



2021 Task Force on Climate-Related Financial Disclosures Report

Table of Contents

03 Introduction

- 03 Welcome letter
- 04 Progress against our climate aspirations

05 Governance

- 05 Governance overview
- 05 Governance bodies overseeing climate-related matters
- 06 Enhancement to climate oversight
- 06 Climate Council purpose and activities

07 Strategy

- 07 Strategy overview
- 08 Investing in education, expertise and capacity building
- 10 Integrating climate-related risk management services and product offering into our core business
- 11 Advancing the energy transition
- 13 Helping our customers build resilience for climate-related risks through innovation
- 13 Advocating for strong climate policy and climate resilience

15 Risk management

- 15 Risk management overview
- 15 How we manage climate-related risk
- 18 Advancing our understanding of climate-related risk to inform our underwriting decisions
- 20 Managing climate-related transition risk: Liberty Mutual's climate-related scenario analysis exercise
- 24 Insights from our systems-level assessment
- 26 Insights from our portfolio-level assessment
- 26 Actions from climate scenario analysis exercise insights

28 Metrics & targets

- 28 Metrics & targets overview
- 28 Progress against carbon reduction commitment
- 30 Progress against coal policy
- 30 Transitioning our investment portfolio

31 Contact us

Introduction

We are pleased to present our second report aligned to the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

Welcome letter

This report highlights our evolution in addressing climate risks and opportunities, and details the progress we've made against the climate aspiration that we established in our inaugural 2020 TCFD report. It complements our [2021 Environmental, Social & Governance Review](#), [2021 GRI Index](#), [2021 Sustainability Accounting Standards Board \(SASB\) Report](#) and additional disclosures available on [our corporate website](#).

Our climate journey in 2021 was grounded in active learning and discovery, which informed decisions to strengthen our enterprise climate strategy, risk management and governance structure. We conducted our first climate transition risk scenario exercise that provided macro-economic, policy-related and portfolio-specific insights, that will inform our transition strategy. As detailed throughout this report, some highlights of our progress this year include:

- Evolving our ESG and climate strategy and governance to help guide Liberty Mutual into the next phase of our climate journey
- Deepening ESG understanding and climate education across the organization
- Conducting extensive evaluation of climate-related data and tools to advance our understanding of risk and inform our first climate scenario analysis exercise
- Engaging in public/private partnerships and cross-sector collaboration to promote the need for climate resilience and enhance our understanding of climate-related risk
- Supporting the energy transition through our investments, underwriting, research and product innovation
- Assessing our own operations and establishing emission reduction goals

We are proud of our progress, but there is still much to do – within our own organization and as an industry. This work is complex and challenging. No single company can do it alone, and we believe it requires public-private cooperation and cross-industry collaboration to advance solutions for all stakeholders. As examples of our commitment, in 2021 Liberty Mutual was proud to join the Partnership for Carbon Accounting Financials (PCAF) and the Taskforce for Nature-related Financial Disclosures (TNFD). We believe that true advancement requires us to remain curious and willing to challenge our own thinking, and we hope that our learnings can help inform others on this journey.

We're excited by what we have planned for 2022.

Daniel Hogan,
Chief Risk Officer, Enterprise

Rakhi Kumar,
Senior Vice President of Sustainability Solutions & Climate Council Chair

Introduction

Progress against our climate aspirations

In 2020, Liberty Mutual's Climate Council formalized five aspirations that shape our company's enterprise-level climate transition strategy and serve as a directional roadmap for our businesses to adapt and implement climate strategies and initiatives within their operations. Below is a summary of our 2021 progress.

Climate Aspirations	2021 Accomplishments
Aspiration 1: We are committed to transitioning to a low-carbon economy and are undertaking activities that will help inform our climate strategies.	<ul style="list-style-type: none"> • Prioritized investment in risk mitigation efforts to both increase customer resilience and protect communities (page 11) • Advanced climate-modeling capabilities by synthesizing available climate data and providing climate-resilient solutions (page 15) • Completed systems- and portfolio-level climate scenario analysis, leveraging the Network for Greening the Financial System (NGFS) framework to inform our risk assessment, strategy and decision-making (page 20) • Partnered across the public and private sectors, including hosting collaborative sessions with National Oceanic and Atmospheric Administration (NOAA) and the BuildStrong Coalition, to advocate for coordinated action and infrastructure investments to increase overall resiliency to climate change and foster sustainable growth (page 8)
Aspiration 2: We are building capabilities to help us monitor and measure the progress of our climate journey.	<ul style="list-style-type: none"> • Advanced our measurement and reporting across the enterprise at both global and local levels (page 28) • Progressed our understanding of climate-related risk factors, particularly related to hurricane, flood and wildfires (page 18) • Joined the Taskforce on Nature-related Financial Disclosure (TNFD) Forum to support development of a framework for reporting and acting on nature-related risks (page 9) • Joined the Partnership for Carbon Accounting Financials (PCAF) and participated in Insurance-Associated Emissions Working Group to assist in the development of the first global standard to measure and disclose insurance-associated Scope 3 greenhouse gas (GHG) emissions (page 9)
Aspiration 3: We support the development of responsible investment and underwriting guidelines that will enable our climate journey while supporting businesses in traditionally high-impact sectors that are committed to transitioning to a low carbon economy.	<ul style="list-style-type: none"> • Embarked on a values-driven, customer-focused approach to integrate ESG and climate-related risk considerations into underwriting risk (page 10) • Continued to integrate ESG efforts throughout Liberty Mutual's investment portfolio to enhance our overall investment processes and align with Liberty Mutual's purpose, values and ESG goals (page 12) • Partnered with customers to accelerate the energy transition towards a low-carbon economy (page 12)
Aspiration 4: We aim to support innovation that can significantly impact the pace and design of the transition to a low-carbon economy.	<ul style="list-style-type: none"> • Prioritized customer resilience by evolving our low-mileage incentive program, expanding parametric insurance, and introducing new offerings such as FloodFlash and personalized flood warnings with Previsico (page 11, page 13) • Became the first major insurer to support the Climate Transition Pathways (CTP) solution, an accreditation framework aligned with the Paris Agreement (page 14)
Aspiration 5: We favor a '3-Rs' strategy to transition our operations to a low-carbon future: <ol style="list-style-type: none"> 1. Reducing our emissions through improved efficiency 2. Investing in renewable/alternative technologies and businesses 3. Utilizing RECs (renewable energy credits) and offsets 	<ul style="list-style-type: none"> • Publicly committed to 50% reduction of Scope 1 and 2 global emissions by 2030 (page 12) • Achieved a 43% reduction of Scope 1 and 2 global emissions compared to our 2019 baseline, by increasing operational efficiencies and identifying renewable energy opportunities across our real estate portfolio amid a hybrid working environment (page 28)¹

¹COVID-19 pandemic restrictions continue to impact this data and our emissions may increase in 2022 as we return to more in-person experiences.

Governance

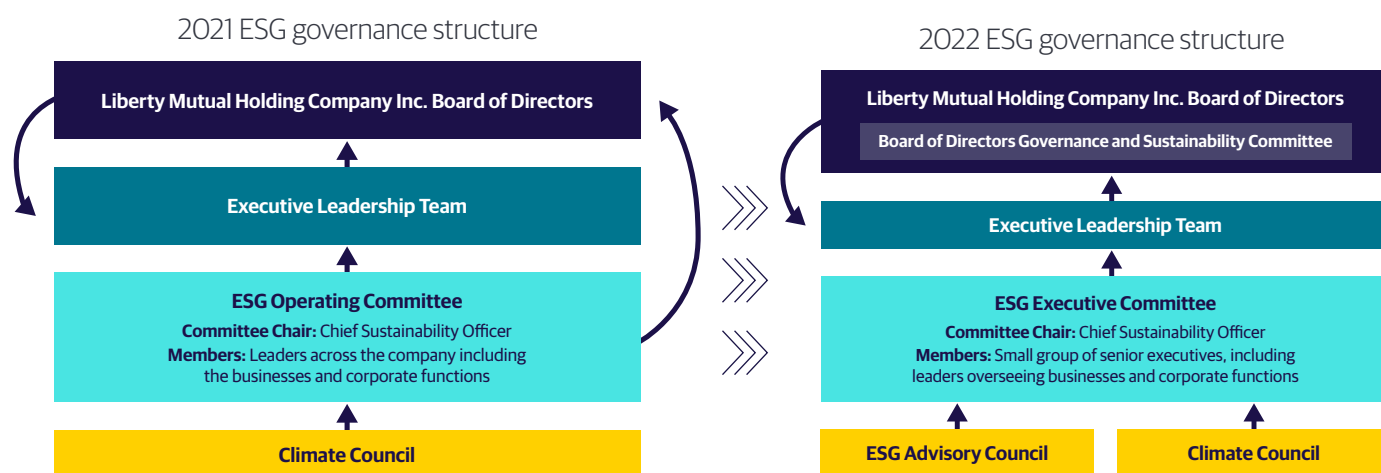
Liberty Mutual's governance structure is designed to monitor and address emerging risks, including climate and other ESG-related risks at multiple levels within the company.

Governance bodies overseeing climate-related matters

Climate-related considerations play an increasingly important role in Liberty Mutual's corporate and business strategy, and we are investing in talent and technology to address climate-related challenges. Climate-related risk is assessed at the highest levels of leadership, starting with our Board of Directors, through our Office of Sustainability and carried through multiple operational teams:

- The Board of Directors is ultimately accountable for our enterprise-wide business strategy, including our climate strategy. When formulating strategy, the Board considers material climate-related information and receives regular updates from our Sustainability and Enterprise Risk Management teams. In April 2022, the Board approved the creation of a new Governance and Sustainability committee to provide strategic oversight and performance evaluation of Liberty Mutual's ESG practices and priorities, including our climate strategy and approach.
- The enterprise-level Climate Council, chaired by a senior member of the Office of Sustainability, oversees the implementation of our climate strategy and ensures that our ongoing assessments of climate-related risk remain coordinated across business lines and functions.
- Our Office of Sustainability is led by the Chief Sustainability Officer, who chairs our ESG Operating Committee, oversees ESG integration within Liberty Mutual and reports to the Executive Leadership Team. The Office of Sustainability oversees and collaborates with the Enterprise Risk Management team and business units on climate-related issues through a cross-functional Climate Council. In early 2022, we established an ESG Executive Committee, a small group of senior executives collectively responsible for overseeing the implementation of our ESG strategy, chaired by our Chief Sustainability Officer. While the Climate Council was initiated as a subcommittee of the ESG Operating Committee, moving forward, the Climate Council will report to the ESG Executive Committee (additional governance changes are detailed below).
- Our Enterprise Risk Management team monitors risk, including climate-related risk, on an ongoing basis. To strengthen our climate-related analysis, the Enterprise Risk Management team continues to invest in related technology and talent, including expanding our team of climate scientists. Our climate scientists analyze data through a business lens to better predict how, when and where climate change will impact our operations.

Liberty Mutual's ESG and climate governance-at-a-glance



Enhancement to climate oversight

We have evolved our governance structure to enhance accountability across all levels of the organization. In 2021, Liberty Mutual:

- Enhanced oversight of climate-related matters by providing regular updates to the Board of Directors on climate risk and electing George Serafeim, the Charles M. Williams Professor of Business Administration at Harvard Business School and a sustainability and corporate governance expert, to the Board.
- Assessed our Board structure to ensure it was best equipped to address climate and ESG-related risk. As a result, as of April 2022, we introduced a new structure to explicitly distribute oversight for climate-related risk across Board committees and revised Board committee charters.
- Increased internal coordination through regular Climate Council meetings and evolving ESG oversight bodies.

Climate Council purpose and activities

Membership and purpose

The Climate Council meets every other week to advance climate strategy and implementation. Working closely with Enterprise Risk Management, the Council discusses ESG-related risks and coordinates appropriate measurement, monitoring and mitigation activities. Chaired by the Senior Vice President for Sustainability Solutions, the Council includes representation from our business units, investments, risk management, public affairs and finance functions.

Our Climate Council seeks to:

- Support the development of climate-related policies and frameworks.
- Monitor, identify and share knowledge of emerging climate issues, risks, opportunities and trends.
- Work with business units to advance climate-related actions across Liberty Mutual.
- Coordinate implementation of climate efforts across Liberty Mutual.
- Measure progress and recommend adjustments as necessary.

Discussion topics and progress

In 2021, the Climate Council met more than 20 times and ensured cross-functional coordination across key topics, including:

- **Physical climate risk and research:** The Council discussed findings and impacts of the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report and heard from internal climate scientists and natural catastrophe modeling experts on weather- and climate-related peril analysis.
- **Emerging risk and climate-related regulation:** The Council served as a cross-functional forum to surface and discuss emerging climate-related risk, such as nature-related risk, climate reporting frameworks and requirements, as well as other emerging transition and physical risks. Council members assisted in monitoring emerging global climate-related regulation.
- **Advancing transparency, data collection and climate-related risk disclosures:** Council members assisted in further development of ongoing ESG-related reporting and disclosures. This included advancing voluntary reporting, such as our annual ESG Review and TCFD Report, and regulatory reporting requirements, including the EU Taxonomy, Own Risk and Solvency Assessment (ORSA), Climate Biennial Exploratory Scenario (CBES) and National Association of Insurance Commissioners (NAIC) climate risk disclosure survey.
- **Climate scenario analysis:** The Council took a lead role in developing the scope, plan and design of the inaugural scenario analysis exercise. The Council assessed the scenario analysis insights, ensuring the analysis reflected perspectives from across the organization and geographies.
- **Strategic partnerships to further global alignment and standards:** The Council discussed the landscape of global carbon accounting standards and our strategy for future carbon accounting efforts, resulting in Liberty Mutual's decision to become a signatory of the Partnership for Carbon Accounting Financials (PCAF).

Council members debated and supported Liberty Mutual's enterprise-wide involvement, informing our contributions to PCAF's Insurance-Associated Emissions Working Group and the Task Force for Nature-related Financial Disclosures (TNFD), to shape industry standards and foster global alignment.

In 2021, we established our ESG ambition: 'Advance Resilience and Inclusive Growth,' and developed an enterprise-wide ESG strategy centered around four core pillars of activities — increasing customer resilience, enabling sustainable growth, improving lives and communities and advancing diversity, equity and inclusion.

Incorporated in this ESG strategy is our approach to climate that focuses on:

- Investing in education, expertise and capacity building
- Integrating climate-related risk management services and product offerings into our core business
- Advancing the energy transition
- Helping our customers build resilience for climate-related risks through innovation
- Advocating for climate resilience and adaptation

This section expands on some of the activities that we have executed on over the past year in each of these focus areas.

Liberty Mutual's ESG ambition and strategic pillars

Our purpose: We exist to help people embrace today and confidently pursue tomorrow

Our ESG ambition: Advance resilience and inclusive growth

Increase customer resilience

Help our customers adapt to and mitigate the risks affecting their lives and businesses.

Enable sustainable growth

Support a more equitable and responsible climate transition and integrate ESG into our day-to-day decision making.

Improve lives and communities

Advance security, further opportunity and strengthen communities.

Advance Diversity, Equity & Inclusion

Embed DEI across all aspects of our business.

Our ESG strategy and priorities are further detailed in the 2021 Environmental, Social & Governance Review.



Investing in education, expertise and capacity building

A critical aspect of our climate strategy is education. We aim to further develop expertise and climate competency at the Board of Directors, senior leadership and employee level. We hold briefings and training programs to facilitate knowledge-sharing of ESG- and climate-related topics, hosted by the Enterprise Risk Management and Sustainability teams. As part of this effort, we also support a global internal employee sustainability group, which is connected through MyLiberty, our internal networking site, to share and debate best practices.

In addition to educating our employees, we are committed to educating our customers and communities where we operate by collaborating with peers and cross-industry partners to further our collective understanding of climate-related risks and solutions. In 2021, we engaged with several educational and capacity-building forums, including:

- International Risk Management Institute (IRMI)'s 2021 Construction Risk conference
- National Association of Insurance Commissioners (NAIC) 2021 International Insurance Forum
- 2021 Climate and Resilience Risk Workshop, hosted by NOAA and cross-sectoral partners
- Institute of International Finance (IIF) 2021 US Climate Finance Summit
- Cat Risk Management and Modeling Summit
- Reinsurance Association of America Cat Risk Management Conference
- World Environment Day virtual event with the British Antarctic Survey
- Career-focused events at several leading US universities to inspire the next generation of insurance and climate professionals

2021 Climate and Resilience Workshop

In October 2021, we jointly hosted a virtual Climate and Resilience Workshop with the **National Oceanic and Atmospheric Administration (NOAA)**, which featured and attracted policymakers, academics and industry participants. The workshop provided meaningful insights to inform Liberty Mutual's approach and served as the beginning of an ongoing dialogue with industry peers, academic partners and policymakers. Takeaways included:

Insights on climate risk modeling and gaps in climate data

Panelists highlighted the need to incorporate social science and economic data into climate models to better assess risk at the community level and called for advanced planning and capital investment to help communities prevent escalating cycles of climate impacts.

Insights on community impacts of climate change and challenges for local governments

Panelists highlighted the preparedness of local governments to withstand the impacts of extreme weather events. There was acknowledgement that different approaches may be necessary to help communities address stresses that will change over time, particularly related to land use and building infrastructure.

Insights on NOAA's science and capabilities

Panelists highlighted advancements relevant for the insurance and finance industries, such as satellite observations that help to improve weather forecasting, and acknowledged a need for strong data collection and analysis. Panelists also called on participants to collaborate, sharing datasets in the cloud to improve data accessibility, increasing high performance computing capabilities and supporting researchers who can develop experimental products that are helpful to different users and stakeholders.

Strategy

Liberty Mutual also does extensive work evaluating available climate data sources and modeling as part of our efforts to incorporate climate change assessments into our risk management practices. We recognize that to make real progress, we must share our knowledge and work collaboratively across the industry as well as with governmental organizations. In 2021, we initiated or continued partnerships with peers, federal and state government representatives, as well as experts across industries to better understand needs, evolve technological capabilities and help develop industry solutions to climate-change challenges. Select partnerships include:

- Liberty Mutual joined the **Taskforce on Nature-related Financial Disclosure (TNFD) Forum** to support development of a framework to report and act on nature-related risks. The Forum is a consultative network of more than 100 organizations who share the TNFD's vision of creating a new risk management and disclosure framework for reporting and acting on evolving nature-related risks.
- We joined the **Partnership for Carbon Accounting Financials (PCAF)** and became a member of the newly established Insurance-Associated Emissions Working Group. Participation in this group enables Liberty Mutual to be a voice of change, helping the financial sector develop a collaborative approach to GHG reporting and risk analysis.
- We continued to participate in **Ceres Company and Investor Networks** to learn from companies across industries and collectively inform better climate policy.
- We have also advanced our own measurement and reporting at the enterprise level and in specific functions and geographies, aligning with the **UN Principles for Responsible Investment (UNPRI)** and the **ClimateWise Principles**.

Partnering with industry and non-profit leaders

Strategic partnerships help raise our ESG and climate expertise, capabilities and accountability across geographies and sectors. In 2021, we are proud to have been active members of the following organizations, at an enterprise- or business unit-level:



Sustainable Finance
Policy Expert Group



Climate Committee



Disclosures
Working Group



We highlight a few of these partnerships in the ["Partners for Progress" video series](#) on our website.

Integrating climate-related risk management services and product offering into our core business

Liberty Mutual is on a multi-year journey to create and implement an enterprise-wide strategy that thoughtfully addresses both the risks and opportunities presented by climate change, while supporting our customers, investors and employees in their efforts to advance and adapt to

a low-carbon future. As a global insurer and investor, we are committed to enabling this transition by providing leading risk advisory services to help customers advance their strategies, insuring and investing in emerging sectors to support “green” growth and striving to become the partner of choice for our brokers and others working to advance the global energy transition. We are also reducing our own environmental impacts and lowering emissions across our operations.

These actions are part of a broader ESG integration strategy, highlighted below, and expanded on in our 2021 Environmental, Social & Governance Report.



Integrating ESG into our core business

At Liberty Mutual, we believe progress happens when people feel secure. As one of the largest global property and casualty insurers, we hold ourselves to the highest standards of governance and behavior. Underpinned by our conviction that insurance is a force for social good, we are committed to addressing environmental and social challenges while delivering security for our customers, employees and communities. We have redesigned our approach to underwriting and investments to ensure that ESG risks and opportunities — including those related to workers, cybersecurity and climate change are considered in every stage of the process.

ESG in Underwriting

Our multi-year journey to evolve our underwriting practices includes identifying new and evolving ESG risks, embedding ESG considerations into our processes and decisions and developing methods to measure our progress. We are empowering policyholders, brokers and underwriters to advance ESG and energy transition goals through partnership and collaboration, and are using technology and data to build more sophisticated and innovative product offerings.

ESG in Investments

Liberty Mutual Investments believes that ESG integration matters because ESG performance is often a reflection of broader business practices and can lead to valuable insights that otherwise wouldn't be a part of the traditional investment analysis. Our ESG integration strategy aims to enhance the overall investment process by expanding the information set available to our investment professionals in their daily decision-making. In line with these core ESG integration principles and our growing commitment to ESG, we developed the LMI ESG Framework in 2020 to integrate ESG considerations across our investment portfolio. In accordance with the framework, Liberty Mutual considers material ESG factors as part of its investment process and day-to-day operations. In particular, across our overall investment research and analysis, we prioritize ESG materiality to identify key ESG factors by industry for proposed investments. Our definition of ESG materiality is informed by the Sustainability Accounting Standards Board (SASB) materiality guidelines.

Advancing our understanding of climate risk to inform our underwriting decisions

We are committed to maintaining a deep understanding of the sectors in which our customers operate and tapping the expertise of our Liberty Mutual climate scientists to advise customers as they transition their own operations toward a low-carbon future. As detailed throughout this report, we are collaborating across the business to advance data analytics and modeling capabilities. This work both enables the adaptation of our products and services to help our customers mitigate risk today, while also supporting the affordability, availability and accessibility of our insurance solutions for decades to come. Details on activities related to climate risk mitigation and management can be found in the [Risk management](#) section of this report.

It is more important than ever that we leverage responsible and accountable internal risk management that aligns with our ESG priorities to inform business decision-making. In 2021, we developed a taxonomy through a highly collaborative process that allows us to apply a consistent framework to assess material ESG factors, including climate-related risks and opportunities, within our underwriting process. This approach is a natural progression of our core underwriting philosophy, and will continue to evolve and be informed by reliable data, technological and regulatory changes and market forces. We piloted the taxonomy internally and have committed to a program of work to accelerate and operationalize how we embed this work into our portfolio and underwriting decisions more broadly.

Advancing the energy transition

In recognition that GHG emissions from the use of fossil fuels are contributing to climate change, we are committed to incorporating measurement and reduction of emissions into relevant decision-making across our business and investment portfolios and operations.

Energy transition in underwriting and product offerings

We are committed to supporting the energy transition through our underwriting and partnerships with current and prospective customers. These efforts include:

- Offering complementary access to ESG-related risk advisory services about sustainability- and climate-

related risks and opportunities for US and Canadian clients who opt-in to Marsh's ESG Risk Rating

- Addressing climate change and energy transition-related risks in renewal conversations with energy clients
- Partnering with companies developing credible transition plans and advancing alternative energy projects
- Seeking out companies involved with clean technology and renewable energy, including hydrogen project construction and battery storage
- Working with third parties to build tools that will assist clients in understanding climate-related risk
- Expanding our portfolio of products to provide asset and revenue protection for solar, wind, geothermal, biomass and hydroelectric energy companies
- Evolving and expanding product offerings to help our customers reduce their own emissions, such as incentivizing eco-friendly driving decisions by providing benefits to low-mileage drivers

Leveraging our business to advance climate-related activities

Responding to commercial banks and public agencies' increased demand for renewable energy projects, Liberty Specialty Markets is writing several new accounts focused on supporting capital for climate mitigation, partnering with the International Finance Corporation (IFC) in two unfunded risk sharing programs. Since the first risk-sharing program was signed in 2017, approximately 47% (\$239 million) of Liberty Mutual's total participation (\$505 million) has been used for climate-related activities, including climate mitigation, climate adaptation and special climate activities. Examples include:

- IFC provided a senior loan of \$200 million to an African bank to help develop its climate finance platform, to on-lend to renewable energy projects and contribute to expanding the bank's climate strategy.
- IFC supported a South American bank with a senior loan of \$80 million to support the growth of lending to Small and Medium Sized Enterprises (SMEs) and helping these businesses reduce their GHG emissions through the implementation of climate smart practices and equipment.

Energy transition in our investments

We believe that the energy transition is having, and will continue to have, a profound impact on society, and that this impact must be reflected across our investment portfolio. By integrating ESG factors into our investment process, Liberty Mutual Investments is able to identify the most material effects of the energy transition across asset classes and companies. At the same time, we recognize that certain sectors will be particularly critical to the energy transition, which will create significant new opportunities for innovative, forward-thinking companies and investors.

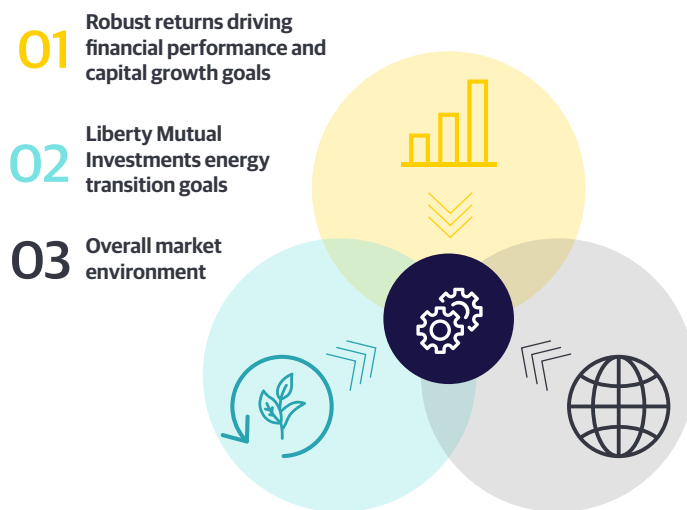
In late 2020, we formalized an Energy Transition Investment Strategy, and a dedicated Energy Transition and Infrastructure (ET&I) team within our private investments group.

We aim to lead through actions. The ratio between our investments in alternative versus traditional energy has improved from 1:15 in 2018 to 1:3 by the end of 2021. Illustrating our commitment to hydroelectric power, we have allocated capital to a project that will acquire, develop and build power generation capabilities at 22 existing non-powered dams. We have also made investments that support residential solar and wind power generation, and other important aspects of the overall energy transition investment ecosystem.

Alongside our efforts to support a low-carbon economy, we believe that ensuring continued access to energy that is stable and affordable is vital. While we support and invest in alternative energy sources, we do not believe we can rapidly walk away from all traditional energy projects and investments because doing so would cause supply disruptions and unintended economic harm to workers, communities and businesses that are currently reliant on traditional energy sources. At least for the immediate future, we believe the world needs to retain some level of balance between energy generation from fossil fuels and alternative energy sources.

Energy Transition Investment Strategy

Liberty Mutual Investment's Energy Transition Investment Strategy aims to both maximize returns based on our financial performance and capital growth goals, while also supporting the global energy transition and capitalizing on the overall market environment.



Our Energy Transition Investment Strategy complements our overall investment ESG integration approach, referenced above and further detailed in our [2021 Environmental, Social & Governance Review](#).

Energy transition in our operations

This year, we announced that we plan to reduce our Scope 1 and 2 global GHG emissions by 50% from our 2019 levels by 2030.

We have also made significant progress against [our 2019 coal policy](#) as detailed in the Metrics & targets section, and continue to innovate on our product offerings and investment strategy to support the energy transition.

Read more in our Metrics & targets section of this report.

 **METRICS & TARGETS SECTION**

Helping our customers build resilience for climate-related risks through innovation

As noted in the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report, even with drastic emissions reductions, there are unavoidable climate impacts baked into our future. As part of our commitment to customer and community resilience, we are developing products and services that help our customers and their communities address and mitigate a range of existing and emerging risks before disaster strikes including climate-related risks and disasters. In 2021, we introduced and expanded the following products:

- **Parametric insurance:** Parametric insurance offers cover for climate impacted perils in at-risk regions, including tropical cyclones, snow, frost, wildfire and hail. Products are also offered to a number of industries pivotal to supporting the energy transition, such as solar and wind farms. Liberty Mutual's parametric insurance has grown in the past years, in both size and the scope of products offered, and aims to provide climate-resilient solutions to those who may not otherwise be able to source insurance.

This year we formed a strategic partnership with **FloodFlash**, to expand access to commercial flood insurance in areas that were historically unable to get flood insurance coverage or had a very difficult time doing so. As a parametric product, this product uses sensors placed at a property to automatically trigger payments based on water depth. The technology developed for this product will also provide us with granular flood data to inform our traditional flood underwriting, improving our understanding of floods in historically underinsured areas.

- **Real-time flood warnings:** In partnership with Previsico, our UK-based specialty operation has become the first UK insurer to provide both real-time flood warnings to clients, triggered by Internet of Things (IoT) sensors placed in watercourses close to their premises, and surface water flood warnings. This will provide flood-affected commercial clients with personalized warnings and graphical representations of water levels in their immediate area, allowing them to take action to protect their premises from flood water.

- **Liberty Risk Reduce Portal:** Liberty Specialty Markets offers the Liberty Risk Reduce Portal, a tool that analyzes policyholders' comprehensive individual risk and offers additional, personalized resources such as e-learnings with accredited materials from the Royal Society for the Prevention of Accidents.
- **Eco-friendly upgrades:** In the US, our Global Retail Markets business unit is beginning to roll out eco-friendly upgrades that allow customers to replace damaged property with products of equal value, while covering additional costs associated with upgrades to a higher "green" or eco-friendly standard. This could include replacing a damaged roof and covering the cost of adding solar panels or replacing broken windows with more energy-efficient ones. This policy's goal is to expand the use of sustainable building materials and practices in home repairs.

Advocating for strong climate policy and climate resilience

We recognize that policy transition risk and physical risk from climate change will have a significant impact on our business and our customers. We are working with policymakers, regulators and associations to collaborate on solutions for these complex challenges. For example, through our participation in the BuildStrong Coalition, Liberty Mutual has engaged with regulators globally, particularly in the US, Canada, the UK and European Union (EU), to shape and support an informed and fair climate policy, particularly related to climate-related financial disclosures and resilience. Through our membership associations, such as the Institute of International Finance, we have advocated globally on climate-related policy, and in select jurisdictions we've advocated for a substantial increase of funding for mitigation and resilience.

Advocating for climate resilience policy

A recent World Economic Forum report assessed that more than 70% of the 576 biggest urban centers worldwide, comprising more than 1.4 billion people, are at elevated or extreme risk from environmental hazards like pollution, water contamination or extreme heat. About \$31 trillion, or 44% of their GDP, is at risk from these losses.²

Supporting resilient infrastructure funding and smarter building codes will help save lives, reduce property damage and decrease the financial burden of future rebuilding efforts. Billions of dollars are flowing to support the rapid evolution of future green technology, but financial attention is critically needed today to protect our communities and reduce systemic risk.

In 2021, we engaged in the following activities to bring attention to the need for increased climate resiliency in partnership with the BuildStrong Coalition:

- Liberty Mutual partnered with the BuildStrong Coalition in the US to advocate for the expansion of the Federal Emergency Management Agency's (FEMA) Building Resilient Infrastructure and Communities (BRIC) grant program which helps fund communities' resilient infrastructure projects. In 2021, the Biden Administration allocated an additional \$1 billion for the program. Liberty Mutual is now focused on encouraging communities to take advantage of this historic level of funding for resilience on a state, regional and local level.
- Ahead of the opening for Federal Emergency Management Agency's (FEMA) Building Resilient Infrastructure and Communities (BRIC) grant submissions in October 2021, we conducted a webinar in partnership with BuildStrong to explore how elected officials can prepare communities for the impacts of climate change by investing in and prioritizing resilient infrastructure.

The BuildStrong Coalition is actively working on developing the next major disaster reform bill, known as the Resilient America Act, which includes provisions designed to protect homes, communities and infrastructure in the face of climate risk.

Supporting the Climate Transition Pathways solution

Through Liberty Specialty Markets, we are the first major insurer to support the [Climate Transition Pathways \(CTP\)](#) solution, an accreditation framework developed by Willis Towers Watson that gives insurance companies and financial institutions a consistent approach to identify businesses with robust low-carbon transition plans aligned with the Paris Agreement.³ The assessment is performed by CDP Worldwide, an international nonprofit organization recognized for its environmental risk reporting.

²"BiodiverCities by 2030: Transforming cities' relationship with nature | World Economic Forum." World Economic Forum, <https://www.weforum.org/reports/biodivercities-by-2030-transforming-cities-relationship-with-nature>.

³CTP is in the process of becoming a fully independent nonprofit.

Risk management

This section expands on the recent steps we've taken to refine our understanding of climate-related risks, which we consider alongside other risk factors.

Read our **2021 Environmental, Social & Governance Review** to learn more about our approach to ESG risk management more broadly.



2021 ESG ANNUAL REVIEW

How we manage climate-related risk

We assess climate-related risk at an enterprise-level and within each business line. The effort is led by the Enterprise Risk Management team and is coordinated through our Emerging Risks Committee and Climate Council. Our internal risk management processes are aligned with our ESG priorities and informed by our understanding of climate-related risks. Below, we have highlighted core oversight of climate-related risk management processes.

Board oversight

Climate-related risk informs decision-making at every level of Liberty Mutual, beginning with our Board of Directors. The Chief Risk Officer and Chief Sustainability Officer provide annual briefings for the Board, and in 2021, there was an additional session for the Board with a Liberty Mutual climate scientist.

Catastrophe risk management

Liberty Mutual has a mature, well-developed catastrophe risk management discipline. Central to this discipline is an Enterprise Risk Management-led catastrophe risk management governance system that derives natural catastrophe gross and net tolerances and limits at the corporate and business unit levels, based on the company's risk appetite, capital and planned earnings. Our Enterprise Risk Management function maintains exposure databases and models losses for key perils, then reports on modeled losses relative to limits and tolerances on a quarterly basis.

The company uses a combination of sound underwriting practices, exposure management and reinsurance to mitigate the financial impact of extreme natural catastrophe events. Our catastrophe risk management

team also does extensive work assessing climate data, modeling and technology. We continue to grow our Catastrophe Research and Development function, staffed by climate scientists, engineers and analytical talent, to develop our own proprietary views of risk to prepare ourselves and our clients for a future in which the risk landscape may look very different from today.

Extensive reviews of climate data and modeling

We continue to review the existing climate data and modeling landscape to better understand the proper usage, limitations and reliability of such data and the tools available for use by the insurance sector. Based on our review in 2021, we acknowledge that climate modeling for the kind of extreme physical hazards that are most material to the insurance industry is still in the early development stage, and the reliability of climate data differs by peril, geography and time horizon.

The insurance industry uses three types of models to assess climate-related risks: 1) catastrophe models, 2) physical climate models and 3) transition risk models. Each brings particular strengths and limitations to the problem of incorporating climate risk into insurance industry risk appetites. Some of the key takeaways from our review process that are vital to understanding the climate data and modeling capabilities currently available to the financial industry are highlighted below.

- **Catastrophe models**, used by the insurance sector for decades to help price physical risks, are useful tools to measure the impacts or financial losses from catastrophic events. Catastrophe models are built primarily using historical statistical distributions that describe physical hazards, and therefore do not explicitly consider future climate considerations. Their strength lies in providing probabilities of extreme event occurrence assuming current climate conditions.

Risk management

Catastrophe models are only well developed for geographic areas and hazards where a large percentage of the population is insured against that hazard, and are less developed in geographies with low amounts of insurance coverage. This limitation affects parts of the world that may be vulnerable to climate-driven catastrophes but have limited insurance availability and uptake.

- **Climate models** are largely physical models that represent the Earth system and help to understand the evolution of the system over different time scales (past, present and future). Climate models do not measure the financial or economic impact of climate events. The efficacy of data from climate models is dependent on the projected time scale of interest (e.g., from present time to 2050) and the spatial resolution of the model's data (e.g., results from a specific model may be on a ~100-kilometer grid). More model uncertainty is introduced at shorter time horizons or smaller spatial scales.

Unlike catastrophe models, climate models can produce realistic future climate conditions, but then struggle to predict many of the extreme events that most impact the insurance industry (such as hurricanes and wildfires). These events occur on spatial scales that are too small to be "seen" in most climate models. To leverage climate models effectively, the insurance industry must approach these models with a sophisticated understanding of the uncertainty represented at the shorter time horizons and smaller spatial scales where our sector operates.

- **Transition risk models**, typically based on Integrated Assessment Models, are tools that can inform economic risks arising from the transition to a zero-carbon economy. Transition risk models incorporate two different types of information — climate data that doesn't measure the financial and economic impacts of climate events and economic data that leverages historical patterns to predict a future we know will look different due to intensifying climate change impacts. Their strength portrays plausible scenarios or pathways to transition the economy from a predominantly fossil fuel-energy perspective to one incorporating new types of fuel sources.

However, these models also include simple representations of the climate system, which could potentially result in misunderstandings or misinterpretations of the relative risk between actual transition and physical climate risks. Due to the highly simplified and backward-looking representation of physical hazard impacts on the economy, interpreting

transition risk models at face value potentially risks underweighting the actual potential impact of physical risks on the economy.

In the absence of sufficient expertise to evaluate these complex families of models, financial institutions run the risk of misinterpreting the output of the models when making portfolio-level decisions. In short, existing transition risk models, if used in isolation, may lead to results that cannot be fully relied upon for business and supervisory decision-making.

At Liberty Mutual, we use transition risk models to inform our economic strategy, but pair them with the unique expertise of the insurance industry, using catastrophe models to represent our most important physical risks.

All of these models struggle to represent the true societal or community impacts of climate change. At Liberty Mutual, we believe that understanding these limitations is crucial to ensuring climate risk is handled with an eye toward climate equity. Integrating a social lens into these models is imperative to better understanding the impact climate events will have on our communities. This realization will inform internal policy development and resource allocation decisions at Liberty Mutual.

In the longer-term, effective climate risk management requires incorporating the strengths of each model — extreme events modeling from catastrophe models, the forward-looking perspective gained from physical climate models and the economic risk modeling predicted by transition risk models.

In the short-term, however, the strengths and limitations of each tool must be respected to ensure data created by each model is not misunderstood or misinterpreted. Likewise, when allocating capital or making financial investment decisions, caution should be exercised when evaluating quantitative risk models based on current climate science and climate models, given their inherent limitations. The data can be used to evaluate probable impacts on a range of financial outcomes, to inform appetites and thresholds for climate-related risks, and to build risk management frameworks based on exposure to and probability of different climate events. We are taking this all into consideration in our risk management analysis, and are actively working to improve data modeling in partnership with other academic and industry partners.

Risk management

Understanding climate data and models

	Catastrophe Models	Climate Models	Transition Risk Models
Use	To measure the impact or financial loss to physical risks from catastrophic events.	To understand the evolution of the system over different time scales (past, present and future).	To inform economic risks arising from the transition to a zero carbon economy.
Inputs	Historical statistical distributions that describe physical hazards; do not explicitly consider future climate considerations.	Physical models that represent the Earth system and help to understand the evolution of the system over different time scales (past, present and future); do not measure the financial or economic impact of climate events.	Incorporates two different types of information: climate data that doesn't measure the financial and economic impacts of climate events, and economic data that leverages historical patterns to predict a future that will look different due to intensifying climate change impacts.
Benefits	Provides probabilities of extreme event occurrence assuming current climate conditions.	Can produce realistic future climate conditions.	Portrays plausible scenarios or pathways to transition the economy from a predominantly fossil fuel energy perspective to one incorporating new types of fuel sources.
Limitations	Only well developed for geographic areas and hazards where a large percentage of the population is insured against that hazard. They are less developed in geographies with a low amount of insurance coverage that could be susceptible to climate change.	Struggles to predict many of the extreme events that most impact the insurance industry (such as hurricanes and wildfires). These events occur on spatial scales that are too small to be "seen" in most climate models.	Risk of misinterpreting the output of the models when making portfolio-level decisions due to the highly simplified and backward looking representation of physical hazard impacts on the economy.

Industry collaboration and strategic partnerships

We are expanding our own capacity, engaging in cross-industry collaborations and making strategic investments in technology, such as Jupiter Intelligence, the leading provider of predictive data and analytics for climate risk, to further enhance our understanding of climate and risk-related data and research. In 2021, we engaged

with stakeholders across industries in such groups as the Partnership for Carbon Accounting Financials (PCAF), UN Principles for Responsible Investment (UNPRI), the National Oceanic and Atmospheric Administration (NOAA), academic institutions and more, to continue developing expertise in this area.

Read more about our efforts investing in education, expertise and capacity building through strategic partnerships in the **Strategy** section of this report.



Advancing our understanding of climate-related risk to inform our underwriting decisions

In general, the greatest physical risks posed to insurance underwriting by climate change are the potential for increased frequency and severity of extreme weather-related events, which impact both the magnitude and volatility of losses. We have identified hurricane, flood and wildfire risk as highly material to Liberty Mutual's book of business, as well as scientifically credible, based on near-term climate models. In 2021, we completed several initiatives to assess these key physical hazards in our business, some of which include:

Hurricane risk

- **Reverse climate stress tests:** We conducted reverse climate stress tests on major hurricane frequency in our US hurricane portfolio to better inform our understanding of physical risks that will impact our portfolios and our customers. This exercise allowed us to produce actionable strategic intelligence for portfolio management in the face of considerable scientific uncertainty on near-term changes in hurricane frequency.

Secondary perils

- **Enhanced data and modeling:** The insurance industry has seen the rise of so-called "secondary perils" like floods and wildfires, which have traditionally produced lower losses than primary perils like hurricanes and earthquakes. However, the climate-related impacts of both flood and wildfire are likely to be substantial, and they require different data standards to manage than hurricane or earthquake risk. Notably, these are both "high-resolution" perils, meaning the underlying risk varies greatly even from one neighbor to another. Liberty Mutual has invested in improving our customer data at the scale of these emerging perils, leveraging aerial imagery, machine learning and advanced geospatial analytics to differentiate our risk management in these fast-changing insurance markets.
- **Wildfire maps:** We have developed new, proprietary wildfire hazard maps for the western US, to better reflect a consistent view of risk across the organization in this rapidly emerging, climate-driven peril.

- **Water hazard models:** We have undertaken an intensive evaluation of water hazard models, including hurricane-induced rainfall and inland flood, to ensure they align with the best available science in light of recent events (like Hurricane Ida's flooding in the northeast US).
- **Sea level rise:** Finally, we partnered with the flood modeling firm Fathom to assess the changing risk of sea level rise on both sunny days and resulting from storm surge (from the present to 2050). This hazard may not be limited only to our commercial flood books. We are also investigating our residential lines to assess concentrations of risk that could be susceptible to future property value risk and examining our industrial lines for emerging environmental liability risks from coastal or groundwater flooding.

Climate hazards do not occur in a vacuum — they intersect with the built environment. To help our society and business better prepare for emerging climate hazards, we are investing in assessing the details of our exposure in emerging business lines like renewables, as well as defining best practices for resilient infrastructure. For example:

- We worked with leading global risk and engineering advisors to further enhance our expertise in the identification, assessment and treatment of risks arising from emerging renewable technologies, including offshore wind.
- Liberty Mutual continues to partner with leading academic institutions and groups, like the US-based Insurance Institute for Business and Home Safety (IBHS), to advance resilient building practices.

Establishing a research-based standard to distinguish a home as wildfire-resilient

Wildfires have become larger and more intense, leading to rising temperatures and spreading into densely populated suburban neighborhoods where the losses and human suffering are significant. Liberty Mutual engaged with the Insurance Institute for Business and Home Safety (IBHS) on a set of requisite mitigation actions that, when taken together, will significantly reduce a given property's wildfire risk. The framework — Wildfire Prepared Home™ — will incorporate the latest-available wildfire science, building performance characteristics, data analytics insights and contributions from a diverse group of wildfire leaders to address today's wildfire risk. Wildfire Prepared Home™ will provide homeowners with a pathway to meet and maintain a three-year designation recognizing their commitment to reducing wildfire risk.

Investigating future coastal flood risk posed by sea level rise

We are exploring future coastal flood risk posed by sea level rise, incorporating both future flood hazard information and loss projections from Fathom, a benchmark in global flood mapping. Our work underscores the importance of not only considering impacts to lines of business explicitly covering flood, but also careful consideration of future portfolio risks and opportunities from changes in property values and other lines of business.

This work emphasizes the importance of our ongoing efforts to ensure accurate data quality throughout the business. Perils like floods, that occur hyper-locally with significant variation from one area to the next, require high-quality location and policy information in order to be accurately modeled.

We will continue to monitor the portfolio we insure along the coast to better understand what types of exposures are more at risk from coastal flood impacts, across multiple lines of business. However, our preliminary results indicate some key learnings:

- Return periods for coastal flooding will shorten in the future, increasing the frequency of severe flood events.
- Sea level rise increases both coastal flood depth and inland flood extent, meaning locations currently not at risk for a given hazard level (such as a 100-year return period flooding) may experience some level of flooding by 2050.
- Smoothly varying hazards like sea level rise may have abrupt changes in risk profiles as they interact with the built environment. For example, coastal flood defenses like levees and seawalls act as "critical thresholds" against potential damage, for risk is minimal until those defenses are breached, but thereafter risks may increase rapidly.
- Key regions and business units with coastal wind underwriting guidelines may provide additional climate risk management benefits, sheltering the portfolio from more severe future coastal flood impacts.
- The mid-Atlantic region may be impacted by increased sunny day flooding, or "nuisance flooding," in the future relative to other areas along the coast, in line with similar findings in the scientific literature. This area has high population density at low elevations, increasing the potential impacts of flood hazards. We will continue to monitor this area, especially regarding future impacts to the region's broader economy.

Risk management

Managing climate-related transition risk: Liberty Mutual's climate-related scenario analysis exercise

Scoping the climate scenario analysis exercise

In 2021, Liberty Mutual conducted climate-related scenario analysis to inform our risk assessment, strategy and decision-making. While scenario analysis is a well-established method for developing strategic plans that factor in a range of plausible future states, its use for assessing the potential business implications of climate-related risks and opportunities is relatively nascent. Currently there is no universal approach to climate scenario analysis, and due to the fundamental gaps in the data and models available [discussed earlier in this report](#), it demands significant in-house expertise to ensure appropriate incorporation into strategy.

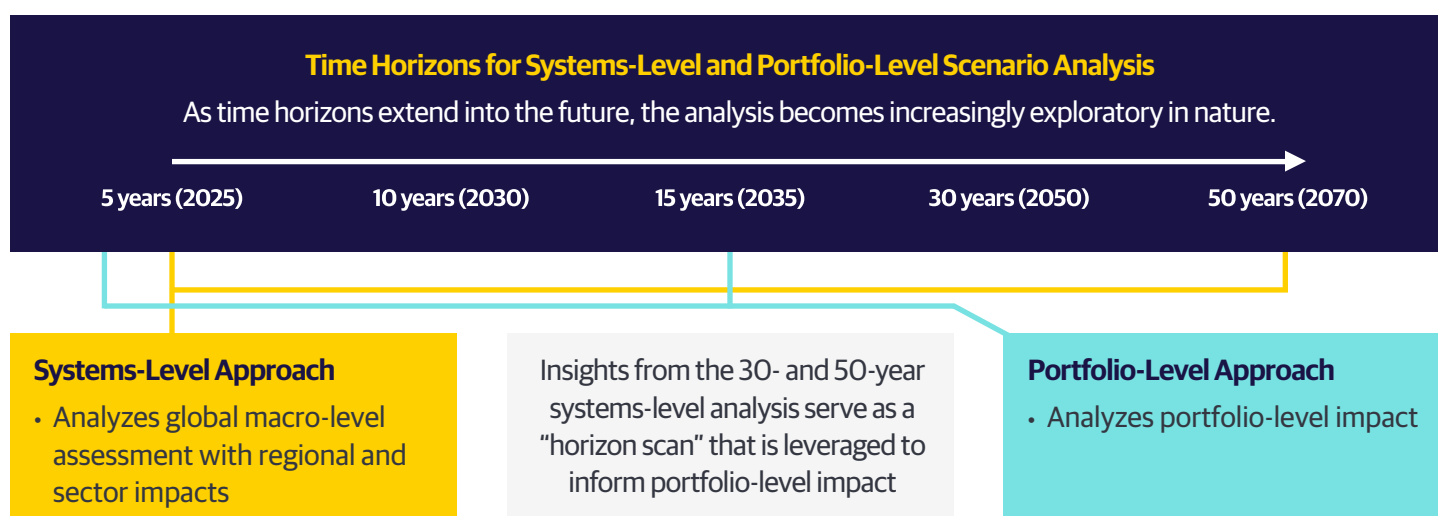
According to TCFD, climate-related scenario analysis should be used to assess and disclose potential business, strategic and financial implications of climate-related risks and opportunities over a short-, medium- and long-term time horizon. Given the limitations of existing climate-related scenario modeling, we opted to combine a

systems-level, top-down stress test and a portfolio-level, bottoms-up stress test to better understand different dimensions of climate-related transition risks. The scope of the two exercises included:

- **Systems-level climate scenario analysis** exploring macroeconomic, policy and legal, reputational and technological risks (with regional and sector insights) over a five-, 10-, 15-, 20- and 30+ year time horizon, recognizing that quantitative approaches do not yield meaningful insights between 30- and 50-year time horizons.
- **Portfolio-level climate scenario analysis** of Liberty Mutual's investments over a five-, 10- and 15-year time horizon. Data limitations and business strategy constrain realistic portfolio-level analytics to a shorter time scale of 15-years.

These two approaches are complementary. The systems-level approach allows us to perform a more qualitative "horizon-scanning" exercise to consider emerging risks where detailed quantitative data may not be available.

Our approach to climate-related scenario analysis



Risk management

The climate scenario analysis was conducted and coordinated through the Climate Council. Results from the exercises were shared and discussed with our executive leadership team, ESG management committees and business leaders. The insights provided will continue to inform strategy discussions over the coming months.

Selecting the climate scenario tools

There are an array of proprietary and open-source tools to inform climate scenario analysis. Our process started with assessing available tools to identify which were most applicable for Liberty Mutual:

- **Proprietary scenario tools offered by reputable vendors:** We evaluated these offerings against several dimensions and found that private sector tools offered solutions for portfolio-specific application, but could not provide the macro-economic insights that are needed to better understand the strategic climate-related transitions underway in specific geographies and sectors. Additionally, private sector platforms are often opaque about their methodology, making it difficult to assess the applicability of the results.
- **Open-source tools:** These models were more transparent in their methodologies and informed our understanding of what data is available, how that data is being used in the climate scenario analysis tool, and where there are gaps in information that require additional research and analysis to derive meaningful

insights for our climate scenario analysis exercise. This assessment led us to the Central Banks and Supervisors Network for Greening the Financial System (NGFS) scenarios.

Ensuring a variety of scenarios to be analyzed

While we used NGFS scenarios for both the systems- and portfolio-level exercises to ensure our approach was consistent and complementary,⁴ there were some differences in the NGFS versions leveraged for the analysis, detailed in the [“Leveraging a variety of climate stress test scenarios” graphic](#) on page 23.

This is a reflection of the rapidly evolving nature of climate risk assessment thinking globally – and our desire to consider the most timely insights, tools and data available. For our **systems-level analysis**, we selected four of the six 2.0 NGFS scenarios.⁵

For our **portfolio-level analysis**, we opted to use a proprietary tool that leveraged four 1.0 NGFS scenarios using the most up-to-date third-party data (2.0 NGFS scenarios were not offered at the time of the analysis) to test how Liberty Mutual's investment portfolio would perform under different scenarios. We then used insights from the systems-level analysis to complement and further contextualize these results.

⁴We leveraged different versions of the NGFS scenarios to take advantage of the latest available data. For future climate scenario analysis exercises at both the systems-level and portfolio-level, we will aim to incorporate updated scenarios from NGFS that capture ongoing developments informing plausible transition pathways.

⁵We determined that two of the NGFS version 2.0 scenarios were not considered realistic outcomes based on evidence from the 6th IPCC report and therefore were not reviewed in the systems-level analysis.

Selecting scenarios from the Central Banks and Supervisors Network for Greening the Financial System

Informed by existing tools and methodologies, we opted to develop our own approach to climate scenario analysis, leveraging the scenarios published by the Central Banks and Supervisors Network for Greening the Financial System (NGFS).

NGFS comprises leaders within the financial sector working to establish industry standard practice for climate risk stress testing and more broadly on transition risks overall. NGFS's climate scenarios provide a common reference point for understanding how climate change, climate policy and technology trends could evolve.

Liberty Mutual opted to move forward with this framework for several reasons:

Industry relevance

As of February 2022, NGFS is a group of 108 members and 17 observers, including a number of central banks, committed to sharing best practices, contributing to the development of climate- and environment-related risk management in the financial sector and mobilizing mainstream finance to support the transition towards a sustainable economy.

Timeliness of insights

NGFS scenarios are updated in a timely manner. The first report was released June 2020 (1.0) and an updated dataset was released June 2021 (2.0).

Academic backing

NGFS is supported by an academic consortium from the Potsdam Institute for Climate Impact Research (PIK), International Institute for Applied Systems Analysis (IIASA), University of Maryland, Climate Analytics and Swiss Federal Institute of Technology in Zurich.

Used by regulators

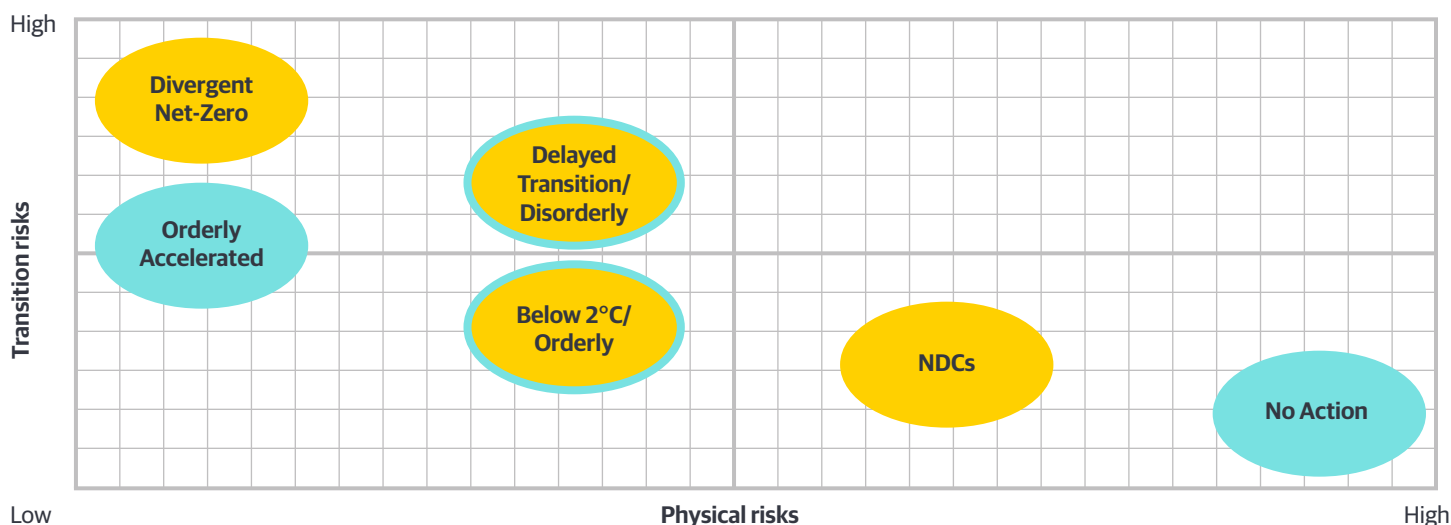
The NGFS Framework provides a common reference point for prudential regulators and informs oversight of climate-related risks in different markets.

Support from NGOs

It is backed by Bloomberg Philanthropies and other organizations with a track record for helping establish industry standards and developing innovative tools to advance climate action across the financial sector.

Risk management

Leveraging a variety of climate stress test scenarios⁶



Systems-level analysis scenarios

Below 2°C

- Assumes net-zero CO₂ emissions by 2070 and limits warming to 1.7°C.
- Assumes that globally coordinated climate policies are introduced immediately, resulting in relatively low physical and transition risks.

Divergent Net-Zero

- Assumes net-zero CO₂ emissions by 2050 and limits warming to 1.5°C.
- Assumes considerably high transition risks, due to quickened energy transition pace and policy variation, but overall results in the lowest physical risks.

Delayed Transition

- Assumes global annual emissions do not decrease until 2030 with strong policies needed to limit warming to below 2°C.
- Assumes new climate policies are not introduced until 2030 and the level of policy action differs across countries and regions.

Nationally Determined Contributions (NDCs)

- Assumes continued progress towards a moderate climate ambition resulting in a steady decline in emissions and warming of -2.5° to 3°C.
- Assumes moderate to severe physical risks.

Portfolio-level analysis scenarios

Orderly

- Assumes climate policies are introduced early and become gradually more stringent. Net zero CO₂ emissions are achieved before 2070, giving a 67% chance of limiting global warming to below 2°C.
- Low transition and physical risk as a result.
- Significant investment is needed to transition to a carbon neutral economy.

Orderly Accelerated

- CO₂ emissions need to reach net zero around 2050 to limit global warming to 1.5°C with a 67% chance.
- This emissions reduction is much more rapid than the Orderly scenario, leading to higher transition risks.

Disorderly

- Assumes climate policies are not introduced until 2030.
- Since actions are taken relatively late and limited by available technologies, emissions reductions need to be sharper than in the Orderly scenario to limit the warming to the same target.

No Action

- Assumes only currently implemented policies are preserved.
- Nationally determined contributions are not met; emissions grow until 2080 leading to 3°C warming.
- Severe physical risks (e.g., irreversible sea level increase).

⁶Network for Greening the Financial System (NGFS) Framework used as a foundation, with Liberty Mutual insights on specific scenario selection.

Insights from our systems-level assessment

Macro-level policy insights

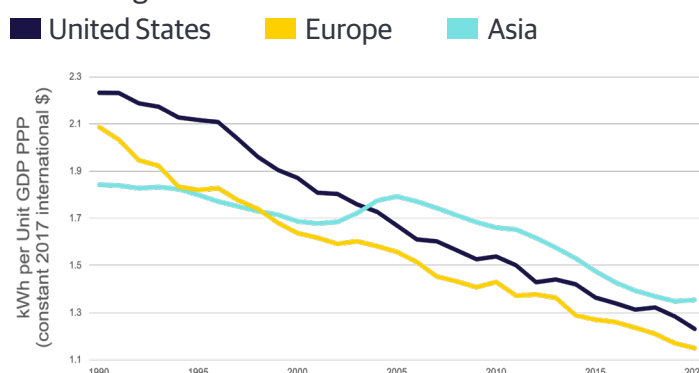
Through our systems-level analysis, we observed the following key considerations for our business strategy and decision-making. We are and will continue to closely monitor climate-related regional policy action to inform our approach.

- **Global common policy action is unlikely.** The time horizons of transition risk vary by region as they are based on different and sometimes divergent policy commitments made by countries. For example, in the last few years the UK, European Union (EU), China and India have all committed to net-zero emissions, but their time horizons for achieving these goals differ – the UK and EU pledged to do so by 2050, China by 2060 and India by 2070. This means that each of these countries will be developing policy to deliver ambitions at different time horizons setting up different economic realities by region.
- **Coordination of policy action reduces negative economic impact.** A surprising insight from our systems-level analysis runs contrary to the current thinking which emphasizes the need for commonality in policy. Our analysis indicates that coordination, not commonality in policy is the best path to reduce economic costs of transition risks. As seen in the graphs on the [next page](#), “Regional GDP impact,” a coordinated global policy approach would reduce the relative negative impact to GDP across the three regions in every scenario.
- **The pace and shape of policy development is informed by the energy and carbon intensity of the corresponding sector.** Based on the disproportional GDP impact experienced by different regions, we completed further analysis to understand the reasons for disparity in impact. This scenario analysis reveals macro-economic impacts stemming from transition risk over time, that are initially influenced by a region's current energy and carbon intensity. The more carbon-intensive energy a regional economy consumes, and the higher its economic output, the more prone it is to macro-economic impacts stemming from transition risks. As such, the magnitude and time horizon of policy development to address climate change is expected to be specific to regional economies.

Energy and carbon intensity of GDP

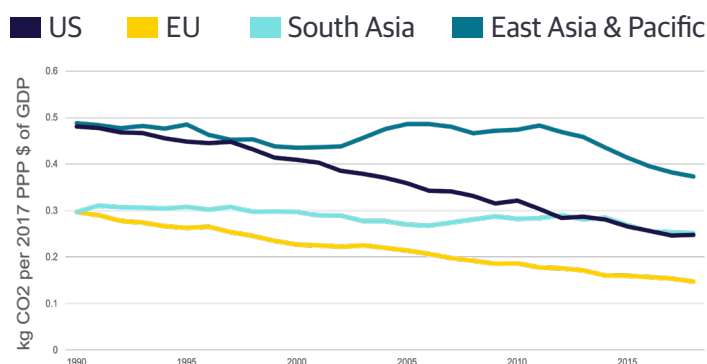
Energy Intensity of GDP^{7, 8}

Energy Intensity of GDP provides a basis for projecting energy consumption and its environmental impact with economic growth.



CO₂ Emissions per Unit of GDP⁹

Carbon intensity of GDP can be used to understand how much a country/region's economic growth in contributing to climate change.



- **Divergent, regional energy transition pathways should be expected.** Regional-specific energy transition pathways will impact the type of preferred renewable investment and strategy, further challenging a one-size-fits-all approach to decarbonization. Historical energy transition pathways progressed from coal to oil to natural gas to renewables over time. The EU, while still reliant on fossil fuels, has an ambitious policy in place to transition to renewables in the near future. The US, currently at the natural gas phase of its energy transition, is more conservative in its transition to renewable energy sources. Asia's energy transition, however, may not go through a sequential transition but could leapfrog from its current reliance on coal to natural gas or renewables.

Risk management

- **The lack of coordinated policy approaches will challenge companies**, particularly global companies, who will need to design their transition pathways to meet differing economic realities. This could result in creating increased reputational risk from stakeholders who prefer commonality over a coordinated approach. During the next UN Climate Change Conference (UNFCCC COP27), scheduled for November 2022 in Egypt, it will be important for governments to recognize this reality and incorporate a coordination, not commonality approach in their communications.

Business-level insights

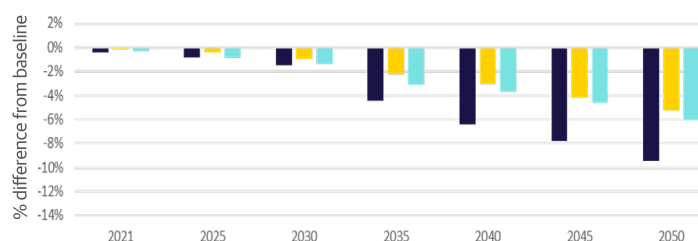
The TCFD describes transition risks as those stemming from policy and legal, reputational, market and technology changes. At Liberty Mutual, our systems-level analysis helped us understand how different types of transition risk can challenge businesses:

- **Policy risk:** The most immediate and greatest source of climate-related transition risk relates to policy, in terms of both policy ambition and pace of adoption. Through our systems-level analysis, we observed key takeaways related to policy transition risk that need to be taken into consideration for our business strategy and decision-making (further detailed on the [previous page](#)).
- **Reputational risk:** Reputational risk could also challenge companies in the short-term, particularly if they fail to communicate how they are mitigating risk and adapting business strategy to climate change.
- **Market risk:** Policy influences market-related transition risk, but multiple models indicate market-related transition risk is still 5-10 years away, barring major exogenous factors.
- **Technology risk:** While technology transition is evolving at a rapid pace, the models show that it is not likely to disrupt existing businesses in the short-term. Insights from technology transition provide areas of strategic opportunities that should be explored.

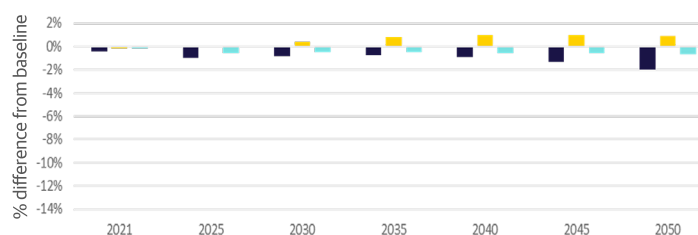
Regional GDP impact¹⁰

■ United States ■ Europe ■ Asia

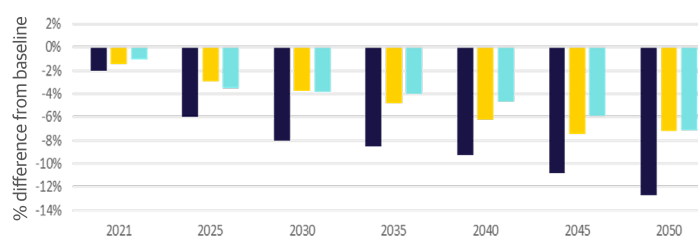
Delayed Transition



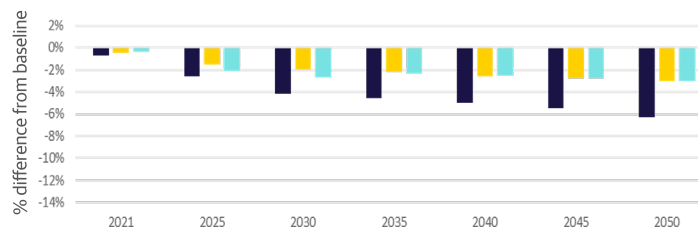
Below 2°C



Divergent Net-Zero



Nationally Determined Contributions (NDCs)



⁷"Statistical Review of World Energy." BP Global, <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>.

⁸"GDP per capita, PPP (constant 2017 international \$) - East Asia & Pacific | World Bank." World Bank Open Data, <https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD?locations=Z4>.

⁹"GDP per capita, PPP (constant 2017 international \$) - East Asia & Pacific | World Bank." World Bank Open Data, <https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD?locations=Z4>.

¹⁰"NGFS Climate Scenarios Database: Technical Documentation V2.2 | NiGEM Model with GCAM Inputs." NGFS, https://www.ngfs.net/sites/default/files/ngfs_climate_scenarios_technical_documentation_phase2_june2021.pdf

Risk management

Insights from our portfolio-level assessment

Liberty Mutual Investments conducted a climate stress assessment to gain a baseline understanding of climate risk across our portfolio. This analysis found overall climate-related transition risk associated with our portfolio holdings to be quite limited.

Across all scenarios we evaluated as part of this assessment, climate risk negligibly impacts Liberty Mutual Investment's portfolio holdings over the near-term, and it increases moderately over a 15-year time horizon. It is important to note that these results are based on the assumption that there is no active management of the portfolio over a 15-year period. With active management, Liberty Mutual would be able to reposition its portfolio over time to address evolving climate risks.

Our portfolio-level analysis finds transition losses are highest in the "accelerated" scenario, where they are similar in magnitude to the types of losses that may be experienced in a moderate recession. There is a lesser portfolio impact in the "orderly" and "disorderly" scenarios. While the "no action" scenario has no impact on the portfolio under this analysis, it is important to note that this should not be considered a desirable outcome, as it is likely to introduce significant climate-related physical risk over the long term (15+ year time horizon), as discussed above.

Portfolio-level scenario analysis key findings

	5 years	10 years	15 years
Accelerated			
Orderly			
Disorderly			
No Action			

Low risk Medium low risk Medium risk
Medium high risk High risk

The asset class analysis, which can be viewed on the [next page](#), suggests that the overall climate risk associated with Liberty Mutual's investment portfolio is mitigated largely due to portfolio concentration in highly rated fixed-income instruments. Where Liberty Mutual does hold exposure to impacted asset classes, exposures are minimal.

Actions from climate scenario analysis exercise insights

Informed by our combined systems- and portfolio-level analysis, we have developed a short-term transition strategy to focus our actions over the coming year and inform our longer-term strategy, including:

- Monitoring and evaluating global and regional policy development and its implications to our business strategy. From our systems-level stress testing exercises, we understand policy risk to be the most immediate transition risk, which has downstream implications to market and technology risks. We recognize government policies vary by region and assume governments will focus on reducing transition-related stresses on their economies, particularly given economic hardships resulting from the pandemic.
- Conducting sector deep dives to understand time horizon implications of the energy transition on our existing business and identifying opportunities for growth and innovation.
- Continuing to facilitate enterprise-level coordination of business activity — including across underwriting and investments — encouraging coordination without pushing for commonality of action across geographies and business units.
- Sharing our scenario analysis approach and insights to help inform and encourage a responsible energy transition globally.

In the coming years, we will take action to implement and further develop our climate transition strategy and will share insights from our implementation efforts in future reports.

Risk management

Asset class level scenario analysis key findings

■ Low risk
 ■ Medium low risk
 ■ Medium risk
 ■ Medium high risk
 ■ High risk

5 Years

Asset Class	Accelerated	Orderly	Disorderly	No Action
Investment Grade Bonds	Low risk	Low risk	Low risk	Low risk
High Yield Bonds	Low risk	Low risk	Low risk	Low risk
Public Equity	Medium low risk	Low risk	Medium low risk	Low risk
Private Equity	Low risk	Low risk	Low risk	Low risk
Structured Products (Non-Agency)	Low risk	Low risk	Low risk	Low risk
Private Credit	Low risk	Low risk	Low risk	Low risk
Natural Resources	High risk	High risk	High risk	Low risk
Leveraged Loans	Low risk	Low risk	Low risk	Low risk

10 Years

Asset Class	Accelerated	Orderly	Disorderly	No Action
Investment Grade Bonds	Low risk	Low risk	Low risk	Low risk
High Yield Bonds	Medium low risk	Medium low risk	Medium low risk	Low risk
Public Equity	Medium risk	Medium low risk	Medium risk	Low risk
Private Equity	Medium low risk	Low risk	Medium low risk	Low risk
Structured Products (Non-Agency)	Low risk	Low risk	Low risk	Low risk
Private Credit	Low risk	Low risk	Low risk	Low risk
Natural Resources	High risk	High risk	High risk	Medium low risk
Leveraged Loans	Medium low risk	Medium low risk	Medium low risk	Low risk

15 Years

Asset Class	Accelerated	Orderly	Disorderly	No Action
Investment Grade Bonds	Low risk	Low risk	Low risk	Low risk
High Yield Bonds	Medium risk	Medium low risk	Medium risk	Low risk
Public Equity	Medium high risk	Medium low risk	Medium high risk	Low risk
Private Equity	Medium risk	Medium low risk	Medium risk	Low risk
Structured Products (Non-Agency)	Low risk	Low risk	Low risk	Low risk
Private Credit	Medium low risk	Low risk	Medium low risk	Low risk
Natural Resources	High risk	High risk	High risk	Medium low risk
Leveraged Loans	Medium risk	Medium risk	Medium risk	Low risk

Metrics & targets

This section details metrics and targets measuring progress against our climate-related commitments year-over-year. We are continuing to improve our own data collection and are working with partners across industries to share best practices.

Liberty Mutual is committed to advancing transparency, measurement and disclosures. To learn more about our efforts:



2021 ESG ANNUAL REVIEW



2021 GRI INDEX



2021 SASB REPORT



OUR CORPORATE SITE

Embracing the ClimateWise Principles

ClimateWise, part of the University of Cambridge Institute for Sustainability Leadership, brings the insurance industry together with related organizations with world-class academic expertise and global sustainability leaders to innovatively tackle climate change. As a member of ClimateWise, Liberty Specialty Markets will publish its first [ClimateWise report](#) in 2022, detailing progress against seven principles – which are aligned with the Task Force on Climate-related Financial Disclosure Recommendations:

Principle 1

Be accountable

Principle 2

Incorporate climate-related issues into our strategies and investments

Principle 3

Lead in the identification, understanding and management of climate risk

Principle 4

Reduce the environmental impact of our business

Principle 5

Inform public policy-making

Principle 6

Support climate awareness amongst our customers/clients

Principle 7

Enhance reporting

Progress against carbon reduction commitment

This year, Liberty Mutual announced a commitment to a 50% reduction of Scope 1 and 2 global GHG emissions from 2019 levels by 2030, taking another step in our long-term strategy toward a low-carbon future. In 2021, we achieved a 43% reduction of Scope 1 and 2 global emissions compared to our 2019 baseline.

Measuring carbon emissions

Scope 1 CO₂ emissions (MTCO₂e)



Scope 2 CO₂ emissions (MTCO₂e) location based



Scope 3 CO₂ emissions¹¹ (MTCO₂e) U.S. only



72,701

Total Scope 1 & 2 CO₂ emissions (MTCO₂e)

¹¹Scope 3 figure is limited only to global commercial air and ground travel, including employee mileage reimbursement, and waste from U.S. owned and operated facilities; 2019 and 2020 Scope 3 figures are limited to only commercial air and ground travel for U.S.-based employees.

Metrics & targets

Efforts to reduce operational efficiencies

To reach our GHG reduction goals, we continue to decrease our operational carbon footprint by taking actions to increase operational efficiencies and identifying renewable energy opportunities across our real estate portfolio. We used learnings from 2020 to increase emission reduction rates as we started the return-to-office transition. With employees across the global network continuing to work from home or in a hybrid format, we are engaged in a property review to ensure we are using our office space appropriately, and considering climate mitigation and adaptation across our global operations. We anticipate completion of this review in 2022.

We took advantage of empty offices to drive our sustainability initiatives ahead of schedule, including converting our headquarters to full LED lighting three years early. Additionally:

- In the US, four of our 10 owned buildings have LEED certifications, representing 74% of our total owned square footage in the US and 58% globally.
- In the US, five of our 10 owned buildings have Energy Star labels, representing 57% of our total owned square footage in the US and 45% globally.
- Our leased London office holds BREEAM UK status.

Notable 2021 initiatives to ensure our business operations are sustainable include:

- **Waste diversion:** We implemented a landfill diversion program for our US-owned buildings where we installed three-stream waste stations throughout offices, requiring employees to sort waste into recycling, compost and landfill at centralized locations, with the objective of building a culture of increased awareness around what is being disposed of.
- **Water use measurement and awareness:** We began measuring water use and recorded 282.2 megaliters for US-owned sites.
- **Furniture reuse:** We donated 41.6 tons of furniture with a fair market value of \$584,870 to local social service agencies, nonprofits and schools.

- **Printing conservation:** Through the Print\$mart initiative in the US (which captures printing activities both in-office and through remote work), total printed page volume in 2021 was 79% lower than 2019 levels. As a result, employees conserved 24 million gallons of water, saved 28,279 trees and reduced CO₂ and GHG emissions by 3,352 tons and 1,178 tons, respectively.
- **Paper recycling:** For offices that remained open, shredding and recycling of files eligible for destruction through a record storage vendor allowed Liberty Mutual to recycle 1,438 short tons of paper, offsetting approximately 2.1 million pounds of CO₂ emissions.
- **Fleet highlights:** Around the world, Liberty Mutual is working to ensure that claims adjusters and other employees are using green cars and are mindful of their carbon emissions. In the US, 100% percent of Liberty Mutual's automotive fleet (field drivers) consists of either partial zero emission vehicles (PZEVs), low emissions vehicles (LEVs), ultra-low emissions vehicles (ULEVs), super ultra-low emissions vehicles (SULEVs) or flex-fuel vehicles. Due to COVID-19, there continues to be a significant decrease in miles and gallons consumed, so our impact in 2021 over 2019 baseline levels includes: a 35% reduction in miles driven, 37% decrease in gallons consumed. Our impact in 2021 was 2.8% increase in miles-per gallon (MPG), 37% reduction in CO₂ emissions and a \$1.2 million reduction in fuel costs.

In Europe, Liberty Specialty Markets has driven increasing progress with the adoption of a green company car policy in 2021, which will convert its fleet of vehicles to fully electric vehicles (FEVs) or hybrids (PHEVs) by the end of 2024. UK offices also launched a green car program in November 2021 that provides employees access to FEVs via a tax-efficient plan. Within a month, 25% of staff had registered.

Metrics & targets

Progress against coal policy

Liberty Mutual continues to uphold our global policy on coal underwriting and investing. Liberty Mutual Investments has fully implemented our commitment, formalized in December 2019, that stipulates that Liberty Mutual will not make new investments in:

- Companies that generate more than 25% of their revenues from thermal coal mining or utility companies generating more than 25% of their electricity production from thermal coal
- Liberty Mutual will divest existing investments in companies that exceed this threshold by 2023

Since implementing the coal policy, we have reduced our overall exposure to coal-intensive investments (as defined in the policy) by 75%. Additionally, our coal-intensive holdings as of mid-2021 are entirely comprised of bond investments. Direct investments have been fully eliminated.

We are also continuing to implement our coal policy across our underwriting portfolio, which stipulates that we will no longer accept underwriting risk for companies where more than 25% of their exposure arises from the extraction and/or production of energy from thermal coal. For customers that we began working with prior to December 2019 that do not meet this threshold, we are actively discussing plans with those committed to a transition and continuing to phase out coverage for those not tracking towards our threshold.

Transitioning our investment portfolio

We have made measurable progress on advancing the energy transition through our investments. In 2021, Liberty Mutual Investments directly managed more than \$73 billion in fixed income investments and oversaw more than \$11 billion in private investments in asset classes such as private equity, real estate and direct lending funds and co-investments. In particular, we improved the ratio between our investments in alternative versus traditional energy from 1:15 in 2018 to 1:3 by the end of 2021.

Responsible insurance and investment progress

	2021	2020	2019
Total investments in traditional energy¹²	\$3,249 million	\$3,779 million	\$3,841 million
Total investments in alternative energy (US\$)¹³	\$1,468 million	\$861 million	\$420 million
Ratio of investments in alternative: traditional energy¹⁴	1:3	1:5	1:10
UNPRI signatory	Yes	Yes	No
Responsible investment policy	Yes	Yes	No
Non-investment grade fixed income and private credit as a percent of total portfolio	6.5%	6.9%	5.5%

¹²Includes unfunded commitments of US\$38 million (2021), US\$67 million (2020), US\$119 million (2019).

¹³In 2020, Liberty Mutual modified its definition of alternative/renewable energy to include only energy derived from solar, wind and hydro sources. In 2021, fixed maturities and public equities of US\$506 million, LP, LLC and other equity method investments of US\$406 million and unfunded commitments of US\$556 million were included, while 2020 includes fixed maturities of US\$180 million, LP, LLC and other equity method investments of US\$288 million and unfunded commitments of US\$393 million. Amounts from 2019 include fixed maturities of US\$22 million, LP, LLC and other equity method investments of US\$254 million and unfunded commitments of US\$144 million.

¹⁴In 2020, Liberty Mutual modified its definition of alternative/renewable energy to include only energy derived from solar, wind and hydro sources.

Contact us

For questions or comments regarding this report, please contact **Sustainability@LibertyMutual.com**.

Cautionary statement regarding this report

This report has been prepared solely for informational purposes from sources understood by the Company to be reliable at the time included in this report. Liberty Mutual Group (the Company) does not guarantee the accuracy, completeness, timeliness, or availability of the contents of this report. The Company is not responsible for any errors or omissions, regardless of the cause, for the results obtained from the use of the contents of this report. In no event shall the Company be liable to any party for any direct, indirect, incidental, exemplary, compensatory, punitive, special, or consequential damages, costs, expenses, legal fees, or losses (including, without limitation, lost income or lost profits and opportunity costs or losses caused by negligence) in connection with any use of the contents of this report even if advised of the possibility of such damages. The Company's opinions, quotes, and analyses are statements of opinion as of the date they are expressed and not statements of fact or recommendations to purchase, hold, or sell any securities or to make any investment or insurance-related decisions and do not address the suitability of any security or insurance policy. The contents of this report should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors, and/or clients when making investment, insurance-related, and other business decisions.

This report contains forward looking statements that are intended to enhance the reader's ability to assess the Company's future financial and business performance. Forward looking statements include, but are not limited to, statements that represent the Company's beliefs concerning future operations, strategies, financial results, or other developments, and contain words and phrases such as "may," "expects," "should," "believes," "anticipates," "estimates," "intends" or similar expressions. Because these forward-looking statements are based on estimates and assumptions that are subject to significant business, environmental, economic, and competitive uncertainties, many of which are beyond the Company's control or are subject to change, actual results could be materially different.

The Company's forward-looking statements speak only as of the date of this report or as of the date they are made and should be regarded solely as the Company's current plans, estimates and beliefs. The Company assumes no obligation to update these forward-looking statements or the contents of this report following publication in any form or format. For a discussion of the Company's financial information, visit the Company's Investor Relations website at www.libertymutualgroup.com/investors.

This report may contain links to other Internet sites and may frame material from other Internet sites. Such links or frames are not endorsements of any products or services in such sites, and no information in such sites has been endorsed or approved by the Company.

Except where noted, the information covered in this report highlights our performance and initiatives in fiscal year 2021.

The inclusion of information in this report should not be construed as a characterization regarding the materiality or financial impact (or potential impact) of that information.