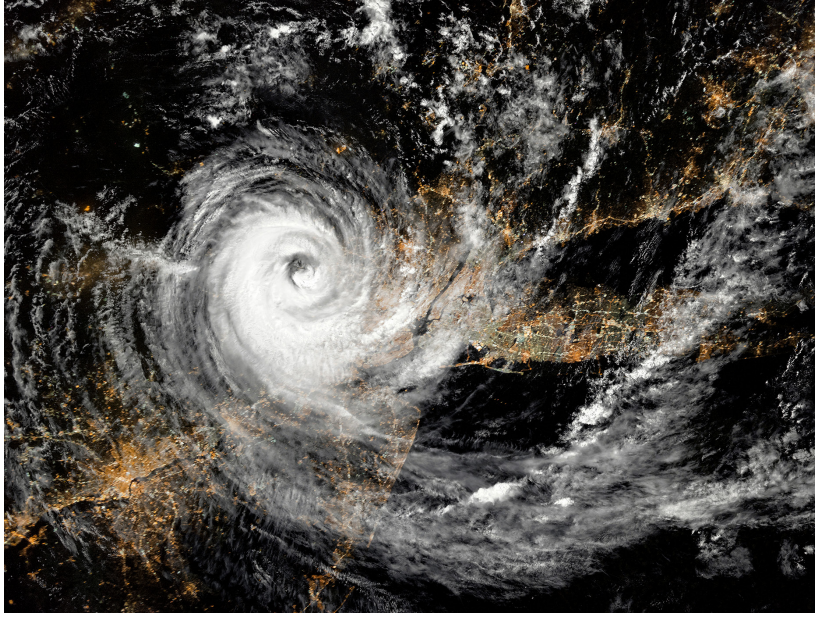

Climate risk management in the U.S. insurance sector

An analysis of climate risk disclosures

July 2023

Ceres

Ceres Accelerator
for Sustainable Capital Markets

About the report

This report was a joint undertaking by Ceres and the California Department of Insurance to review, analyze and present findings from insurance company responses to the National Association of Insurance Commissioners' (NAIC) 2021 Climate Disclosure Survey, which is aligned with the Task Force on Climate-related Financial Disclosures (TCFD) framework for climate risk disclosure. The purpose of this report is to encourage improvement in the comprehensiveness of climate-related disclosures in future years and provide insights that may be valuable to insurance regulators and other stakeholders.

The California Department of Insurance analyzed the reports using python-based text mining methods developed by Banco de España for evaluating climate-related disclosures. Separately, Ceres commissioned AI-powered software provider Manifest Climate to measure TCFD-alignment with a machine learning-based algorithm. In this report, these complementary results are presented together.

Acknowledgments

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About Ceres

Ceres is a nonprofit organization working with the most influential capital market leaders to solve the world's greatest sustainability challenges. Through our powerful networks and global collaborations of investors, companies, and nonprofits, we drive action and inspire equitable market-based and policy solutions throughout the economy to build a just and sustainable future. For more information, visit **ceres.org** and follow **@CeresNews**.

About the Ceres Accelerator for Sustainable Capital Markets

Ceres is a nonprofit organization working with the most influential capital market leaders to solve the world's greatest sustainability challenges. The Ceres Accelerator for Sustainable Capital Markets is a center of excellence within Ceres that aims to transform the practices and policies that govern capital markets to reduce the worst financial impacts of the climate crisis. It spurs action on climate change as a systemic financial risk — driving the large-scale behavior and systems change needed to achieve a net zero emissions economy through key financial actors including investors, banks, and insurers. The Ceres Accelerator also works with corporate boards of directors on improving governance of climate change and other sustainability issues. For more information, visit **ceres.org/accelerator**.

Contents

Executive Summary

This report is the first systematic review of U.S. insurance companies' climate risk strategies, yielding new insights that will assist the work of risk managers and regulators to maintain a sustainable insurance sector. The costs of climate change are already apparent to the insurance sector.

Catastrophic events, such as wildfires and hurricanes, are becoming more severe in many places — making insurance more important for individuals and businesses while more challenging to secure. Insurance regulators are tasked with safeguarding a reliable insurance market for consumers through this challenge. In a sector that fuels itself by assuming risk, accessible information on how this risk is being managed is critical for regulatory oversight that maintains a healthy, accessible market.

In 2022, fifteen U.S. state insurance regulators implemented the National Association of Insurance Commissioners' (NAIC) **Climate Risk Disclosure Survey**, receiving responses from more than 1,500 companies representing over 80% of the U.S. insurance market. While some states have been administering a version of the Climate Risk Disclosure Survey for over a decade, this reporting year (2021) marked the first iteration in which the questions were **aligned with the prompts** from the Task Force on Climate-related Financial Disclosures (TCFD) recommendations on climate risk reporting. The TCFD framework, developed in 2017 by financial industry participants at the request of Financial Stability Board to improve and increase reporting on climate-related financial information, is built upon 11 specific recommended disclosures that fall within four broad categories, or pillars – governance, strategy, risk management, and metrics and targets.

When risks are identified and managed, insurance is more available and affordable for the public. Globally, recognition is growing that climate risk disclosures can encourage more thorough risk awareness and risk mitigation by businesses and provide necessary information for regulators, investors, lenders, insurers, and the public to understand how companies are approaching climate risk management and to fill critical data gaps. However, these disclosures are only valuable if the information in them is accessible, can be analyzed, and leads to improvement in practices.

The goal is not simply disclosure; the transparency afforded by these disclosures is critical for informing actions that can keep insurance available and reliable in the face of rising climate risks. Climate-related disclosures are one of the many tools that regulators have to assess climate risk, ensure a healthy insurance market, and close insurance protection gaps, such as examinations, scenario analysis, and data collections. Comprehensive climate risk disclosures can provide an annual snapshot of the insurance sector, informing these other exercises and filling remaining data gaps where they may exist, for the benefit of a broad array of stakeholders.

This study, developed jointly by the largest U.S. state insurance regulator, the California Department of Insurance, and Ceres, represents the first comprehensive attempt to review and describe the contents of the TCFD-aligned Climate Risk Disclosure Survey Responses for the insurance sector.

Climate risks are impacting major sectors of regional and national economies, presenting multiple risks to insurance companies. The insurance sector, including both regulators and businesses, has ample risk expertise and experience, from actuaries, risk management professionals, risk scientists, and financial analysts. As insurers develop more robust strategies to meet the challenge of managing climate risk, insurer disclosures will include more specificity, and regulators and other stakeholders will need aggregate analysis to identify systemic risks and emerging practices.

Insurance company responses to the Climate Risk Disclosure Survey demonstrate diverse, and sometimes sophisticated, approaches to climate risk management. The responses provide specific information that may be useful for regulators, including:

- Many insurers describe purchasing reinsurance as their primary strategy for managing climate risk, while some reinsurers describe how climate risk is leading them to reprice or reduce their offerings.
- Some insurers describe reliance on their reinsurance provider for climate risk education, expertise, and resources.
- Insurers are offering a variety of new products that support risk reduction among their customers or that support clean technology, including discounts for risk reducing retrofits, insurance products for renewable energy, green endorsements, and other products.
- Insurers describe a diverse array of strategies for managing climate risk and sometimes explain their reasoning for employing certain climate risk management strategies over others.
- Many insurers describe managing any material climate risk in the same way that they manage any other risk to their business, through their enterprise risk management process.

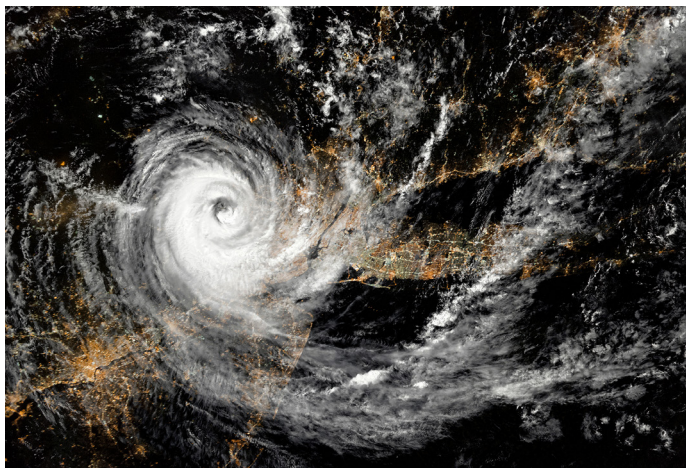
Key quantitative findings

- Some 78% of the reports (387 out of 494) disclosed information related to six or more of the TCFD recommended disclosures, while 23% disclosed 10 or more, and 13% disclosed information on all 11 TCFD recommended disclosures.
- The 2022 Climate Risk Disclosure Survey achieved a very high rate of response from insurance companies. Insurers across all types of business (Property & Casualty, life, health, etc.) and all sizes provided detailed disclosures according to the TCFD recommendations.
- Among the four TCFD pillars, the responses to risk management and strategy were the strongest, both in terms of number of reports providing any information (473 and 471 reports, respectively) and in terms of the detail of the information. They included information on integration of climate risk into enterprise risk management, specific opportunities for insurance products that support clean technology, and specific climate risks, such as those associated with extreme weather, changes in the spread of disease, policies regulating greenhouse gas emissions, and changing consumer preferences.
- Nearly 20% of the reports mention scenario analysis explicitly but not all reports specify for which risks. At least 5% mention modeling scenarios where global temperatures increases remain 2 degrees Celsius or lower and more than 3% where global temperatures rise more than 2 degrees Celsius, and 3% explicitly mention climate scenario analysis for both scenario types.
- Metrics and targets was the pillar with the weakest responses, with only 193 reports providing any information and very few encompassing a comprehensive set of climate-related metrics.
- Approximately 12% of the reports stated their scope 3 emissions (indirect emissions from the value chain), giving specific values often for multiple consecutive years.
- While all types of business demonstrated an ability to disclose detailed information, there were significant differences by type of business. For example:
    - Property & Casualty insurers provided the most comprehensive information on climate-related risks and opportunities, as well as impacts to their businesses.
    - Health and life insurers, as compared to other types, provided the greatest detail on the resilience of their strategy (strategy recommended disclosure c).
    - Health insurers had the greatest fraction of reports disclosing information on risk management and strategy, but this margin was small since the vast majority of reports from all types of business disclosed information on these pillars and the information was often minimally comprehensive.

- Life insurance had a higher fraction of reports disclosing information under metrics and targets than other types and had the highest indicator for comprehensiveness in this pillar of all types.

Ceres commissioned Manifest Climate to perform a detailed analysis on 15 of the companies and groups that addressed all or almost all of the 11 TCFD recommended disclosures, against specific recommendations of the TCFD framework. A **separate report** highlights areas of their disclosures that were informative, comprehensive, and effective for both investors and peer companies.

TCFD reporting is widely used in financial markets and is supported by over 101 jurisdictions globally. The NAIC Climate Risk and Resiliency Task Force has noted that alignment with the TCFD framework provides a baseline supervisory tool to assess how climate-related risks may affect the insurance sector, while also creating a consistent approach that reduces redundancy in reporting and encourages shared learning. The TCFD guidelines also provide consistent disclosure standards across financial sectors, as well as the flexibility for insurance companies to respond with information that is relevant to the specific risks they face in their types of business. This report underscores the benefits of that approach, providing a window into the diversity of strategies, approaches, and engagement by insurance companies in identifying risks and implementing mitigation strategies to address those risks.



Introduction

Understanding climate risks and opportunities is central to the sustainability of a strong insurance sector. Insurance companies are exposed to a multitude of risks associated with climate disasters, with skyrocketing costs from increased losses. And these impacts have significant consequences for individuals and businesses, threatening the availability and reliability of insurance — a critical tool for hastening recovery.

The costs of climate intensified events are already apparent, with lingering consequences for impacted communities. According to the National Centers for Environmental Information, part of the National Oceanic and Atmospheric Administration, since 1980 there have been 357 natural disasters in the U.S. that had damages of **more than $1 billion**. These disasters spanned a variety of perils — 174 severe storms, 41 flood events, 22 winter storms, 30 droughts and heat waves[1], 21 wildfires, 60 tropical cyclones, and nine freezes (extreme cold). The total cost of these events exceeded 99 lives and $2.54 trillion. The cost of individual disasters can be more extreme, such as Hurricane Harvey which cost approximately $152 billion in 2017, and the 2017 western wildfires and 2022 western U.S. drought and heat waves, which each cost approximately $22 billion. These are likely underestimates as they include insured and uninsured physical damage to buildings and vehicles, damage to public assets and agricultural assets, and wildfire suppression costs, but do not include business interruption, environmental degradation, supply chain effects, and mental or physical healthcare related costs, among other factors.

The frequency of these billion-dollar events is increasing dramatically with significant implications for financial resilience for communities. According to non-profit climate researcher **Climate Central**, the time between billion-dollar disasters[2] in the U.S. in the last five years from 2017 to 2021 was just 18 days on average, compared to 82 days in the 1980s. According to data from **Swiss Re** and **Munich Re**, natural disasters cost the insurance industry $76 billion in 2020 globally, and around $280 billion in 2021, of which roughly $120 billion was insured.

The impacts, both financial and nonfinancial, of these climate-driven disasters fall most heavily on people with low and moderate-incomes and people of color who **struggle to recover their lives and livelihoods**, especially when they are uninsured or underinsured. However, through public policy and private sector innovation, **insurance markets can adapt to be more inclusive** and provide critical services for equitable recovery from climate disasters.

Health and longevity consequences of climate change and economic changes may also impact the insurance sector and insurance protection gaps. The World Health Organization (WHO) projects that climate change will result **in 250,000 additional deaths per year** between 2030 and 2050 from malnutrition, malaria, diarrhea, and heat stress. Changes in the spread of vector-borne diseases, extreme heat, and natural disasters can impact the underwriting, operations, and investments of insurance companies now and in the future. At the same time, changes in the global economy as a result of the uncertain scope and scale of society actions to adapt to and mitigate climate change impacts may pose significant risks to insurers that are not prepared for such changes.

The purpose of this report is to demonstrate and provide insights from two methods of review for the Climate Risk Disclosure Survey responses that insurers operating in certain states submit to U.S. state insurance regulators annually. This study is timely, capturing the first year of responses in which the Climate Risk Disclosure **Survey** was aligned with the recommendations of the TCFD.

1. In the NCEI dataset, deaths associated with drought are the result of extreme heat, although not all droughts are associated with extreme heat.
2. Inflation adjusted to 2023 using the Consumer Price Index.

At this time, the TCFD framework for climate risk disclosure is used widely across jurisdictions and economic sectors, with TCFD aligned reporting supported in **101 countries**, and implemented or required by various financial regulators worldwide including in **New Zealand**, the **United Kingdom**, **France**, and **Hong Kong**.

This review and analysis provide:

- An accessible overview of information that insurers disclosed on climate risk governance, strategy, risk management, and metrics and targets in their responses to the Climate Risk Disclosure Survey, for NAIC members, insurers, and the public.
- A guide for how insurance companies may improve the specificity of their disclosures by providing more comprehensive information about their exposure and efforts in response to climate risk.
- A gauge for insurance regulators in the U.S. and internationally to understand how companies are considering and responding to climate risk, demonstrated through tangible examples.
- A reference for interested parties to quickly locate responses that are likely to be comprehensive in nature and examples of the diversity of strategies insurance companies are developing to address multiple risks.

Participation in the Climate Risk Disclosure Survey among states has grown rapidly in recent years and market coverage has grown steadily, receiving responses for over 80% of the U.S. insurance market in 2022, representing over $2 trillion in direct premiums written. This analysis uses responses from text mining and machine learning approaches to provide an efficient method for gathering information from a large number of climate-related disclosures. As of 2023, there are 27 member states and jurisdictions administering the Climate Risk Disclosure Survey — American Samoa, Arizona, California, Colorado, Connecticut, Delaware, District of Columbia, Guam, Hawaii, Illinois, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nevada, New Jersey, New Mexico, New York, Northern Marianas Islands, Oregon, Pennsylvania, Puerto Rico, Rhode Island, U.S. Virgin Islands, Vermont, and Washington. Experience from other industry disclosures in line with TCFD recommendations indicates that disclosure responses get more and more descriptive and comprehensive in each consecutive year that companies file them. Consistent review will allow an opportunity to monitor and document this progress in future years, and ensure that these submissions are accessible and transparent, and provide productive information to all stakeholders.

Methods In-brief

The TCFD pillars and recommended disclosures

In developing its recommendations, the TCFD structured them around four thematic areas, which it calls pillars – governance, strategy, risk management, and metrics and targets. The four pillars are supplemented by several recommended key climate-related financial disclosures. The 11 recommended disclosures fill out the framework with more detailed information that will help investors and others understand how reporting organizations think about and assess climate-related risks and opportunities. The TCFD also provides additional detail in sector-specific guidance for each recommendation. As Figure 1 shows, three of the pillars have three recommended disclosures each (A through C), while one, governance, has just two recommended disclosures (governance A and governance B).

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

Figure 1. TCFD Pillars and Recommended Disclosures. Source: Task Force on Climate-related Financial Disclosures.

Methods overview

The study utilizes two complimentary methods of review for TCFD-aligned Climate Risk Disclosure Survey responses[3]:

1. A machine learning (ML) based approach that provides an indicator for whether a given report provides any information related to each of the 11 detailed TCFD recommended disclosures; and
2. A rules-based text mining (RBTM) approach that provides an indicator for the comprehensiveness, or level of detail, of any information provided related to the TCFD recommended disclosures

The machine learning approach was performed by Manifest Climate commissioned by Ceres, while the rules-based text mining approach was performed by the California Department of Insurance using methods developed by researchers at Banco de España.

3. The Climate Risk Disclosure Survey responses are hosted by the California Department of Insurance on a public database: https://www.insurance.ca.gov/0250-insurers/0300-insurers/0100-applications/ClimateSurvey/

Machine Learning approach

Using advanced machine learning in combination with climate experts, Manifest Climate's models assess how well an organization's climate-related disclosures align to different disclosure frameworks and standards. Based on these assessments, Manifest Climate can recommend specific actions that an organization can take to improve its overall climate response.

Manifest Climate's alignment model examines whether an organization's disclosures broadly address the information required or requested by leading frameworks and standards. For example, it assesses whether an organization's disclosures generally trend toward alignment with the recommended disclosures of the TCFD and/or other standard setting bodies. (For the current analysis, Manifest Climate focused on TCFD alignment.)

The machine learning algorithm relies on a dataset of climate risk-related text from a variety of sources where the sentences or paragraphs have been labeled by experts indicating whether the human reader thought that it counted towards the recommended disclosure or not. Then the algorithm scans the Climate Risk Disclosure Survey responses (in this case) at a high level and uses natural langauge processing and machine learning to recognize patterns (words, phrases, and sentence structures) that are similar to what was labeled by the humans as aligning with the TCFD recommendations. The algorithm uses these patterns to replicate this labeling. The result of the alignment model is a one (or a zero) for each of the 11 TCFD recommendations depending upon whether the report does (or does not) include information related to that recommendation.

As an example, **1.** below would be labeled **1** or 'yes' for a description of board oversight, but zero or 'no' for outlining management's role. And **2.** would be labeled zero or 'no' for board oversight and **1** 'yes' for management's role.

1. The Board of Directors reviews the Group ESG performance and programs twice annually as a minimum, in addition to any specific review related to an ESG topic that falls within the remit of each of the Committees (i.e. the Nomination Committee's review of diversity & inclusion performance, the Audit Committee's of climate-related risks factors, and the Strategic Committee orientation and monitoring of the SustainAgility program).
2. Through the CCT, I am overseeing the implementation of the climate strategy we introduced in December 2020, and monitoring the Group's progress against the seven pathways to delivering our targets and net zero ambition.

Manifest Climate also has capabilities to assess the detail of reports through their "detailed assessment model." Ceres, in partnership with Manifest Climate, performed a detailed analysis on 15 of the companies that addressed all, or almost all, of the 11 TCFD recommended disclosures, against specific recommendations of the TCFD framework. It highlights areas of their disclosures that were informative, comprehensive, and effective for both investors and peer companies. The details and results of this analysis, along with a benchmarking tool, and a list of all insurers that completed Climate Risk Disclosure Survey responses, can be found **here**.

Manifest Climate's detailed assessment model examines an organization's disclosures at a more granular level than an alignment review. It is based on a methodology that, like the alignment model, draws on multiple frameworks, but which deconstructs those frameworks to extract specific criteria against which an organization's disclosures can be judged. For example, the first recommendation of the TCFD asks organizations to disclose how the board oversees climate-related risks and opportunities. This is a general statement, which can be unpicked – by reference to TCFD guidance – to identify a number of criteria that can be used to evaluate board oversight, such as

the cadence of board meetings on climate, and the processes that underpin the board's climate oversight. Manifest Climate's detailed assessment model uses 12 elements for that first recommendation. And it takes a similar approach to the remaining sub-pillars of the TCFD.

Note that Manifest's Climate's detailed assessment model, which was used to perform the in-depth analysis of 15 reports, evaluates organizational disclosures in a specific way. In this context, it is possible for an organization to disclose against a TCFD recommendation, but for that disclosure not to satisfy the specific criteria used in the Manifest Climate model. This is because Manifest Climate, generally (and by design), takes a relatively narrow view of what represents a decision-useful disclosure. Note too that the dataset used for this analysis was limited in scope. It is possible for an organization to disclose climate-relevant information in multiple places, and the Manifest Climate platform is able to perform a multi-source review, but this was beyond the scope of the present analysis.

Rules-based text mining approach

To understand which reports provided comprehensive, detailed information on each TCFD recommended disclosure, the California Department of Insurance employed a rules-based text mining (RBTM) approach to evaluate the responses according to specific criteria, or rules.

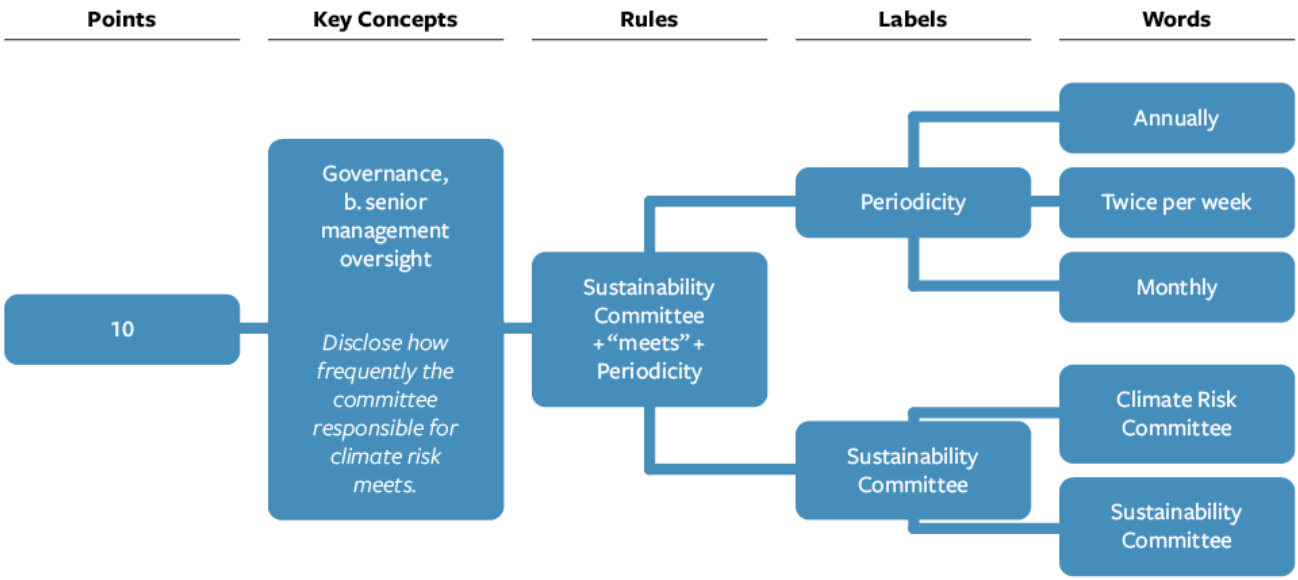


Figure 2. Schematic of rules-based text mining approach. Rules were developed to search for key concepts using combinations of labels. A lexicon was used to match words to overarching labels. Points were assigned for each rule.

The rules provide a process for systematic review of the TCFD reports to identify specific points that are relevant and convey meaningful information. The rules-based text mining approach and tools were developed by researchers at Banco de España to evaluate TCFD alignment in financial reporting by companies within their jurisdiction. It uses a set of evaluation criteria, or "rules," related to the key detailed information for each TCFD recommended disclosures. Each rule can be attributed a different number of points, to reflect how detailed or important the information prompted by the rule is. If a company provides information that counts towards following the rules for a given recommended disclosure, they will achieve a higher RBTM indicator for comprehensiveness. To calculate the indicator for each recommended disclosure, the average number of points obtained for each key concept was calculated and scaled to a number between one and 10. For the overall indicator, the indicators for all recommended disclosures were averaged.

The maximum indicator (10) conveys that the report provided information for all of the evaluation criteria (rules). Conversely, the minimum indicator of zero conveys that the report did not provide any information related to any of the evaluation criteria.

The rules are constructed from combinations of overarching labels that apply to words with a shared meaning. For example, a rule developed to search for information about the frequency with which a sustainability committee meets may utilize the labels "Sustainability Committee" and "periodicity." The label "Sustainability Committee" may apply to the phrases "Climate Committee," "Sustainability Committee" or "Sustainability Council." The label "periodicity" may apply to phrases such as "bi-weekly," "twice a month," or "annually." A manual review of each excerpt is performed using a Python-based tool to ensure that the labels have been applied appropriately in context. More detail on this method can be found in the methods report, **Application of Text Mining to the Analysis of Climate-Related Disclosures**, by Ángel Ivan Moreno and Teresa Caminero from Banco de España[4].

A report that disclosed information on a given TCFD recommendation according to the Manifest Climate machine learning algorithm may still receive an indicator of zero in the rules-based approach if the information provided does not align with the specific criteria from the rules, as this is different from the criteria that the machine learning algorithm was trained on. Likewise, a report that disclosed information on all 11 TCFD recommended disclosures according to the machine learning algorithm, may receive the maximum RBTM indicator (10) if the details of that information align with the specific rules, or criteria, from the rules-based approach, or may receive a lower indicator if some of the criteria are not met.

Treatment of Climate Risk Disclosure Survey responses

In 2022, insurance companies were given the option to submit their Climate Risk Disclosure Surveys by uploading a PDF to a database, or to respond to an online survey with text boxes for each TCFD pillar[5]. Companies are encouraged to provide one comprehensive response. However, a few companies and groups responded in multiple ways with distinct information in each. For example, by responding to the online survey and also uploading a supplemental PDF with figures, or by responding to the online survey and also uploading a TCFD report. While this is discouraged, it was decided that both responses would be counted towards review of a company or group's response in this analysis for this first year and considered as a single report.

Companies are required to submit responses individually to the database. However, companies that are part of a group often submit identical responses to their other group members, particularly when climate risk management is handled at the group level. This results in many duplicate surveys. For this analysis, duplicates were removed. Some companies that were not required to file a report chose to do so voluntarily. These voluntary submissions were often from companies that were members of a group where some, but not all, of the group members were subject to a requirement

After removal of duplicates and consolidation of multiple response documents from single companies, there were 446 unique reports remaining. In the machine learning-based results, submissions for groups representing multiple types of business were counted once for each type of business they represented, leading to 494 separate reports for the purposes of analysis of the number of responses related to each of the TCFD recommendations.

4. Researchers at Banco de España are continuing to improve and expand on these tools, making them available to other financial regulators. Their recent advances include application of a Large Language Model filtering method to reduce false positives and allow for flexibility of the rules approach while harnessing the ability of the LLM models to "understand" context.

5. The RBTM analysis requires conversion of documents to a machine readable format. Information stored in figures will not be captured by the program and information within tables may not be accurately labeled if there is insufficient context or if the table is fragmented during the conversion process.

Results

Overview

To understand how and to what extent U.S. insurance companies are aligning their Climate Risk Disclosure Survey responses with each of the recommendations of the TCFD framework some 4,700 pages were examined using machine learning and rules-based text mining approaches. In this report, the results are presented: a) in comparison with other sectors and geographies using published information from the TCFD 2022 Status Report, b) separated by type of business (e.g. life, P&C, health, title), and c) separated by company size. On average, companies' responses were 10 pages in length, however this varied by type of business with title and health insurers providing the shortest reports (average 3-5 pages), and property and casualty (P&C) and life insurers providing the longest reports (average 11-16 pages).

Of the submissions[6], approximately half of the responses (218) are from P&C insurers, a quarter (114) are from life insurers, 57 are from health insurers, and 11 are from title insurers. The remaining quarter is split between groups of insurers covering multiple types, with the most common combination being groups that have both life and P&C companies (32 submissions).

In the machine learning analysis performed by Manifest Climate, insurers with multiple types of business were analyzed such that each type of business was treated as a separate entity. In other words, if Acme Insurance was both a health and life insurer, Acme Health Insurance was treated as one entity and Acme Life Insurance was treated as another. This resulted in a total of 494 entities.

Number of reports containing each of the TCFD recommended disclosures (ML approach)

The machine learning-based analysis, performed by Manifest Climate in partnership with Ceres, provides an indicator of whether or not the report included any information related to a given recommended disclosure of the TCFD Framework, regardless of the level of detail provided for that recommended disclosure.

Most Climate Risk Disclosure Survey reports (78%)[7] provided information on more than six of the 11 TCFD recommended disclosures. A significant number of reports, 23%, provided information on more than 10 of the TCFD recommended disclosures. Only 12 reports, from a variety of types of business, made none of the TCFD recommended disclosures (Figure 3).

6. This breakdown of Climate Risk Disclosure Survey submissions is out of the 446 unique responses, and does not double count for groups with multiple types (e.g Life, Health, P&C) of companies.

7. The Manifest Climate Machine learning results double count reports from groups with multiple types of business, once for each business type they represent, resulting in statistics out of a total of 494 reports.

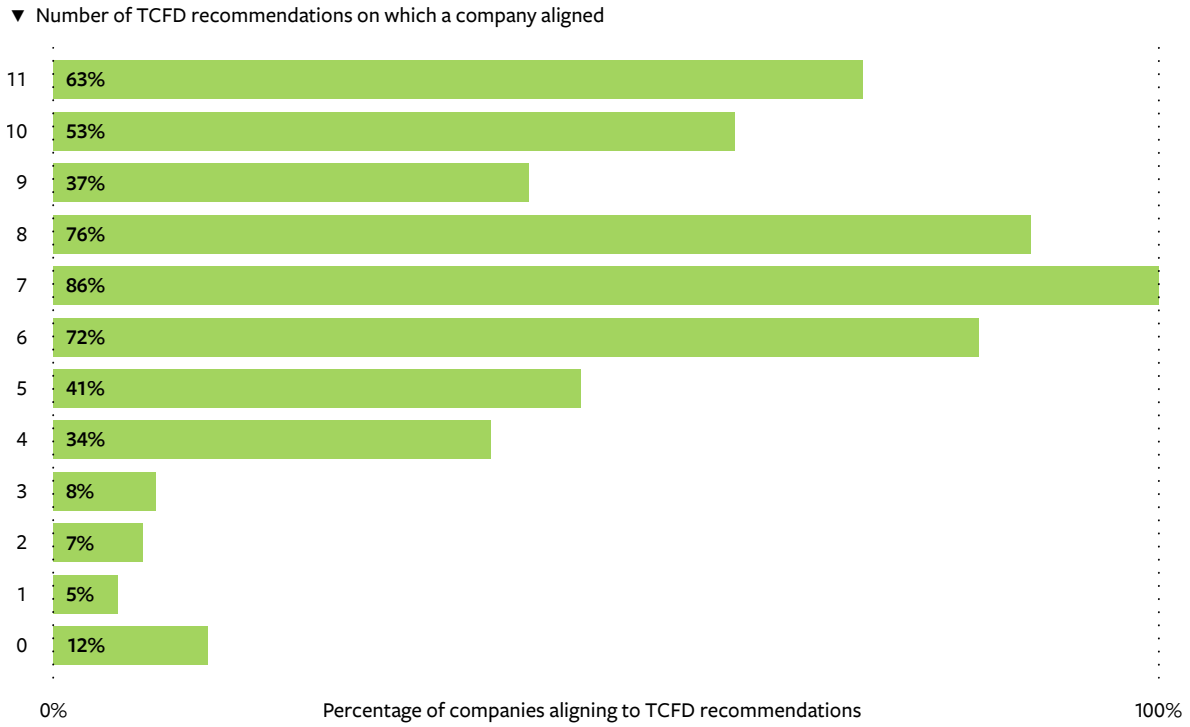


Figure 3. Histogram showing the distribution of results for how many TCFD recommended disclosures were included in each of the Climate Risk Disclosure Survey Responses. For example, 12 reports didn't provide any information related to the TCFD recommendations, and 63 reports provided information on all 11 of the recommendations. These numbers are out of a total of 949, since groups representing multiple types of companies were double counted — once for each type of business. Source: Manifest Climate

Out of the four TCFD pillars--risk management, strategy, governance, and metrics and targets – the metrics and targets pillar was identified as the pillar with the fewest reports providing information, across all three of its recommended disclosures (Figure 4). As an example of the types of metrics that could be disclosed in this pillar, the TCFD guidance for insurance companies recommends that insurers and reinsurers provide aggregated risk exposure to weather-related catastrophes, the extent to which their underwriting and investment activities are aligned with a well below 2-degrees Celsius scenario, greenhouse gas emission metrics, and a variety of targets.

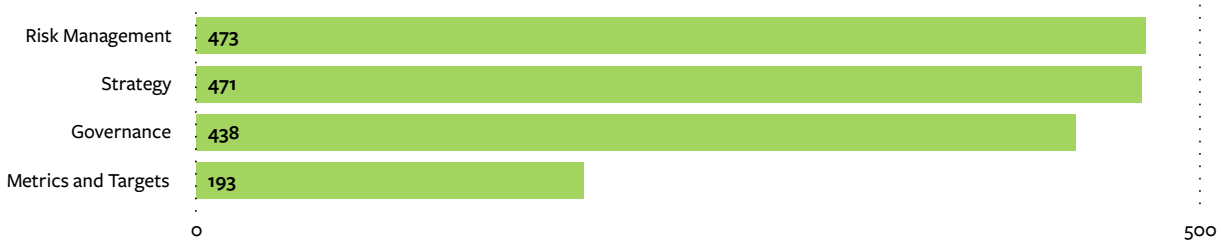


Figure 4. Number of reports disclosing information on each of the four TCFD pillars. These numbers are out of a total of 949, since groups representing multiple types of companies were double counted — once for each type of business. Source: Manifest Climate

In contrast to the weak responses for metrics and targets, the number of reports providing information related to the risk management and strategy pillars are almost equal at over 470 reports each, with the governance pillar in a close third place, at 438 reports.

While climate risks impact companies from all types of insurance business (life, P&C, health, title, and more), the impacts may vary leading to differences in their responses to the Climate Risk Disclosure Survey. To understand these differences, we conducted an analysis of disclosures by individual type of business (Figure 5).

As can be seen in the charts below, health insurance reports were slightly more likely than other types to provide information related to the risk management and strategy pillars, though other types were not far behind (Figure 5). Life insurance reports were most likely to provide information related to the governance and metrics and targets pillars, as compared to other types.

Very few title insurers responded to the Climate Risk Disclosure Survey, and those that did generally provided very little information related to the TCFD recommended disclosures. However, title insurance responses consistently provided information on senior management's role in climate risk management, with 78% of responses providing this (Figure 5).

Across all types of business, nearly all reports provided information on risk management and very few reports provided information on metrics and targets (Figure 5).

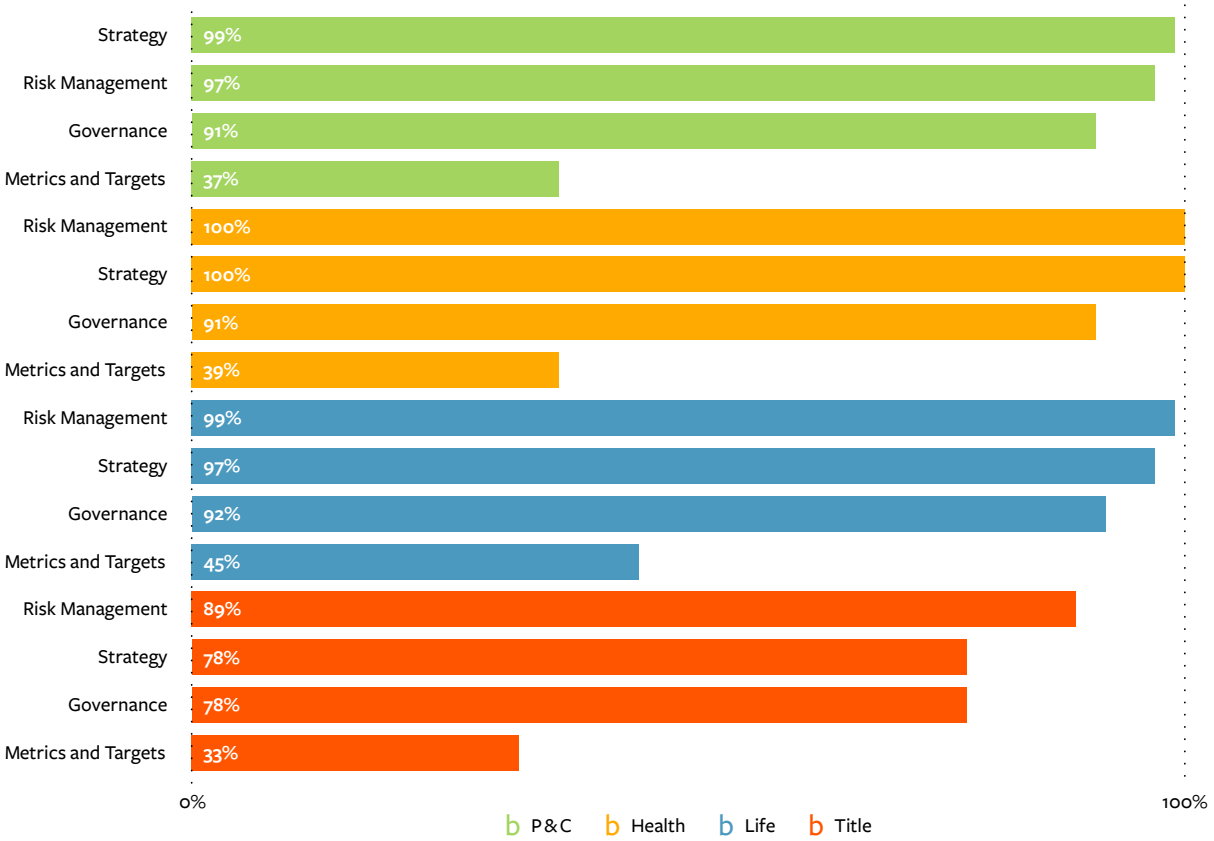


Figure 5. Percentage of reports disclosing each of the four pillars by type of business. Source: Manifest Climate

A company's size may also impact its decision-making on the management of climate risk. To understand differences in Climate Risk Disclosure Survey responses by size, the responses were classified by their nationwide direct premium written ($) (Figure 6). This proxy for company size represents the amount that each company or group (and associated subsidiaries) collected in premiums for the reporting year. The responses were classified into categories of low, medium, or high direct premium written with an approximately even number of companies/groups in each category[8]. Note that truly small companies (Less than $100 million in direct premium written) are exempt from the reporting requirement and are therefore not fully represented this sample.[9]

8. Companies/groups with less than or equal to $388,565,760M in direct premium were classified as "low"; Companies/groups with between $388,565,760M and $1,664,750,243 were classified as "medium"; Above this was classified as "high." This resulted in 163 low, 163 medium, and 168 high direct premium written companies/groups based on the 33rd percentile and the 66th percentile of direct premium written for the 494 reports. If a group had multiple types of companies, it was counted one for each type of company and the premium category is based on the sum of the premiums for all of the businesses of that type within the group.

Reports from individual companies and groups of all sizes[10] demonstrated capability to provide information related to many of the TCFD recommended disclosures. However, large companies and groups generally were more likely to provide information each of the TCFD recommended disclosures than smaller companies or groups. For the first and second recommendations under the strategy and risk management pillars, where disclosures were generally strong, the differences between large (high direct premium written) and smaller (low direct premium written) companies/groups were not as apparent, with each size category contributing approximately equally to the responses related to these pillars (Figure 6). The impact of business size was much more apparent for the strategy recommendation related to resilience of strategy (Strategy C) and the risk management recommendation related to integrating climate risk into overall risk management (risk management C), with large companies/groups contributing to over 40% of the related responses, while only making up a third of the sample (Figure 6). This indicates that larger companies may be more advanced in conducting and reporting on scenario analysis and are more likely to have incorporated climate risk into their enterprise risk management.

The largest differences based upon size of business were for the metrics and targets recommendations. For this pillar, large (high direct premium written) companies and groups contributed more than half of the related responses, despite being only a third of the sample. Small companies only contributed 17% of the metrics and targets-related responses, despite also making up a third of the sample (33%). Across all sizes, metrics and targets was the weakest pillar, while the risk management and the strategy pillars vied for position as the strongest.

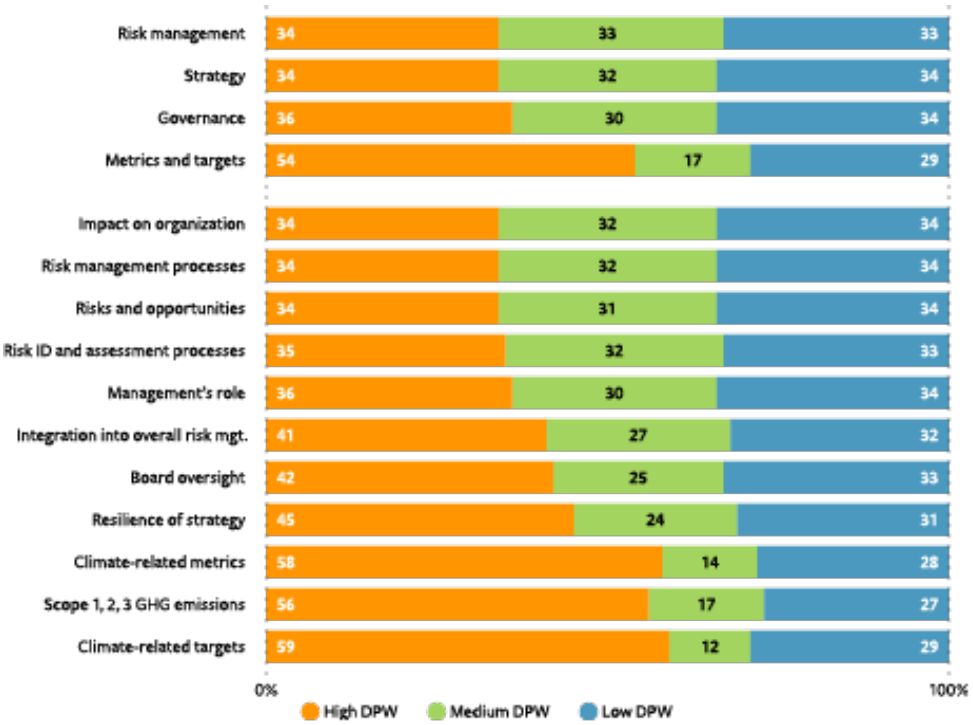


Figure 6. Contribution of company/group size, measured by nationwide direct premium written, to the Climate Risk Disclosure Survey responses with information on each of the TCFD pillars and each of the 11 recommendations. Companies were distributed into the three size categories, with nearly even numbers of companies in each, base upon their direct premium written[13]. Source: Manifest Climate

The reports very consistently provided information related to 'climate-related risks and opportunities the organization identified over the short, medium, and long term' (strategy A) and 'the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning' (strategy B). In fact, the second recommendation under the strategy pillar (strategy B) was the most consistently disclosed recommendation of them all. The reports also very commonly provided information related to the second governance recommendation – 'describe management's role in assessing and managing climate-related risks and opportunities.'

Benchmarking with other sectors and geographies

Alignment with the TCFD recommendations within these reports from U.S. insurers far outpaces other sectors and nations. Climate Risk Disclosure Survey Responses provided information on more of the TCFD recommended disclosures than a separate sample of reports from varying sectors and geographies that was separately analyzed, using a similar machine learning approach, by the TCFD Task Force in its **2022 Status Report**. (The TCFD 2022 status report reviewed 1,434 companies, including 118 insurance companies that ranged in size from $118 million to $130 billion in assets.)

Specifically, the Climate Risk Disclosure Survey response reports from U.S. insurers in certain states provided information related to approximately 65% of the TCFD recommendations (7.2 of 11 recommended disclosures), while the reports from other sectors and geographies disclosed 38% on average. The disclosure rate for U.S. insurers was most similar to the rate for European companies (across sectors), which was 60%, and far greater than Asia Pacific companies (36%). All regions showed significant increases in disclosure rates from 2017 figures, of between 11 and 23 percentage points.

It is worth noting that the sample of reports analyzed in the **2022 Status Report** included financial filings, annual reports, sustainability reports, and other relevant documents, while the Climate Risk Disclosure Survey responses are prompted directly by specific climate risk-related questions aligned with the TCFD and may therefore be more likely to achieve greater alignment. This also showcases a strength of the Climate Risk Disclosure Survey in eliciting specific, relevant information.

The TCFD Task Force's sample included reporting from North American companies from many sectors that, on average, adhered to 29% of the TCFD recommended disclosures — indicating that U.S. insurers may be achieving more TCFD-aligned information than other U.S. sectors. Globally, the TCFD Task Force's research found that disclosure rates varied among sectors. The average percentage of disclosure of the 11 recommendations by industry were: energy 43%; materials and buildings 42%; banking 41%; insurance 41%; agriculture, food, and forest products 37%; consumer goods 33%; transportation 32%; and technology and media 15%.

While 13% of the U.S. Climate Risk Disclosure Survey responses disclosed all 11 of the TCFD recommended disclosures, only 4% of the cross-sectoral multinational sample of reports analyzed by the TCFD Task Force disclosed information on all 11 recommended disclosures.

The global, cross-sectoral research by the TCFD Task Force found that reporting of TCFD-aligned information increased by **32% per year between** 2017 and 2021, indicating that the alignment with the TCFD framework will likely grow over time.

Most of the insurers who responded to the TCFD-aligned Climate Risk Disclosure Survey were required to do so by their state insurance regulator. However, in the TCFD Task Force's research (on many sectors and geographies), the reasons for companies' disclosure of TCFD-aligned information varied. Some 85% of companies, when surveyed, indicated that they provided TCFD-aligned information because climate-related issues are material to the company, 77% because investors ask for the information, and only 26% because TCFD is required by law or regulation for that company.

While U.S. insurers were least likely to disclose information on the metrics and targets pillar, the TCFD Task Force research found that in their cross-sectoral, global set of reports, governance was the pillar least frequently reported on, with only 29% of companies disclosing board oversight, and only 22% management's role.

While in the TCFD Task Force's research, the global insurance industry largely displayed greater alignment with the TCFD framework than other sectors, the alignment values were still lower than what was found for the Climate Risk Disclosure Survey of insurers from certain U.S. states. Notably, this trend is bucked for the metrics and targets pillar. The global insurance sector reports and the all-sector European reports display a much higher rate of disclosure of metrics and targets than the Climate Risk Disclosure Survey responses.

Table 1. Comparison of the average percent of the TCFD recommendations, or recommended disclosures, in reports analyzed in the 2022 TCFD Status Report, to that for the NAIC Climate Risk Disclosure Surveys from reporting year 2021. The TCFD 2022 status report sample represented financial filings, annual reports, sustainability reports, and other relevant documents from 1,434 companies including 118 insurance companies. The insurance companies reviewed ranged in size from $118 million to $130 billion in assets.

Recommendation	TCFD 2022 Status Update	TCFD 2022 Status Update	Climate Risk Disclosure Survey
	All sectors, European	Insurance sector, Global	
Board Oversight	42%	36%	59%
Management's Role	40%	31%	89%
Risks and Opportunities	75%	58%	92%
Impact on Organization	63%	46%	95%
Resilience of Strategy	35%	25%	50%
Risk ID and Assessment Processes	59%	45%	90%
Risk Management Processes	55%	49%	94%
Integration into Overall Risk Management	58%	52%	68%
Climate-Related Metrics	81%	38%	33%
Scope 1, 2, 3 GHG Emissions	75%	33%	33%
Climate-Related Targets	74%	33%	22%

Detail related to the TCFD recommended disclosures (RBTM approach)

The rules-based text mining (RBTM) method provides an indicator metric representing the comprehensiveness of any information provided for each TCFD recommended disclosure. The machine learning generated metric provided by Manifest Climate in this study represents whether a report provided any information for each of the TCFD recommended disclosures, regardless of the level of detail provided for that recommended disclosure. The machine learning algorithm is optimized to identify information that aligns with the TCFD framework, but is not, per se, optimized for insurers or for the specific information prompted by the Climate Risk Disclosure Survey. In order to understand which reports provided comprehensive, detailed information on each TCFD recommended disclosures and insurer-specific guidance, a rules-based text mining RBTM approach was used to evaluate the responses according to specific criteria, or "rules."

These rules were developed based upon a synthesis of not only the TCFD recommendations, but the additional guidance for insurance companies for the TCFD framework, and the specific questions and prompts in the Climate Risk Disclosure Survey. The rules were synthesized from these sources based upon expert judgement by senior staff members at the California Department of Insurance Climate & Sustainability Branch.

This method will heavily favor reports that comprehensively address the four pillars: governance, strategy, risk management, and metrics and targets. Comprehensive answers include specifically discussing the spectrum of risks and opportunities relevant to an insurance company's business, the structures and

processes they are using to identify and manage those risks, how these decisions fit into the broader market, regulatory, and social environment, and how they are setting targets and measuring climate-relevant variables, including emissions.

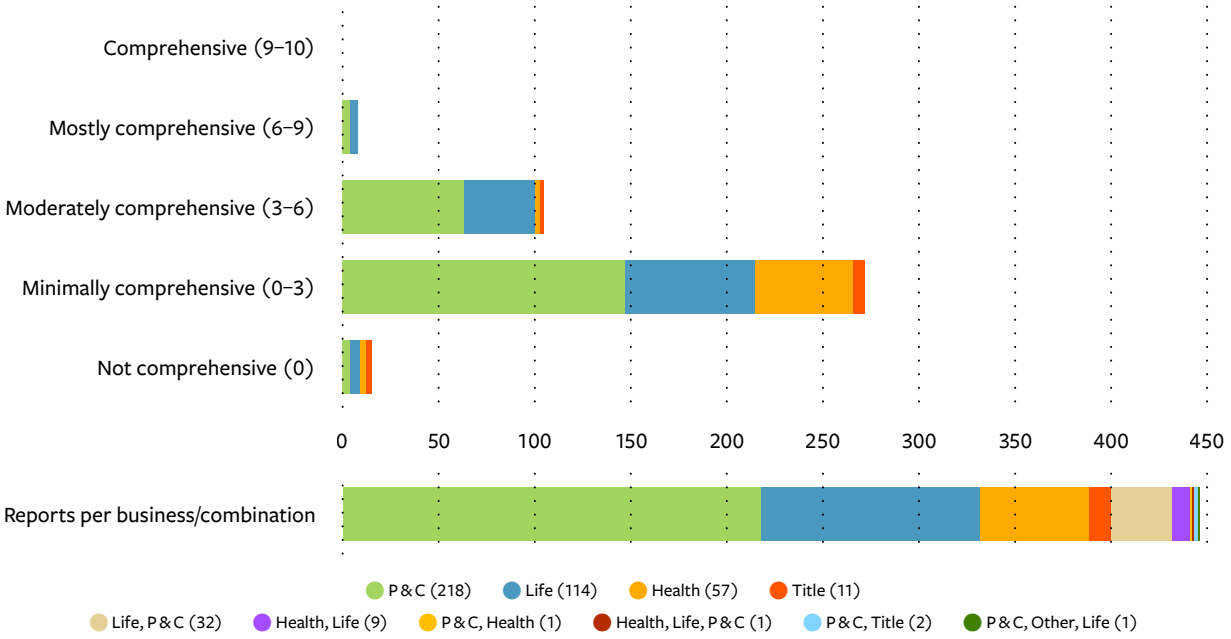


Figure 7. Bar chart showing the number of reports classified into each of five categories, ranging from not comprehensive to comprehensive, based upon the indicators developed using the rules-based text mining approach (RBTM indicator: 0 – not comprehensive, 0 to 3 – minimally comprehensive, 3 to 6 – moderately comprehensive, 6 to 9 – mostly comprehensive, 9 to 10 – comprehensive). Colors represent different types, or combination of types, of business. Source: California Department of Insurance

Insurers with any type of business are capable of obtaining a high indicator of comprehensiveness under this framework. Figure 7 shows the number of reports classified into each of five categories of comprehensiveness, ranging from not comprehensive to comprehensive, based upon the rules-based text mining indicator for each report. Note that the range of RBTM indicator for each category is not equal, with the "not comprehensive" category representing only reports that received exactly zero for their RBTM indicator, while the other categories represent ranges of indicators. The colors represent the reports grouped by the type (or types) of business that they represent.

There are reports from insurers of several types of business (multiple colors) in the moderately and mostly comprehensive categories, based on their RBTM indicators, demonstrating that all types of business can provide comprehensive, detailed information in their Climate Risk Disclosure Surveys, and aligning with the TCFD framework.

At the same time, no single report achieved a completely comprehensive report (RBTM 9-10), meaning that there is significant room for improvement. Fifteen reports came close in the mostly comprehensive category (RBTM 6-9). These reports were from life insurers, P&C insurers, insurance groups with subsidiaries offering both life and P&C types, and one insurance group with life and health types. The reports most commonly fell within the minimally comprehensive category with over 280 reports receiving RBTM indicators greater than zero but less than three.

Only 15 reports fell into the "not comprehensive category" with RBTM indicators of zero. These reports did not provide information that aligned with any of the rules or evaluation criteria developed for the RBTM approach. As previously noted, a report that was considered to disclose information on a given TCFD recommendation by the machine learning algorithm may still receive an indicator of zero in the rules-based approach if the information provided does not align with the specific criteria from the rules.

The reports that provided the most comprehensive and detailed disclosures, as measured by their RBTM indicator, were reports from groups that represented both life and P&C types. These reports, on average, achieved an RBTM indicator of 4.27 out of 10. These groups tended to be large in size, averaging just over $7 billion in direct premiums written, while the average direct premiums written for P&C-only and life-only groups were $1.5 billion and $6.9 billion, respectively. The individual report with the most comprehensive score, as measured by the RBTM, was a life insurer. The vast majority (90%) of health insurers provided minimally comprehensive responses. In comparison, 67% of P&C insurers, 60% of life insurers, and 55% of title insurers fell into this category.

The most comprehensive information in these filings was related to the risk management pillar, while the reports provided the least comprehensive information on metrics and targets. This aligns with Manifest Climate and Ceres' finding that the largest number of reports provided information on risk management and the fewest on metrics and targets. The reports commonly provided sophisticated descriptions on the risks and opportunities facing their businesses, impacts to their organization, and risk management processes. The majority disclosed climate change as part of their enterprise risk management process. However, relatively few discussed the use of scenario analysis in their strategy and risk management processes. Of the four pillars, the metrics and targets pillar demonstrated the weakest overall indicators. The strongest recommended disclosure within metrics and targets was in response to questions on greenhouse gas emissions.

Large companies and groups are more likely to provide comprehensive responses, but individual companies and groups of all sizes have demonstrated that they are capable of providing comprehensive responses and receiving a high RBTM indicator. The companies and groups represented in the sample ranged in size from $100 million in direct premiums written, up to over $150 billion in direct premiums written. While there is statistically significant (99.9% confidence) correlation between the indicator received and the size of the company and group, as measured by the direct premium written, the correlation is not strong (Pearson r^2= 0.12), meaning that many large companies/groups received low indicators for comprehensiveness and many small companies/groups still received high indicators for comprehensiveness.

At least 180 reports (40%) state that climate risk exposure is not material or is not a considerable risk to the organization at this time. However, many of these companies still provide detailed information on the ways they are working to or plan to address climate risk. More than 90 reports mention that climate change has limited to no material impact on their business because of the type of business they write. These responses are largely from life and annuity, workers compensation, title insurers, insurers writing Medicare prescription drug plans, and dental insurers. At least eight reports state that the company or group is too small to be impacted by climate change and/or too small to address it through governance, engagement with policyholders, climate risk analysis, or metrics and targets. These companies ranged in size from $124 million to $3.47 billion in direct premiums written.

The remaining sections will provide detail for each TCFD recommended disclosures summarizing the number of disclosures found in the machine-learning based analysis and the information searched for by the rules-based method and provide examples from reports that provided detailed information on the recommended disclosure, as evident in their RBTM indicator.

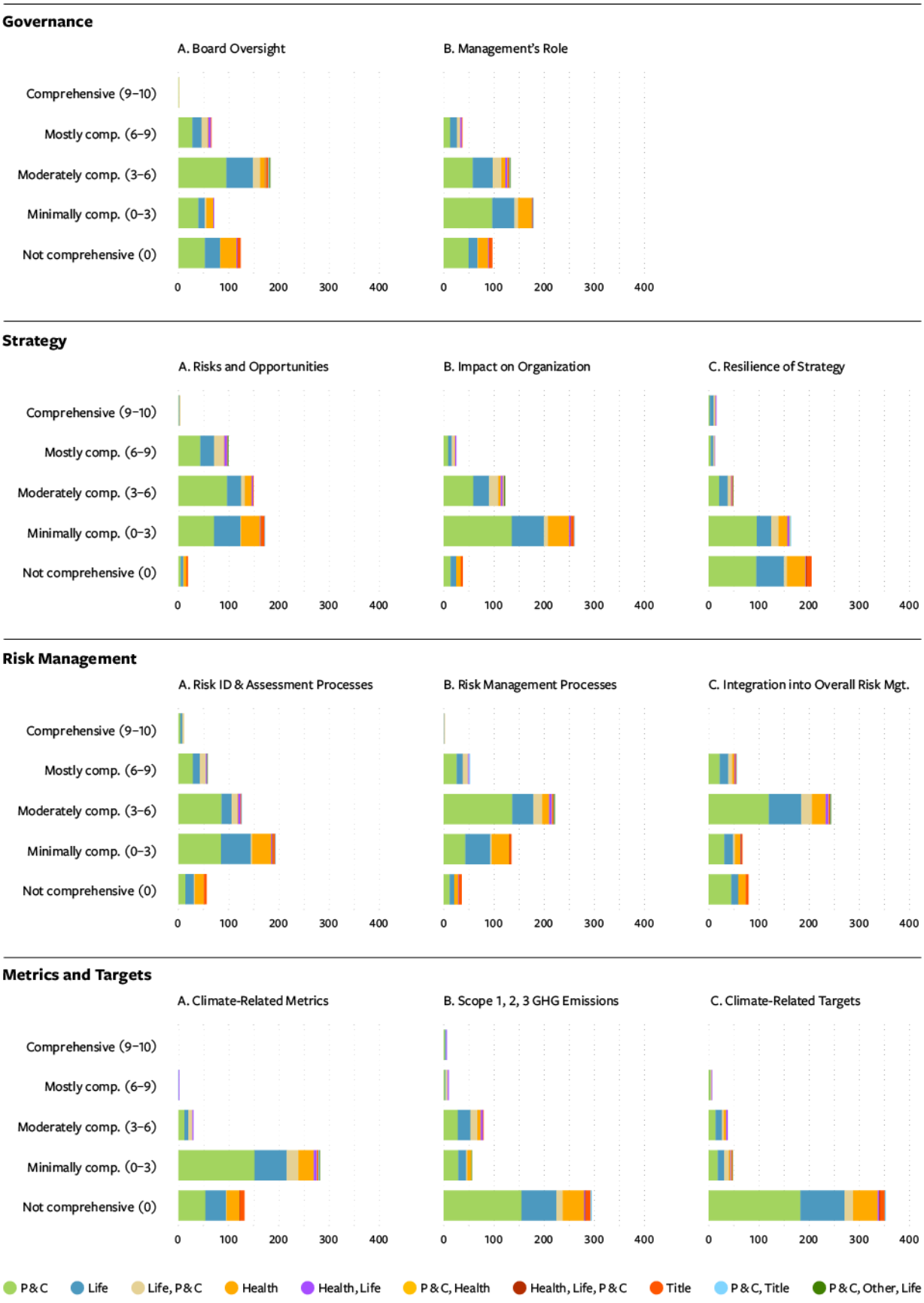


Figure 8. Bar chart showing the number of reports classified into each of five categories, ranging from not comprehensive to comprehensive, based upon the indicators developed using the rules-based text mining approach for each TCFD recommended disclosure. Colors represent different types, or combination of types, of business. Source: California Department of Insurance

TCFD Pillar 1: Governance

Climate risk assessment and awareness is essential for strong risk management strategies for insurance businesses, and the TCFD recognizes the importance of being prepared for the substantial and varied risks faced by the insurance sector. The governance pillar of the TCFD Framework recommends that companies disclose the organization's governance around climate-related risks and opportunities. The Climate Risk Disclosure Survey aligns directly with the TCFD prompts under this pillar.

A. Role of governing board oversight

The first recommended disclosure under the governance pillar is to describe the governing board's engagement and oversight of climate-related risks and opportunities.

Number of disclosures (ML approach)

The machine learning-based analysis by Manifest Climate and Ceres found that 292 reports out of the 494, representing 59%, included some kind of information on the role of the governing board in management of climate risk.

Detail of disclosures (RBTM approach)

The rules-based methodology employed rules to evaluate the description of the role of board oversight. These rules focused on concepts related to the board's involvement in acknowledging, discussing, and monitoring climate risk and sustainability issues, as well as its involvement in a defined strategy for addressing climate risk. These rules assign higher weightage to disclosures that detail the relationship between the board and any climate or sustainability committees, including the frequency of interactions between these committees and the board. Moreover, disclosures that discuss climate performance linked remuneration for the board received greater credit. In cases where disclosures outline the existence of a committee or committees responsible for climate-related matters, even if it is not specifically a sustainability committee, partial credit is assigned.

Life insurers, as compared to reports from other types, provided the most comprehensive disclosures under this recommended disclosure, receiving an average indicator of 3.48 out of 10. This was followed closely by P&C insurers, which received an average indicator of 3.31 out of 10.

Figure 8 represents the number of reports classified into each of five categories, ranging from not comprehensive to comprehensive, based on their RBTM indicator for each subpillar. Reports from different types of business, or combinations of types, are represented by different colors.

Over 14% of the reports, from varying types of business, provided mostly comprehensive responses. One report, from a P&C company, obtained the maximum possible indicator of 10, meaning that it comprehensively provided information on the governing board's oversight of climate risk in accordance with the evaluation criteria (rules). There were reports from insurers of all types of business that provided moderately comprehensive responses on this subpillar, as shown by the multitude of colors present in that category. Some 96 P&C insurers and 53 life insurers provided enough detail fall into this category.

Over 120 (27%) reports fall into the category of "not comprehensive" responses for the first subpillar under governance, meaning that they did not provide any information that was aligned with the evaluation criteria, or "rules," for governing board oversight of climate risk and therefore received an RBTM indicator of zero. Of these reports, 53 were P&C insurers, 30 were life insurers, and 32 were health insurers. As previously noted, a report that was considered to disclose information on a given TCFD recommendation by the machine learning algorithm may still receive an indicator of zero in the rules-based approach if the information provided does not align with the specific criteria from the rules.

COMPANY SPOTLIGHT

> Specificity on the makeup and frequency of engagement by the board on climate risks was an important indicator. The **Hartford Fire and Casualty** (Direct premiums written: $18 billion; Types: Life/P&C), stated that its full board of directors has oversight of sustainability matters, including climate-related issues, received routine updates on these risks and their impact on the company, and met five times in 2021. This company described in detail how each of its governance structures is involved in climate and sustainability strategy. Its report describes its sustainability governance committee, which is comprised of senior management, executes the sustainability strategy and reports to the full board of directors annually. This committee has several sustainability subcommittees that meet at least quarterly and regularly report progress to the full committee.

B. Role of senior management oversight

The second recommended disclosure under the governance pillar is to describe the management's role in assessing and managing climate-related risks and opportunities.

Number of disclosures (ML approach)

438 reports (89%) provided some kind of information on the role of senior management in management of climate risk, making this the most commonly disclosed recommendation under the governance pillar.

Detail of disclosures (RBTM approach)

The rules utilized for evaluating reports on the TCFD recommendation related to the role of senior management focus on concepts pertaining to whether the senior management of the company recognizes, discusses, and monitors climate risk and sustainability issues, as well as their involvement in a well-defined strategy for addressing climate risk. These "rules," or evaluation criteria, attribute greater weightage to disclosures that provide details about the relationship between senior management and any climate or sustainability committees, including the frequency of committee meetings. Furthermore, disclosures that discuss climate performance linked remuneration for senior management are also given increased credit. In cases where disclosures describe the existence of a committee or committees responsible for climate-related matters, even if they are not specifically sustainability committees, partial credit is assigned.

Life insurers were the single type of business that provided the most comprehensive information related to senior management's management of climate risk, similar to what was found for the board oversight of climate risk. The average RBTM indicator for life insurers was 2.88 out of 10, closely followed by P&C insurers (2.18 out of 10). An individual P&C insurer provided the most comprehensive information, as measured by the RBTM indicator of 8.89 out of 10.

The distribution of RBTM indicators (Figure 8) for senior management of climate risk was similar to what was found for board oversight of climate risk. Slightly more reports provided information that aligned with the rules, with only 97 reports (22%) falling into the "not comprehensive" category because they did not align with any of the rules. Over 130 reports (29%) provided moderately comprehensive information and at least 37 (8%) provided mostly comprehensive information related to senior management oversight of climate risk. These reports came from insurers representing all types of business, demonstrating the ability to provide comprehensive responses. No single insurer provided completely comprehensive information (RBTM 9-10), demonstrating that there is room for improvement. The most common category, with 179 responses (40%), was minimally comprehensive, representing reports that provided information according to enough of the evaluation criteria to obtain indicators between zero and 3.

COMPANY SPOTLIGHT

> Specificity again was a driving factor for the results. **Argo Group** (Direct premiums written: $820 million; Type: P&C) described its Sustainability Working Group, which meets every six weeks to discuss climate change issues and coordinate activities for the Group's sustainability plan. The working group includes a climate risk and sustainability officer from the executive committee, who reports to the executive committee on these issues quarterly. The sustainability working group receives a detailed threat and opportunity analysis of the major sustainability risks facing the organization every six months and escalates key issues to the enterprise risk management steering committee. The executive committee also has a key performance indicator dashboard, which is presented to the executive risk committee, reporting on over 20 metrics to track sustainability performance against targets.

TCFD Pillar 2: Strategy

The strategy pillar of the TCFD framework recommends that companies disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material. Under this section, the Climate Risk Disclosure Survey also requests that insurers disclose steps they have taken to engage key constituencies on the topic of climate risk and resiliency, plans to reduce GHG emissions it its operations, and resilience of the insurer's strategy to a 2 degrees Celsius or lower warming scenario. The Climate Risk Disclosure Survey also requests that insurers disclose any products or services to support the transition to a low-carbon economy or help customers adapt to climate-related risk.

A. Risks and opportunities

The first disclosure under the strategy pillar recommends that companies describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.

Number of disclosures (ML approach)

454 reports (92%) included information related to risk and opportunities under the strategy pillar, making this the third most frequently provided recommended disclosure overall.

Detail of disclosures (RBTM approach)

The rules, or evaluation criteria, employed for evaluating disclosures within the Risks and Opportunities recommended disclosure prioritizes reports that provide specific details about insurance opportunities and specific climate risks within defined short, medium, and long-term timeframes. Disclosures are assessed based on their descriptions and discussion of both transition risks and physical risks. Furthermore, if extreme weather is discussed as part of the climate risks, it is considered as a component contributing to the fulfillment of this disclosure.

The rules assigned additional credit to disclosures that delve into opportunities for organizational cost savings through efficiency enhancements, exposure of investment portfolios to climate risks, and climate risks impacting underwriting activities. Furthermore, these rules assign weightage to discussions surrounding the reputational, litigation, and transition risk impacts on the company.

P&C insurers on average provided the most comprehensive information on risks and opportunities, as measured by their RBTM indicator of 4. An individual group with both life and P&C types provided the most comprehensive information related to this recommended disclosure, as measured by its RBTM score of 9.39 out of 10.

The distribution of RBTM indicators (Figure 8) for risks and opportunities under the strategy pillar shows that these responses were markedly improved in their comprehensiveness, as compared to the responses for the governance pillar. Only around 19 (or 4%) of the reports received an RBTM indicator of zero, meaning that they didn't provide any information that aligned with the rules. The remaining responses provided a variety of levels of comprehensiveness. At least 100 responses provided mostly comprehensive responses, and three reports provided fully comprehensive (RBTM 9-10) responses.

COMPANY SPOTLIGHT

> **Selective Insurance Group** (Direct premiums written: $2.94 billion; Type: P&C) highlighted several key risks and opportunities related to climate change. Its response identified short-term risks associated with increased model uncertainty surrounding severe weather events resulting in higher catastrophe loss. It also noted medium-term investment losses from physical risk to infrastructure affecting property values, and transition risks due to technology changes affecting asset prices. In addition, its report discussed medium transition risks to underwriting due to evolving consumer preferences and medium-term regulatory risks limiting flexibility to exit personal lines segments. Its report also discussed short-term climate opportunities associated with selling renewable energy generated at its facilities, short-term opportunities for strengthening relationship to customers by helping them prepare for extreme weather with value-added services and technologies within its personal lines segment, demand for climate smart products and products for emerging industries in the medium term, and new investment opportunities as the low-carbon economy and clean energy matures in the long term.

Policies related to fossil fuel underwriting

Several insurers disclosed that they have adjusted their underwriting policies related to fossil fuels. Some insurers disclose that they have updated their company policies and are no longer accepting new underwriting risk for companies where more than a specified share of their exposures arise from the extraction or production of energy from thermal coal or from coalfired generation projects. Some others broadly describe phasing out of thermal coal from insurance, facultative reinsurance, and investment portfolios, and limiting business related to oil sands and the Arctic National Wildlife Refuge. However, several other insurers and reinsurers describe opposition to these types of exclusions, with some indicating that it is irresponsible to remove this coverage while these facilities and practices are still in use in critical areas.

Climate litigation risk was also disclosed as a factor in underwriting decisions. **Argo Group** noted that it considered climate-related litigation risk as a motivating factor in its 2020 decision for AMA to no longer provide directors & officers insurance on a direct basis to major clients.

B. Impact on organization

The second recommended disclosure under the strategy pillar of the TCFD framework advises companies to describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning. The supplemental TCFD guidance for insurance companies recommends that insurers and reinsurers report quantitative and qualitative information on the impacts on broker or client selection and development of specific climate-related products or competencies. The supplemental TCFD guidance for asset owners recommends disclosures about how climate-related risks and opportunities are factored into relevant investment strategies.

Number of disclosures (ML approach)

467 reports (95%) provided information on the impact of climate-related risk and opportunities on business, strategy, and financial planning, making this the most commonly disclosed recommendation across **all** TCFD recommended disclosures.

Detail of disclosures (RBTM approach)

The rules employed to assess disclosures within the impact on organization strategy pillar recommended disclosure are designed to identify concepts pertaining to the specific impacts of climate risks on the company and its corresponding strategy for addressing these risks. Emphasis is placed on disclosures that articulate defined objectives associated with the company's strategy for investments and underwriting. Reports that mention external standards for climate-related disclosure, metrics calculation, or climate risk management in relation to their strategy receive additional credit. In addition, the rules give credit to companies that discuss opportunities to mitigate greenhouse gas emissions in their operations.

The rules prioritize reports that incorporate discussions on reducing emissions and energy, as well as fuel, water, and waste consumption as integral components of their strategy. Companies are also assigned credit for discussions of how climate change factors into interaction with or selection of brokers and clients. Moreover, reports that highlight the utilization of external or internal climate research to inform their strategy are also favored. Lastly, the rules for this recommended disclosure also prompt discussion of opportunities associated with climate smart financial instruments and insurance products that promote climate smart practices.

P&C insurers were the type of business that, on average, provided the most comprehensive information on the impact of climate change on their organizations (RBTM indicator of 2.53 out of 10). However, an individual life insurer received the highest indicator (8.63).

The distribution of RBTM indicators (Figure 8) for climate impacts on the organization under the strategy pillar shows that the responses were not quite as strong, in their comprehensiveness, as the first recommended disclosure under the strategy pillar (risks and opportunities). At least 38 reports received an RBTM of zero, indicating that they didn't provide any information aligned with the evaluation criteria (rules). However, the majority of the reports (>280) provided either minimally or moderately comprehensive information. Some 25 reports provided mostly comprehensive information, but none achieved the highest category of comprehensive, meaning that while the disclosures are still relatively strong for the "impact on organization" recommended disclosure, there is still room for improvement.

COMPANY SPOTLIGHT

> The **TIAA Family of Companies** (Direct premiums written: $16 billion; Type: Life) discussed in its report impacts on its business associated with increased energy costs, shifts in consumer demand, and increased regulatory requirements. The report discussed the need to adapt to these changes, while avoiding stakeholder scrutiny or reputational or brand impairment. It mentions that TIAA, through Nuveen, offers investment strategies across multiple asset classes that are designed with the goal to outperform in a low-carbon transition. These strategies generally look to prioritize companies and assets that are relatively more resilient to and will benefit from the low-carbon and net zero transition. Nuveen actively engages with portfolio companies to improve disclosure of their climate-related metrics and risks and encourages them to set targets for emissions reduction which align to the 2015 Paris Agreement goals.
>
> The **TIAA** report specifically identifies that, as a multi-asset class investment vehicle, the General Account is sensitive to regulatory changes over the short, medium, and long term. The report also

states that despite the increasing urgency surrounding climate change, many issuers do not quantify and disclose emissions. This may lead to understatement of associated financial risks. Once the difference in reporting dissipates, markets can function more efficiently to price climate risks. The report discloses that TIAA is working with regulators, such as the SEC, the EU Commission and the UK FCA, on climate risk regulation to support the development of disclosure regimes.

Climate smart insurance products

At least 28 companies and groups mention opportunities or existing products that fall under a general category of "climate smart" insurance products. Among these is **AXA**'s sustainability linked insurance program, where the cost of the insurance premium is linked to the client's goal to reach 55% of its total installed capacity from renewable sources by a target date. **AXA** also describes performance insurance solutions for the technical risks associated with breakthrough low-carbon technologies.

Many of these climate smart insurance products are in the form of renewable energy or green technology insurance or reinsurance products. **AXIS Capital, Arch Insurance, Chubb, Everest, HDI Global, The Hartford, Markel Insurance, Swiss Re, Travelers Insurance, Tokio Marine Group, United Guarantee Residential Insurance Company, SirusPoint,** and **Munich Re**, among others, all describe offering products to the renewables sector. These include credit insurance or surety products for wind, solar, and hydropower projects and other cleantech products. It also includes expanded tax liability insurance coverage to protect against the loss of investment or production tax credits for renewable energy projects.

Some reports, including that from **FMH** group, describe coverage endorsements to encourage or subsidize farmers to adopt climate smart agricultural practices. The **Cincinnati Insurance Companies** describes offering policyholders new products, including coverage for green buildings that allows them to rebuild damaged buildings in more energy efficient ways. **Utica National Insurance Group** describes ISO Green Coverage Endorsements to help cover costs if the insured has "environmentally friendly" equipment or substitute such equipment during a claim. **SiriusPoint** describes launching a full services climate underwriting and distribution advisory firm in partnership with **Parameter Climate**. C**ourtesy Insurance** and **Sentruity** describe new products specifically focused on electric vehicles. Lastly, **W. R. Berkeley Corporation** describes one of its operating units, which has an insurance product for restoration of wetlands and streams.

As the promotion and desire for greater adoption of electric vehicles (EVs) grow for both personal and commercial purposes, so does the need for robust and reliable EV charging infrastructure especially in rural communities. As a result, some insurance companies and groups are already providing insurance coverage for home charging equipment as well as accounting for additional costs and risk via homeowner policies. In addition, the specialized equipment related to EVs and their high replacement cost have a greater potential impact on insurance premiums compared to their internal combustion engine counterparts. Insuring EV charging infrastructure involves assessing risks such as potential damage to equipment, liability for accidents or injuries, and cybersecurity threats, while also considering the unique characteristics and requirements of charging stations.

Over 45 companies and groups specifically reference electric vehicle charging infrastructure in their reports. The majority of these entities discuss the integration of charging infrastructure within their operational facilities. Moreover, they anticipate that the gradual expansion of charging infrastructure will result in increased demand for electric vehicle insurance over time.

The Hartford Fire and Casualty distinguishes itself by claiming to be the first insurer to have offered coverage for garage EV charging stations within its homeowners policies. Some insurers disclose their investments in charging infrastructure companies, indicating their commitment to supporting the growth of charging networks. One company states that its subsidiaries track metrics associated with the number of EV charging stations. A number of reports cite limitations in charging infrastructure as a significant factor preventing the utilization of EVs within their claim services fleets. They cite this constraint as a reason for maintaining conventional vehicles.

In terms of strategic initiatives, **CSAA** includes mobile charging stations as part of its driver assistance strategy. **Toyota Motor Insurance Company** outlines its ongoing study aimed at comprehending the electrical infrastructure requirements necessary to successfully transition 240 shunt trucks from diesel to electric power. Toyota also describes its work with Kenworth to roll out 10 hydrogen fuel cell electric heavy-duty trucks at the Port of Los Angeles.

Insurance products and incentives for risk reduction

A variety of products are being offered to incentivize adaptation or risk reduction in the insurance industry. Some companies and groups, such as **CSAA Insurance Group** and **Agency Insurance Company**, provide replacement cost endorsements. **Assurant**, **AXIS Capital**, **Electric Insurance Company**, **Everest**, and other insurers offer discounts for fortified homes. Premium discounts for wind, fire, and hail mitigation features are available from companies and groups like **Auto Owners Insurance**, **Farm Bureau Financial Services**, **Farmer's Alliance Mutual Insurance**, **Farmers Insurance**, and many others. These discounts are also extended to policyholders by companies/groups such as **Homeowners Choice**, **WT Holdings**, **Pacific Specialty Insurance Company**, and **State Farm**.

In addition to mitigation discounts, approximately 20 other reports emphasize the importance of risk management resources and loss prevention services, which they offer for free to their policyholders. **FMH** rewards farmers who adopt climate smart agricultural practices, such as planting cover crops or using no till or minimum till practices, with premium discounts. Split deductibles for wind and hail losses are provided by **Farm Bureau**. Equipment breakdown coverage is offered by **Farmers Alliance Mutual Insurance**, **Merchants Insurance Group**, **Penn National Insurance**, and **WR Berkley Corporation**. Farmers Insurance gives discounts to homeowners with Energy Star/EPA Certified Homes, LEED Certified Homes, Fortified Homes, Automatic Gas Shutoff Valves, or Whole House Water Leak Detection systems. **Nationwide** and **WT Holdings** mention discounts on mitigation devices, while **Pharmacist Mutual xInsurance Company** promotes sustainability among policyholders through incentives. **USAA Group** offers premium discounts to homeowners eligible for Florida Building Code Credits and FireWise USA Communities, which is a U.S. nationwide program established by the National Fire Protection Association.

C. Resilience of strategy

The final recommended disclosure under the strategy pillar of the TCFD framework recommends that companies describe the resilience of the organization's business, strategy, and financial planning. The supplemental TCFD guidance for insurance companies recommends insurers and reinsurers that perform climate-related scenario analysis on underwriting activities provide information on a 2-degrees C scenario and a greater than 2-degrees scenario for physical effects of climate change. The supplemental guidance for asset owners recommends that companies disclose how climate-related scenarios are used to inform investments in specific assets.

Number of disclosures (ML approach)

249 reports (50%) that provided information related to this recommended disclosure, significantly fewer than the number of reports that provided information according to the other recommendations under the strategy pillar.

The challenges involved in conducting a scenario analysis, according to research of the TCFD Task Force, are the cause for low disclosure levels against this recommendation. For example, the **2022 TCFD Status Report** stated: "51% of respondents identified specific issues related to implementing the Strategy recommendation, with 36% of those respondents highlighting issues related to conducting climate-related scenario analysis such as selecting relevant scenarios and identifying key inputs and parameters." In addition, the TCFD Task Force's status report also noted that the majority of companies globally did not disclose information on specific scenarios.

Detail of disclosures (RBTM approach)

The rules or evaluation criteria employed for evaluating disclosures within the recommended disclosure focus on identifying concepts related to the utilization of climate scenario analysis or climate scenarios to assess the resilience of the company's business and strategy across a range of possible futures. The rules strongly prioritize companies that provide reports on quantitative climate-specific scenario analysis or stress testing exercises, as they demonstrate a robust approach to assessing climate risks and utilize both greater than 2-degrees Celsius scenarios for physical risks and below 2-degrees Celsius scenarios for transition risks.

However, partial credit is given to companies that mention the qualitative utilization of scenarios to evaluate their management practices, recognizing their acknowledgement of the importance of scenario analysis. Furthermore, the rules may assign a modest amount of credit to companies that mention stress testing, even if they do not explicitly specify the use of climate scenarios in their analysis.

While the vast majority of companies or groups, — 205 and 164, respectively — provided either not comprehensive (RBTM of zero) or minimally comprehensive responses on this recommended disclosure (Figure 8), at least 15 of those that did provided information in a way that comprehensively addressed the TCFD recommendations, allowing them to achieve RBTM indicators between 9 and 10. This was the case across most types of business – health, life, P&C, and reports from groups with companies from multiple business types. The reports that fell within the minimally or moderately comprehensive category were those that mentioned the use of climate or extreme weather scenarios but did not provide significant specific information about the scenarios used, the time horizons, the risks addressed, or other details. The comprehensive responses generally did provide this information and described how scenario analysis fits into their strategy for addressing climate risk.

COMPANY SPOTLIGHT

> Unum Group (Direct premiums written: $7.84 billion; Type: Life) stated that quantitative scenario analysis for investments supports its decision to integrate climate change analysis into its overall risk assessment process. It describes quantitative scenario analysis of the transition risk in Unum's investment portfolio using International Energy Agency (IEA) scenarios and quantitative scenario analysis of Unum Group's underwriting practices modeling impacts at below 2-degrees Celsius and above 2-degrees Celsius scenarios across multiple time horizons. The group states that the underwriting scenario supports effective management of climate risks, including transition and physical risk impacts. The underwriting scenario analysis was conducted on key insurance risk factors including morbidity, mortality, persistency, and longevity to understand climate change's impact on these factors over a 30-year time horizon. The group modeled each scenario's financial impact relative to

> baseline expected cash flows for claim incidences and recoveries, mortality and lapses. Additionally, Unum Group evaluated impacts of scenarios to operating expenses relative to baseline expenses. Through the scenario analysis, the company identified the ability to reprice group contracts as a significant measure against climate-related risks, as well as business diversification across geographies and regular risks. The company identified that its exposure to higher risk industries is limited, with the ability to replace lost business with emerging sectors.

Transition risk versus physical risk scenario analysis

Climate scenario analysis or stress testing can be used for assessment of transition risk, physical risk, or both. At least 87 submissions mention scenario analysis explicitly, but not all reports specify which risks. Transition risks are likely to be most evident in results of scenario analysis exercises that utilize a below 2-degrees Celsius warming climate scenario. At least 30 reports explicitly mention using a below 2-degrees Celsius warming scenario in their scenario analysis exercises. Another nine companies and groups mention doing transition risk scenario analysis but may not mention a specific temperature threshold. Another 14 or more companies and groups describe using a below 2-degrees Celsius scenario in the context of a process (e.g. analysis, risk assessment), but may not explicitly state that it is a formal scenario analysis exercise. In total, 102 reports mention a 2-degrees Celsius or below scenario in some context.

Physical risks are likely to be most evident in the results of scenario analysis exercises that utilize a greater than 2-degrees Celsius warming climate scenario. At least 17 reports explicitly mention using a greater than 2-degrees Celsius warming scenario in their scenario analysis exercises. Another 11 companies and groups mention doing physical risk scenario analysis but may not mention a temperature. Another 19 or more companies and groups describe using a greater than 2-degrees Celsius scenario in the context of a process (for example, for analysis, risk assessment), but may not explicitly state that it is a formal scenario analysis exercise. In total, 37 reports mention a greater than 2-degrees Celsius scenario in some context. At least 23 reports mention both a 2-degrees Celsius or lower and a greater than 2-degrees Celsius scenario, and 13 explicitly mention climate scenario analysis for both scenario types.

TCFD Pillar 3: Risk management

The risk management pillar of the TCFD framework recommends that companies disclose how the organization identifies, assesses, and manages climate-related risks. Under this section, the Climate Risk Disclosure Survey also asks that insurers disclose underwriting exposure to climate-related risks, any steps that have been taken to encourage policyholders to manage their potential physical and transition climate related risks, impacts to the insurer's investment portfolio, and whether and how climate risks are addressed in the insurers' enterprise-risk management process or a separate process. The insurers are also asked to disclose the climate scenarios, if any, that are used to evaluate underwriting risks and investment risks.

The supplemental TCFD guidance for insurance companies recommends that insurers and reinsurers describe processes for risk management of the underwriting portfolio including physical risks, liability and litigation risks, and transition risks resulting from a reduction in insurable interest due to a decline in value, changing energy costs, or implementation of carbon regulation. The supplemental guidance for asset owners recommends that companies describe engagement with investee companies to encourage better disclosure and practices related to climate risks and improve data availability.

A. Risk identification and assessment process

The first recommended disclosure under the risk management pillar advises companies to describe the organization's process for identifying and assessing climate-related risks.

Number of disclosures (ML approach)

445 reports (90%) included information on climate risk identification and assessment processes, making this the fourth most disclosed of all TCFD recommended disclosures.

Detail of disclosures (RBTM approach)

The rules employed to evaluate disclosures within the risk identification and assessment process recommended that disclosures aim to identify concepts related to the identification and assessment of risks. Emphasis is placed on reports that detail the utilization of climate scenarios as a means to identify key risks to the company's business. This recommended disclosure encompasses the identification of liability and emerging regulatory risks associated with climate and relevant climate-related alliances or international goals and agreements. Furthermore, the rules for this recommended disclosure seek out reports that discuss the company's engagement with investee companies, asset managers, and policyholders concerning climate risk matters. These recommended disclosure rules also evaluate disclosures related to the role of reinsurance in their process.

Many insurers, with varying types of business, provided comprehensive information on this recommended disclosure. Some life, P&C, and life/P&C combined groups received indicators as high as 9.58 out of 10. The 31 reports representing groups with both life and P&C companies fared best in this recommended disclosure, receiving an average indicator of 5.66.

The distribution of RBTM indicators (Figure 8) for risk identification and assessment process under the risk management pillar is similar to that for the strategy – risks and opportunities recommended disclosure. At least 11 companies and groups earned RBTM indicators between nine and 10, meaning that they provided fully comprehensive responses in accordance with the rules. Most insurers (194 and 127) provided minimally to moderately comprehensive responses, while 56 (12.5%) provided responses that did not address the rules, or evaluation criteria, earning an RBTM indicator of zero.

COMPANY SPOTLIGHT

> **Aflac** (Direct premiums written: $5.43 billion; Type: Life), described its risk assessment process. **Aflac** discloses that it became a signatory of the Principles for Responsible Investment (PRI) in November of 2021. The company integrates climate risk into its enterprise risk management process by utilizing a risk assessment matrix. Risk ratings are assigned based on the impact and likelihood of each enterprise risk, categorized as critical, high, medium, or low. High-risk ratings indicate significant financial or strategic effects with extreme or major impacts, while critical-risk ratings represent potential major disruptions. Ongoing and annual risk assessments involve a comprehensive approach, considering emerging risks such as climate risks and engaging business units. Periodic assessments are conducted to evaluate climate-related risks, focusing on reputation, products, and investments. Stakeholder engagement plays a vital role in identifying and addressing climate-related risks, safeguarding the company's brand reputation. Climate risks are also considered in investment assessments, taking into account issuer exposure, sustainability considerations, and potential impacts on business and financial conditions. Additionally, the company evaluates climate-related risks in products, including acute and chronic physical risks, while recognizing the need for further assessment and data to quantify their impacts. The company specifically identified market risks as relevant for its investment portfolio as changes in supply and demand for products and services impact investee companies. It identified acute physical risks to its real estate assets and insurance products such as natural disasters. The company identified the potential for higher lapse rates or claims in the wake of natural disasters. In addition, the company's offerings and pricing may be impacted by changes in the prevalence or geographic range of novel viruses due to climate change.

Role of reinsurance in risk management strategies

Approximately 216 reports mention reinsurance, however some of these are from companies and groups that sell reinsurance. Many companies describe evaluating their climate risks alongside consideration of their reinsurance contracts and indicate that they view reinsurance as part of their climate risk management strategy. For example, **Bretheren Mutual Insurance Company** describes the purchase of reinsurance as "a critical tool for the insurance industry in managing climate related risk." Some describe this as their primary strategy for addressing their climate-related catastrophe exposure. For example, **Clear Blue Insurance Group** states that the most significant risk to its underwriting portfolio is a hurricane loss from climate-related exposures, and that the company manages this risk by purchasing catastrophe reinsurance. **Columbia Insurance Group** mentions that it manages its exposure in coastal regions with reinsurance. **FMH** states that its primary climate-related risks are to its underwriting portfolio and that it "primarily mitigates these risks via reinsurance." Many companies go as far as to say that reinsurance coverage is a (or the) factor leading them to conclude that their climate risk is not a material threat or solvency concern for their company.

At the same time, some reinsurers describe exiting the market. Even if they do not describe existing contraction of offerings, many reinsurers describe the ability to withdraw from a position at the end of a policy year, or adjust pricing, as important risk management strategies for their business. **Federated Insurance** describes how in 2021 it reduced its assumed reinsurance exposure by reducing the number of property catastrophe treaties, a form of reinsurance contract, it supports from three to two. **Argo Group** disclosed that in 2020, it announced the sale of its reinsurance business providing property catastrophe reinsurance, citing the increasing uncertainty inherent in climate change-related property exposures as part of the business rational for doing so. **Amerisure** explains that it has observed increasing upward rate pressure in the reinsurance markets as reinsurers spread the cost of these events around to all of their clients. Many other companies describe anticipating this risk, but do not directly state that this is already being felt. **Swiss Re** states that it has actively de-risked its portfolio of aggregate excess of loss covers in the last two years because of inadequate pricing, but believes that the natural catastrophe market is healthy.

Many insurance companies and groups describe the risk of rising costs or lack of availability of reinsurance. **Agency Insurance Company** mentions a medium-term risk that reinsurance companies may be strained due to changing climate conditions. **Allianz** alludes to this as well. **Farmers Insurance** describes availability of reinsurance as among the top concerns facing the organization. **AmTrust** describes a risk of reinsurance counterparties introducing strict climate-related minimum standards that may be onerous. As an example, **Associated Industries of Massachusetts** mentions reinsurance exclusions on its voluntary book of business prohibiting it from insuring certain lines of businesses, including oil and gas operations, steamship lines, aviation, and chemical manufacturing.

Several insurers point to recent changes that they have made to reinsurance treaties to reflect climate risks. For example, **Arabella** states that in recognition of the recent trend of increasing frequency of natural catastrophes, it has, over the past few years, increased the limits of its reinsurance program to provide coverage for return periods well in excess of the 1-in-100 year period to ensure capital adequacy for the most extreme events. **CSE Insurance Group** describes how it has adjusted its reinsurance strategy over the past few years as the frequency and severity of wildfires has changed, in order to protect the company from high frequency/low severity events and how it is exiting protection from low frequency/high severity events.

Companies also allude to the role of reinsurance providers and brokers in providing technical capacity related to climate risks. Some companies and groups mention that their catastrophe modeling is provided by their reinsurance broker as part of the placement process (for example, **Agency Insurance Company**, **Alaska National Insurance Company**, **Amerisure**, **Co-Operative Insurance Companies**, and **Fairfax**

Financial Holdings). Others mention that they consult their reinsurance partners for climate-related issues. For example, A**rabella Insurance Group** mentions annually engaging its reinsurance partners that are viewed as leading research institutions on climate change to understand the risks to the property and casualty industry. Many others, such as **Co-operative Insurance Companies** and **Mutual of Enumclaw Insurance Company**, describe relying on climate risk education from their reinsurance brokers.

Some companies mention reinsurance or reinsurance-like support from government or quasi-government entities. For example, **Hudson Insurance Group** describes its crop insurance business as potentially impacted by climate change, but states that the risk is mitigated by reinsurance provided by the U.S. government. As another example, **Assurant** stated that it views some of its tail risk as having been transferred to the Florida Hurricane Catastrophe Fund.

Investment management

Insurance companies commonly rely on asset managers to handle their investment portfolios. Asset managers provide expertise in managing and allocating funds across various asset classes, such as stocks, bonds, and real estate, with the goal of generating returns for the insurance company. However, insurance companies should be aware and involved in the content and management of their investment portfolios even when working with an asset manager. A substantial number of reports, specifically 61, refer to asset managers, and the majority of them discuss the incorporation of climate risk into their investment process. However, in many cases, the reports do not provide explicit details on how precisely climate risk factors or drivers influence the ultimate investment decisions.

B. Risk management process

The second recommended disclosure in the risk management pillar of the TCFD recommendations prompts description of the organization's process for managing climate-related risks.

Number of disclosures (ML approach)

464 reports (94%) provided information on climate risk management processes, making this the second most disclosed of all TCFD recommended disclosures.

Detail of disclosures (RBTM approach)

The supplemental guidance for insurance companies recommends that insurers and reinsurers describe risk models used to manage climate-related risks in relation to product development or pricing. The Climate Risk Disclosure Survey also prompts disclosures on the use of catastrophe modeling to manage climate-related risks. In addition, it requests that insurers and reinsurers consider disclosing metrics on climate-related exposure, such as alignment with scenarios, probable maximum loss, climate Value at Risk (VaR), carbon intensity, and the amount of financed or underwritten GHG emissions. The supplemental guidance for asset owners recommends companies describe how they consider and manage their investment portfolios' position with respect to the transition to a low-carbon economy.

The rules utilized to evaluate disclosures within the risk management process recommended disclosure focus on identifying concepts pertaining to the integration of climate change into the company's enterprise risk management program and the comprehensive management of significant risks, including transition risk, litigation risk, reputational risk, and extreme weather risk. The rules favor reports that discuss any plans to position the investment portfolio in light of a transition to a low-carbon economy. Credit is awarded to reports that elaborate on existing, anticipated, or potential changes in client preferences related to climate change.

Under this recommended disclosure, reports are also given credit for discussing incentives to encourage policyholders to manage their potential physical and transition risks.

This TCFD recommended disclosure prompts information on the use of modeling. While the TCFD recommendations and the Climate Risk Disclosure Survey aim to gather information from insurers on the use of models for evaluation of climate risk, it is very difficult in the existing responses to determine which models described incorporate climate change and which models do not. Therefore, in this analysis disclosures are analyzed for the use of modeling of catastrophe risk even if it does not explicitly include climate change. If future iterations are pursued, this may be adjusted.

All types of business demonstrated a high capacity to provide detailed, comprehensive information on this recommended disclosure. P&C insurers were the single type that, on average, provided the most comprehensive information related to this recommended disclosure (average 3.85 out of 10). Insurers with both life and P&C types provided even more comprehensive information earning, on average, an indicator of 5.56 out of 10. Even title insurers, who generally did not provide comprehensive information on the other recommended disclosures, provided enough information to receive some credit here (indicator of 1.17 out of 10).

Nearly half (221) of the responses for climate risk management processes within the risk management pillar fell within the categories of moderately or mostly comprehensive, making this the strongest recommended disclosure. Only 36 reports (8%) provided responses that were not comprehensive, meaning that they did not provide any information that aligned with the rules. However, only two companies and groups (one life and one life/P&C) provided fully comprehensive responses, revealing that there is room for improvement.

COMPANY SPOTLIGHT

> **Sun Life** (Direct premiums written: $4.48 billion; Type: Life) integrates climate risk management into its risk framework, governance, and supporting processes. The company's definition of climate risk includes the physical impacts of climate change and the effects of transitioning to a lower carbon economy, encompassing various risks such as damage to assets, reduced investment values, litigation risks, health impacts, and socio-economic and regulatory changes. The company incorporates climate-related risks into its investment decisions, conducting analyses on physical risks, business model risks, and carbon transition risks. Each asset management business within the company adopts its own approach to identify, assess, monitor, and respond to climate-related risks, employing methods such as climate risk surveys, risk analysis, emissions data analysis, stranded asset modeling, and engagements on decarbonization. The company has environmental risk management programs in place to mitigate potential financial and reputational impacts from environmental issues on its properties, including the implementation of business continuity plans. The company evaluates climate change-related hazards and works to enhance the resilience of its buildings against events such as tornadoes, floods, storms, and coastline flooding.

C. Integration into overall risk management

The final recommendation of the risk management pillar advises companies to describe how the processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.

Number of disclosures (ML approach)

338 reports (68%) provided information related to the integration of climate risk identification, assessment, and management into the organization's overall risk management. Significantly fewer reports disclose information related to this recommendation, as compared to the other recommendations under the risk management pillar.

Detail of disclosures (RBTM approach)

The rules employed to assess this recommended disclosure aim to identify reports that address the integration of climate change into the company's enterprise risk management system, and how frequently the risk management process occurs. These rules prioritize reports that explicitly discuss the incorporation of climate risks into the overall process of identifying, assessing, and managing risks. Additionally, emphasis is placed on reports that provide details about a specific risk control system implemented in relation to climate risks. The rules give credit to reports that discuss the employment of a business continuity plan, and that discuss how climate scenarios are used to analyze investment and underwriting risks.

Insurers across types (P&C, life, health) demonstrated capacity to provide comprehensive information on this recommended disclosure and received indicators as high as 8.57. Groups that had both life and P&C types were, on average, the cohort with the highest indicator under this recommended disclosure (5.43 out of 10).

At least 300 of the responses for integration into overall risk management fell either within the "moderately" or "mostly" comprehensive categories, meaning that insurers were often quite sophisticated in their response under this pillar. These covered many types of business. Less than 80 reports did not provide any information that aligned with the rules and therefore fell within the not comprehensive category.

COMPANY SPOTLIGHT

> **CareFirst** (Direct premiums written: $9.81 billion; Type: Health) recognizes climate change as a significant social determinant of health that impacts the physical environment and health of communities. The company acknowledges that climate change, through extreme weather events and other consequences, will disproportionately affect vulnerable communities, including people of color and those with lower socioeconomic status. **CareFirst** actively engages in addressing social determinants of health by advocating for policies and programs that promote health equity and inclusion. The company has processes in place to identify and assess climate change-related risks and their potential financial implications. **CareFirst** works with regulators to ensure its capitalization accounts for the impacts of climate change on healthcare consumption. The company continuously monitors policyholders' health to protect against emerging risks, including climate change. The organization's annual enterprise risk assessment process identifies climate change as a key risk, and comprehensive action plans are developed and monitored to address the identified risks.

TCFD Pillar 4: Metrics and Targets

The metrics and targets pillar of the TCFD recommendations advises companies to disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities, where such information is material.

A. Climate-related metrics

The first recommended disclosure under the metrics and targets pillar of the TCFD recommendations advises companies to disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities, where such information is material. The supplemental guidance

for insurance companies recommends that insurers and reinsurers provide aggregated risk exposure to weather-related catastrophes, and the extent to which their underwriting activities are aligned with a well below 2-degrees Celsius scenario. The supplemental guidance for asset owners recommends that companies provide metrics used for investment decisions related to climate risk, and how their investment portfolio aligns with a well below 2-degrees Celsius scenario.

Number of disclosures (ML approach)

164 reports (33%) included information on climate-related metrics. All three metrics and targets recommended disclosures were weaker than the recommendations under other pillars, in terms of the number of reports disclosing this information. However, this recommended disclosure on climate-related metrics had the greatest number of reports containing information on it, as compared to the other recommendations under the metrics and targets pillar.

Detail of disclosures (RBTM approach)

The rules employed to assess disclosures within the climate-related metrics recommended disclosure aim to identify reports that provide information on various metrics related to renewable energy, emissions reductions, waste reduction, electricity or energy consumption, water consumption, and fuel consumption. These rules prioritize reports that provide specific numerical values for these metrics and methodologies used for calculating metrics, enabling a more precise understanding of the company's performance in these areas. The rules also favor reports that discuss remuneration policies, use of an internal carbon price, and metrics on alignment of insurance underwriting and investment activities with a well below 2-degrees Celsius scenario. Finally, the rules favor reports that discuss underwriting metrics such as probable maximum loss and climate value at risk.

It is worth noting that there were limited instances of reports that encompassed a comprehensive set of climate-related metrics, indicating that the inclusion of such detailed metrics remains relatively uncommon among the analyzed reports.

Across all types of business, very few insurers provided comprehensive information about climate-related metrics. At least 132 companies or groups of companies didn't provide any information that aligned with the rules, and therefore received an RBTM indicator of zero. Another 282 companies or groups of companies provided minimally comprehensive responses (RBTM indicators between zero and 3). Groups with both health and life insurance companies were most likely to disclose comprehensive climate-related metrics, achieving a 2.3 out of 10 on average. No other type of business obtained a higher average indicator than two out of 10. No single report received an indicator higher than a 6.67 out of 10, meaning there is significant room for improvement in the disclosures under this recommendation.

COMPANY SPOTLIGHT

> **John Hancock/Manulife** (Direct premiums written: $22 billion; Type: Life), which operates under the name Manulife outside of the United States, gives values for measurement of the avoided CO2 emissions from its low-carbon investments and green bond investments from its general account. For measurement of scope 1, 2, and 3 financed emissions, the company describes using the PCAF Global GHG Accounting and Reporting Standard. For energy consumption, it reports energy use in ekWh for corporate, real estate, green power, investment, and other categories, in addition to total energy use. The company gives values for real estate water consumption in million metrics cubed and in terms of water use intensity (m^3/sq ft). It also discloses that it has added goals linked to its climate action plan into its executive performance assessment and compensation. The company discloses using a Climate Value at Risk metric for equity, bond, and real estate portfolios. The company also gives metrics for trees planted, percent of farms that have regenerative practices, and real estate under a sustainable building certification program, among other metrics.

Internal carbon pricing

Zurich American Insurance Company describes using an internal carbon price set at $15 per ton in 2020, subject to an annual increase. **Swiss Re** describes that it was the first multinational company to announce a triple-digit ($100-200 per tonne of CO2) internal carbon price on both direct and indirect operational greenhouse gas emissions. **American Family Insurance** describes using an internal carbon cost for shadow pricing, using a price based on the open market-based price of carbon allowances in the EU emissions trading system. The company discloses that the use of an internal carbon price has impacted its business most by influencing investment decisions in energy efficiency projects, and included an example from determining a business case for building a 197 MW solar array on the grounds of one of its facilities.

B. Risk associated with GHG emissions

The second recommended disclosure of the metrics and targets pillar of the TCFD recommendations prompts companies to disclose scope 1, 2, and, if appropriate, scope 3 greenhouse gas emissions and the related risks. The supplemental guidance for insurance companies recommends that insurers and reinsurers include weighted average carbon intensity or GHG emissions associated with commercial property and specialty lines of business where data and methodologies allow. The supplemental guidance for asset owners recommends that companies disclose GHG emissions for assets they own and weighted average carbon intensity for investments, calculated with the Global GHG Accounting and Reporting Standard.

Number of disclosures (ML approach)

164 reports (33%) included information related to scope 1, 2, and 3 greenhouse gas emissions.

Detail of disclosures (RBTM approach)

The rules employed to assess disclosures within the scope 1, 2, and 3 GHG emissions recommended disclosure are designed to identify reports that provide comprehensive information on greenhouse gas emissions. These rules prioritize reports that include both absolute emissions and emissions intensity metrics for scope 1, 2, and 3 emissions.

By requiring the provision of both absolute emissions and emissions intensity metrics, these rules aim to capture a holistic understanding of a company's GHG emissions profile. This approach enables a thorough assessment of the company's performance in managing and reducing emissions across different scopes, including emissions from direct operations (scope 1), indirect emissions from purchased electricity (scope 2), and indirect emissions from the value chain (scope 3).

Across all types of business, very few insurers provided comprehensive metrics on greenhouse gas emissions. At least 295 companies and groups didn't provide any information for this recommended disclosure that aligned with the rules, earning them RBTM indicators of zero. There were limited instances (six) of reports that achieved the maximum possible indicator of 10 out of 10. These reports came from P&C-only groups and companies, life-only groups and companies, and groups with both life and health companies, demonstrating **capacity for emissions reporting regardless of insurance type of business**. Life insurers and insurers offering multiple types including life tended to produce the most comprehensive disclosures according to this recommended disclosure.

Approximately 54 responses (12%) reported their scope 3 emissions, giving specific values often for multiple consecutive years. Another 52 companies and groups mentioned scope 3 emissions in some way but may not have given values or specific enough information to gain the full points associated with this rule. Only five responses seemed to include specific scope 3 emissions intensity metrics, though 14 mentioned scope 3 emissions intensity without giving values.

COMPANY SPOTLIGHT

Thrivent (Direct premiums written: $5 billion; Type: Life) disclosed scope 1, 2, and 3 emissions and scope 1 and 2 emissions intensities according to the GHG Protocol.

Cigna (Direct premiums written: $30 billion; Types: Health/Life) disclosed scopes 1, 2, and 3 emissions metrics, as well as energy consumption/intensity and water consumption/intensity.

HCSC (Direct premiums written: $45 billion; Type: Health) disclosed specific metrics for its scope 1, scope 2, and certain scope 3 emissions. The company's emissions data was externally verified utilizing the World Resources Institute/World Business Council for Sustainable Development Greenhouse Gas Protocol Corporate Counting and Reporting Standard for scopes 1 and 2 and the WRI/WBCSD Greenhouse Gas Protocol Corporate Value Chain Accounting and Reporting Standard for scope 3. The report described exactly which categories of scope 3 emissions were included in its analysis, which included emissions associated with purchased goods and services, waste generated in operations, business travel, leased assets, and other categories. This report did not give metrics for waste, water, and fuel consumption.

United Fire Group (UFG) (Direct premiums written: $547 million; Type: P&C) did not disclose emissions metrics but gave metrics for total natural gas consumed, year-over-year change in natural gas consumption, total electricity purchased, year-over-year change in electricity purchased, water usage in gallons, waste generated in tons, paper recycled in tons, and percentage recycled.

C. Climate-related targets

The final recommended disclosure of the metrics and targets pillar of the TCFD recommendations advises that companies describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.

Number of disclosures (ML approach)

109 reports (22%) included information related to climate-related targets, making this the least frequently disclosed of all TCFD recommended disclosures.

Detail of disclosures (RBTM approach)

The rules employed to assess disclosures within the climate-related targets recommended disclosure are designed to identify reports that provide comprehensive information on targets related to climate-related metrics. These rules prioritize reports that discuss targets for renewable energy, emissions reductions, waste reduction, electricity or energy consumption, water consumption, and fuel consumption.

By emphasizing the inclusion of specific values and timelines for these targets, these rules aim to evaluate the level of ambition and clarity in a company's approach to addressing climate-related challenges. Reports that provide specific targets enable a more precise assessment of a company's commitment and progress towards achieving sustainable outcomes in areas such as renewable energy adoption, emissions reduction, waste management, and resource consumption.

Through the evaluation of these metrics and targets, the rules facilitate the identification of companies that demonstrate a proactive and accountable approach to managing climate-related issues and fostering sustainable practices within their operations.

Across all types of business, very few insurers provided comprehensive information about climate-related targets. The vast majority of companies and groups (more than 350) didn't provide any information that aligned with the rules, and therefore received RBTM indicators of zero. While health insurers

generally provided less comprehensive information than other types for the other TCFD recommended disclosures, for the climate-related targets pillar they fared better than P&C and title insurers. Multi-type insurers tended to provide more comprehensive disclosures on this recommended disclosure than single type insurers. There were limited instances of individual reports that did provide highly specific and comprehensive reports. For example, one report from a company that offers both life and P&C types achieved an indicator of 8.33 out of 10.

COMPANY SPOTLIGHT

> **Banner Life** (Direct premiums written: $2.27 billion; Type: Life) describes its net zero by 2050 target for its operations. The company also describes its goal to enable all new homes the group builds from 2030 to be capable of operating with net zero emissions by 2030. The group is planning to set Science Based Targets by the end of 2022 and publish them. **Banner Life** describes quantitatively its progress towards its target, in terms of scope 1 and 2 (location) emissions. Banner also describes its goal for its asset portfolio to be net zero by 2050, aligned with the 1.5-degrees Celsius Paris agreement objective. Progress towards this target is measured in investment portfolio carbon intensity, including equities and bonds but not cash and derivatives. The company aims to reduce the portfolio GHG emissions intensity by 18.5% by 2025 and by 50% by 2030, as compared to a 2019 baseline. **Banner Life** reports progress towards that goal, giving specific emissions intensity values for 2020 and 2021. It also reports progress in terms of the degree Celsius alignment – stating that its portfolio in 2021 was aligned with a 2.72-degrees Celsius pathway (and a 2.85-Celsius pathway in 2020).

Specificity of net zero targets: investments and operations

As part of their individual business strategies, certain insurance companies have aligned their business actions with net zero targets. Net zero targets may apply to investments, operations, underwriting activities, or any combination of these components. At least 20 unique submissions, representing 10% of the U.S. market by premiums written nationwide, mention net zero targets relating to their investments by or before 2050, with some specifying that the target applies to their general account investments. At least nine companies and groups, representing a 7% market share, specifically disclose that their net zero target applies to their operations (scope 1 and 2), often with an earlier target year between 2030 and 2050. Some have narrower targets, such as ones applying to only certain operational buildings, for example. At least seven companies and groups, representing 2.3% of the market, mention net zero targets specifically for their underwriting portfolios. In total, approximately 14% of the U.S. market by premiums written nationwide mentioned net zero targets in their responses. Several companies and groups lacked the specificity and clarity expected when communicating their net zero targets and could improve the quality of their disclosures with a breakdown of operational (scope 1 and 2), as well as financed emission and underwritten emission targets (scope 3). The vast majority of submissions contained no net zero targets.

Conclusion of TCFD disclosure results

In the 2021 TCFD-aligned Climate Risk Disclosure Survey responses, companies made disclosures on a range of issues including transition risk, scope 3 metrics and targets, carbon offsets, and carbon pricing.

The majority, 78%, of the reports, provided information on more than six of the 11 TCFD recommended disclosures and nearly a quarter of the reports provided information on more than 10. Only 12 reports, from a variety of types of business, made none of the TCFD recommended disclosures, according to the machine learning analysis. However, the level of detail of the information provided varied substantially. More than half of the reports provided minimally comprehensive information, and only fifteen provided information that was mostly comprehensive, indicating significant room to increase the depth of the survey responses.

According to the machine learning analysis, of the four main TCFD pillars, the metrics and targets pillar was identified as the pillar with the fewest reports providing information. For example, only 22% of reports included information related to climate-related targets. In these categories, there tended to be very little detail disclosed, with the exception of a few standout reports. This is an area that may require additional capacity building to ensure that companies are disclosing the metrics and targets that they are using and have thoughtfully considered adopting appropriate metrics and targets if they have not already.

In contrast, reports providing information related to the risk management and strategy pillars were relatively ubiquitous, at over 470 reports each. For the risk management pillar, the information disclosed tended to be relatively comprehensive. The vast majority (upwards of 90%) of reports provided some information related to the impact of climate-related risks and opportunities on business, strategy, and financial planning, climate risk identification and assessment, and climate risk management. Nearly 70% of the reports described climate risk in the context of their enterprise risk management systems.

Despite there being many comprehensive disclosures on the other TCFD recommendations related to strategy, few reports provided information on the resilience of their business under different climate scenarios, and even fewer provided comprehensive information on this topic. This recommendation prompts disclosures related to climate scenario analysis and could be an area for additional capacity building efforts in the insurance sector to encourage appropriate climate risk management.

The most comprehensive and detailed disclosures, as measured by the rules-based text mining indicator, were reports from groups that represented both life and P&C types combined, and were groups that tended to be large, averaging just over $7 billion in direct premiums written. In the risk management recommended disclosures, P&C insurers on average provided the most comprehensive information on risks and opportunities and on the impact of climate change on their organizations.

While there is certainly room for improvement in the comprehensiveness of disclosures, both in alignment with the TCFD framework and in the detail provided for each prompt, this is the first year for which the Climate Risk Disclosure Survey has been aligned with the TCFD Framework. In other industries that require TCFD reporting, disclosures have become increasingly detailed in years two, three and four, with disclosures aligning further with the framework. Improved levels of disclosure, consistently applied using the TCFD pillars and recommended disclosures, encourage cross-company analysis, by industry practitioners and investors.

Within the insurance sector, all companies should be encouraged to look at the range of responses and consider how else they can mitigate climate risk and capitalize on climate opportunities. There is a lot of information within these disclosures — from the use of carbon offsets to the adoption of remote work — to consider for implementation. In addition to employees, management and investors, customers, regula-

tors and lobbyists are going to be assessing these disclosures. Also, while the risks and opportunities that the industry faces are not universal across all types of business, climate risk is affecting the entire industry and these disclosures provide critical information related to all types of insurance companies.

We are eager to see the next set of disclosures and the expanded coverage and detail.

Additional Questions of Interest

The Climate Risk Disclosure Survey responses provide valuable and unique insights into the approaches that insurers are taking to address climate risks and opportunities. These responses can provide insights that reach beyond the direct prompts and guidelines of the TCFD framework. The following section highlights questions sourced from the Climate & Sustainability Branch at California Department of Insurance, and answers that have been developed through queries using the text mining tool.

What do the reports say about the U.S. Flood Insurance market?

Some reports describe the challenges with private flood insurance in the U.S. **Co-operative Insurance Companies** states that it evaluated, with the help of its reinsurer, the possibility of offering flood coverage, but determined that the private market for this coverage is not yet competitive and tabled the offering. **SirusPoint** uses the National Flood Insurance Program (NFIP) as an example of how some risks may become uninsurable over time. The company notes that U.S. flood protection is highly supported by the U.S. government, given the difficulty that private markets have in fully covering the risk due to lack of confidence in the ability to anticipate frequency and severity and maintain adequate margins for business to be viable.

However, some submissions indicate that insurers see opportunities for private flood insurance moving forward. **NYCM** describes supporting supplementary flood insurance education through its agents.

Chubb describes offering private flood insurance (primary and excess policies) to homeowners who have higher limits, basement coverage, more coverage for precession possessions, etc. than the NFIP, which they note dominates the market, covers. **Grange Insurance Association** and **Hiscox** both indicate that they have identified flood insurance as a potential climate-related growth opportunity.

Arch Insurance describes seeing opportunities for underwriting flood control infrastructure as public and private entities address changing climate. **Assurant** says that additional risk and U.S. policy support for climate-related risk insurance (e.g. NFIP) may offer additional opportunities to pool risk and develop new products in the Global Housing Business. **Liberty Mutual** describes its partnership with FloodFlash, a parametric insurance product, to expand access to commercial flood insurance in areas that were historically unable to get flood coverage or had difficulty doing so. It also describes personalized flood warnings with Previsco. Lastly, **Swiss Re** describes QuickFlood – a simplified flood insurance product for lower risk flood zones in the U.S.

Do any of the insurers discuss methane, hydrofluorocarbons, or other greenhouse gases within their goals?

At least four companies and groups make reference to methane, while one mentions nitrous oxide, which is commonly considered a short-lived climate pollutant, or "super pollutant" similar to methane or hydrofluorocarbons (HFCs). However, none of them address HFCs or refrigerants. Furthermore, none of these companies and groups provide specific targets for reducing these emissions.

One of the companies acknowledging methane is **Caterpillar Insurance Co**, which discusses the utilization of methane gas as fuel in its power systems. Another group, **Co-operative Insurance Companies**, ad-

dresses methane in the context of litigation risk, expressing concerns regarding its farm owner portfolios in Vermont due to methane gas generated from bovines in dairy farms. The **Interinsurance Exchange of the Americas** includes methane and nitrous oxide emissions in its carbon footprint. Lastly, **Secura Insurance** mentions collaborating with asset managers who engage with portfolio companies to implement programs aimed at reducing methane and CO_2 emissions.

Do insurers mention investments in carbon markets?

In the transition to green energy, insurance companies, as major financial institutions, will play a crucial role by monetizing greener energy sources and investing in climate change solutions. It is important to prioritize the quality of carbon offsets and ensure they are used only as a last resort for emissions that cannot be avoided. The rise of carbon markets that verify, validate, and sell carbon credits will be encouraged through investments, promoting necessary growth. Additionally, investments in stocks, bonds, and markets that drive a decrease in our reliance on carbon are essential beyond offsetting emissions (scopes 1-3).

Among the roughly 20 companies and groups that discuss carbon credits, many highlight their commitment to procuring carbon offsets as a means of neutralizing residual emissions. **AXA** mentions the inclusion of Blue Carbon Resilience Credits, which will be further elaborated on in the subsequent section dedicated to nature-based solutions. Additionally, **AXA** acknowledges the acquisition of carbon credits to compensate for emissions resulting from air travel, which is consistently identified as the largest contributor to its carbon footprint.

AIG specifically discusses providing coverage for tax credits available for investments in eligible renewable energy projects, including, but not limited to solar farms, wind turbines, fuel cell power plants and carbon capture and sequestration. **FMH** discusses the opportunities that farmers may have to sell carbon credits associated with the carbon sequestered on their land by crops.

HCSC, **Liberty Mutual Group**, **MetLife**, **Tokio Marine Holdings**, **Universal Property** and **Casualty Insurance Company**, and other entities describe their investment in renewable energy credits. **Tokio Marine Holdings** delves into the carbon credits associated with its mangrove planting projects.

Is there discussion of drayage trucks or zero emissions trucks?

Drayage trucks are used to transport containers and bulk freight between ports and other facilities such as rail facilities, distribution centers, and other near-port locations. They are historically diesel-fueled, heavy-duty vehicles but recently there has been significant effort in certain states, including California, to transition to cleaner fuel sources. Drayage trucks are essential to operations and economies around seaports and for goods movement to much of the country. As the demand for zero-emissions trucks increases, insurance companies may be adapting their policies to cover these vehicles. Insuring zero-emissions trucks presents unique considerations due to their advanced technology, higher initial costs, and specialized maintenance requirements. Insurance companies may be working to develop specialized coverage options and risk assessment models tailored to the specific needs and risks associated with zero-emissions trucks to support their adoption and provide appropriate coverage for operators and owners.

Solely **Toyota Motor Insurance Company** addresses the topic of drayage operations. Specifically, they reveal the delivery of ten fuel cell electric heavy-duty Class 8 trucks to demonstration fleet customers for the purpose of conducting drayage operations at ports. Notably, within the initial five months of operation, these trucks successfully accumulated over 8,000 miles of in-service travel, all accomplished with zero emissions.

Is there mention of nature-based solutions in these reports?

Nature-based solutions refer to the preservation or restoration of natural ecosystems and biodiversity to provide protection or services and address environmental challenges. Insurance companies are increasingly recognizing the value of nature-based solutions in managing and mitigating risks associated with climate change and natural disasters. By investing in and supporting nature-based solution initiatives, such as reforestation, wetland restoration, and coastal protection, insurers can enhance resilience, reduce the severity of risks, and potentially lower insurance claims related to events such as flooding, wildfires, and storms.

AXA highlights its collaboration with The Nature Conservancy on Blue Carbon Resilience Credits, which serve to assess the combined benefits of carbon sequestration and resilience provided by coastal wetland ecosystems. Additionally, **AXA** discusses its Coastal Risk Index, a tool that maps present and future flood hazards resulting from climate change while integrating the protective advantages of coastal ecosystems into insurance models.

W.R. Berkeley Corporation discloses the creation of a new insurance product within one of its operating units. This product specifically caters to clients engaged in the restoration, construction, enhancement, and preservation of wetlands and streams. The aim is to offset the loss of resources resulting from other projects authorized by the U.S. Army Corps of Engineers. By providing coverage, the operating unit instills confidence in customers regarding the successful completion of these aquatic resource construction endeavors. The disclosure states that the unit has extended coverage to over 34 policyholders involved in the development of more than 3,500 acres of wetlands.

John Hancock/Manulife, which operates internationally as Manulife, addresses the increasing popularity of natural climate solutions, which entail protecting, sustainably managing, and restoring natural or modified ecosystems in a manner that effectively and adaptively addresses societal challenges. As a timberland and agricultural investment manager and member of the WBCSD's Nature Action and Forest Solutions Group Projects, John Hancock/Manulife Group emphasizes that its core business revolves around managing nature.

Swiss Re also acknowledges nature-based solutions and its role in supporting and enabling investments in natural assets that facilitate climate adaptation and mitigation. However, the report does not provide extensive detail on this aspect.

Apollo Group mentions its strategic planning and maintenance of native grasses and wetlands at Athene's West Des Moines campus as a measure to reduce flood risk in the area.

Fairfax Financial Group/Allied World mentions its co-authorship of research insurance reports highlighting the value of nature, particularly the performance of natural systems such as wetlands and forests in the face of hurricanes, floods, wildfires, and other disasters.

Toyota highlights its collaborative efforts with multiple partners in habitat restoration, including the provision of grants for invasive species removal, prescribed burns, wetland maintenance, and stimulation of native seed banks in preserves across southern Michigan.

Tokio Marine Holdings discusses its funding of mangrove planting projects and the ecosystem services generated as a result. Over the past 20 years, the valuation of these services has reached approximately 118.5 billion yen, with an expected increase to 391.2 billion yen by the end of 2038.

Appendix

Appendix I: Additional Figure

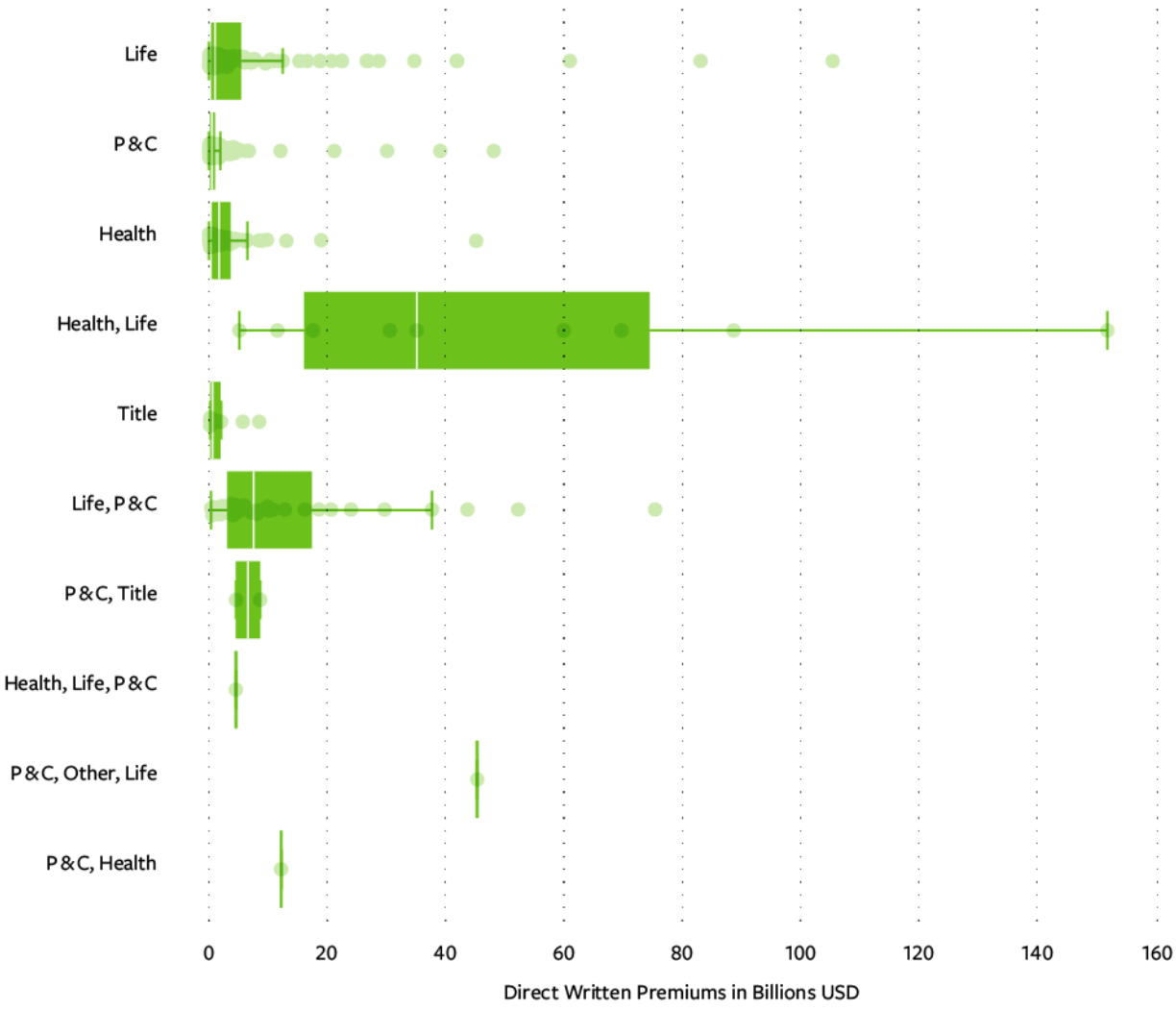


Figure 9. Box plot and associated points for the nationwide Direct Premiums Written ($) for groups in each type of business or combination of types.

Appendix II: Key Concept Questions

TCFD Pillar 1: Governance

Governance, Board Oversight Key Questions:

- Does the report discuss climate change in the context of board activities?
- Does the report mention climate-performance linked remuneration for the board?
- Does the report mention a board-level sustainability committee that meets with a defined frequency or a below-board level sustainability committee that reports with a defined frequency to the board?
- Does the board discuss climate risk?
- Is the board involved in a strategy for addressing climate risk?
- Is the board staying informed of or monitoring climate risks?
- Is there a board level sustainability committee?

Governance, Management's Role Key Questions

- Does the report discuss climate change in the context of senior management activities?
- Does the report discuss sustainability in the context of senior management activities?
- Does the report mention climate-performance linked remuneration for senior management?
- Does the report mention a sustainability committee with senior management participation that meets with a defined frequency?
- Does the report mention a sustainability committee that meets with a defined frequency?
- Does the report mention a sustainability committee?
- Does the senior management discuss climate risk?
- Is the senior management involved in a strategy for addressing climate risk?
- Does the senior management stay informed of or monitor climate risks?

TCFD Pillar 2: Strategy

Strategy, Risks and Opportunities Key Questions:

- Does the report discuss specific insurance opportunities and specific climate risks?
- Does the report discuss climate risks?
- Does the report discuss risks and opportunities with specific time horizons?
- Does the report discuss risks with specific time horizons?
- Does the report discuss transition risks?
- Does the report discuss physical risks?
- Does the report discuss extreme weather as climate risk?
- Does the report discuss opportunities for cost savings through efficiency improvements?
- Does the report discuss exposure of investment portfolios to climate risks?
- Does the report discuss climate-related underwriting risks?
- Does the report discuss reputational or litigation risks?

Strategy, Impact on Organization Key Questions

- Does the report discuss direct impacts of climate risks on the company?
- Does the report discuss a specific climate strategy?
- Does the report mention standards for climate-related risk disclosure, calculation, or management?
- Does the report mention specific emissions reductions objectives in its strategy?
- Does the report mention reductions in energy consumption?
- Does the report mention reduction of fuel consumption?
- Does the report mention reduction of water consumption?

- Does the report mention waste reduction?
- Does the report mention internal or external research related to climate?
- Does the report discuss the impact of a transition to a low-carbon economy on the business?
- Does the report mention specific objectives related to climate in its strategy?
- IDoes the report discuss how climate change impacts client or broker selection?
- Does the report discuss development of sustainable insurance products (products that support the transition to a low-carbon economy or help customers adapt to climate-related risk)?
- Does the report discuss climate-related client engagement?
- Does the report discuss opportunities to mitigate greenhouse gas emissions in its operations?
- Does the report discuss how climate risks factor into investment strategy?

Strategy, Resilience of Strategy Key Questions

- Does the report discuss climate scenario analysis informing their strategy?
- Does the report discuss using a greater than 2-degrees Celsius scenario for physical risk analysis?
- Does the report discuss using a below 2-degrees Celsius scenario for transition risk analysis?

TCFD Pillar 3: Risk Management

Risk Management, Risk Identification and Assessment Key Questions

- Does the report mention utilization of scenarios to identify climate risks?
- Does the report identify liability or litigation risks?
- Does the report identify and consider existing or emerging regulatory requirements related to climate change?
- Does the report identify relevant climate-related alliances or international goals/agreements?
- Does the report describe the relation to other risks?
- Does the report describe the process for identifying risks to insurance portfolios by geography, business division or product segment (eg. physical risks from weather, transition risks from a reduction in insurable interest due to a decline in value, or other risks)?
- Does the report discuss engagement with investee companies or asset managers?

Risk Management, Risk Management Processes

- Does the report describe how climate risk fits into the context of their enterprise risk management system?
- Does the report discuss management of litigation risks?
- Does the report discuss client preferences in the context of climate risk?
- Does the report discuss management of reputational risk?
- Does the report discuss management of extreme weather risks?
- Does the report discuss use of risk models?
- Does the report discuss plans to position investment portfolio through a transition to a low-carbon economy?
- Does the report discuss incentives to encourage policyholders to manage their potential physical and/or transition risks?

Risk Management, Integration into Overall Risk Management

- Does the report mention climate change in the context of their enterprise risk management system?
- Does the report discuss integrated identification, assessment, and management of climate risks?
- Does the report mention a risk control system?
- Does the company have a business continuity plan?

- Does the report discuss the climate scenarios used to analyze underwriting risks?
- Does the report discuss the climate scenarios used to analyze investment risks?
- Discuss frequency of risk management process?

TCFD Pillar 4: Metrics and Targets

Metrics and Targets, Climate-Related Metrics

- Does the report discuss renewable energy metrics with specific values given?
- Does the report discuss emissions reduction metrics with specific values given?
- Does the report discuss waste reduction metrics with specific values given?
- Does the report discuss electricity or energy consumption metrics with specific values given?
- Does the report discuss water consumption metrics with specific values given?
- Does the report discuss fuel consumption metrics with specific values given?
- Does the report discuss remuneration policies?
- Does the report discuss use of an internal carbon price?
- Does the report discuss the methodologies used for calculating metrics?
- Does the report discuss underwriting metrics (eg. probable maximum loss, value at risk)?
- Does the report discuss metrics of alignment of insurance underwriting and investment activities with a well below 2-degrees Celsius scenario?

Metrics and Targets, Scope 1, 2, 3 GHG Emissions

- Does the report discuss emissions of any scope with specific values given?
- Does the report discuss scope 3 emissions with specific values given?
- Does the report discuss scope 2 emissions with specific values given?
- Does the report discuss scope 1 emissions with specific values given?
- Does the report discuss scope 3 emissions intensity with specific values given?
- Does the report discuss scope 2 emissions intensity with specific values given?
- Does the report discuss scope 1 emissions intensity with specific values given?
- GHG emission of assets and weighted average carbon intensity?

Metrics and Targets, Climate-Related Targets

- Does the report discuss a target for renewable energy?
- Does the report discuss a target for emissions reductions?
- Does the report discuss a target for waste reduction?
- Does the report discuss a target for energy consumption reduction?
- Does the report discuss a target for water consumption reduction?
- Does the report discuss a target for specific scopes of emission reductions?