward real emissions reduction. Instead, we adopt an approach of reviewing a range of metrics pertaining to our portfolio emissions exposure and using this data to optimize our engagement with investee companies to make strides toward—and ultimately achieve—meaningful change over time.

Lack of company-disclosed data in the fixed-income asset class as well as credibility of estimated data points is a reality we're challenged with while striving to improve it through engagement. Investment managers, asset owners, and investee companies are on similar journeys toward overcoming these data and disclosure challenges. As a global investor, we're committed to publishing our GHG emissions analysis, capturing a greater proportion of our AUM, and increasing the usefulness of the metrics we provide. At the same time, we're also committed to expanding our offering of sustainable and thematic products and solutions to make more meaningful contributions to reducing global GHG emissions for investors with climate-aligned objectives.

Looking ahead

In this report, we've built on our previous TCFD report and the responses to the recommendations related to the four core elements and five supplemental recommendations for asset managers. We outline our approach to climate-related risks and opportunities, as well as where we strive to show leadership and demonstrate innovation.

In recognition of how climate overlaps with other natural systems, we've also touched on some of our efforts to positively affect nature and biodiversity through our business and investment activities. In the near future, we look forward to developing more robust disclosures that specifically address our impact on nature and biodiversity in line with recommendations from the TNFD.

Sustainable investing is an evolving field, so we'll continue this journey with our clients as we navigate the changing regulatory and global environment. We look forward to continuing to enhance our efforts, disclosures, and impact.

Manulife Investment Management

The case studies shown here are for illustrative purposes only, do not represent all of the investments made, sold, or recommended for client accounts, and should not be considered an indication of the ESG integration, performance, or characteristics of any current or future Manulife Investment Management product or investment strategy.

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Manulife Investment Management is the global wealth and asset management segment of Manulife Financial Corporation. We draw on more than a century of financial stewardship to partner with clients across our institutional, retail, and retirement businesses globally. Our specialist approach to money management includes the highly differentiated strategies of our fixed-income, specialized equity, multi-asset solutions, and private markets teams—along with access to specialized, unaffiliated asset managers from around the world through our multimanager model.

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