

Modeling climate change litigation risk

Impact on liability insurance: Focus on
directors & officers liability



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Executive summary

Climate change is a complex and multifaceted issue that is affecting global economies. This report examines the emerging field of climate change litigation and its potential implications for the insurance industry. Using advanced modeling methodologies and toolsets, this comprehensive analysis assesses how climate change affects liability risks associated with the directors and officers (D&O) line of business.

Recognizing the market's growing need to anticipate and manage liability risks efficiently, Moody's has developed a liability modeling framework to identify and quantify risks across various scenarios. The framework employs coverage-specific litigation pathways and a legal model to quantify the various types of liability risk within the context of different scenarios from natural and man-made catastrophes to climate change.

The analysis of over 1,500 cases in the United States shows the potential exposure of the D&O line to climate change-related claims. Legal precedence shows that D&O lines may face substantial risks linked to misleading or deceptive statements, and securities class actions. Certain sectors exhibit an increased vulnerability to these types of claims; the energy, utilities, manufacturing, and food and agriculture industries are particularly susceptible to this nature of D&O claim.

As well as representing one of the most tangible adverse impacts of climate change, physical losses or damage could also trigger legal actions with consequential insurance implications and hence pose a material risk. Examples of physical damage that could potentially lead to indirect legal losses include: flooding of low-lying areas, damage to coastal infrastructure from rising sea levels or more frequent intense storms, or crop failures resulting from meteorological change. Our analysis shows that, for just one legal pathway related to physical damage, the RCP8.5 climate change scenario causes an increase of up to 1.6 percent in the contribution to the pure premium losses.

DISCLAIMER INFORMATION

This report shows preliminary results and insights from ongoing Moody's research on the climate change litigation impacts on liability insurance. These results constitute an interim update and are not a formalized Moody's view of risk.

Introduction

Climate change is one of the greatest challenges the world faces, with potentially irreversible consequences that could impact multiple generations. On December 12, 2015, the Paris Agreement was adopted at the UN Climate Change Conference, marking a significant step in addressing climate change. The agreement is legally binding under international law and aims to limit global average temperature increases to 1.5 degrees Celsius above pre-industrial levels.

Achieving such an ambitious goal requires significant reforms that cut across the social, economic, and technological sectors. Transitioning to a greener economy involves policy changes, technological advancements, and shifts in corporate practices, all of which are linked with risks. These can be categorized into two primary risk types: transition risk, associated with these reforms, and physical risks, linked to the direct impacts of climate change.

However, the financial consequences of climate change extend beyond the immediate risks posed by physical and transition risks. As the economic impact of climate change becomes more evident and is attributed to actions or inactions of certain actors or industries, the risk of liabilities and legal claims increases.

Liability accumulations are dynamic – they evolve and come in different shapes and forms. The drivers of litigation are susceptible to legal, social and technological changes. Climate change litigation highlights the evolving nature of the risk, with the number of cases quintupling in the United States over the past decade.¹ A similar trend is also observed globally, reflecting a sustained pattern of increased legal action related to climate change.²

The insurance sector, through risk underwriting, can expect to be called to cover legal costs, settlements, or other court damages as these risks materialize. To effectively price and manage these risks, insurers will need to employ expanded data capture, advanced modeling, and detailed analytics. Moody's has developed a liability modeling framework that enables the quantification of liability accumulations arising from catastrophic events and emerging risks, such as climate change litigation.

In the following sections, we use this liability modeling framework to examine the topic of climate change litigation and its implications for the insurance sector, with a particular focus on the directors and officers (D&O) line of business. In addition, we briefly explore the intersection of climate change litigation with the environmental, social, and governance (ESG) framework, highlighting how litigation data could provide insights into corporate vulnerabilities across the three ESG pillars.

¹Based on data from: <http://climatecasechart.com/> - Accessed on 02/2023

²Based on data from: <http://climatecasechart.com/> - Accessed on 02/2023

Climate change and litigation risk

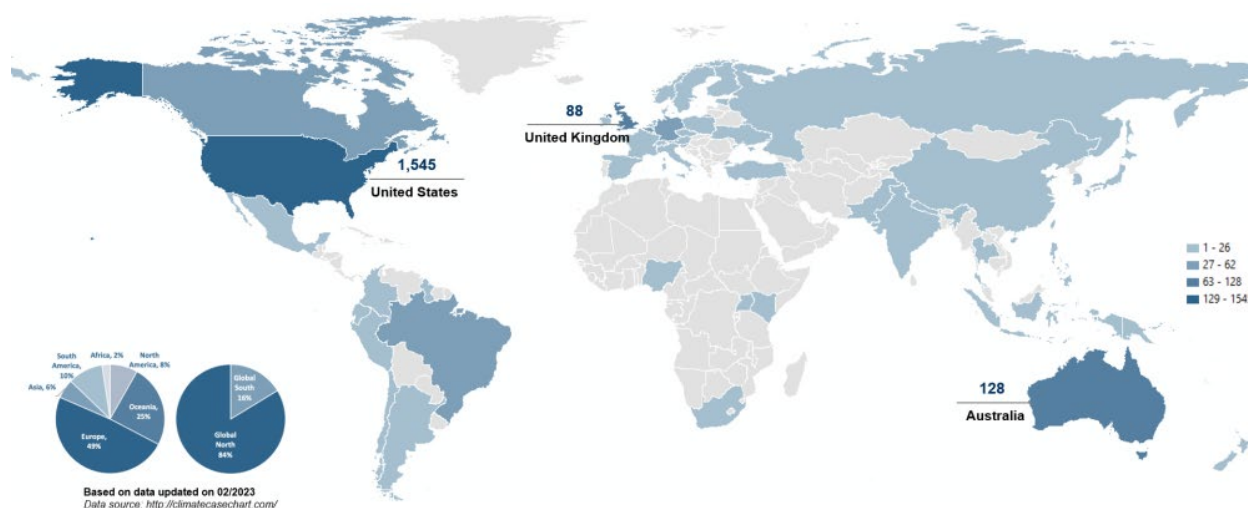
December 12, 2015, marks a landmark date in addressing climate change. At the UN Climate Change Conference (COP21) in Paris, 196 parties adopted the Paris Agreement, a legally binding treaty under international law, on actions to limit the impacts of climate change.

Over time, human activities have contributed to the increase of greenhouse gasses in the atmosphere. Today, we are observing significantly increased concentrations of carbon dioxide, methane, and nitrous oxide compared to pre-industrial levels. To avoid the more catastrophic impacts of climate change, social, economic, and technological transformations are required to limit the global average temperature increase to 1.5 degrees Celsius above pre-industrial levels.

The financial implications of climate change, and the actions taken to limit climate change, include both additional physical impacts as well as the risks created by required reforms. Physical risks, as a direct result of natural hazards, can have tangible effects on an organization, both from sudden-onset catastrophes and long-term “chronic” changes in climate. In tandem, transition risks refer to risk associated with the actions required from businesses and governments to facilitate the shift towards a lower greenhouse gas emission economy. Both physical and transition risks form the basis for the emergence of a third class of risk to businesses and their insurers: litigation risk. Climate change-related litigation aims to establish legal responsibility for damage instances and to seek compensation, based on the actions or inactions of the implicated parties.

Climate change litigation is a rapidly emerging risk. As of February 2023, the total number of climate change-related lawsuits filed globally has reached 2,229. Approximately 70 percent of all the climate change cases have been filed in the U.S. The U.S., Australia (6 percent) and the United Kingdom (4 percent) together constitute the three most active jurisdictions in terms of climate change litigation ([Figure 1](#)).

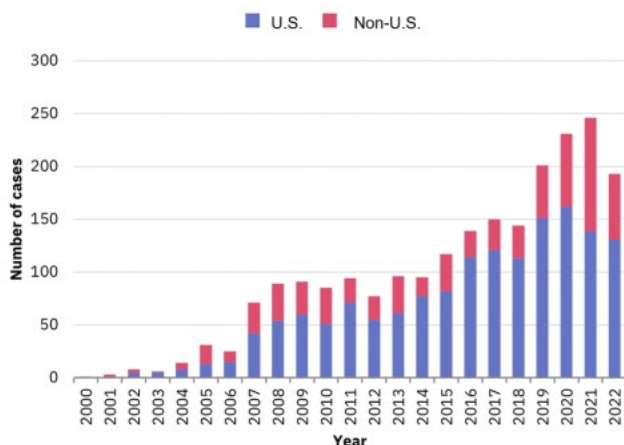
Figure 1: Climate change litigation – number of legal cases by jurisdiction³



³Data source: <http://climatecasechart.com/> - Accessed on 02/2023

The expansion of climate change-related legal claims is shown in [Figure 2](#). Since the first filings in 1986, the number of cases has steadily increased, quintupling in the United States over the last decade. This substantial rise in litigation is a global phenomenon.

Figure 2: Number of climate change-related litigation cases filed since 2000⁴



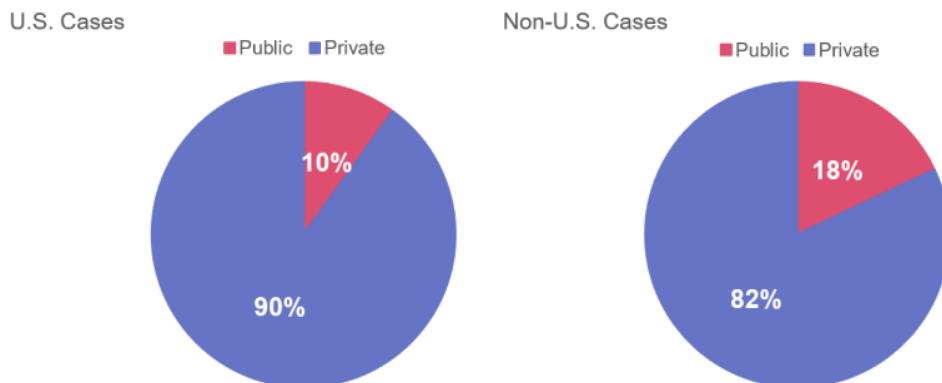
As with any legal claims, to be substantial a valid cause of action is required. This can be either a legal right, a law, or a duty that has been breached by the defendant. Public nuisance, negligence, and inaccurate or misleading statements are amongst the most common causes of action in climate change litigation.

In principle, any industry sector is susceptible to climate change-related legal actions if they fail to adapt their practices and operations in response to the impacts of climate change and actions required to limit greenhouse gas emissions. However, there are certain activities that present a higher degree of vulnerability, either due to a long-term reliance on burning fossil fuels or the impact of that organization’s responsibility for the contamination of land or sea. Activities such as waste management, energy production, transportation, manufacturing, agriculture, and consumption of goods or services which could have environmental impact are considered key climate change contributors, and companies engaged in these activities are often exposed to such liabilities.

This diverse nature of the risks brings in a wide range of entities acting as plaintiffs and defendants. However, as shown in [Figure 3](#), climate change litigation has been dominated by legal cases against governments and other public bodies, both in the United States and globally.

⁴Data source: <http://climatecasechart.com/> - Accessed on 02/2023

FIGURE 3: Defendant types in climate change litigation cases⁵



Most of the claims against public bodies challenge decisions related to a lack of effective policies and measures to mitigate climate change, as well as failures to ensure corporate compliance. Governments and other public organizations are being held accountable for not taking appropriate actions, by failing to legislate or ensure compliance with existent legislation.

On the other hand, the main body of claims targeting companies and their directors concern a failure to mitigate or adapt to climate change and company's false claims regarding environmental sustainability efforts that aim to deceive or mislead. Corporations face lawsuits for legacy emissions or ongoing greenhouse gas (GHG) emissions, misrepresentation of their actions, and failure to mitigate climate change risks resulting in environmental disasters.

⁵Data source: <http://climatecasechart.com/> - Accessed on 02/2023

The climate change liability scenario

Quantification of climate change risk is not a trivial exercise. Industry groups, governmental committees, and regulators have highlighted the need for comprehensive risk assessments, but also recognize the challenges posed by the unique features of this composite risk, and the lack of appropriate data and modeling techniques.

Stakeholder entities expect companies to take a similar risk management approach to that of the other drivers of financial risk. However, when estimating materiality, the approach taken needs to reflect how long-term changes in the inherent characteristics and complexity of litigation risk affect losses, as well as the vulnerability of this risk to changes in governmental policies.

Moody's is developing an end-to-end framework for modeling liability that supports the essential risk management disciplines of exposure data capture, loss modeling, and reporting, which is simple enough to be transparent and flexible to allow for easy customization. To calculate losses in a consistent and objective manner, a standardized methodology is employed to understand and measure litigation risk.

The key components of the liability risk management framework comprise the coverage trigger pathways and the litigation model. Thus, coverage trigger pathways (CTPs) are scenario- and coverage-specific mechanisms that describe how different liability insurance coverage payouts are triggered by a given event, referred to as a liability trigger. Liability triggers can be considered for any natural catastrophe or man-made event that could result in subsequent liability, while the severity of an event determines whether a policy is activated through the triggering of liability insurance coverages.

Climate change litigation is an expanding concern for the insurance sector with increasing alerts for potential rises in climate change-related claims. As part of our liability modeling efforts, Moody's is currently expanding the liability scenario suite to include a climate change liability scenario.

This climate change scenario focuses on the U.S. market and is based on the analysis of litigation data available from the Sabin Centre for Climate Change Law at Columbia Law School. The scenario models how climate change litigation risk can affect insurers. Each of the following sections highlights a different element of our liability modeling framework, from exposure requirements and event type definition to loss pathways and industry footprints.

EXPOSURE

Any high-quality risk assessment requires reliable input data as a starting point. When it comes to capturing climate-related financial risks, the lack of quality data is identified as one of the top reasons for the incomplete integration within regulatory frameworks (Bank of England - Prudential Regulation Authority, 2021).

On an industry-wide basis, there is a good understanding of the size and types of companies that may be most susceptible to climate change litigation, and this has been used for the purpose of this report. Translating this understanding into an insurer-specific view of risk, however, should be based on an analysis of the company's insured risks and coverages. Although not addressed further in this report, Moody's recognizes that getting the right data in the right format can be a challenge and has supported insurers in that effort.

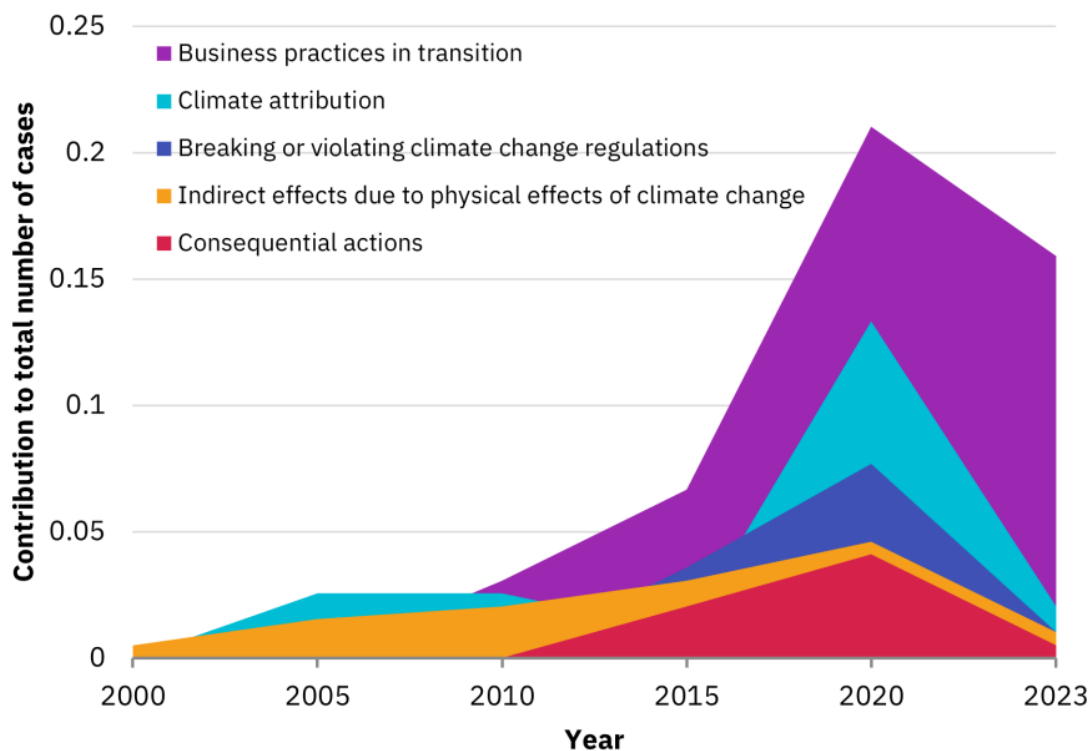
EVENTS (LITIGATION ORIGINS)

We classify sources of climate change liability into five main types of litigation origin event, each of which includes multiple loss pathways. While these pathways share a common event as the litigation origin trigger, they vary in terms of intensity, frequency, or industry footprint. The five types of litigation origin event are:

- [Breaking or Violating Climate Change Regulations](#)
- [Climate Attribution](#)
- [Business Practices in Transition](#)
- [Indirect Effects due to Physical Effects of Climate Change](#)
- [Consequential Actions](#)

Figure 4 shows the evolution of the volume of cases for each type of litigation origin event over time. All events present an upward trend, with the cases that relate to transition and adaptation risk expanding fastest.

Figure 4: Events volume (number of cases)



Breaking or violating climate change regulations

In this category, litigation arises from plaintiffs claiming that defendants did not comply with climate change regulations. Federal laws governing environmental law and policy form the legal ground for complaints to be made against legal entities. Amongst the most used statutes in the U.S. are:

- Clean Air Act (CAA)
- Clean Water Act (CWA)
- Comprehensive Environmental Response Compensation and Liability Act (CERCLA)
- National Environmental Policy Act (NEPA)
- Resource Conservation and Recovery Act (RCRA)

Climate attribution

In this category, plaintiffs use climate change attribution science to prove that certain operations are responsible for directly affecting climate-related changes, such as the impact on the likelihood and severity of weather events like heatwaves, wildfires, and floods. Plaintiffs seek compensation for losses due to climate change by providing a cause of loss that links the actions of the defendants to their losses.

Business practices in transition

In this third category, businesses face the challenges arising from the urgent need to act on climate change by changing their practices and incorporating sustainability into their operations. Transition-related risks have an impact on both the profitability and the assets of a business, affecting their operations and potentially resulting in climate change-related litigation.

One prominent example is the risk of stranded or devalued assets resulting from inadequate adaptation to policy changes. Additionally, failure to disclose or mitigate climate-related risks can give rise to transition-related litigation initiated by investors or activists.

Indirect effects due to physical effects of climate change

There are expected to be increases in the occurrence of some physical risks as a result of climate change. Where such catastrophic or chronic risks are not anticipated, the consequent damage could have a cascading effect. Climate change not only expands the intensity of the risk but also introduces risk to areas that were previously unaffected by such hazards or not considered as perils in the past. Examples of expansion of risk into unprecedented areas include intense heatwaves in regions of the Northern Hemisphere that were not historically known for experiencing extreme heat, and the spread of tropical diseases to new regions such as parts of the U.S. and southern Europe. Such changes could both cause increases in expected losses and introduce liabilities linked either to the causation or the aftermath of the natural catastrophe peril.

Liability risk may arise not only from the usual high materiality perils such as hurricanes, floods, and wildfires, but also from other perils that are more directly linked to human behaviours. Examples of

such perils include coastal erosion or drought where a clearer linkage can be made with human-induced climate change through sea-level rise and regional warming.

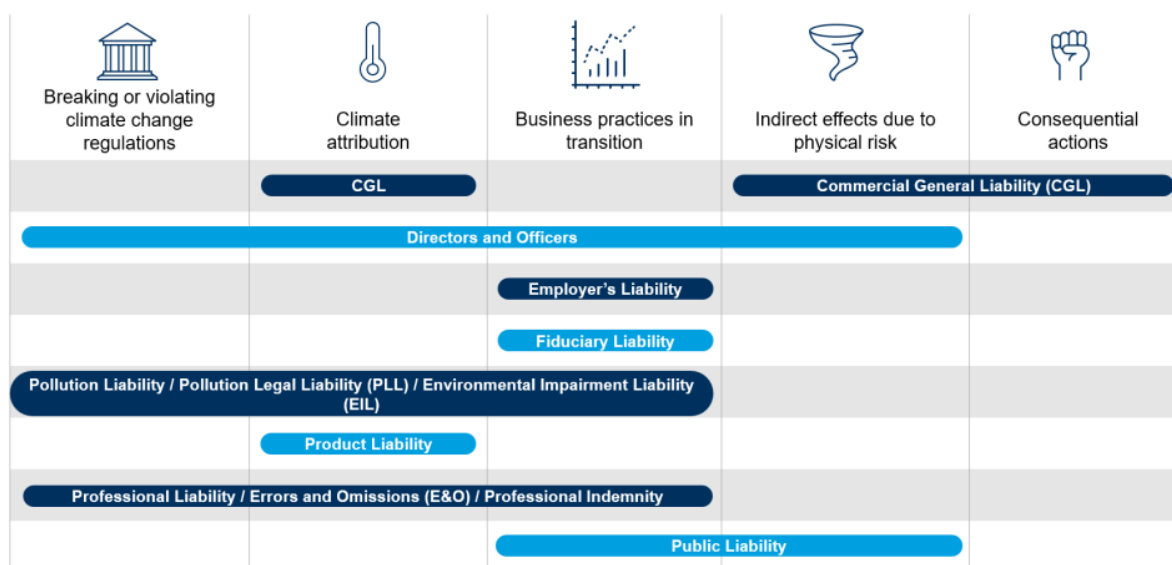
Consequential actions

Actions to raise awareness and actively participate in activist movements can lead to litigation against non-governmental organizations (NGOs), or other climate change-related activist organizations and their members, alleging disruption or defamation.

THE LIABILITY FOOTPRINT

Each of the types of litigation origin event described in the previous section can pose risk to different liability insurance lines, as shown in [Figure 5](#). Claims can be made through various channels, leading to different loss pathways, and each event type can potentially affect more than one liability coverage. We can think of this combined insurance impact as the “footprint” of the scenario that connects what might otherwise be disparate claims.

Figure 5: Liability footprint



Commercial general liability (CGL) insurance, for example, provides coverage to the insured for bodily injury and physical damage due to negligent acts or omissions on the premises or due to business operations. In the context of climate change, such claims can be triggered through litigation related to physical damage that can be linked back to legal entities, based on their contribution to climate change and associated severe events (indirect effects due to physical risk). Alternatively, a consequential action type of event, such as a destructive protest that results in physical damage s or bodily injuries, could potentially lead to CGL claims against a corporation or NGO.

Other liability lines would have claims arising from the intersection of climate change-related damage and insurance policy triggers and coverages. This white paper is not intended to capture all liability

consequences but will instead specifically focus on D&O insurance. The following section dives deeper into the loss pathways associated with each of the five main event types.

Directors and officers – Class analysis

Directors and officers (D&O) insurance provides “liability cover for company managers to protect them from claims which may arise from the decisions and actions taken within the scope of their regular duties.” (Allianz, 2010). As shown in [Table 1](#), there are four common coverages available in D&O policies (Allianz, 2010) (Cambridge Centre for Risk Studies, in collaboration with Risk Management Solutions, Inc., 2018a).

Table 1: Directors and Officers (D&O) insurance coverage common types

Type of Insurance	Sub-Type of Insurance	Type of Coverage	Sub-Type of Coverage
		Side A: Personal Liability Cover	Excess Side A - DIC (Difference in Conditions) Management Liability Insurance
			Employment Practices Liability (EPL or EPLI)
			Fiduciary Liability
		Side B: Company Reimbursement Cover	
		Side C: Securities Entity Cover	
		Side D: Investigative costs relating to Side C	

The policies typically provide coverage for alleged “wrongful acts;” however, they do exclude claims that arise from fraudulent or intentional criminal acts. Covered D&O legal liability exposures include breach of trust, breach of duty, neglect, error, misleading statements, and wrongful trading.

KEY RISK DRIVERS BY EVENT TYPE

The risk of litigation arising from climate change-related events is a key concern for directors and consequently a key risk for the D&O class. Terms such as “corporate social responsibility” and “environmental accountability” reflect the current consensus concerning the broader responsibilities associated with corporations.

The main mechanisms to ensure accountability are legislative and policy measures. Legislation describes the actors and their responsibilities, along with assessment methods and corrective measures and penalties. In cases where legislation falls short, alternative strategies are employed to either enforce existing laws, or bring attention to the shortcomings in current legislative frameworks.

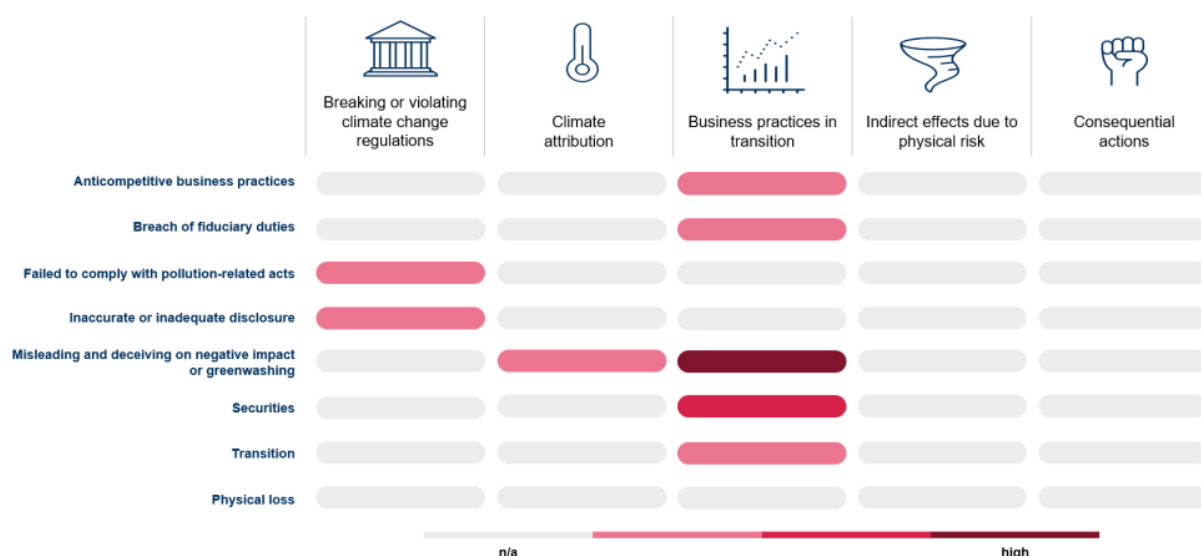
Litigation can be used as an alternative strategy to establish corporate accountability using various legal arguments. Irrespective of the origin of the litigation, failure to demonstrate compliance,

responsibility, and action in addressing climate change-related risks can put directors at risk of increasing liability exposures.

The modeled loss pathways reflect the different ways that a legal entity engaged in a certain activity type could attract a D&O claim, triggering a lawsuit. These pathways are generalizations of historical legal precedents, as well as potential future legal avenues, yet to be utilized.

[Figure 6](#) shows the key drivers of D&O risk within each event type using the modeled loss pathways, the majority of which fall under the transition event type. For those pathways with historic precedence, the number of cases illustrates the historical frequency. Precedence is a particularly important point, as addressed later in this paper, because it can pave the way for future similar litigation which can employ the same legal arguments.

Figure 6: Key loss drivers for D&O risk



The “physical loss” pathway involves suing directors for

- Lack of preparedness
- Operational disruption caused by underestimating their exposure to physical damage resulting from climate change-modified events

While there is no record, so far, of such cases in the climate change litigation database, this pathway is included to anticipate the evolving nature of the risk.

Loss pathways

The impact of climate change on Side B and Side C coverages for D&O insurance ([Table 1](#)) is illustrated through specific loss pathways that we identified by analyzing the current legal landscape in the United States ([Table 2](#), [Table 3](#), and [Table 4](#)).

The pathways outline the various channels along which adverse effects may materialize for the implicated economic sectors. We classify these channels as high, medium, or low frequency based on historical precedence of the supporting cases. Side D is not modeled separately and Side A is beyond the scope of this scenario, which aims to model the potential climate change ramifications and risks faced by insurers through their corporate portfolios.

Table 2: High frequency pathways

Coverage Type	Loss Pathway
Side B: Company Reimbursement Cover	<p>Misleading and Deceiving Statements on Negative Impact on Climate / Climate Change Risks or Greenwashing</p> <p>A company is being sued for:</p> <ul style="list-style-type: none"> ▪ Misrepresentation of their negative environmental sustainability impact by making misleading claims and deceptive practices. ▪ Greenwashing (using deceptive marketing to persuade on their green status). ▪ Failure to disclose climate-related risks. ▪ False claims and deceptive acts aiming to undermine the climate science. <p>Sectors at Risk</p> <p>Energy / Food & Agriculture / Manufacturing / Retail / Utilities</p>
Side C: Securities Entity Cover	<p>Securities</p> <p>A company is being sued for:</p> <ul style="list-style-type: none"> ▪ Greenwashing ▪ Breaches of fiduciary duties in connection with pollution event ▪ Misrepresenting / mismanaging the exposure to climate change phenomena such as extreme temperatures and sea level rise <p>Sectors at Risk</p> <p>Energy / Food & Agriculture / Manufacturing / Utilities / Real Estate - Property – Construction / Utilities</p>

Table 3: Medium frequency pathways

Coverage Type	Loss Pathway
Side B: Company Reimbursement Cover	<p>Anticompetitive Business Practices</p> <p>A company is being sued for:</p> <ul style="list-style-type: none"> ▪ Attempting to eliminate alternative competition by implementing a discriminatory pricing scheme ▪ Seeking to gain market advantage using deceptive marketing <p>Sectors at Risk</p> <p>Retail / Utilities</p>
Side B: Company Reimbursement Cover	<p>Failed to Comply with Pollution Related Acts</p> <p>A company is being sued for:</p> <ul style="list-style-type: none"> ▪ Failing to comply with a pollution related act ▪ Disclosing inaccurate or inadequate report on the level of greenhouse gas emissions <p>Sectors at Risk</p> <p>Energy / Manufacturing</p>

Table 4: Low frequency pathways

Coverage Type	Loss Pathway
Side B: Company Reimbursement Cover	<p>Breach of Fiduciary Duties</p> <p>A company is being sued for:</p> <ul style="list-style-type: none"> ▪ Actions that are against the best interest of the company and shareholders using climate change as a façade <p>Sectors at Risk</p> <p>Manufacturing</p>
Side C: Securities Entity Cover	<p>Securities</p> <p>A company is being sued for:</p>

Coverage Type Loss Pathway

- Failing to mitigate transition risk

Sectors at Risk

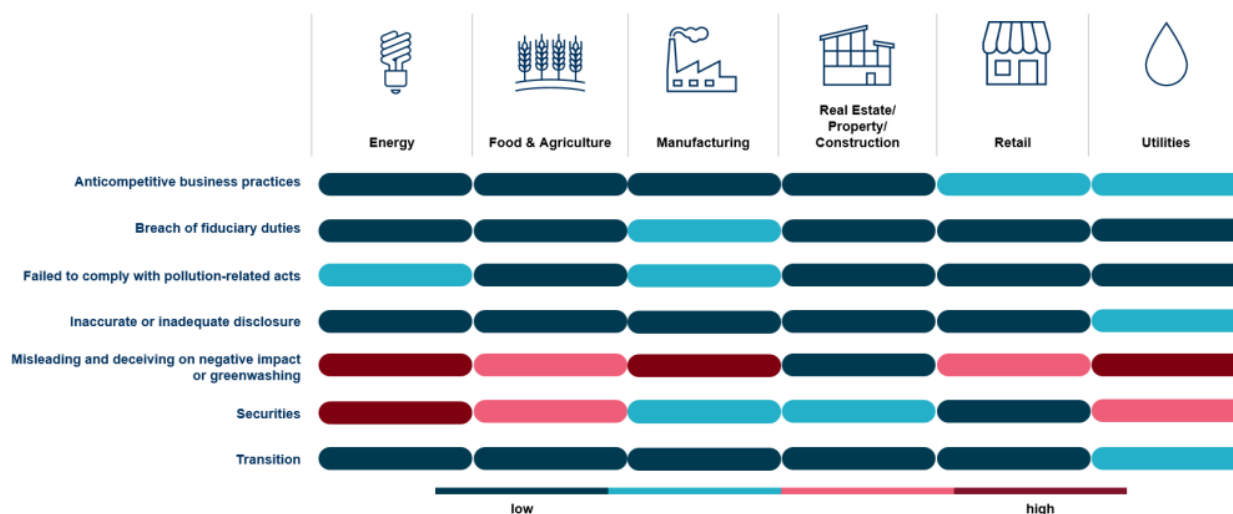
Utilities

D&O RISK BY INDUSTRY

Although no industry can be considered immune when it comes to climate change risks, there are certain industries that have already felt the impact more severely. The degree of severity is tied to their reliance on identified climate change contributors, as well as on their inability to adapt in a timely and efficient manner.

Figure 7 presents a D&O litigation risk heatmap, which highlights potential exposure to legal action across the industry sectors most affected by climate change litigation to date. The energy, utilities, and manufacturing industries are particularly vulnerable to this type of litigation risk, followed by the food and agriculture, retail, and real estate and construction sectors.

Figure 7: Industry heatmap for D&O climate change claims



Within the directors and officers class of business, the heatmap reveals that the *Misleading and Deceiving* statements and *Securities* loss pathways form the primary litigation hotspots.

THE PHYSICAL LOSS PATHWAY

Physical loss or damage represents one of the most tangible adverse impacts of climate change. Increases in the intensity and frequency of various extreme weather events, such as hurricanes, floods, heatwaves, wildfires, and storms, along with the development of chronic risk for example from the rise in sea levels, can lead to significant physical losses and damage directly impacting property insurance books.

However, physical loss could also act as a trigger for legal actions, giving rise to consequential insurance implications and hence posing a material risk. The flooding of low-lying areas, damage to coastal infrastructures from rising sea levels or more frequent intense storms, or crop failures resulting from meteorological change are examples of physical damage that could potentially lead to indirect legal losses.

Climate change-related physical losses may lead to legal actions against responsible entities such as corporations, governments, or insurance companies following both direct and indirect pathways. The legal ramifications of physical loss extend beyond the immediate impact involving environmental regulations, third-party liabilities and complex legal frameworks.

“Legal avenues” could include businesses or individuals taking a legal route to recover losses incurred from property damage from climate-related disasters. They may also include third-party liabilities arising from failures to mitigate climate change-related physical risks. Additionally, legal actions may seek compensation for economic losses suffered, due to disruptions in operations caused by the physical impacts of climate change.

According to the findings from the No Additional Action (NAA) Climate Biennial Exploratory Scenario (Bank of England, 2022), if no additional action to address climate change is taken by 2050, a dramatic increase in physical losses is to be expected. The participating insurers are projecting a 70 percent increase in average annual loss, identifying the expected intensification of hurricanes as the principal driver of the physical risk in the United States. Wildfire losses demonstrated the greatest percentage increase within the scenario horizon, indicating that they may be significantly material under future conditions.

For physical loss liabilities, physical risk modeling techniques can be used to quantify the impact of different climate conditions and identify potential triggers for litigation. Moody's has released a suite of climate change models including the Moody's RMS North Atlantic Hurricane Climate Change Models, the Moody's RMS Europe Inland Flood Climate Change HD Models, Moody's RMS™ Japan Typhoon Climate Change HD Model and Moody's RMS Europe Windstorm Climate Change HD Models, all of which enable the user to assess the physical risk across different climate change scenarios.

This section uses the fictional Hurricane Kayla scenario (Cambridge Centre for Risk Studies, in collaboration with Risk Management Solutions, Inc., 2018b) to illustrate the transformation of physical-related D&O risk across different representative concentration pathway (RCP) scenarios and time horizons. Hurricane Kayla is a counterfactual Hurricane Katrina event which assumes that a strong hurricane hits the Gulf of Mexico in the United States over a September weekend leading to destructive winds, storm surge, and heavy rainfall.

This hypothetical hurricane results in extensive power outages, property damage, business and societal interruptions, and significant loss of human lives. The hurricane footprint directly hits significant

energy and marine assets, and is located slightly west of the modeled Hurricane Katrina footprint seen in 2005.

[Table 5](#) illustrates the loss pathway that connects D&O insurance coverages to claims within the context of this scenario. A storm as severe as Hurricane Kayla has the potential to motivate shareholders to seek compensation for corporate losses due to lack of readiness plans, limited access to insurance, and poor execution of readiness plans.

Table 5: D&O loss pathway (physical)

Loss Pathway:	
Class of Business	Casualty and Liability
Type of Insurance	Casualty and Liability Directors and Officers (D&O)
Sub-Type of Insurance	
Coverage	Side C - Securities Entity Cover
Civil Legal Liability Exposure	Wrongful Act, breach of duty
Narrative	Company share price drops due to hurricane disruption and lack of reasonable preparedness. Class action from shareholders who are not happy at the loss and concerned that the Company did not report their exposure to climate change events in their annual filings.

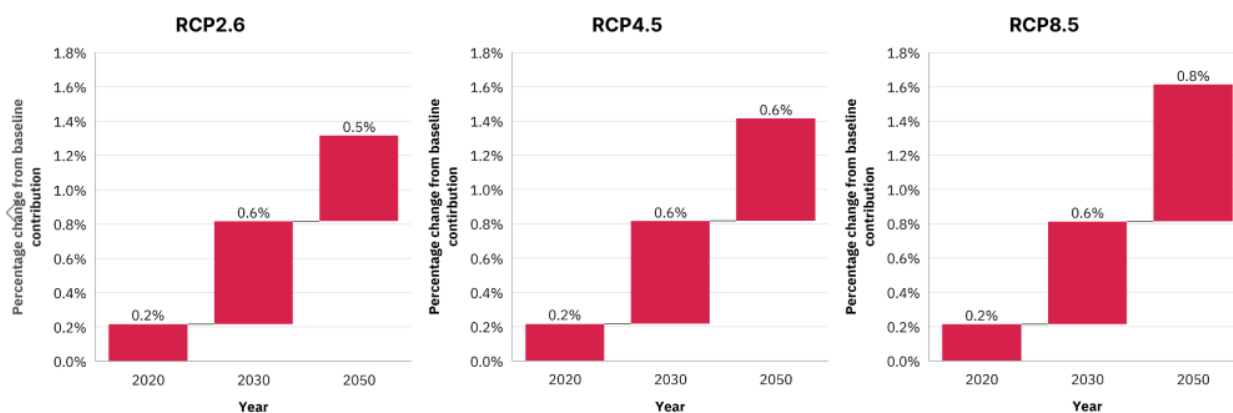
Shareholders may perceive these shortcomings as breaches of directors' duties, prompting them to take legal action to hold responsible parties accountable for the financial losses incurred from the hurricane's impact.

To assess the sensitivity of this physical D&O pathway to the changes in physical risk from anticipated sea level rise, we used the Moody's RMS™ U.S. Hurricane Climate Change Model for illustrative RCP time horizon pairs. RCPs were defined in the Intergovernmental Panel on Climate Change (IPCC) as "four different twenty-first-century pathways of GHG emissions and atmospheric concentrations, air pollutant emissions and land use. The RCPs include a stringent mitigation scenario (RCP2.6), two intermediate scenarios (RCP4.5 and RCP6.0), and one scenario with very high GHG emissions (RCP8.5)." (IPCC, 2014)

This analysis examines how D&O losses evolve from the present day to 2050 for the representative concentration pathways (RCP) 2.6 and 4.5 scenarios. For the most extreme scenario, RCP8.5, we

extended the analysis to 2100. [Figure 8](#) shows how the D&O contribution to the total (property + D&O) pure premium changes compared to the baseline for U.S. Hurricane Climate Change Model states.⁶

Figure 8: D&O percentage change to baseline contribution to the total pure premium



As anticipated, the most significant changes are observed in the high emissions scenario, RCP8.5, where the modeled increase in the D&O contribution to the total pure premium is notable; by 2050, the D&O contribution rises to 1.6 percent compared to the baseline.

This analysis focuses on quantifying the impact from a single loss pathway, specifically accounting for changes in sea levels and not rates of hurricane occurrence. Therefore, the actual impact could be even more significant when considering additional factors, and additional D&O loss pathways related to climate change.

ASSESSING MATERIALITY – LEGAL AVENUES

Access to the U.S. legal system could be limited by various issues, including the separation of powers among the judicial, legislative, and executive branches, and related doctrines such as standing, political and displacement. The cost of legal proceedings can also pose a barrier to accessing the legal system.

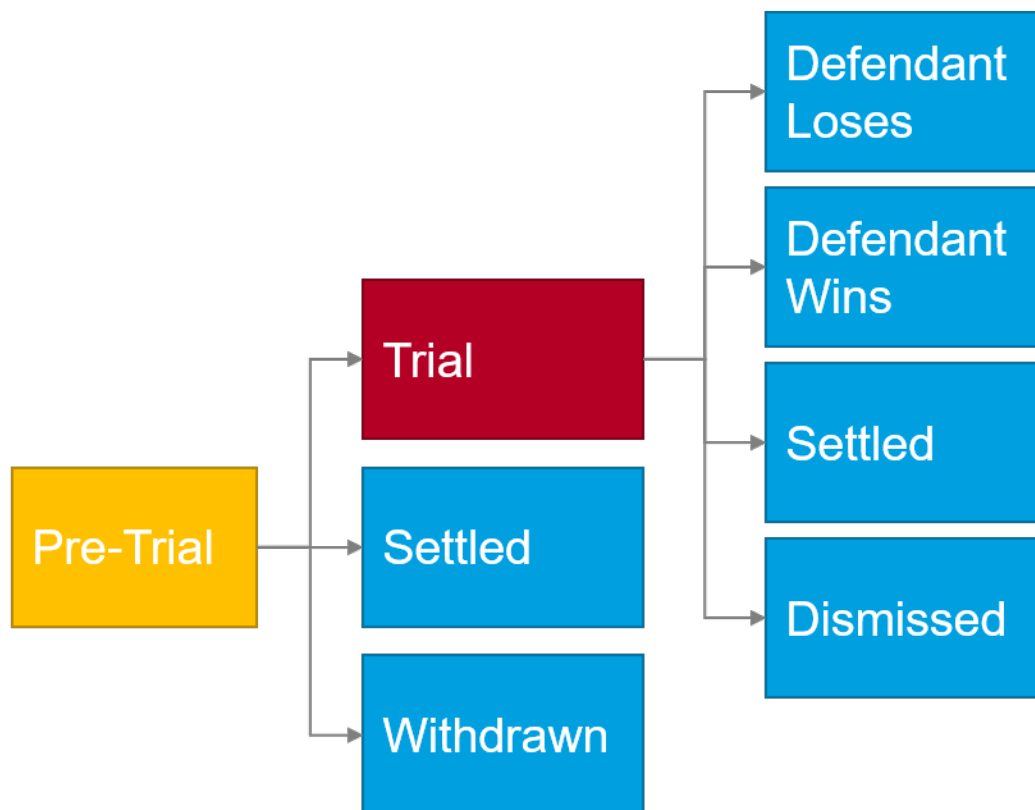
The route a case follows within the legal system depends on various factors, including the nature of the claim, the type of legal argument being made, and the jurisdiction in which the case is filed. Different types of claims follow distinct legal processes, and the jurisdiction in which a case is filed determines which laws, rules, and precedents may apply. All these factors collectively shape the trajectory of a case within the legal system, highlighting the importance of a litigation model that captures those factors, and parameters that influence the likelihood and magnitude of litigation arising from climate change-related liabilities.

[Figure 9](#) is a graphic representation of the litigation model considered in the liability modeling framework. Each outcome is associated with a probability of occurrence, damage type, and legal costs specific to that loss pathway type. The legal route and potential outcomes depend on several factors. Therefore, pathway-specific realizations of this model align with the unique parameters arising from

⁶The U.S. Hurricane Climate Change Model includes the following states: Alabama, Connecticut, Delaware, Florida, Georgia, Louisiana, Maine, Maryland, Massachusetts, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Texas, Vermont, Virginia, Washington, D.C and West Virginia

variations in the nature of the claim, the jurisdiction of the filing, and even the type of plaintiff and defendants involved.

Figure 9: A graphic representation of the liability modeling framework’s litigation model



The Native Village of Kivalina v. ExxonMobil Corp. case serves as an example where the type of legal argument employed had a negative impact on the likelihood of a successful lawsuit outcome. In this case, a federally recognized, self-governing tribe of Inupiat Native Alaskans filed a lawsuit against the ExxonMobil Corporation, seeking compensation for the damage caused by climate change impacts on their coastal community. [Table 6](#) shows how this historical case feeds into the climate change litigation scenario framework.

Table 6: Native Village of Kivalina v. ExxonMobil Corp. pathway overview

Pathway Overview	
Filing Date	2008
Jurisdiction	U.S.
Description	Action by native Alaskans seeking damages from oil and power companies for impacts of climate change on their village

Pathway Overview

Civil Legal Liability	Tort - Nuisance
Liability Type	Commercial General Liability (CGL)
ESG	E
Pathway	Physical damage due to climate change-enhanced phenomena
Risk	Damage: low; legal costs: high

Nuisance tort cases such as this have not seen any success so far, and fail to progress in the context of climate change. One of the most significant barriers to successful litigation is providing evidence to establish violation of duty of care and causal attribution. The global and cumulative nature of emissions pose a significant challenge in linking specific defendants to the impact of climate change, and the establishment of a direct causal link between their actions and the specific harms suffered by plaintiffs.

Despite the limited success of these cases in the courts, they are considered “strategic” since they often attract the media and public attention. As a result, these cases can still pose financial risks to the implicated parties, acting as triggers for subsequent legal actions, reputational risk, or shifts in consumer behaviors and corporate practices, with further economic ramifications. A selection of cases that could potentially act as tipping points has been identified and documented by a scenario analysis working group on climate litigation risk in a report recently issued by the Climate Risk Financial Forum (Climate Risk Financial Forum, 2022).

Along with the type of legal argument, jurisdiction also plays a significant role in shaping the outcome of a legal claim. Factors such as the degree of willingness to impose a particular type of liability, and the presence (or lack) of specific legislation regulating the disclosure of climate risk exposure, can have a notable impact on the outcome of a legal claim. For example, class actions around the consequences of climate change, seeking financial redress from a company’s directors related to their actions under duty of care and due diligence, have better prospects in class-action friendly jurisdictions such as the U.S. and Australia.

A study on the impact of climate litigation on firm value (Sato, et al., 2023) finds a causal link between climate litigation and stock prices. An unfavorable court decision, or even a filing of a climate case, reduces firm value by 0.41 percent on average. The largest stock market responses are observed for cases against Carbon Majors, with a 0.57 percent reduction following filings and a 1.50 percent reduction following unfavourable judgments. “Novel” cases involving innovative legal avenues also trigger significant market reactions.

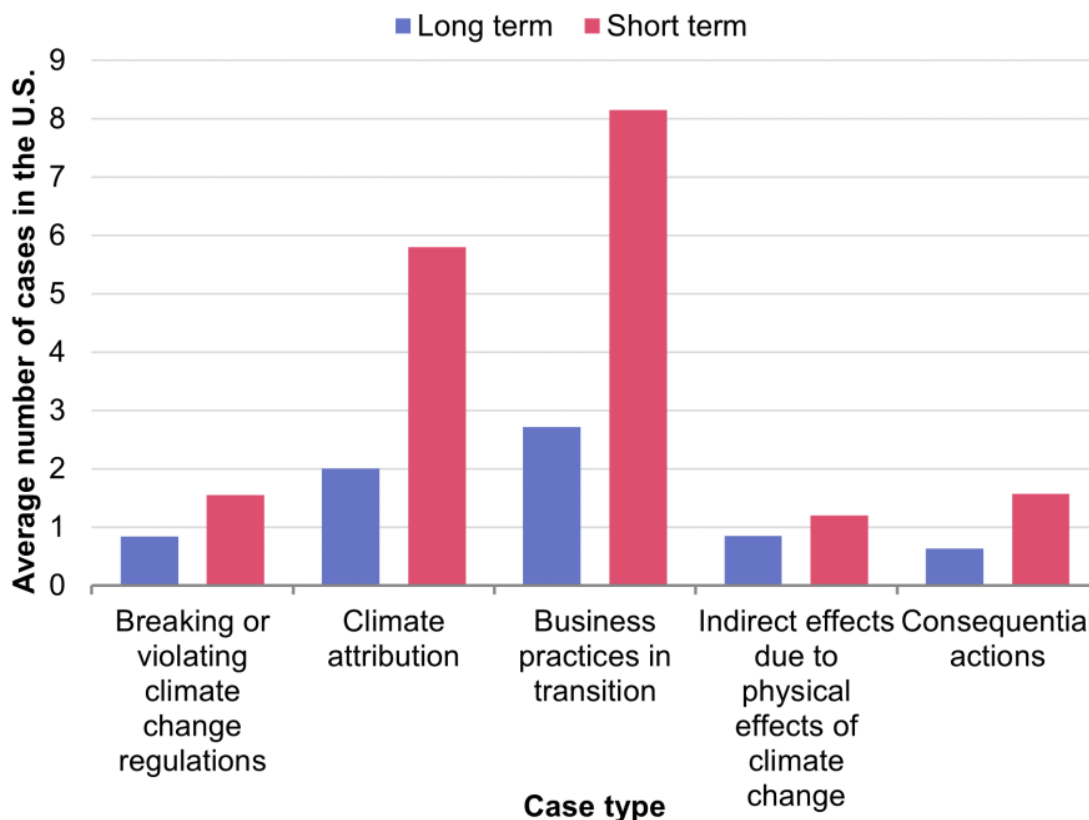
FORWARD-LOOKING VIEW: RATES

The evolving nature of climate change-related liability risk poses challenges when attempting to predict future risks. While analyzing historical data can provide valuable insights into past trends and impacts, relying solely on those to predict future liability risk is not always the best practice. Legal liability definitions evolve over time due to changes in legal and social environments, and emerging technologies like AI introduce new sources of risk. This dynamic nature of risk requires a comprehensive approach that incorporates both historical analysis and forward-looking assessments.

Previous sections used the historical frequency of potential D&O implicating lawsuits to describe the current situation and highlight existing conditions in the liability space in the United States. [Figure 10](#) shows the long-term and short-term average annual number of cases for events that can potentially manifest as insurance liability risk. The long-term average uses the entire data from 1961 to the present, while the short-term average represents the most recent trends by focusing only on the last five years.

A similar acceleration can be observed in transition related events as that seen in climate attribution events, a trend particularly evident in the short-term average.

Figure 10: Average number of cases by event type in the U.S.



To craft a forward-looking perspective on the climate change-related legal landscape, we need to consider several key factors. For example, we need to: incorporate RCP scenarios, monitor tipping point cases, assess the availability of litigation funding, and estimate anticipated consequent litigation, as

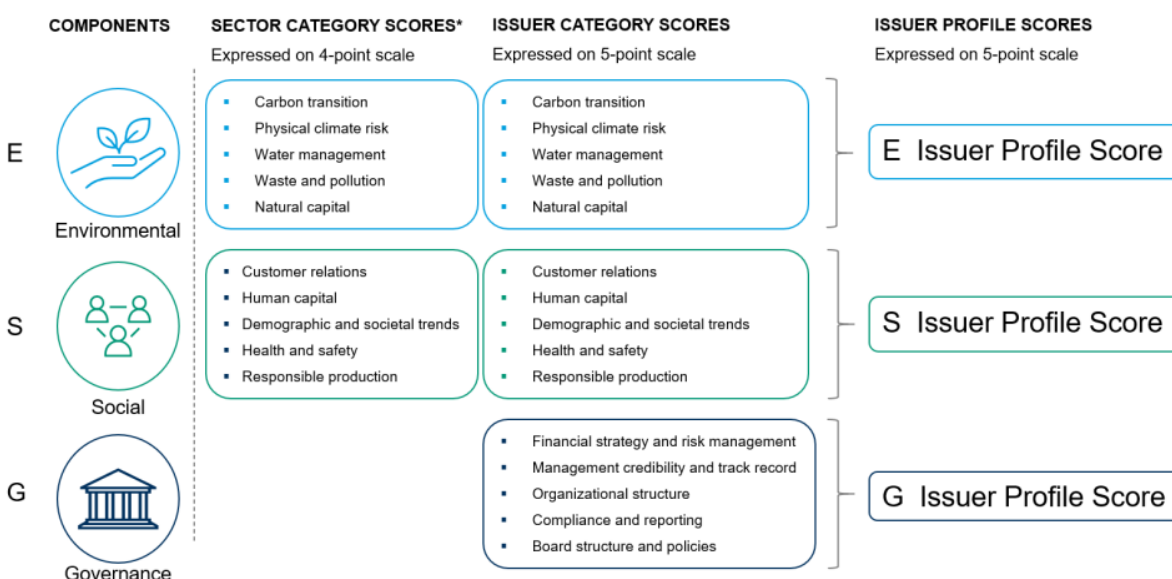
plaintiffs become more creative in navigating the legal challenges and opportunities associated with climate change.

- **RCP scenario assumptions**—Different representative concentration pathway (RCP) scenarios represent different trajectories of GHG emissions. If governments align their targets with the stringent scenario, there will be a rise in litigation related to transition and adaptation risks. On the contrary, aligning with the more relaxed trajectory through the transition to a greener economy, will reduce legal disputes due to disruptions in business practices but may give a rise to cases belonging to the *indirect effects due to physical risk* category.
- **Tipping point cases**—We define tipping point cases as those that could trigger significant changes in how climate change-related issues are addressed. These landmark cases can influence the legal landscape by shaping legal doctrines and prompting policy and regulatory responses.
- **Consequent litigation**—As legal precedents are set, new avenues for litigation may emerge, leading to a cascading effect where one legal action paves the way for subsequent lawsuits. This can include follow-up claims against similar defendants or related industries.
- **Litigation funding**—The availability and accessibility of litigation funding play a significant role in shaping the legal landscape. Adequate funding removes the cost barrier and enables plaintiffs to pursue legal actions against entities responsible for climate change impacts.

Climate change litigation in the context of ESG

Over the past years, the environmental, social and governance (ESG) concept has become a dominant matter among many companies and their investors. Increased awareness of climate change issues has led to an initial focus on the environmental aspect, covering areas such as pollution, energy use, waste management, and animal welfare. However, despite environment being at the top of the ESG agenda, the social and governance pillars continue to gain importance and areas such as health and safety, transparency, and disclosure require attention ([Figure 11](#)).

Figure 11: Environmental, social and governance (ESG) framework – private sector



*Sector category scores are a general reference point for issuer category scores

Source: Moody's Investors Service

The ESG framework is useful for evaluating a company's position in relation to the risks associated with each of the three main pillars. Long-term exposure to issues related to greenhouse gasses, regulatory compliance, or human rights have financial implications that are often not captured by other traditional metrics.

While the environmental aspect of climate change is undeniable, climate change litigation extends beyond that realm. Legal actions related to climate change often seek transparency and disclosure from corporate or governmental entities regarding their activities and practices, to understand the climate-related risks associated with industries, projects, or policies.

As a result, litigation data could help us to identify and highlight vulnerabilities across the whole ESG spectrum. Legal actions that relate to discrimination based on views on climate change, or anti-competition practices that use climate change as a façade, for example, are touching upon the social and governance pillars respectively.

IMPACT BY SECTOR IN THE U.S.: CURRENT VIEW

ESG scores utilize a combination of industry-specific metrics to evaluate and continuously monitor a company's exposure and risk mitigation efforts, for all relevant issues in each of the pillars. High scores highlight areas where the risk is being sufficiently addressed, while low scores indicate material exposure to risks.


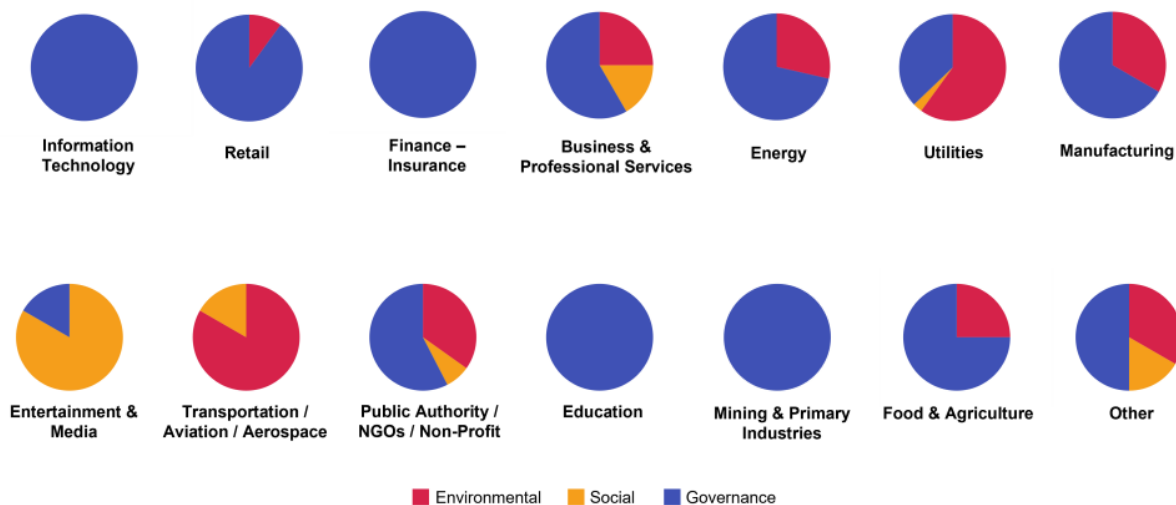
Climate change litigation is becoming a growing issue in the current ESG landscape and can affect the performance of any of the three pillars at various degrees.  shows the potential contribution of climate change litigation to the ESG performance for the different sectors, using the loss pathways methodology against the historical climate change litigation data for the U.S..

Figure 12: ESG vulnerabilities by sector using climate change litigation



By exploring the climate change scenario loss pathways, the relevant ESG pillars can be identified. Most of the loss pathways and corresponding lawsuits are mapped to the governance pillar, which aligns with the nature of legal risk. However, there are specific sectors, such as transportation and utilities, where the environmental pillar remains the largest vulnerability.

These results do not represent a projection or future trend. Instead, they reflect the current situation in the U.S. based on the number of cases examined.⁷

⁷Analysis based on data from: <http://climatecasechart.com/> - Accessed 02/2023

Conclusion

Effective assessment of complex and emerging liability risk is essential to form a comprehensive perspective on insured risk. Moody's is committed to supporting the industry in shaping a holistic view of risk and will continue advancing its liability initiatives, including the modeling of liability risks associated with climate change.

This ongoing effort involves the further development of the comprehensive liability framework that aims to quantify potential liability risk across all lines of liability insurance, enabling a thorough risk assessment of insured portfolios against various scenarios. To ensure comprehensive coverage, the current scenario suite will be expanded to include a wider range of scenarios spanning across different threat categories.

Engagement with the casualty insurance market has allowed Moody's to gain valuable insights and collaborate in developing effective liability modeling approaches. We invite (re)insurers and those involved in the liability insurance market to continue to explore these issues with Moody's, to help maintain a well-informed position regarding the dynamic liability risk, and to support the development of data and risk modeling solutions that align with the industry's needs.

Currently, we provide access to the modeling capabilities within the liability initiative exclusively through consulting services. Further information and guidance can be obtained by contacting the dedicated account teams, or Moody's Support.

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