SOA Research Institute

CAS

16th Emerging Risk Survey

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16th Emerging Risk Survey

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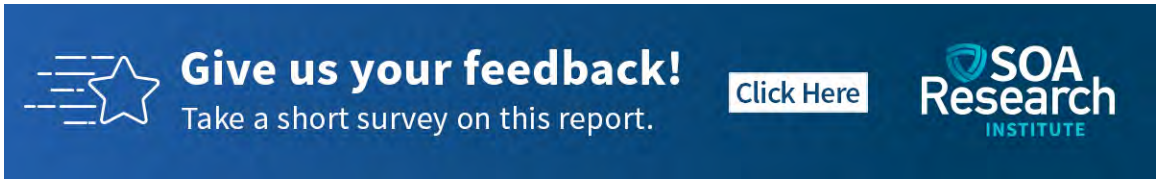

Caveat and Disclaimer

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16th Emerging Risk Survey

This survey attempts to track the thoughts of risk managers about emerging risks across time. It is the 16th survey of emerging risks sponsored by the Casualty Actuarial Society (CAS) and Society of Actuaries (SOA). The researcher thanks the Financial Reporting, Reinsurance and Joint Risk Management Sections for their financial support.

To understand the results of this year's survey, some context is important. The survey was open during November 2022, a period that followed Hurricane Ian and continuing stories about the war in Ukraine and the pandemic, but prior to the release of new artificial intelligence tools. Phenomenon enhanced by climate change, like extreme weather and wildfires, occurred regularly across the globe.

Trends about emerging risks are as important as absolute responses, helping risk managers contemplate individual risks, combinations of risks and unintended consequences of actions and inactions. The survey responses, especially the comments, give risk managers a way to anonymously network with peers and share innovative ways they think about risk. Each completed survey helps those who participate think more deeply about the topic, and it is anticipated that the reader will benefit in this way as well.

The Executive Summary contains a high-level overview of the survey, and the Results section provides commentary about the survey in its entirety. Appendix I includes the current definitions for all 23 individual risks. Complete survey results can be found in Appendix II, allowing the reader to scan specific sections or questions, and includes every comment received for the open-ended questions. Everyone has a different level of expertise and experience, and personally reviewing the comments will allow the reader to reach their own conclusions and pick out ideas that are useful to them. Appendix III provides a link for those interested in reviewing reports, podcasts, articles and other material from previous surveys in the series. A separate source of information has been provided in a Tableau program[1] that allows the reader to look at some of the results in interesting ways and as they wish. A companion document, referred to as the Guide for Use report, was released with the 15th survey and walks the reader through ways to make the document useful to practitioners. Sections discuss each risk and historical data associated with it, as well as how the reader might approach interpreting the report if they choose not to do it through reading Appendix II.

[1] The Tableau data can be accessed here

1. Heat Map: Time Series https://tableau.soa.org/#/site/soa-public/views/EmergingRisks16thReport_v2021_1/1_HeatMapTimeSeries
2. Heat Map: One Year at a Time https://tableau.soa.org/t/soa-public/views/EmergingRisks16thReport_v2021_1/2_HeatMapOneYearataTime
3. Histogram: Time Series https://tableau.soa.org/t/soa-public/views/EmergingRisks16thReport_v2021_1/3_HistogramTimeSeries
4. Histogram: One Year at a Time https://tableau.soa.org/t/soa-public/views/EmergingRisks16thReport_v2021_1/4_HistogramOneYearataTime
5. Average https://tableau.soa.org/t/soa-public/views/EmergingRisks16thReport_v2021_1/5_Averages

Section 1: Executive Summary

The year 2022 began the return to normal from the pandemic, with some people and countries spanning the continuum from continued lockdowns to no restrictions. There were enough alternative risks and events to distract us that many have already been forgotten. China, India and the North American West suffered from a long heat wave and drought, while floods hit Pakistan. Sri Lanka experienced a cluster of risk events: physical, political and environmental. The financial bubble created by low interest rates saw cracks as central banks tried to return to normal. Companies saw supply and demand issues during the pandemic and now debt cost is rising, which will cause zombie companies to face creative destruction and free up the capital for better uses. Crypto markets were stunned with the BTX bankruptcy and charges against the management team. However, the most consequential series of events started with Russia's invasion of Ukraine, which impacted global energy, currency and food security concerns. Since the survey closed in November, China released its COVID-19 lockdown all at once and survived without creating more lethal variants, but it is becoming clearer that the indirect costs of the pandemic in China, the U.S. and elsewhere around the globe were large. Deaths remain above historic trends due to long-COVID, but also in reaction to missed doctor visits, mental health challenges and heightened addiction.

This evolution of risks is captured in the *16th Emerging Risk Survey*, completed in November 2022. Risk managers can add value by looking at risk clusters, where multiple events occurring could lead to insolvency, and threat multipliers where a risk amplifies other risks and creates problems. Regularly taking time to consider emerging risks can aid proactive scenario planning and provide a competitive advantage without drowning a firm in detailed models.

Global economic expectations reached their lowest point using one metric. War and its uncertainties interact with concerns that are economic, climate-based due to technology and, of course, the pandemic and other health concerns. Next year will we be talking about COVID, a new issue tied to the Marburg virus, antimicrobial resistance, microplastics or a new technology? There are many emerging risks to choose from. New ones will receive publicity, but hopefully produce minor issues and easy solutions.

The responses across all questions show reduced perceived risk from pandemics from the previous two surveys. Several open-ended questions solicited the respondent's experience with the pandemic and how it changed the risk team's regular workload. Responses in this survey continue to show that trust was earned and new duties include greater involvement in strategic planning.

1.1 SURVEY FRAMEWORK

This survey is completed annually (except in 2008, which included two iterations, spring and fall), generally in November. In addition to the top emerging and top five emerging risks, the survey also looks at the top current risk and risk combinations. Combinations of risks often follow the patterns shown when looking at emerging risks one at a time, but sometimes also reflect surprises. Some risks are more common when viewed with others than by themselves. This paper will review these quantitative responses, looking for material changes and trends, in addition to considering qualitative risk assessments and current topics. First, we will review the questions that headline the survey.

Respondents selected from 23 risks in five categories as follows. When a chart shows 24 risks, the last one is *Other*, and the survey asks specifically which risks are missing so they can be considered in the future. Some risks that will be considered for increased exposure are disinformation, social media and long-term remote work environments. Appendix I includes definitions used in the survey for each risk and is a key output item of the survey.

Economic Risks

1. *Energy price shock*
2. *Currency shock*
3. *Emergent nation destabilization*
4. *Asset price collapse*
5. *Financial volatility*

Environmental Risks

6. *Climate change*
7. *Loss of freshwater services*
8. *Natural catastrophe: tropical storms*
9. *Natural catastrophe: earthquakes*
10. *Natural catastrophe: severe weather*

Geopolitical Risks

11. *Terrorism*
12. *Weapons of mass destruction*
13. *Wars (including civil wars)*
14. *Failed and failing states*
15. *Transnational crime and corruption*
16. *Globalization shift*
17. *Regional instability*

Societal Risks

18. *Pandemics/infectious diseases*
19. *Chronic diseases/medical delivery*
20. *Demographic shift*
21. *Liability regimes/regulatory framework*

Technological Risks

22. *Cyber/networks*
23. *Disruptive technology*

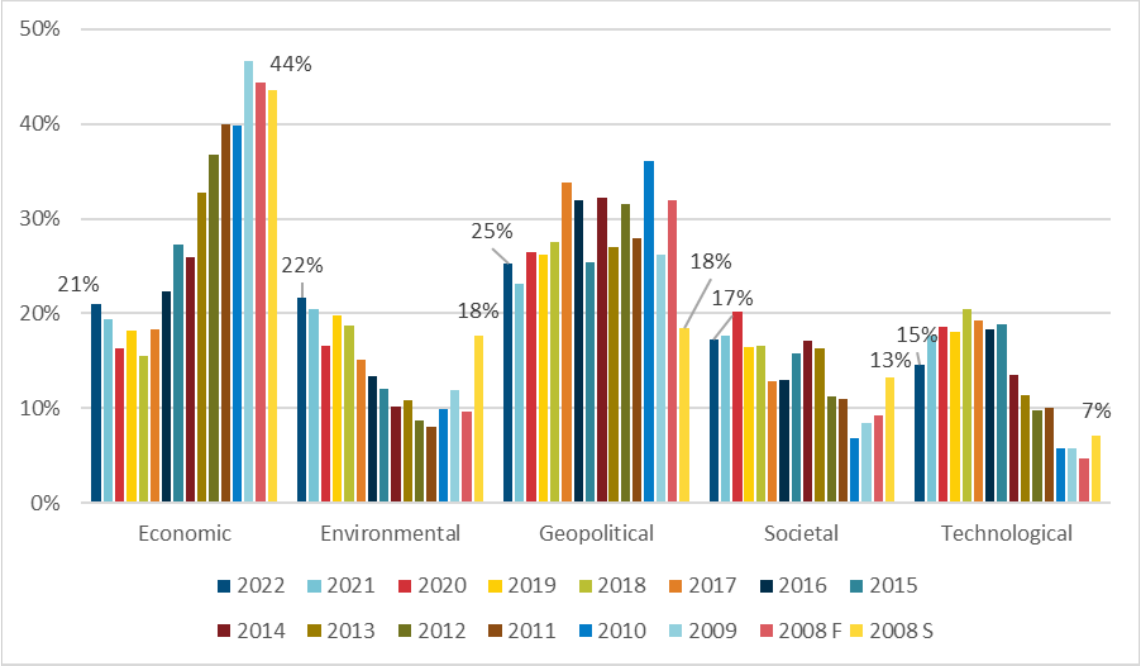
1.2 TOP FIVE EMERGING RISKS

Category trends continued to evolve in this 16th survey. Figure 1 shows the pattern of responses when respondents were asked to choose their top five emerging risks from among 23 individual risks (and *Other*). The risks roll up into five categories (Economic, Environmental, Geopolitical, Societal and Technological). The Geopolitical category of risks increased 2% from the prior survey (25% of the total chosen when up to five emerging risks were selected) and remained the most popular category. Three of the five categories were over 20% and Environmental retained second place (22%), just ahead of Economic (21%). Societal (17%) and Technological (15%) had the lowest response rates, but each had an individual risk inside the top five overall. The Economic, Geopolitical and Environmental categories each rose by 2%. The uppermost choice, and jumping to second place overall, from the Geopolitical category was *Wars (including civil wars)* (43% of respondents chose it in their top five, an increase of 19% from the prior survey).

Figure 1

EMERGING RISKS BY CATEGORY (UP TO FIVE RISKS CHOSEN PER SURVEY)

% of Responses in Given Year



Risks with new highs across the survey history were *Energy price shock* (25%), *Loss of freshwater services* (18%) and *Wars (including civil wars)* (43%). New lows were recorded by *Emergent nation destabilization* (9%), *Terrorism* (9%), *Failed and failing states* (10%) and *Cyber/networks* (42%). From the prior iteration of the survey, three of the four Societal risks were higher, with only *Pandemics/infectious diseases* being lower.

Climate change remains the top response to this question, focused on the top five emerging risks for respondents, followed by *Wars (including civil wars)* and *Cyber/networks*.

The evolution of the top five risks chosen supports general continuity between survey iterations. As shown in Table 1, several risks have remained consistently at the top over the past four years.

Table 1

TOP FIVE EMERGING RISKS, 2019–2022

	2022	2021	2020	2019
1	Climate change	Climate change	Climate change	Climate change
2	Wars (including civil wars)	Cyber/networks	Cyber/networks	Cyber/networks
3	Cyber/networks	Pandemics/infectious diseases	Pandemics/infectious diseases	Disruptive technology
4	Financial volatility	Disruptive technology	Disruptive technology	Demographic shift
5	Demographic shift	Financial volatility	Financial volatility	Financial volatility

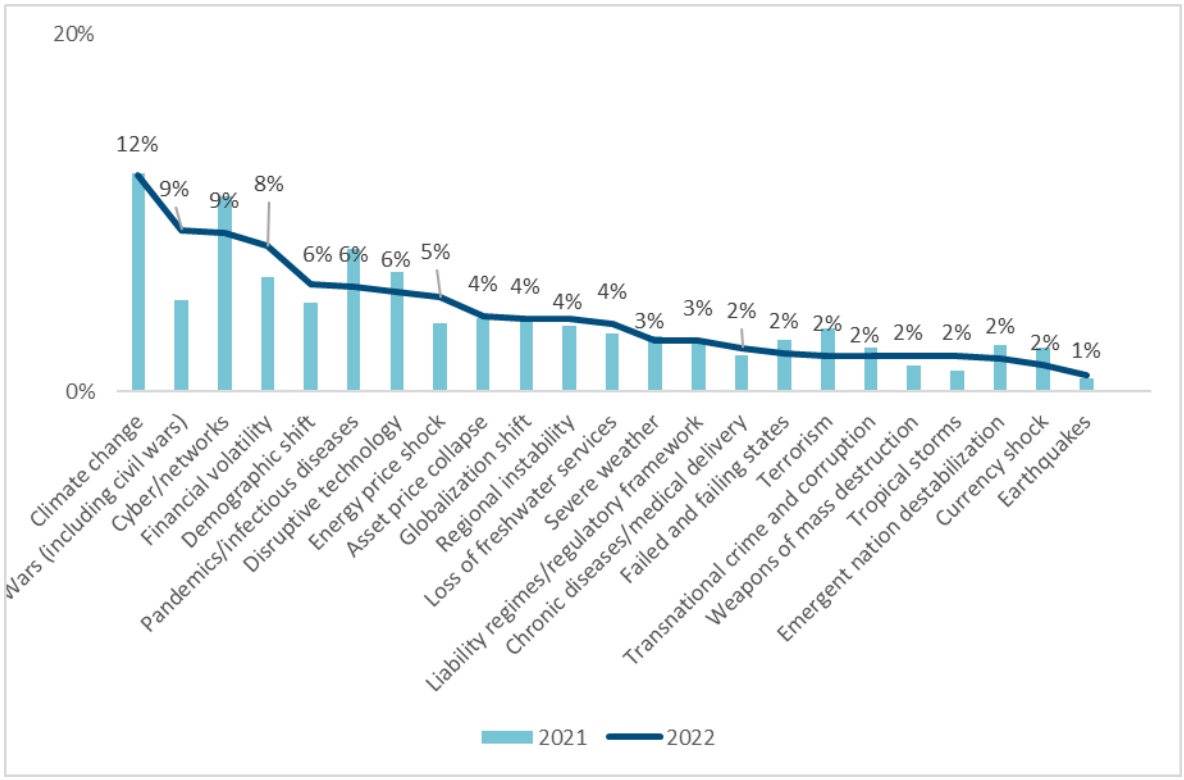
Four risks increased materially from the previous survey when respondents were asked to choose their top five emerging risks. *Energy price shock* increased from 18% to 25%, *Financial volatility* was up 9%, *Wars (including civil wars)* was up 19% and *Demographic shift* was up 6%. Four risks were down 5% or more,

including *Terrorism* (8%), *Pandemics/infectious diseases* (10%), *Cyber/networks* (10%) and *Disruptive technology* (6%).

Figure 2 shows the results for the top five emerging risks from the most recent two surveys, listed in order of the rankings from 2021, highlighting some large changes for a few risks. The increases in *Weapons of mass destruction* and *Natural catastrophes: tropical storms* are as interesting to consider as *Wars (including civil wars)* and *Energy price shock*.

Figure 2
YEAR-OVER-YEAR EMERGING RISKS (UP TO FIVE RISKS CHOSEN PER SURVEY)

% of Responses in Given Year



1.3 TOP EMERGING RISK

When asked for a single emerging risk from the respondents' top five, the results saw some repositioning, with *Climate change* maintaining its lead and *Financial volatility* increasing by 5% into a distant second. The top two risks represent 43% of the total responses.

The results for the top emerging risk question were as follows (61% of respondents selected one of the top five, up slightly with the previous survey):

1. *Climate change* (28%, up from 26%)
2. *Financial volatility* (15%, up from 10%)
3. *Demographic shift* (8%, up from 7%)
4. *Cyber/networks* (7%, down from 13%)

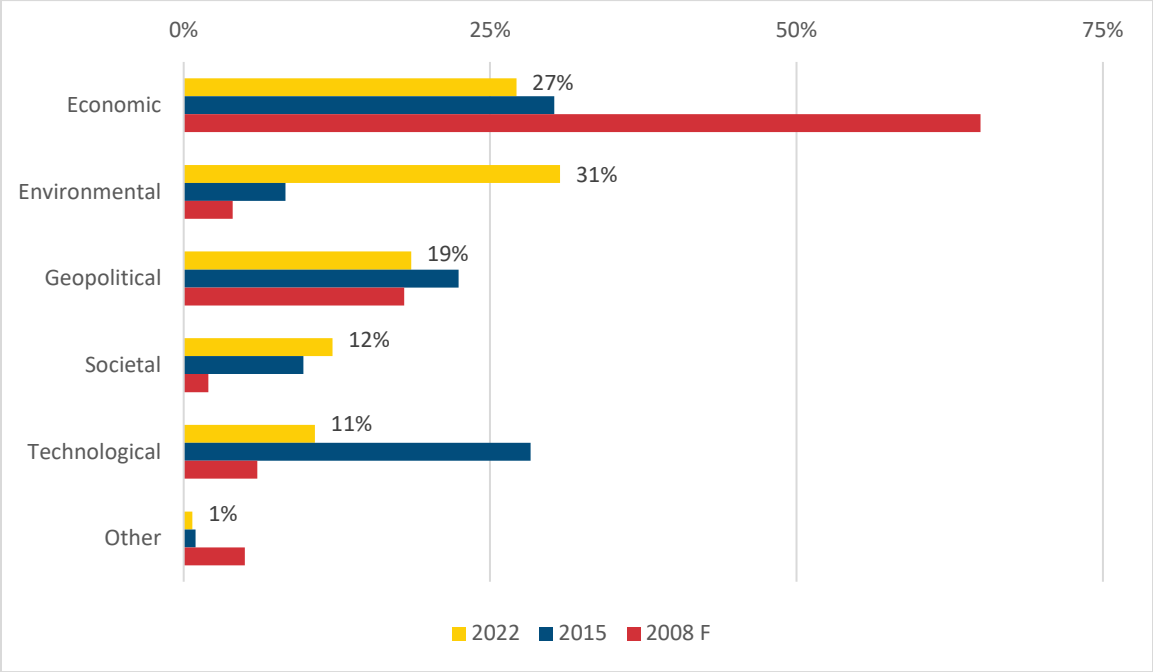
Two Environmental risks, and four overall, were the only ones not chosen as the top emerging risk. *Natural catastrophe: tropical storms*, *Natural catastrophe: earthquakes*, *Currency shock* and *Terrorism* were not chosen. *Climate change* responses kept the Environmental category (31%, up from the previous year's 27%), just ahead of the Economic category (27%, up from 23%, and at its highest level since 2016).

Figure 3 shows how the categories have evolved over the history of the survey, with recent increases in the Environmental and Societal categories offset by recent reductions in the Technological category.

Figure 3

TOP EMERGING RISKS BY CATEGORY—SINGLE GREATEST IMPACT

% of Responses in Given Year



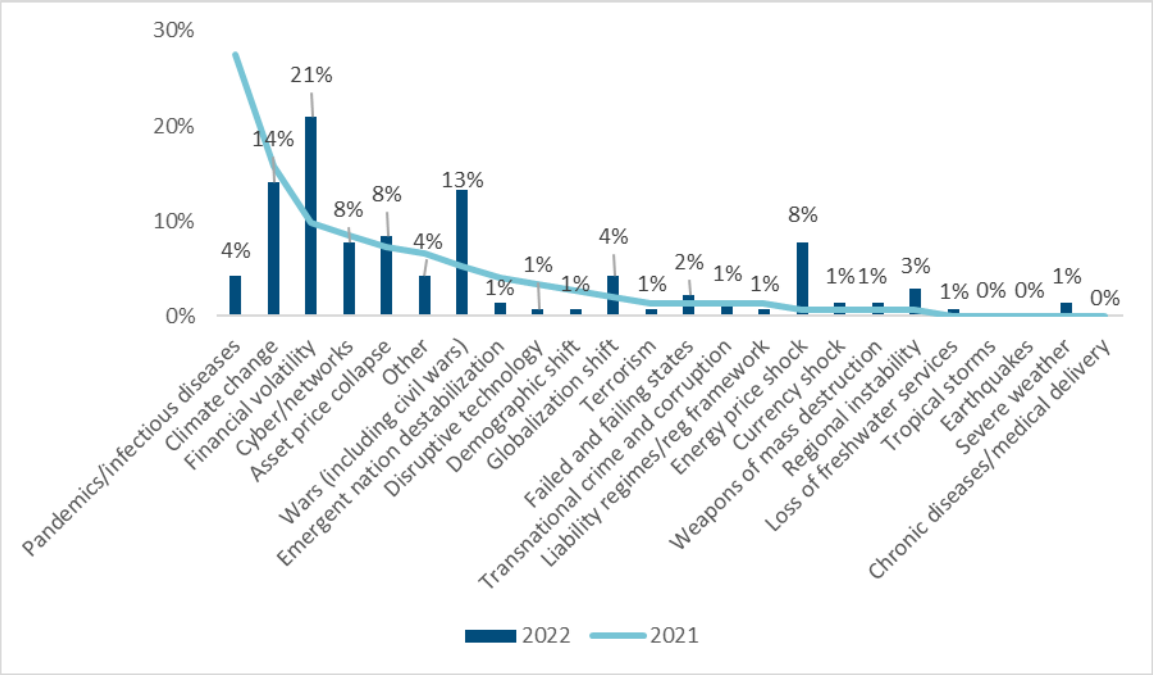
1.4 TOP CURRENT RISK

Last year's top current risk fell completely out of the top five in this year's survey as *Pandemics/infectious diseases* fell from its survey high of 45% in 2021 to 4%. *Financial volatility* is the new leader with 21%. *Wars (including civil wars)*, at 13% and up from 5% previously, and *Energy price shock*, up to 8% from 1%, are the big movers. Three risks received no support: *Natural catastrophe: tropical storms*, *Natural catastrophes: earthquakes* and *Chronic diseases/medical delivery*.

Figure 4

TOP CURRENT RISK, YEAR OVER YEAR

% of Responses in Given Year

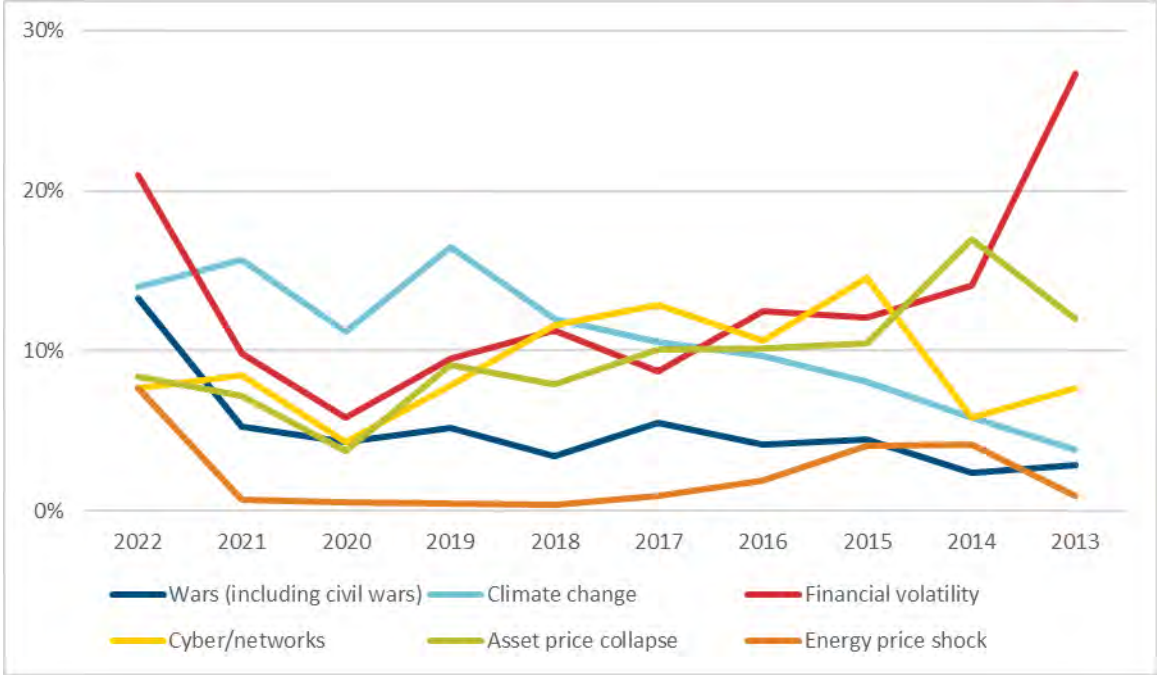


When looking at the 2022 list of top current risks over the last 10 surveys in figure 5, one can see stories unfold: a steady buildup in the realization that climate change will impact traditional actuarial practice areas, slow increases followed by a spike in the concern about wars, a volatile technology concern that seems to ebb and flow opposite pandemics and other spikes, and the growing distance and recent resurgence of economic risks. A single-year change is a lagging indicator, but a trend can be more meaningful to the risk manager.

Figure 5

TOP CURRENT RISK, 10-YEAR TREND FOR TOP FIVE RESPONSES

% of Responses in Given Year Based on all Responses (multiple allowed)



1.5 RISK COMBINATIONS

There are several ways to think of risk combinations. Compound risks are correlated risks that impact a specific result. An example of this would be the interaction between climate change, financial growth and regional conflicts that cascade across geographical regions and financial sectors. Risk clusters do not require correlation, looking at multiple risks that an organization, like an insurer or reinsurer, could incur either in parallel or sequentially. Risk combinations can be insightful, as readers can review which risks other risk managers think work together in material ways. The results also seem to predict threat multipliers that broaden the impact of other risks. The top three risks chosen in combination were *Financial volatility*, *Climate change* and *Wars (including civil wars)*. Interestingly, no combination of these three risks appears in the top five. Overall, the Economic category moved up and the Technological category moved down.

These are the top five combinations that were selected:

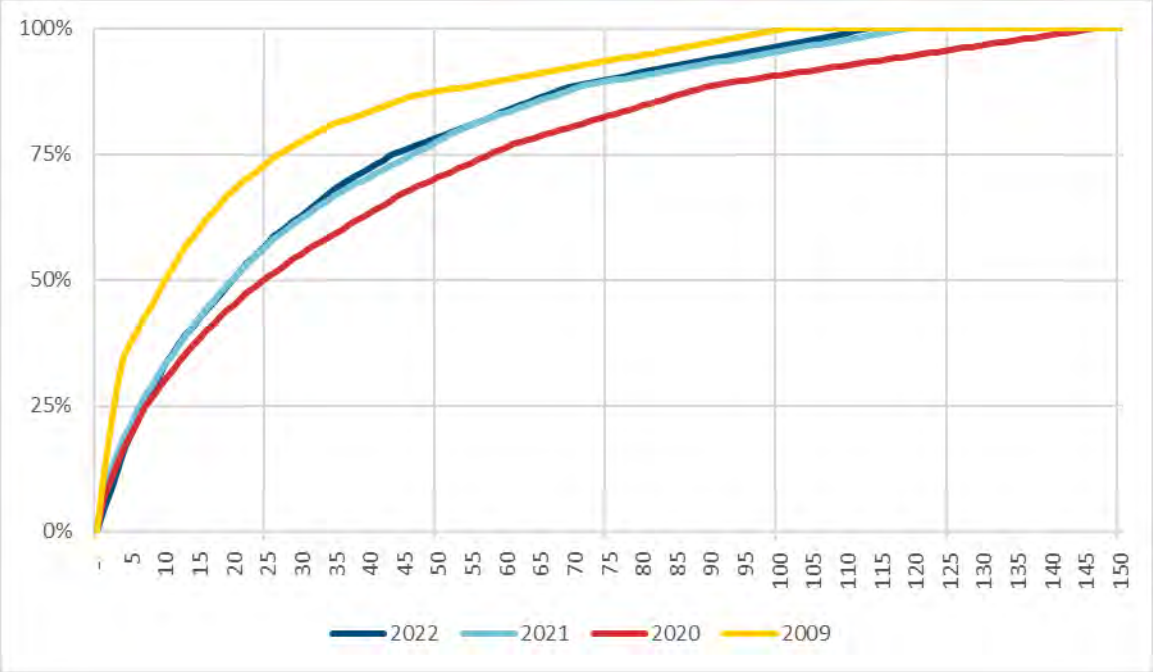
1. *Climate change* and *Loss of freshwater services*—4%
2. *Cyber/networks* and *Disruptive technology*—4%
2. *Climate change* and *Natural disasters: severe weather*—4%
2. *Energy price shock* and *Wars (including civil wars)* – 4%
5. *Asset price collapse* and *Financial volatility*—4%

Results this year for the top five combinations were less concentrated, with their total adding up to 20% after last year's comparable total of 22%.

There are 253 possible two-risk combinations, with many of them not chosen as one of the three possible responses. The first year the risk combination question was added turned out to be the most extreme results recorded so far, so the most recent three survey results are compared against it. A curve closer to

2009 is more concentrated, with leading risk combinations more likely to be chosen. As shown in figure 6, the distribution of results was slightly more concentrated than the prior survey.

Figure 6
CUMULATIVE DISTRIBUTION OF COMBINATIONS



1.6 TRENDS

Figure 7 shows results for this survey by category for the top current risk, the top five emerging risks (as a percentage of the total), the top emerging risk and risk combinations. Risk managers are given an option (*Other*), except for risk combinations, if they feel a risk is not represented in the list. The survey question with the highest response rate among the four questions includes a data label for each category. Generally, the top five emerging risks and combination questions generate similar results, reflecting longer time horizon thinking, while recency bias drives both the top current risks and the top emerging risk categories higher. These results can be upended by an anomaly driven by the presence of a dominant risk. *Climate change* drives the Environmental category higher for the top emerging risk. *Pandemics/infectious diseases* had driven the Societal category higher for the top current risk in 2020 and 2021, but fell back in the current survey.

Figure 7

CATEGORY COMPARISON ACROSS FOUR QUESTIONS

% of Responses to Given Question

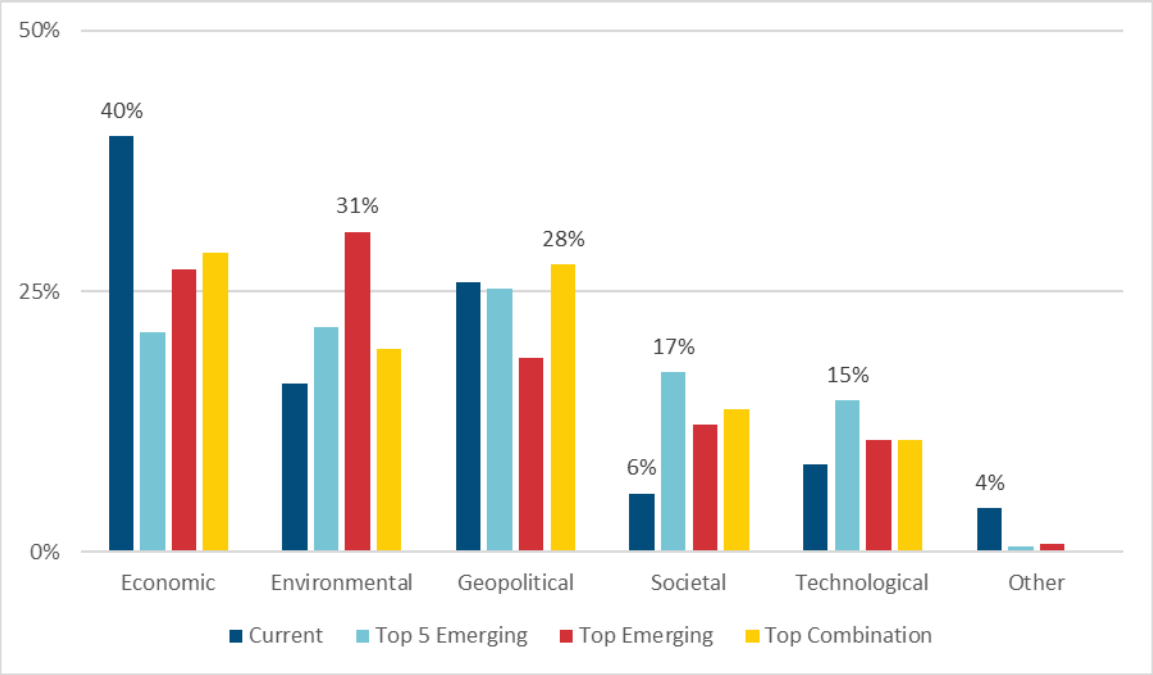
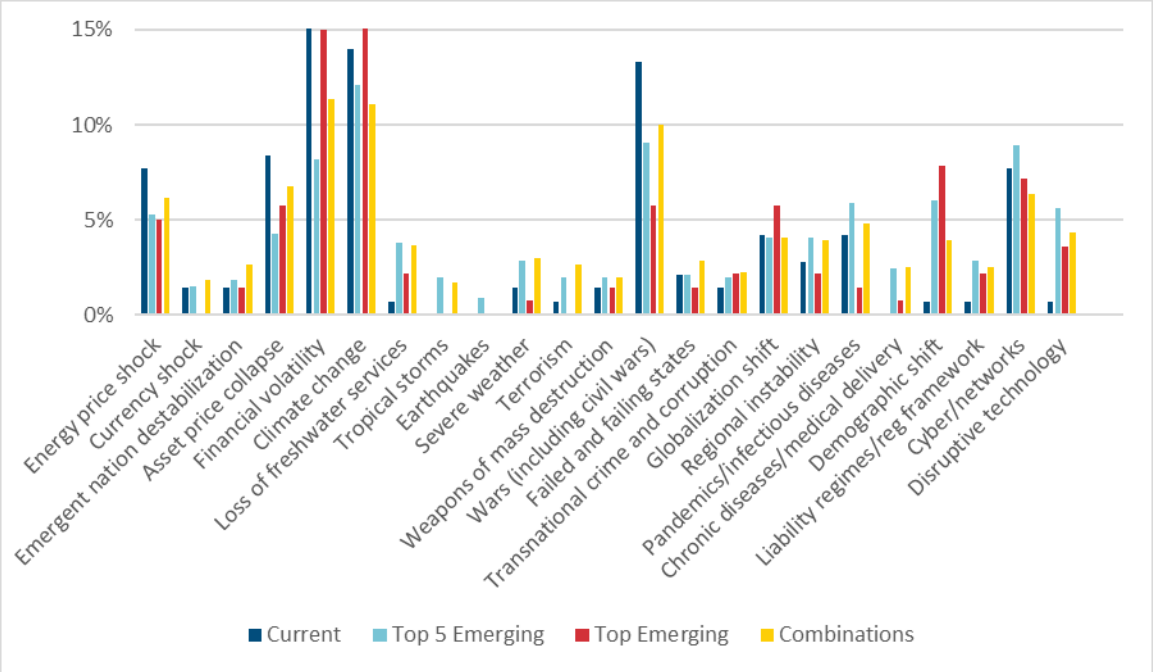


Figure 8 compares the current risk results with the top five emerging risks, top emerging risk and risk combinations at the individual risk level. Hypothesizing why there are discrepancies is useful, and readers may come to different conclusions. (Ed. note: This chart includes information that is located elsewhere, but visually highlights the top risks and those that vary, like *Demographic shift*, between questions.)

Figure 8

RISK COMPARISON ACROSS FOUR QUESTIONS

% of Responses to Given Question (Note that the maximum value for a response has been truncated at 15% to better display differences among the risks—a chart showing an uncapped maximum is available in Appendix II)



The survey credibility, with more detail found in specific sections of the survey, can be inferred by the difference among the results for the four questions. The comments below reflect the researcher's interpretation; that of the reader may differ.

- The top risk with the greatest disparity favoring the current risk over the top emerging risk is *Wars (including civil wars)* (7.6%). With the war in Ukraine a daily news item, this is not surprising.
- The top risk with the greatest disparity favoring the top emerging risk over the current risk is *Climate change* (13.9%). This represents the risk of greatest concern over long time horizons.
- The top risk with the greatest disparity favoring the top five emerging risks over the top emerging risk is *Pandemics/infectious diseases* (4.5%). This represents a risk that is likely to grow in importance over time.
- The top risk with the greatest disparity favoring the top emerging risk over the top five emerging risks is *Climate change* (15.8%). This risk stands out in importance for survey respondents.
- The top risk with the greatest disparity favoring the top current risk over the top five emerging risks is *Financial volatility* (12.8%). This risk is likely to have temporarily surged and may mean-revert.
- The top risk with the greatest disparity favoring the top five emerging risks over the top current risk is *Demographic shift* (5.3%). This risk is important over longer time horizons, but it is not yet clear how the risk will evolve.

1.7 RISK MANAGER GROUPING OF RESULTS

In an initial question, respondents were asked how they define greatest strategic impact. Six options were provided, with three focused on financial impact and three on disruption.

Greatest strategic impact related to risk can have various meanings. The survey provides these options:

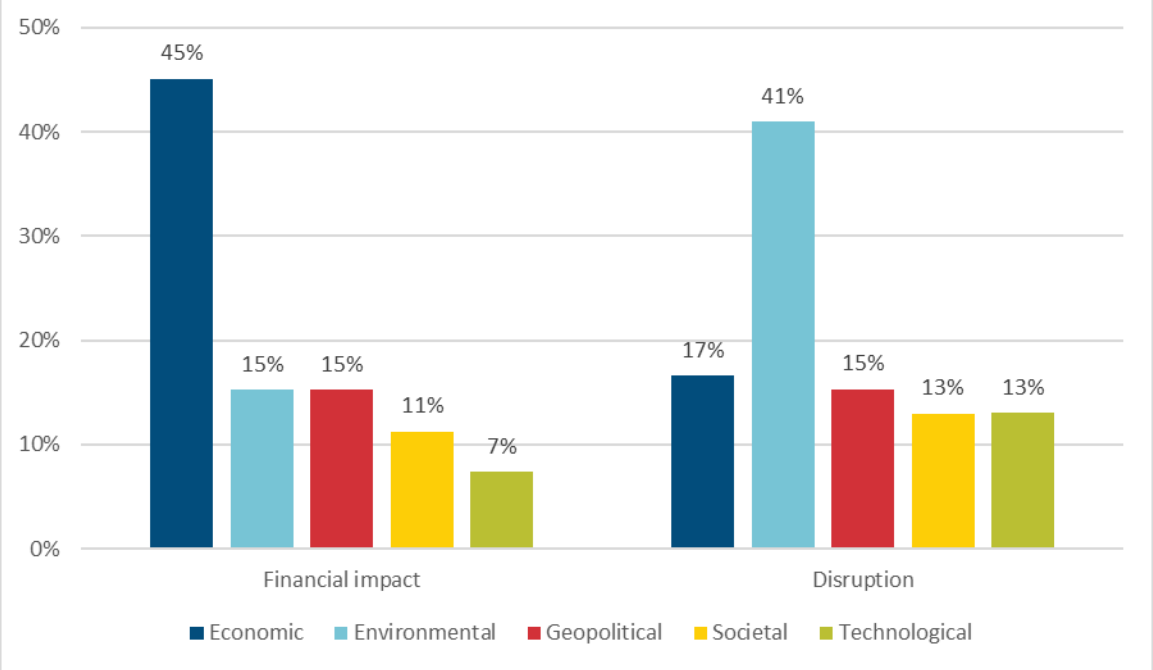
- Financial impact on the world economy
- Disruption to the world economy
- Financial impact on me personally or my firm/industry
- Disruption to me personally or my firm/industry
- Financial impact on lives, habitat and safety
- Disruption to lives, habitat and safety

The survey looked at results for the four primary questions split between impact and disruption. Provided here (with complete results presented in Appendix II) is the split for top emerging risk. The results are not surprising, with those focused on financial impact more likely to choose Economic risks and those focused on disruption more likely to choose Environmental ones, but it is useful to remember that all risk managers do not think alike and having diversity on a risk team can be beneficial. (Note that the Other category is not shown, resulting in the sum of total results being less than 100%.)

Figure 9

TOP EMERGING RISK SEGREGATED BY GREATEST STRATEGIC IMPACT

% of Responses to Given Question



Overall, across the questions in Section A, you see higher results for the Economic category if financial impact is used to define greatest strategic impact, and for Environmental and Technological risks if disruption was preferred.

1.8 IMPACT OF RECENT EVENTS ON RISK TEAM DUTIES

Responding to an open-ended question about how the regular duties of the risk team had changed in response to recent risk events like the pandemic and rising interest rates, several respondents reported that their duties had expanded beyond financial risks while being consulted on a broader range of emerging risks. Some are now looking at risk interdependencies, moving away from silo approaches to risk management.

Respondents were asked if ERM improves returns relative to risk. One comment was *How could it be otherwise? Cost benefit is a form of ERM, especially when capital management and liquidity are considered.* Another respondent, who was not sure, said *it could in some cases lower returns but decrease volatility of returns.*

Building resilience is a key component of the ERM process moving forward. Respondents suggested improved communication, better coordination and business continuity planning. Regular revisiting of models and assumptions allow risk teams to better understand the nuances of risks accepted.

1.9 OPPORTUNITIES AND BUBBLES

Strategic risk management involves looking past a short time horizon and seeking out opportunities. Respondents were asked which emerging opportunities, either priced to add value or to provide diversification, they were monitoring. Comments noted various mitigation tools like reinsurance and opportunities through mergers and acquisitions.

After last year's respondents all seemed to understand what a bubble is, several feigned ignorance when answering this survey. The remaining respondents identified quite a few potential bubbles, and some noted that the concept could apply to things like the green movement, inflation, risk concentration, federal debt and pandemic uncertainties. More traditional responses included housing (including condos and other housing), asset prices due to low interest rates, cryptocurrencies and some provided skepticism regarding official indicators about China.

1.10 UNKNOWN KNOWNS

Unknown knowns, where the analyst is ignorant of the probability distribution of a future event, despite possessing historical data (the results are not predictive of the future), will be a great challenge for the next generation of risk managers. What will the "next new normal" be post COVID? What assumptions should be made for long-COVID, post-COVID mortality and mortality trends generally? Other concerns will be related to climate change, credit risk and inflation spikes.

1.11 RISK VERSUS RETURN

In a result not seen since 2016, nearly two-thirds of respondents (67%) said ERM had a positive effect on their company/industry, and 55% noted that ERM improved returns relative to risk (with only 7% saying it did not). One respondent noted that the process of identifying risks allows for better planning. A "check box" mentality should be avoided and both increased returns and reduced risk encouraged.

Respondents who stated that ERM does not improve returns relative to risk saw it as an administrative burden, had been limited to technology access risks at their firm or was difficult to implement quantitatively.

The respondents who answered *Not sure* about the effects of ERM at their company noted the need for practicality, saw challenges over the short-term or noted that ERM doesn't change things at a well-managed company.

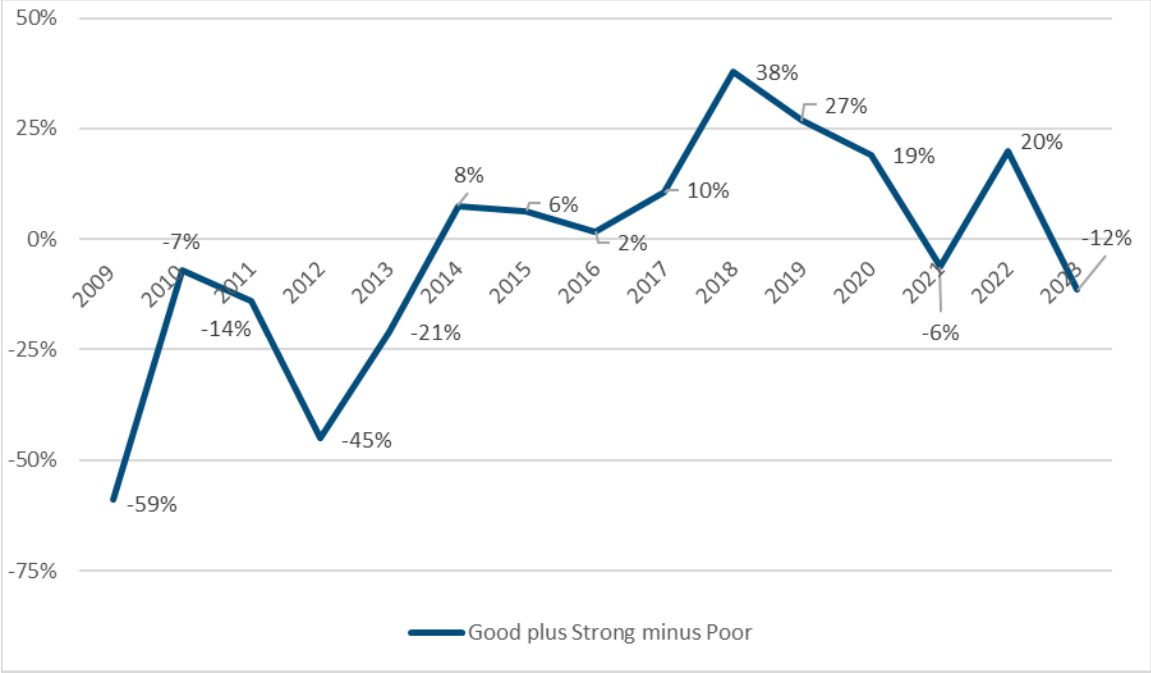
1.12 ECONOMIC EXPECTATIONS

Respondents were downbeat about global economic expectations for 2023, with a net (Good plus Strong minus Poor) of -12%, down from 20% and the lowest since 2012, as shown in figure 10.

Figure 10

COMBINED GOOD + STRONG - POOR ECONOMIC EXPECTATIONS

% of Responses



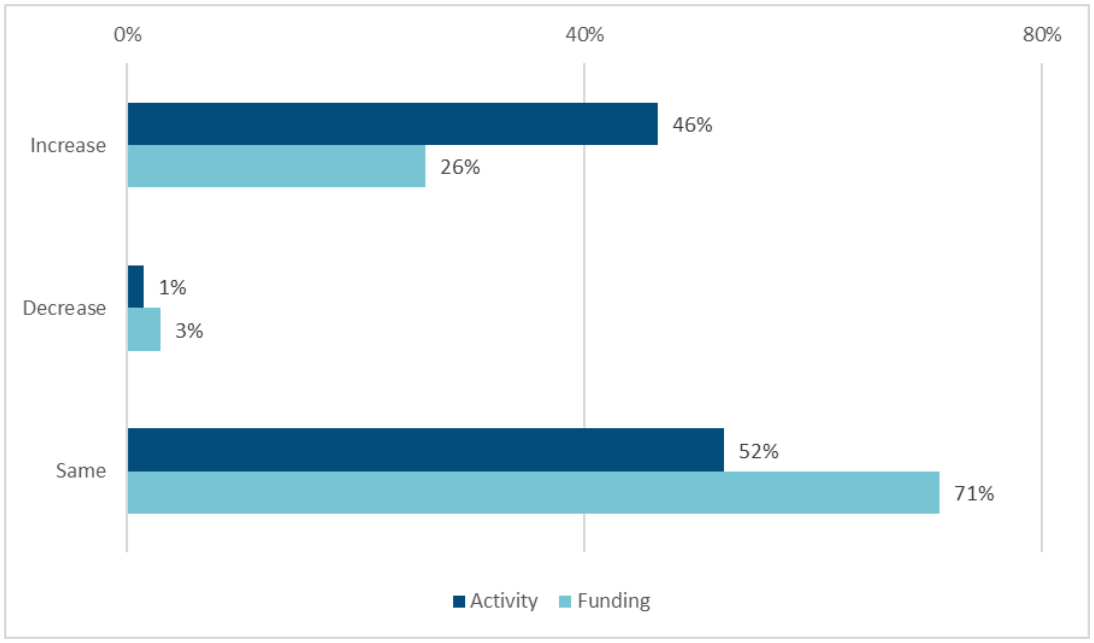
1.13 RISK ACTIVITIES AND FUNDING

Nearly half of respondents reported that activities related to ERM continued to grow in 2022 (but only 14% of respondents reported experiencing staff growth), with 46% expecting activity growth in 2023. As seen in figure 11, only 26% of respondents anticipate an increase in 2023 funding. Risk managers continue to improve efficiency as they complete implementation of projects related to regulatory requirements. After several years where the value of risk management was clearly demonstrated and recognized, it is disappointing not to see an enhanced view of the risk team as having strategic value.

Figure 11

ANTICIPATED ERM LEVELS IN 2023

% of Responses to Given Question



1.14 STRATEGIC OPPORTUNITIES

Nearly all (88%) of risk managers reported that they have input (a seat at the table) during strategic opportunities and half are encouraged to share their opinion.

Section 2: Top Takeaways

While this report provides many additional nuggets of information to those who read it in its entirety, those who scan the Executive Summary will find the primary trends and conclusions. The following lists provide interesting tidbits intended to prompt you to read or scan additional sections of the report. Reviewers with different backgrounds and experience from the researcher may highlight different comments. For those interested, the entire dataset is reproduced in Appendix II.

2.1 WHAT RISK MANAGERS ARE THINKING

- The *Climate change* risk is the first-ranked risk across both emerging risk questions and is second for current risk and combination risk. It is especially dominant as the top emerging risk.
- *Pandemics/infectious diseases* is no longer among the top five ranked risks for any of the four primary questions. It was replaced by *Wars (including civil wars)*, which moved up to second (top five emerging risks), third (top current risk, top risk combination) and fifth (top emerging risk).
- The *Financial volatility* risk also surged, moving to first for top current risk and risk combinations, second for top emerging risk and fourth for top five emerging risks.
- The Geopolitical category maintained its top ranking for top five emerging risks and the Environmental category reached a new high. There was one risk from each category among the top five for this question.
- Risk events were widespread, but some risks did not increase with them (e.g., tropical storms, severe weather). Others, like both risks in the Technological category (*Cyber/networks* and *Disruptive technology*), were relatively less important.
- Risk managers tend to segregate between those who define the strategic impact of risks through financial impact and disruption lenses. Their responses varied based on this focus in expected ways. Building a risk team with representatives from each may provide benefits through diversity of thought.

2.2 LEADING-EDGE ACTIONABLE PRACTICES

- Risk management teams continue to be asked to complete additional activities with the same or fewer staff. The Great Resignation made this more challenging, especially when trying to hire experienced staff.
- Risk teams were involved with implementing additional scenarios as interest rates and inflation rose in 2022 and many are seeing broadened duties.
- Some risk managers do not recognize the possibility of bubbles forming. When scanning for emerging risks, this hinders the ability to create challenging scenarios.
- Respondents reported stronger results when asked if ERM has a positive effect on their company or industry, as well as if ERM improves returns relative to risk. The nuances provided in the comments about these questions show the wide level of practice maturity.

2.3 CONCLUSIONS

The year 2022 continued an active risk decade. The stimulus enacted for the pandemic led to inflation and central bank efforts to rein it in. Polarization, inequality and high levels of debt are present throughout the developed world. Add to this a European war, energy concerns and all kinds of weather-related events made more likely by global warming and human actions. The *16th Emerging Risk Survey*, compiled in November 2022, provides a snapshot during this period. Risk teams continue to be seen as adding value by their management, leading to additional stress tests and greater responsibilities. The Economic category continues to bounce off its lows, while the Societal and Technological categories showed relative weakness. Shock analysis types of stress tests, sometimes across multiple events or developed as a narrative scenario that looks across multiple assumptions, are becoming more common. Tipping points and higher-order

interactions with threat multipliers like climate change, wars and financial volatility are likely to become a competitive advantage for those who invest in scanning for emerging risks.

The pandemic, war in Ukraine and recent inflation show that risk managers do not have perfect foresight. Their job is not to predict but to provide a range of possibilities for future outcomes. By telling a plausible story to senior management and other decision makers, discussions about risks they are comfortable holding are more useful. Assumptions are increasingly unstable, so shorter time horizons of liabilities may be necessary to match up risks with assets.

Risk managers have a difficult job anticipating risk events and interpreting how they interact and aggregate with internal risk exposures. Emerging risks play a key role in this analysis. A mix of scenarios that can be trended over time should be complemented with contrarian views and rotating stress scenarios that can be shared with decision makers. Instability leads to scenarios where historical data does not allow modelers to accurately model the future. These unknown knowns become important as those who appropriately consider how assumptions will change can become key advisors and decision makers themselves. Current high levels of debt, geopolitical uncertainty and a changing climate make pricing and projection duties much harder. Success will come to those who continue to provide existing information, while also scanning the environment for changes.

Section 3: Background

This research project was sponsored by the Casualty Actuarial Society, Society of Actuaries, Joint Risk Management Section (JRMS) of the CIA, CAS and SOA, SOA Financial Reporting and SOA Reinsurance Sections.[2] Thanks to all for their support. A survey was developed and made available through an email link to members of the JRMS. Others were invited to participate using the International Network of Actuarial Risk Managers (INARM) LISTSERV, membership distribution lists of several SOA sections, the International Actuarial Association (IAA) ERM Section, and social media such as Twitter and LinkedIn groups related to risk management. A total of 143 responses were received. This represents a material percentage relative to the number distributed (more than 1,200 to the JRMS) in this, the 16th survey in the research series.

Emerging risks can be something new, not seen before, like the Haiti earthquake in 2010 (later research showed such events had happened in the past). They can also be evolving risks, like climate change, where a risk event tomorrow may be similar to past events, but historical data is ineffective in modeling it.

Many questions generate sustained trends that suggest conclusions, but the results continue to evolve as economic and geopolitical risks evolve and cycle. In recent years, concerns over cyber issues and climate change increased and, of course, the COVID-19 pandemic and Ukraine war were great concerns. The previous surveys were distributed in April 2008, November 2008, December 2009, October 2010, October 2011, October 2012, October 2013, October 2014, November 2015, November 2016, November 2017, November 2018, November 2019, November 2020 and November 2021. The current-year survey was conducted in November 2022, just after the mid-cycle U.S. national election and closing just after the U.S. Thanksgiving holiday. Articles, podcasts and previous research reports can be found at:

www.soa.org/resources/research-reports/2015/research-emerging-risks-survey-reports/

April 2008—First survey

- Max J. Rudolph, International Survey of Emerging Risks, International News (SOA), August 2008, pages 18–21, http://soa.org/library/newsletters/international-section-news/2008/august/isn-2008-iss45.pdf
- Article (reprint): pages 17–20 of *Risk Management*, March 2009 issue, http://soa.org/library/newsletters/risk-management-newsletter/2009/march/jrm-2009-iss15.pdf

November 2008—Second survey

- Research report: www.soa.org/research-reports/2009/research-2009-emerging-risks-survey/

December 2009—Third survey

- Research report: www.soa.org/research-reports/2010/research-2009-emerging-risks-survey/
- Article: pages 12–14 of *The Actuary*, August/September 2010 issue, www.soa.org/library/newsletters/the-actuary-magazine/2010/august/act-2010-vol7-iss4.pdf

October 2010—Fourth survey

- Research report: www.soa.org/research-reports/2011/research-2010-emerging-risks-survey/
- Article: pages 6–9 of *Risk Management*, August 2011 issue, www.soa.org/library/newsletters/risk-management-newsletter/2011/august/jrm-2011-iss22-rudolph.pdf

[2] This section has been updated with new information but is otherwise consistent with prior surveys.

October 2011—Fifth survey

- Research report: www.soa.org/research-reports/2012/research-2011-emerging-risks-survey/

October 2012—Sixth survey

- Research report: www.soa.org/research-reports/2013/research-2012-emerging-risks-survey/
- Risky Business Bulletin, June 2013: https://www.soa.org/globalassets/assets/files/newsroom/erb-2013-06.pdf
- Article: pages 12–17 of *Risk Management*, August 2013 issue, https://soa.org/Library/Newsletters/Risk-Management-Newsletter/2013/august/jrm-2013-iss27.pdf

October 2013—Seventh survey

- Research report and Key Findings: www.soa.org/research-reports/2014/2013-emerging-risks-survey/
- Article: pages 34–35 of *Risk Management*, August 2014 issue, www.soa.org/globalassets/assets/library/newsletters/risk-management-newsletter/2014/august/jrm-2014-iss30.pdf

October 2014—Eighth survey

- Research report: www.soa.org/research-reports/2015/2014-emerging-risks-survey/
- Article: pages 5–6 of *Risk Management*, April 2016 issue, www.soa.org/globalassets/assets/library/newsletters/risk-management-newsletter/2016/april/rm-2016-iss-35.pdf

November 2015—Ninth survey

- Research report: www.soa.org/research-reports/2016/2015-emerging-risks-survey/

November 2016—10th survey

- Research report: www.soa.org/research-reports/2017/10th-emerging-risks-survey/
- SOA News Canada blog, *Lessons from the* Masters, September 2017: www.soa.org/Files/Research/Projects/erm-lessons-master.pdf
- Summary of findings: www.soa.org/Files/Research/Projects/10th-emerging-risks-survey-summary.pdf

November 2017—11th survey

- Research report, Key Findings report and Research Insights podcast: www.soa.org/resources/research-reports/2018/11th-emerging-risk-survey/
- SOA News Canada blog, February 2019

November 2018—12th survey

- Research report and Key Findings: www.soa.org/resources/research-reports/2019/12th-emerging-risks-survey/

November 2019—13th survey

- Research report and Key Findings: https://www.soa.org/resources/research-reports/2020/13th-emerging-risk-survey/

November 2020—14th survey

- Research report, Key Findings, Video and Data Visualizations: https://www.soa.org/resources/research-reports/2021/14th-annual-survey/

November 2021—15th survey

- Research report, Key Findings, Video, Podcast and Data Visualizations, Guide for Use https://www.soa.org/resources/research-reports/2022/15th-survey-emerging-risks/

November 2022—16th survey

- Key Findings, Podcast https://www.soa.org/resources/research-reports/2023/16th-survey-emerging-risks/

The 23 emerging risks used in this survey originally used a set created by the World Economic Forum (WEF), but the risks have slightly evolved and the definitions developed more fully since then. Each risk is described in detail in Appendix I. The definitions for nearly half the risks differ slightly from previous years. The current survey questions have also evolved over the years, with base questions stable and open-ended questions replaced once information received had stabilized.

Each risk has been categorized as either Economic (five risks), Environmental (five), Geopolitical (seven), Societal (four) or Technological (two). The current survey continues this evolution, adding and subtracting questions, while leaving the core of the survey intact to allow trends to develop. Responses to open-ended questions have been minimally edited.

Note that individual results have generally been rounded to the nearest 1%, so stated totals may not add up to exactly 100% (charts reflect the actual splits).

Research reports do not create themselves in isolation, and the researcher thanks the Project Oversight Group and SOA staff for their help designing and implementing the questionnaire, along with gleaning information from the results. Of course, all errors and omissions remain the responsibility of the researcher.

3.1 RESEARCHER

The researcher for this project is Max Rudolph. Additional related articles and presentations can be found at his website and LinkedIn profile. His contact information is:

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Section 4: Results

The *16th Emerging Risk Survey* includes sections covering current risks, emerging risks, ERM and current topics. Highlights of each section are presented here, with complete results found in Appendix II. The survey is anonymous and requests individual rather than formal company responses. It uses an anonymous electronic format that encourages individual opinions. Many multiple-choice-format questions are followed up with questions asking "why" or "provide examples," allowing expansion of the concept, comparison from prior surveys, and additional learning for readers of the results. In some cases, the written responses have been sorted based on the answer to the corresponding multiple-choice question. Readers are encouraged to review all comments, compiled in Appendix II, and compare their own conclusions with those of the researcher.

The analysis includes partially completed surveys, with percentages adjusted for the number completing each question. Answers of *Not sure* and *Not applicable* were typically excluded from percentages, except when these responses were considered meaningful. The responses were thought-provoking for the researcher, as occurs each year, and respondents are thanked for their efforts.

4.1 WHAT CHANGES IN RESPONSES MEAN

Note that each survey is taken at a different point in history, so the same risk managers do not necessarily respond. This year, 51% of respondents reported that they also participated in the past and 56% have been a risk manager for at least 10 years. Repeat respondents, especially those with great familiarity of the topic, might be more likely to change their responses based on new or recent experiences. While the actual results (rounded to the nearest 1%) are provided, the survey should be interpreted based on directional and relative changes between iterations. Increases and decreases in response rates reflect the respondents' relative perception of the risk, not actual changes in assessment of the risk itself. A risk may not have changed at all, but another risk may be perceived as higher or lower, and that affects the relative importance of other risks. For example, in 2020, the COVID-19 pandemic generated many discontinuities in the survey.

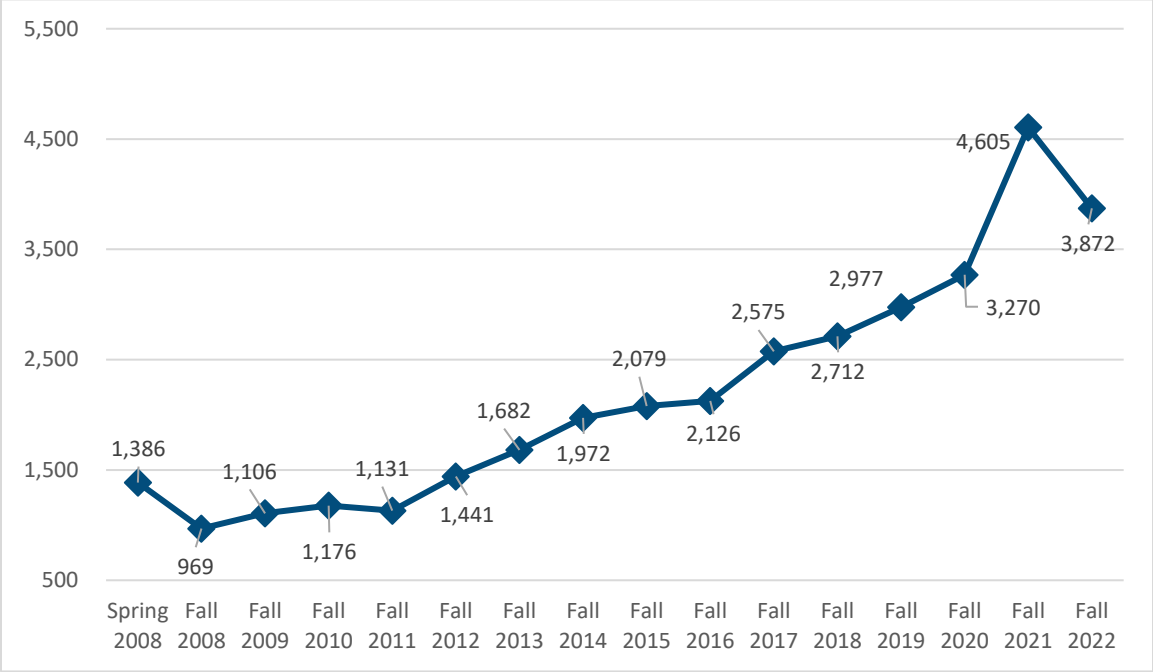
It can be confusing to talk about percentage changes when survey results are reported in percentages, so changes are always reported as absolute percentage-point changes. For example, if the previous survey reported a 10% response rate and this year's response rate is 15%, this is a 5% change (not 50%).

4.2 HISTORY

As in previous reports, the survey results show that current values of the Standard & Poor's 500 (S&P 500) equity index (figure 12), the price of a barrel of oil (figure 13), and the exchange rate of the Euro relative to the U.S. dollar (figure 14) seem to anchor perceptions of risk. Results have evolved over time, often led by recent news topics. For example, the current value of the S&P 500 fell after ten consecutive years of increases and the dollar recorded its strongest result. Only economic factors are shown here, and the researcher would be interested in suggestions of other metrics that are considered drivers of perceptions of emerging risks. As described below, the first survey was conducted in April 2008 (spring) and all subsequent surveys have been in the fall.

Figure 12

S&P 500, 2008–2022

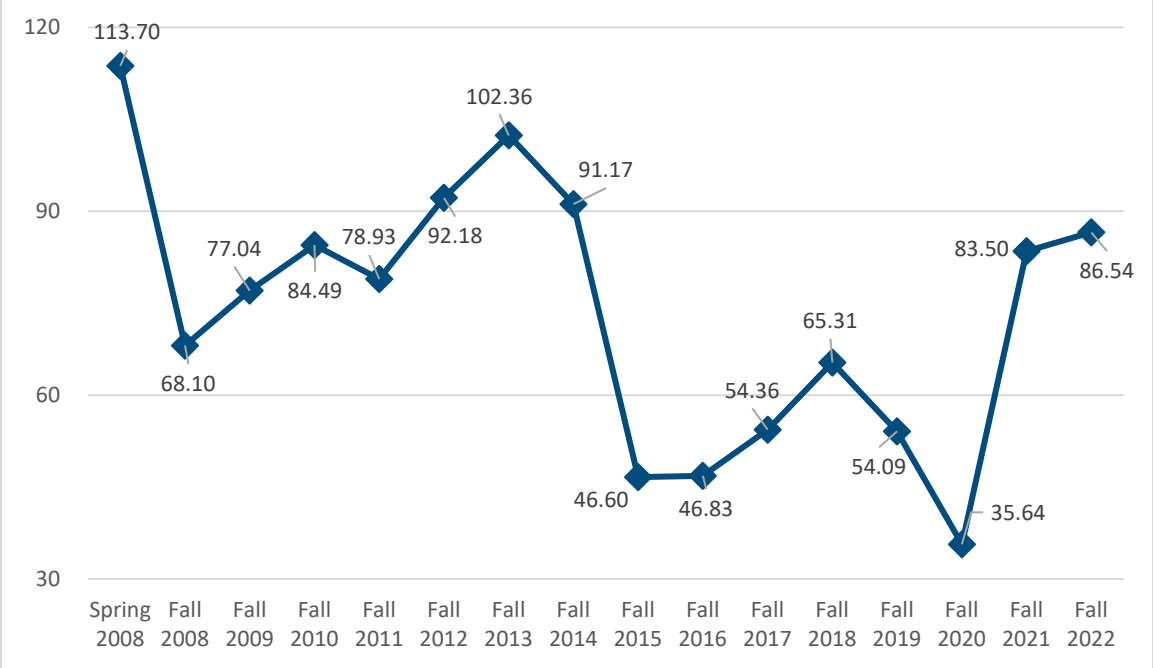


Source: S&P Dow Jones Indices LLC, S&P 500 [SP500], retrieved from FRED, Federal Reserve Bank of St. Louis, https://fred.stlouisfed.org/series/SP500, February 24, 2022.

Figure 13

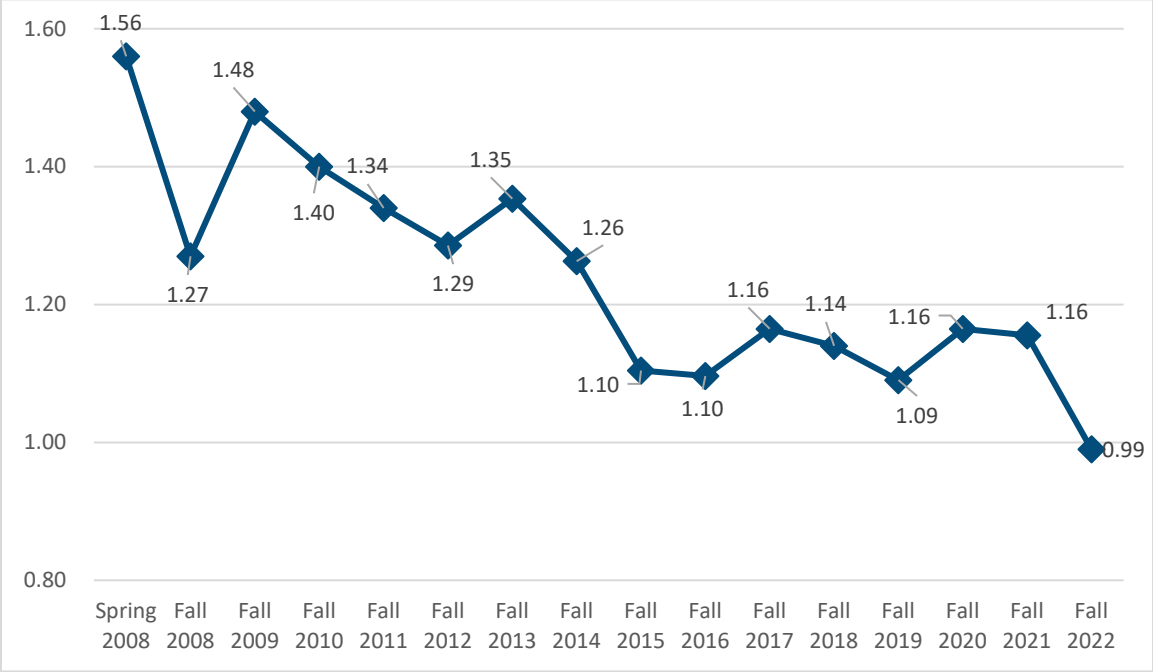
PRICE OF OIL, 2008–2022

US$ per barrel



Source: U.S. Energy Information Administration, Cushing, OK WTI Spot Price FOB, www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=D

Figure 14
EXCHANGE RATE, U.S. DOLLARS PER EURO, 2008–2022



Source: Board of Governors of the Federal Reserve System, Foreign Exchange Rates (H.10): Historical Rates for the EU Euro, www.federalreserve.gov/releases/h10/Hist/dat00_eu.htm

Recency bias influences the results of any survey. The year 2022 left people ready to move on from the pandemic and with geopolitical tensions high. A series of hurricanes impacted the east coast of the United States, especially Florida. Since the survey closed, Turkey and Syria experienced a major earthquake, cyclones have pounded the southeastern African coast and Guam, and a series of atmospheric rivers have pummeled the Pacific coast of North America.

The following information provides context to previous surveys. Note that these responses are to a question asking for respondents' top five emerging risks. For example, in Survey 1, listed immediately below, *Oil shock* was listed by 57% of respondents as one of their five. (Ed. Note: Some risk names have evolved over time, e.g., *Oil shock* is now *Energy price shock*.)

Survey 1 (April 2008)

1. *Oil shock* (57% of respondents)
2T. *Climate change* (40%)
2T. *Asset price collapse* (40%)
3. *Currency trend* (38%)

With oil at historic highs, it was the predominant emerging risk in the initial survey. The second survey was completed in early November 2008, shortly after troubles surfaced at Lehman Brothers, AIG and the mortgage giants, Fannie Mae and Freddie Mac. By the end of October 2008 relative to the previous survey, the S&P 500 had dropped 30%, the price of a barrel of oil had decreased 40% and the U.S. dollar had strengthened 23%. The top four emerging risks from this second iteration of the survey were as follows:

Survey 2 (November 2008)

1. *Asset price collapse* (64%)
2. *Currency trend* (48%)
3. *Short Oil price shock* (39%)

4. *Regional instability* (34%)

Systemic risk was perceived to be very high at the time, with asset values in free fall. Oil prices had fallen, U.S. currency was considered a safe harbor and Barack Obama had just been elected to his first term as U.S. president.

The third survey was in December 2009, by which time the S&P 500 had increased 14%, the price of a barrel of oil was up 13% and the U.S. dollar had weakened by 17%. The economy had begun to recover. For the first time, the top four emerging risks included *Chinese economic hard landing*.

Survey 3 (December 2009)

1. *Currency trend* (66%)
2. *Asset price collapse* (49%)
3. *Oil price shock* (45%)
4. *Chinese economic hard landing* (33%)

The indicators had not changed materially by late 2010 as the European debt crisis ramped up. The stock market was up 6%, the price of oil was up 10% and the dollar had further strengthened by 6%. Most of the top five results continued to come from the Economic category. *International terrorism* and *Failed and failing states* made their first appearance among the top five.

Survey 4 (October 2010)

1. *Currency trend* (49%)
2. *International terrorism* (43%)
3. *Chinese economic hard landing* (41%)
4. *Oil price shock* (40%)
5. *Failed and failing states* (38%)

In late 2011, the U.S. stock market was down 4% overall and volatile during the year, the price of oil was down 7% and the dollar had further strengthened against the euro by 4%. Several major events occurred, including the Japanese earthquake/tsunami and the Arab Spring.

Some of the risks were updated for the 2011 survey. One risk was moved to a different category, two were combined and one was added. (These changes, along with others since then, are described in Appendix I. Comparisons were adjusted for trending purposes.) Most of the top six results continued to come from the Economic category. A new risk, *Financial volatility*, resonated with risk managers, as they made it their top selection. This was the first time that *Cybersecurity/interconnectedness of infrastructure* appeared in the top five and the last time (to date) that *Oil price shock* (now *Energy price shock*) has appeared.

Survey 5 (October 2011)

1. *Financial volatility* (68%)
2. *Failed and failing states* (42%)
3. *Cybersecurity/interconnectedness of infrastructure* (38%)
4. *Chinese economic hard landing* (32%)

5T. *Oil price shock* (32%)

5T. *Regional instability* (32%)

In 2012, equity markets surpassed the levels of spring 2008 for the first time (up 27% since the previous survey), while oil prices rebounded (17%) and the dollar strengthened (4%).

Survey 6 (October 2012)

1. *Financial volatility* (62%)
2. *Regional instability* (42%)

3. *Cybersecurity/interconnectedness of infrastructure* (40%)
4. *Failed and failing states* (33%)
5. *Chinese economic hard landing* (31%)

Equity markets (17%) and oil prices (11%) continued their upward trend in 2013, while the U.S. dollar reversed course and weakened (5%) versus the euro. Natural disasters were prominent, including Hurricane Sandy in the U.S. and Typhoon Haiyan in Asia.

Survey 7 (October 2013)

1. *Financial volatility* (59%)
2. *Cybersecurity/interconnectedness of infrastructure* (47%)
3. *Asset price collapse* (30%)
4. *Demographic shift* (30%)
5. *Failed and failing states* (29%)
6. *Regional instability* (29%)

By the fall of 2014, the dollar had started to strengthen against the euro (7%), the stock market was up (17%) and the price of oil had started to go down (12%). Much stronger moves in oil and the dollar occurred after the survey closed, leaving the geopolitical crisis in Eurasia as a top concern. An Ebola outbreak in Africa raised concerns of a pandemic.

Survey 8 (October 2014)

1. *Cybersecurity/interconnectedness of infrastructure* (58%)
2. *Financial volatility* (44%)
3. *International terrorism* (41%)
4. *Regional instability* (37%)
5. *Asset price collapse* (31%)

Fall 2015 saw the dollar strengthen relative to the euro (up 14%), which also drove the price of oil down (by 49%), since it is primarily transacted in U.S. dollars. The U.S. stock market increased by 5%, and cyber risk seemed to be constantly in the news.

Survey 9 (November 2015)

1. *Cybersecurity/interconnectedness of infrastructure* (65%)
2. *Financial volatility* (45%)
3. *Terrorism* (37%)
4. *Asset price collapse* (31%)
5. *Regional instability* (26%)

The fall 2016 survey occurred during a period of transition, with the survey completed immediately following the election of Donald Trump as U.S. president, and the metrics were stable. The top three risks remained the same. *Retrenchment from globalization* made the largest move, as voters around the world considered populist candidates and causes. The top catastrophic events in 2016 were earthquakes, wildfires and flooding due to tropical storms (e.g., Hurricane Matthew) and thunderstorms.[3]

Survey 10 (November 2016)

1. *Cyber/interconnectedness of infrastructure* (53%)

[3] Swiss Re, "Preliminary Sigma Estimates for 2017: Global Insured Losses of USD 136 Billion Are Third Highest on Sigma Records," news release, December 20, 2017, www.swissre.com/media/news-releases/2017/nr20171220_sigma_estimates.html.

2. *Financial volatility* (44%)
3. *Terrorism* (39%)
4. *Technology* (34%)
5. *Retrenchment from globalization* (30%)

The fall 2017 survey continued a period of calm following the global financial crisis nearly 10 years prior, while geopolitical tensions continued to be high. Natural disasters, some driven by record warming, included Hurricanes Harvey, Irma and Maria, along with atmospheric rivers on the West Coast of the U.S. and wildfires. Earthquakes in Mexico, Cyclone Debbie in Australia, European temperature extremes and Asian flooding all contributed to worldwide risk events.

Survey 11 (November 2017)

1. *Cyber/interconnectedness of infrastructure* (53%)
2. *Terrorism* (41%)
3. *Technology* (38%)
4. *Regional instability* (31%)
5. *Asset price collapse* (30%)

The personal impact of climate change was highlighted in 2018 by wildfires, flooding, heat waves and storm concentrations felt by Hurricane Michael, heavy winter storms and nor'easters. Geopolitical tensions remained high, although events in North Korea and Syria received less attention in the press.

Survey 12 (November 2018)

1. *Cyber/network infrastructure* (56%)
2. *Climate change* (49%)
3. *Technology* (40%)
4. *Demographic shift* (32%)
5. *Financial volatility* (27%)

Climate events were recognized around the world as many people seemed to better understand the ramifications of a warming planet as it impacted their daily lives. The geopolitical situation remained tense.

Survey 13 (November 2019)

1. *Climate change* (54%)
2. *Cyber/networks* (51%)
3. *Disruptive technology* (35%)
4. *Demographic shift* (33%)
5. *Financial volatility* (29%)

The COVID-19 pandemic emerged into a worldwide event as global supply chain and geopolitical tensions were interwoven with the health impacts. Wildfires in Australia and the western United States kept climate change in the discussion, and Black Lives Matter protests were held globally.

Survey 14 (November 2020)

1. *Climate change* (50%)
2. *Cyber/networks* (47%)
3. *Pandemics/infectious diseases* (45%)
4. *Disruptive technology* (40%)
5. *Financial volatility* (31%)

The COVID-19 pandemic evolved with new variants in 2021. Vaccines worked, especially against hospitalization and death, for those with access who chose to receive it. A polar vortex reached to the Mexican border, record heat waves hit France and western North America and major flooding occurred in many places, including India, China, Afghanistan and Europe. Drought and wildfire events occurred around the Mediterranean and Colorado suffered large economic impact from a wildfire.

Survey 15 (November 2021)

1. *Climate change* (58%)
2. *Cyber/networks* (52%)
3. *Pandemics/infectious diseases* (38%)
4. *Disruptive technology* (32%)
5. *Financial volatility* (30%)

Since the survey closed in late November the weather events have continued, with tornados and a derecho in the U.S., multiple cyclones in southeastern Africa and flooding in South Africa, Asia and South America.

Survey 16 (November 2022)

1. *Climate change* (57%)
2. *Wars (including civil wars)* (43%)
3. *Cyber/networks* (42%)
4. *Financial volatility* (39%)
5. *Demographic shift* (29%)

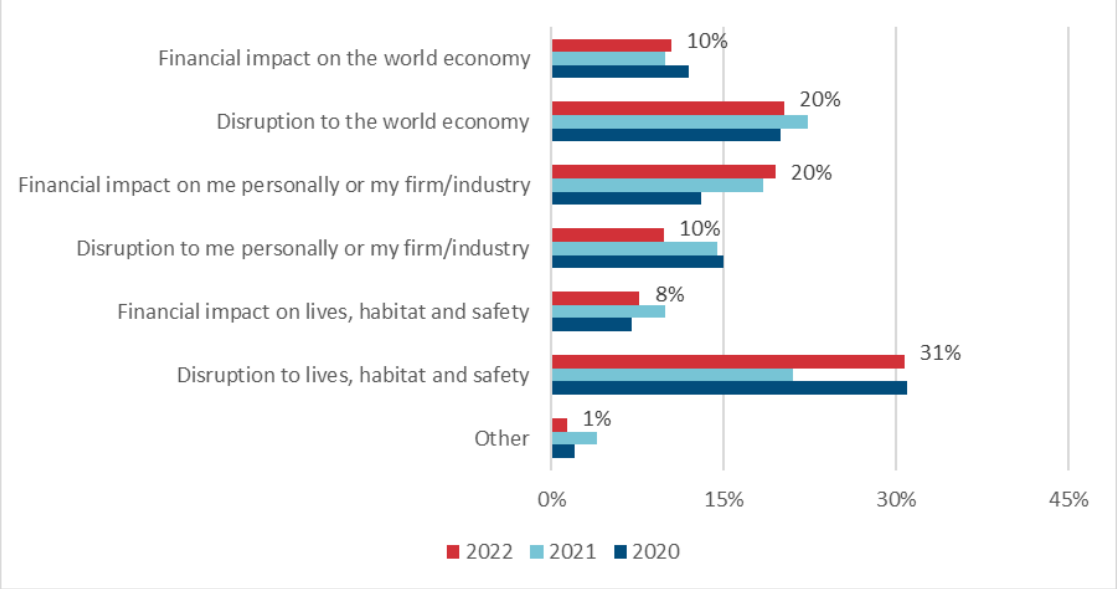
4.3 INTRODUCTORY QUESTIONS

Respondents have varying definitions of the greatest "strategic impact related to risk." Possible responses follow combinations of three groups (world economy; me personally or my firm/industry; lives, habitat and safety) and two types of impact (financial, disruption). Figure 15 shows that, in the current survey, disruption to lives, habitat and safety, up 10% to 31% and the top response by 11%, was the only increase above 2%. The other disruption responses were both down and financial responses were stable in total.

Figure 15

GREATEST STRATEGIC IMPACT

% of Responses



Respondents also were asked to consider 23 risks. Complete definitions of the risks are provided in Appendix I, but the risk names are also listed here for the reader's convenience.

Economic Risks

1. *Energy price shock*
2. *Currency shock*
3. *Emergent nation destabilization*
4. *Asset price collapse*
5. *Financial volatility*

Environmental Risks

6. *Climate change*
7. *Loss of freshwater services*
8. *Natural catastrophe: tropical storms*
9. *Natural catastrophe: earthquakes*
10. *Natural catastrophe: severe weather*

Geopolitical Risks

11. *Terrorism*
12. *Weapons of mass destruction*
13. *Wars (including civil wars)*
14. *Failed and failing states*
15. *Transnational crime and corruption*
16. *Globalization shift*
17. *Regional instability*

Societal Risks

18. *Pandemics/infectious diseases*
19. *Chronic diseases/medical delivery*
20. *Demographic shift*
21. *Liability regimes/regulatory framework*

Technological Risks

22. *Cyber/networks*
23. *Disruptive technology*

Changes to risk names and definitions during the survey's history are documented in Appendix I. The 23 emerging risks used in this iteration of the survey were reviewed. Names were unchanged for all risks, but 12 risks had their definitions updated or clarified. The definitional changes, described in more detail in Appendix I, replaced abrupt price changes with price instability and extremes (*Energy price shock)*, added a soil degradation reference (*Climate change*), pollution (*Loss of freshwater services*), forms of political and economic systems (*Globalization shift*) and added supply chains (*Cyber/networks*). Each reflects updated thinking about the risk. Some were recommended in the previous survey.

4.4 CURRENT RISK

Each year a benchmarking question is asked about the top current risk. Before the respondents answer this question, they are reminded of recency cognitive bias, an anchoring effect identified in prior surveys. In the field of behavioral finance, it is thought that recognizing our shortcomings will help us to overcome them.

The distribution of results by category follows, along with prior-year results. The 2022 survey was impacted by the Russian war in Ukraine, volatility in financial markets and unstable energy prices. The cognitive impact of the pandemic seems to be nearly gone.[4]

Table 2
CURRENT RISK WITH GREATEST IMPACT BY CATEGORY

	2022	2021	2020	2019
Economic	**40%**	22%	13%	25%
Environmental	**16%**	16%	13%	19%
Geopolitical	**26%**	12%	12%	26%
Societal	**6%**	31%	47%	10%
Technological	**8%**	12%	7%	14%
Other	**4%**	7%	7%	6%

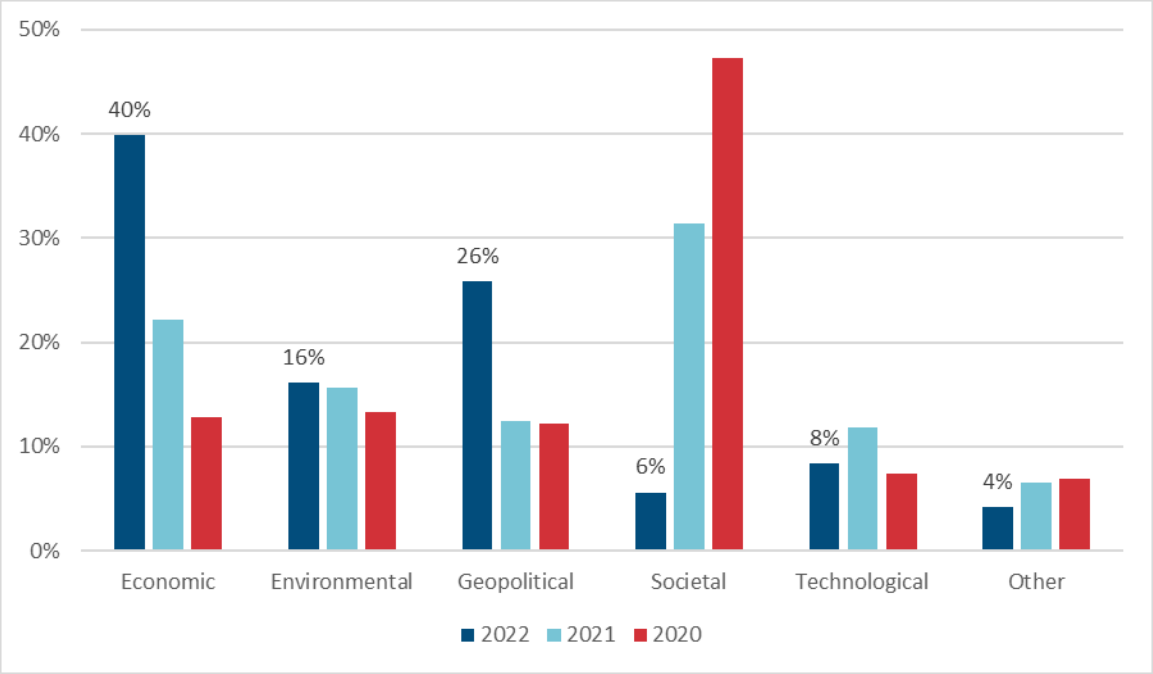
As shown in figure 16, the Economic category had the most responses with 40%. Geopolitical also had a double-digit gain. This was offset by the Societal category fall to 6% from a high of 47% in 2020.[5]

[4] All tables include the most recent results, starting with the current survey and working backward, as shown here.
[5] Throughout this report, a percentage-point change means an absolute increase or decrease (e.g., a two-percentage-point increase from 22% is 24%) and does not reflect a percent change (e.g., a 2% increase from 22% is 22.4%).

Figure 16

CURRENT RISK WITH GREATEST IMPACT

% of Responses in Given Year

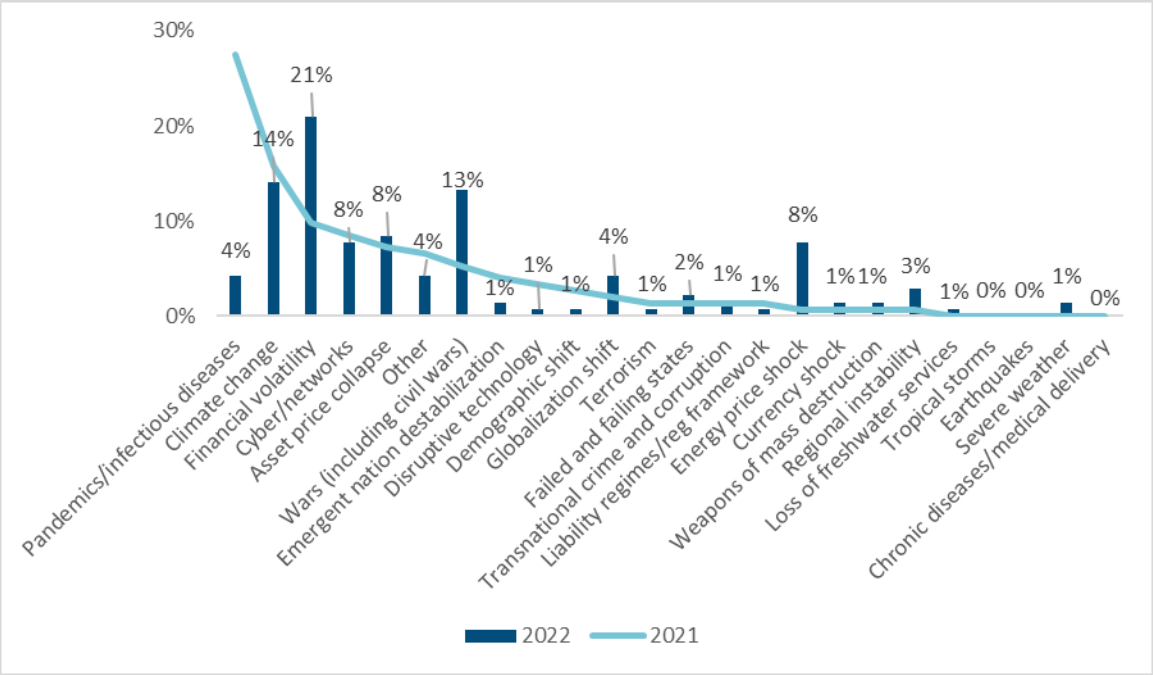


From an individual risk perspective, *Financial volatility* jumped from 10% to 21% (highest since 2013) between surveys to be the leading response for this question. *Pandemics/infectious diseases* decreased from 27% in the previous survey to 4% of respondents selecting it as having the greatest current impact, completing a three-year low to high to low cycle.

All but three risks were chosen as the top current risk by at least one respondent. *Natural catastrophe: tropical storms*, *Natural catastrophe: earthquakes* and *Chronic diseases/medical delivery* were not chosen.

Figure 17 shows how current risks can change between surveys. Data labels reflect 2022 results. Results for top current risk often reflect recency bias, but previously popular risks that have reduced results may be temporary, reflecting a contrarian indicator.

Figure 17
TOP CURRENT RISK, YEAR OVER YEAR
% of Responses in Given Year



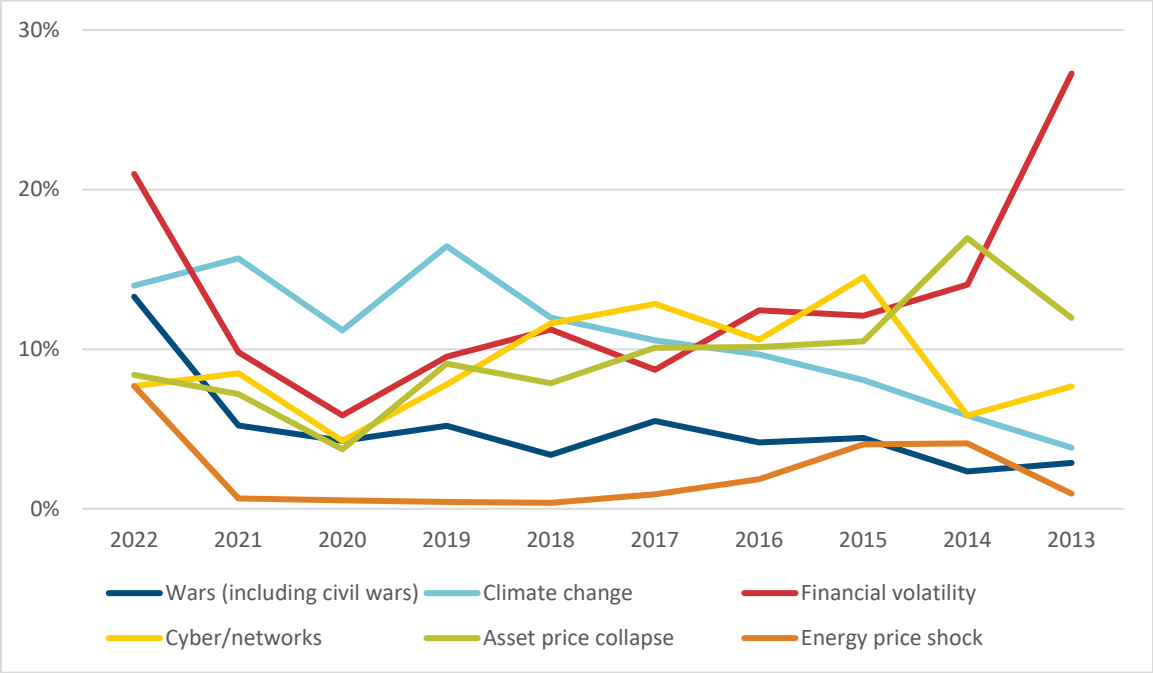
The top choice differentiated itself from the other options. These were the top five current risks chosen, including ties, with *Wars (including civil wars)* and *Energy price shock* new to this list:

Table 3
TOP RANKED CURRENT RISKS

1	*Financial volatility*	21%
2	*Climate change*	14%
3	*Wars (including civil wars)*	13%
4	*Asset price collapse*	8%
5	*Cyber/networks*	8%
5	*Energy price shock*	8%

When looking at trends, it is interesting to see how the top five current risks have performed over the last 10 years. *Financial volatility* fell (along with other economic risks) as time increased since the great financial crisis but has now rebounded to lead the responses. *Wars (including civil wars)* and *Energy price shock* had been stable before spiking in 2022.

Figure 18
TOP CURRENT RISK, 10-YEAR TREND FOR TOP FIVE RESPONSES
% of Responses in Given Year



4.5 SECTION A: EMERGING RISKS

Emerging risks in this survey are probed from several perspectives: top five emerging risks, top emerging risk and risk combinations. Respondents look at each using separate questions.

4.5.1 TOP FIVE EMERGING RISKS: ECONOMIC AND ENVIRONMENTAL RISKS INCREASE

After choosing which risk has the greatest current impact, respondents chose up to five emerging risks that "you feel will have the greatest impact over the next few years." Respondents selected a reasonable time horizon of their choosing. The data is compared across surveys and considers recent events as part of the analysis.

Each survey comes at a unique time in history. Economic and geopolitical concerns overwhelmed pandemics and technological issues. Climate change retained the top position with 57% of respondents choosing it in their top five emerging risks. Prior to viewing the results, the researcher has a view of what to expect based on recency bias. The pullback for *Pandemics/infectious diseases* and increase for *Wars (including civil wars)* were not surprising, but other risks that were in the news did not see the expected gains. These included *Currency shock*, which given the high levels of quantitative easing and tightening around the world seemed susceptible to an increase, and *Natural catastrophe: tropical storms*.

While 80% of respondents chose a full complement of five emerging risks, not everyone did. The average was 4.73 selected per respondent. Percentages reported for this survey for individual risks are based on the number of respondents who answered the specific survey question so sum greater than 100%, in this case 473% (for comparison to other results, this question is later recalculated as a percentage of total responses so individual risks total 100%).

Geopolitical maintained its lead (25% of the total selections came from this category), with the Environmental category (22%, up from 20%) in second place, followed by a resurging Economic category

(21%, up from 19%). Societal and Technological complete the rankings. The results distributed by category (using percentages of total responses) are as follows:

Table 4

TOP RANKED EMERGING RISKS (5) BY CATEGORY

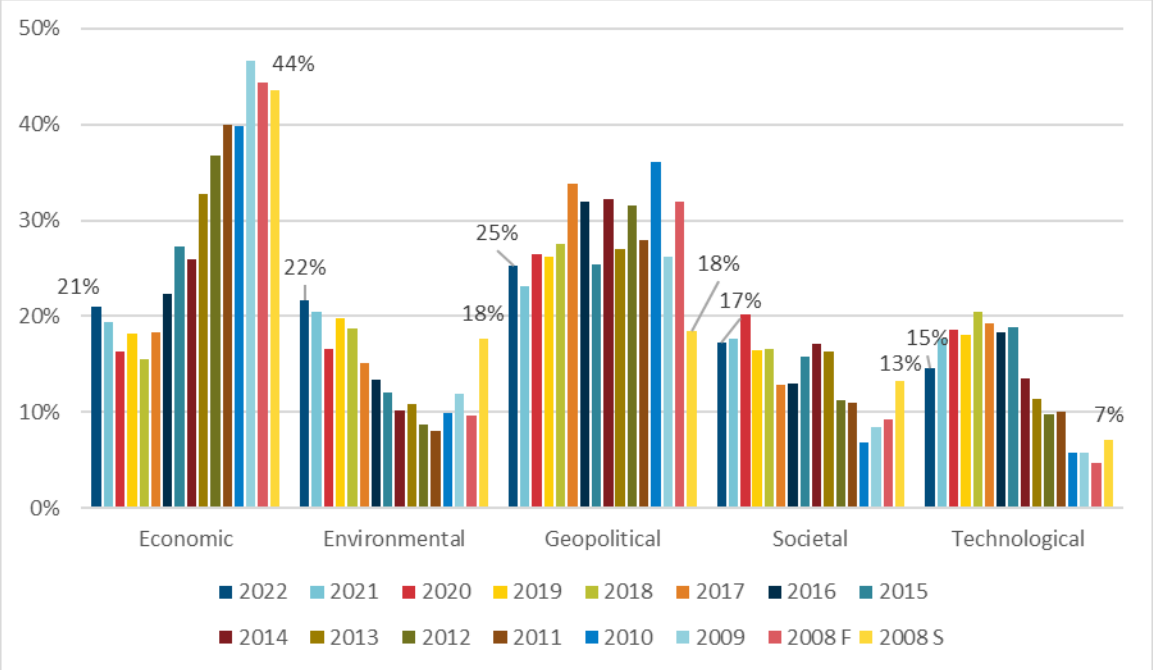
		2022	2021	2020
1	Geopolitical	**25%**	23%	26%
2	Environmental	**22%**	20%	17%
3	Economic	**21%**	19%	16%
4	Societal	**17%**	18%	20%
5	Technological	**15%**	18%	19%

As figure 19 shows, each category has its own story across the history of the survey. A continued recovery by Economic risks continues to reflect heightened concerns.

Figure 19

EMERGING RISKS, BY CATEGORY (UP TO FIVE RISKS CHOSEN PER SURVEY)

% of Total Responses in Given Year



The reader will note that some graphs show 2008 S and 2008 F. In the survey's first year, two iterations were completed, with versions in both spring and fall. *Financial volatility* was added as a risk in 2011, maintaining 23 risks by combining *Pandemics* and *Infectious diseases* into a single risk. Since then, the survey has been completed each fall with the same set of risks (although risk names and definitions have evolved).

In 2022, there was material movement in a few individual risks (four up and four down). Risks up at least 5% included *Energy price shock* (25%, up from 18% last year and 4% in 2020), *Financial volatility* (39%, up from 30%), *Wars (including civil wars)* (43%, up from 24%) and *Demographic shift* (29%, up from 23%). Risks down at least 5% included *Terrorism* (9%, down from 17%), *Pandemics/infectious diseases* (28%, down from 38%), *Cyber/networks* (42%, down from 52%) and *Disruptive technology* (26%, down from 32%). New highs were posted for *Loss of freshwater services* and *Wars (including civil wars)*. New lows were achieved by *Emergent nation destabilization* and *Terrorism*, each for the second consecutive year.

The top five specific responses were spread across all five categories. Multiple responses—up to five—were encouraged. The percentages shown here use the number of respondents in the divisor, so totals are much greater than 100%. The top five total 209%, slightly less concentrated than last year's 210%.

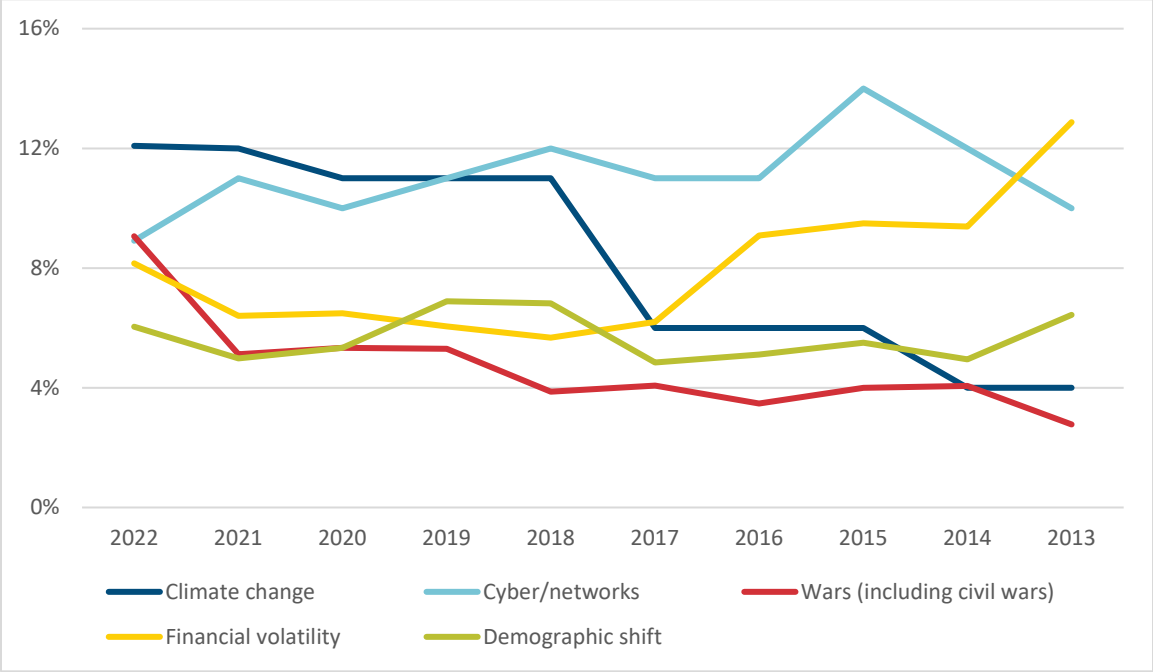
Table 5
TOP RANKED EMERGING RISKS (5)

		2022	2021	2020
1	*Climate change*	**57%**	58%	50%
2	*Wars (including civil wars)*	**43%**	24%	25%
3	*Cyber/networks*	**42%**	52%	47%
4	*Financial volatility*	**39%**	30%	31%
5	*Demographic shift*	**29%**	23%	25%

Calculating the mean and standard deviation covering the history of each risk, then comparing the ratio of standard deviation to mean, results in a broad range. *Currency shock*, with a range from 1% to 14%, has the largest ratio at 0.82 (next highest are *Energy price shock* at 0.75 and *Disruptive technology* at 0.74). The most stable risk is *Demographic shift*, with a range of 5% to 7% and ratio of 0.12 (next lowest is *Loss of freshwater services* at 0.29).

The trends over the past decade for these five risks are interesting to interpret. *Climate change* steadily increased but has stabilized, while *Financial volatility* has cycled off its low. *Wars (including civil wars)* rose in 2022 at a faster pace. *Cyber/networks* is slowly decreasing from its peak in 2015.

Figure 20
TOP FIVE EMERGING RISKS, 10-YEAR TREND FOR TOP FIVE RESPONSES
% of Responses in Given Year Based on all Responses (multiple allowed)



Trends of at least two consecutive years may act as a leading indicator. Nearly half meet this criterion in 2022. Two-year increasing trends were observed for *Energy price shock*, *Loss of freshwater services* and *Natural catastrophes: earthquakes*. The longest decreasing trend is a four-year streak for *Failed and failing states*, with three-year streaks for *Transnational crime and corruption* and *Emergent nation destabilization*.

Two-year decreasing streaks have started for *Terrorism*, *Globalization shift*, *Pandemics/infectious diseases* and *Disruptive technology*.

One method for analyzing this data over time is to highlight those risks reported in the current survey that are above long-term averages. For this purpose, the data was analyzed as a percentage of all responses (so totals are 100%). Three of the five categories were higher than their average over the 16 survey cycles. Environmental (22% vs 14% average), Societal (17% vs 14% average) and Technological (15% vs 13% average) each satisfied this criterion, while Economic (21% vs 29% average) and Geopolitical (25% vs 28% average) were lower. Among individual risks, six of the 23 had above-average results. The greatest positive differentials were 5% for *Climate change* and *Wars (including civil wars)*. *Loss of freshwater services* was the only other risk more that 1% above average, at 2%. Eight trended below average, including most of the Economic risks despite some recent gains in the category. *Terrorism* was the most below average (4%). *Currency shock*, *Emergent nation destabilization* and *Failed and failing states* were 3% below average. *Asset price collapse* was the only other risk that fell more than 1%.

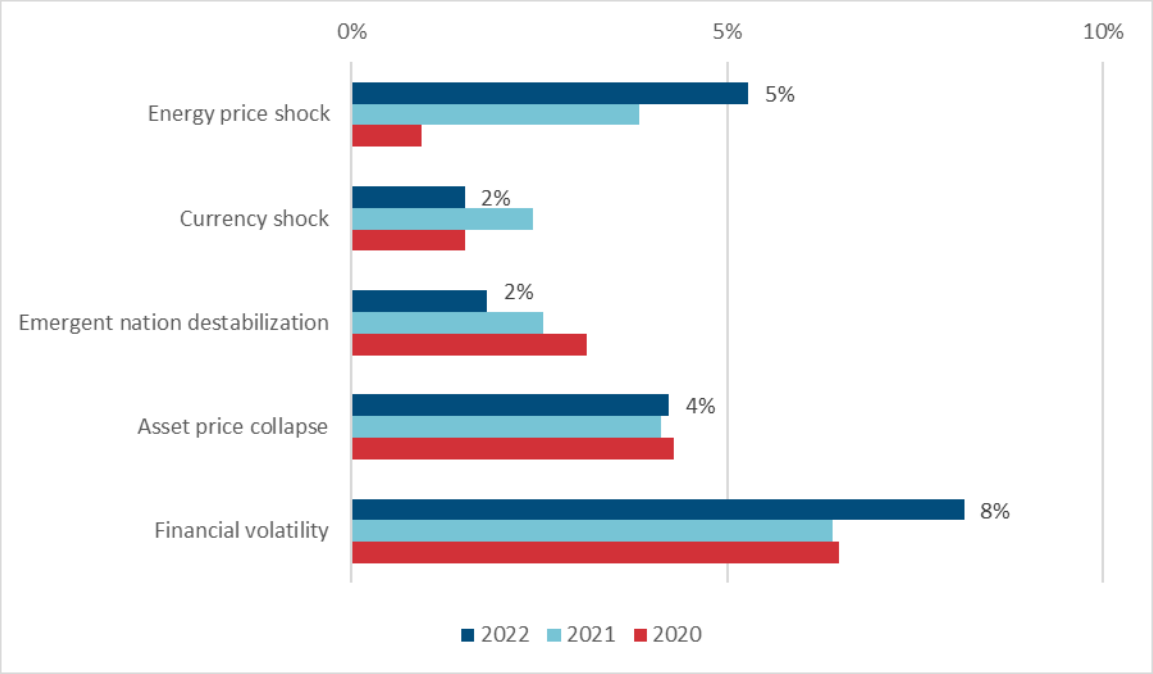
Figures 21 through 25 show recent trends for each category when respondents chose (up to) five emerging risks. The denominator in the percentages is the total number of responses received, rather than the number of respondents. This allows a comparison to other questions.

Economic risks were selected more often in total than in the previous survey, led by *Financial volatility* and *Energy price shock*, as shown in figure 21.

Figure 21

EMERGING RISK TRENDS: ECONOMIC RISKS

% of Total Responses

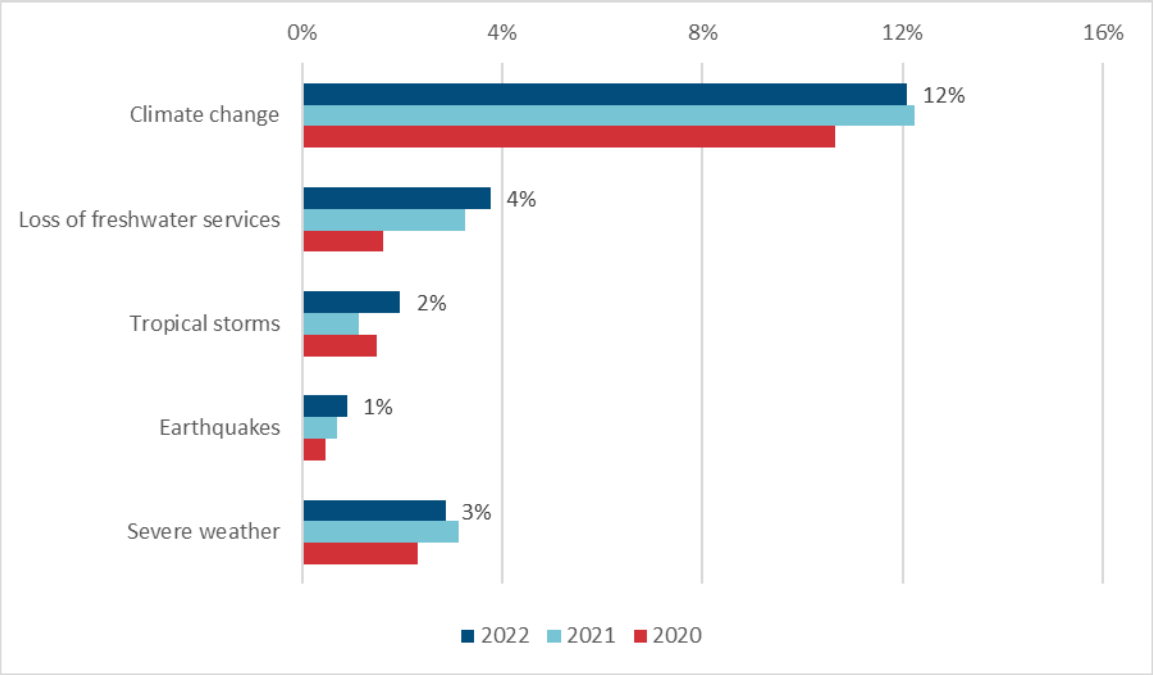


As shown in figure 22, three of the five Environmental risks were selected more often in the current survey. The increase in responses for *Natural catastrophes: earthquakes* is especially interesting as the large earthquake centered in Turkey occurred after the survey closed.

Figure 22

EMERGING RISK TRENDS: ENVIRONMENTAL RISKS

% of Total Responses

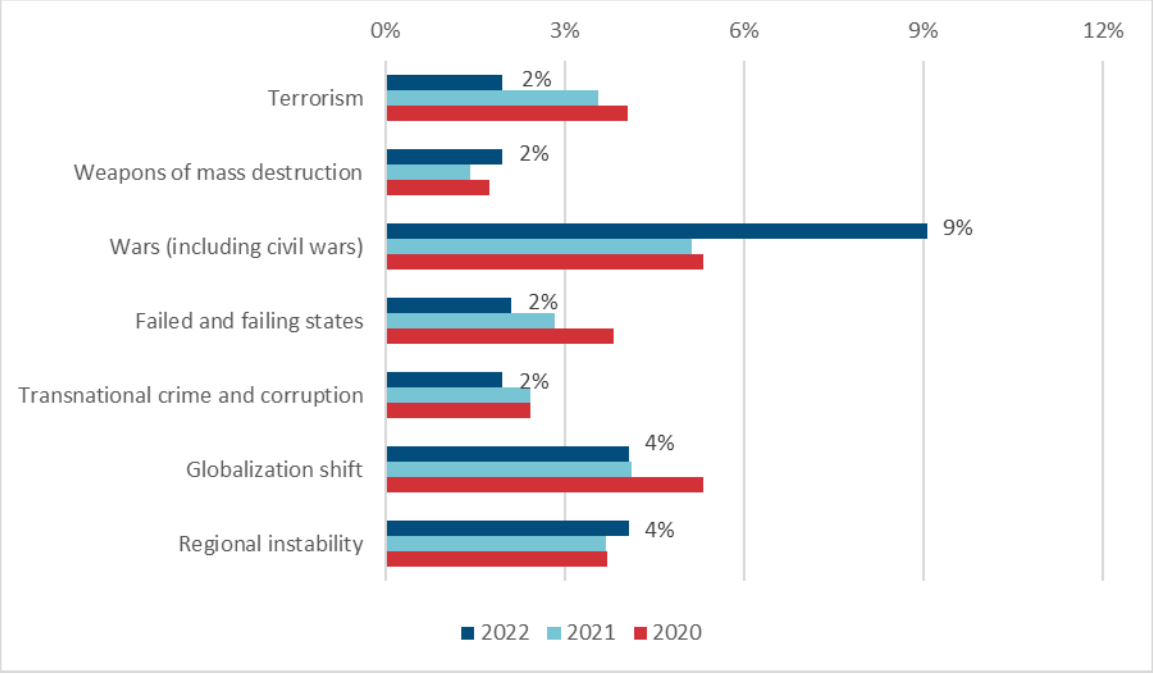


In the Geopolitical category *Wars (including civil wars)* spiked in the current survey, as shown in figure 23, reflecting the conflict in Ukraine and heightened tensions elsewhere.

Figure 23

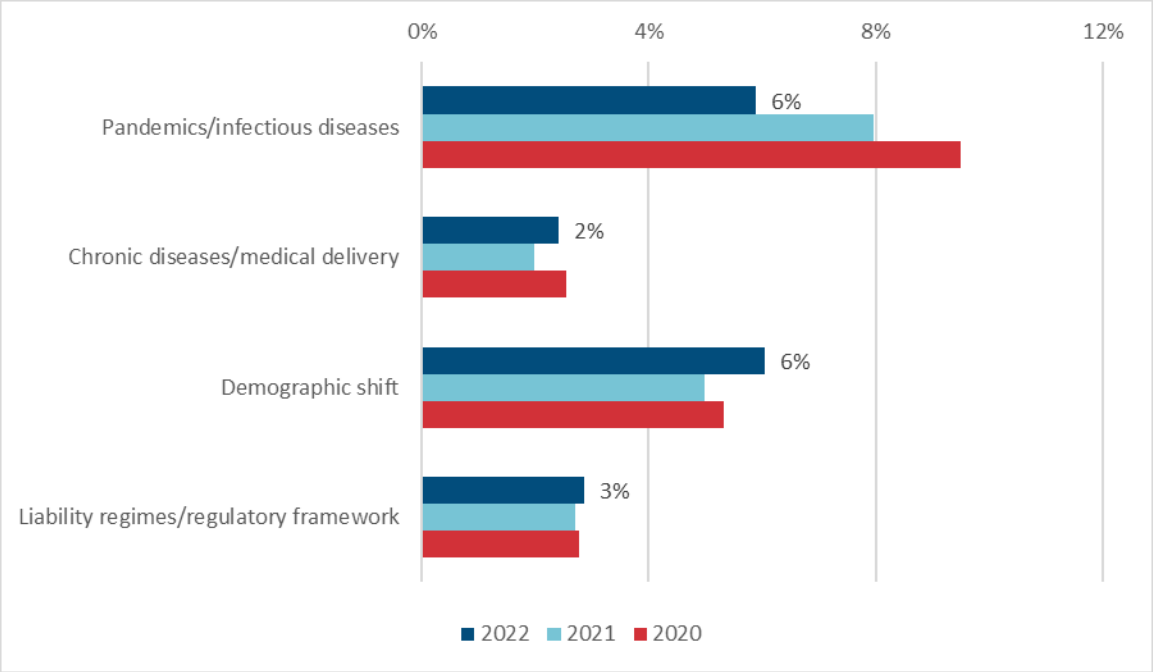
EMERGING RISK TRENDS: GEOPOLITICAL RISKS

% of Total Responses



Three of the four Societal risks increased in 2022, but *Pandemics/infectious diseases* fell by enough to offset them in total. This can be seen in figure 24.

Figure 24
EMERGING RISK TRENDS: SOCIETAL RISKS
% of Total Responses

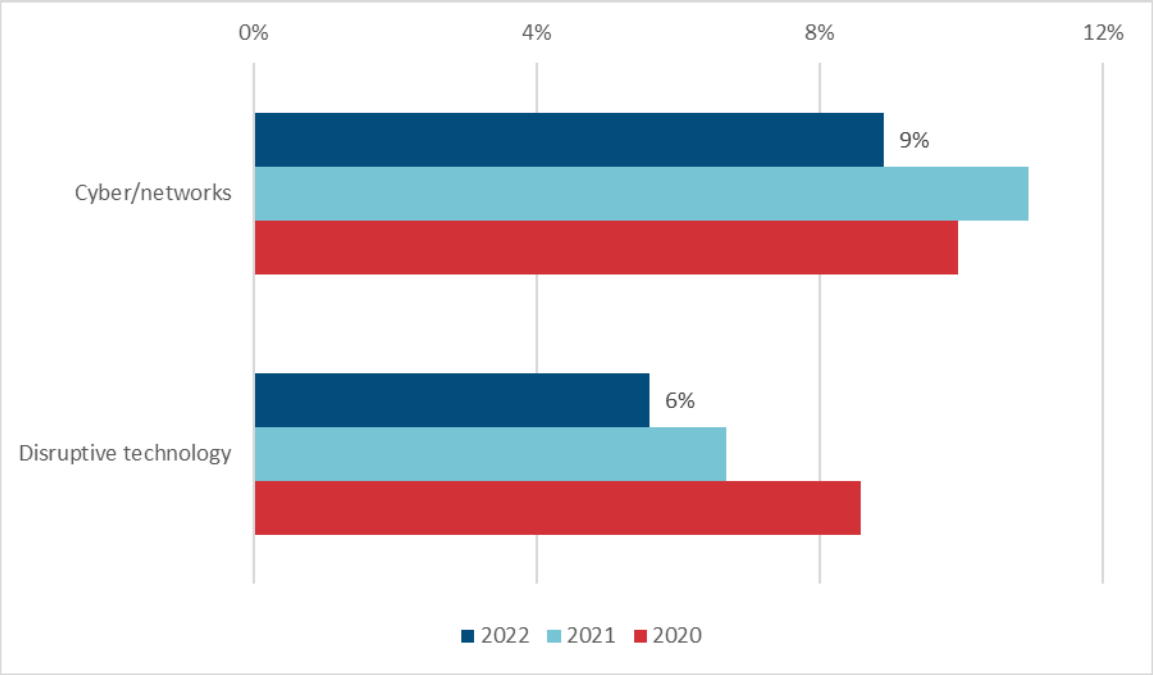


Both *Cyber/networks* and *Disruptive technology* fell, as seen in figure 25. Both remain among the top seven risks chosen.

Figure 25

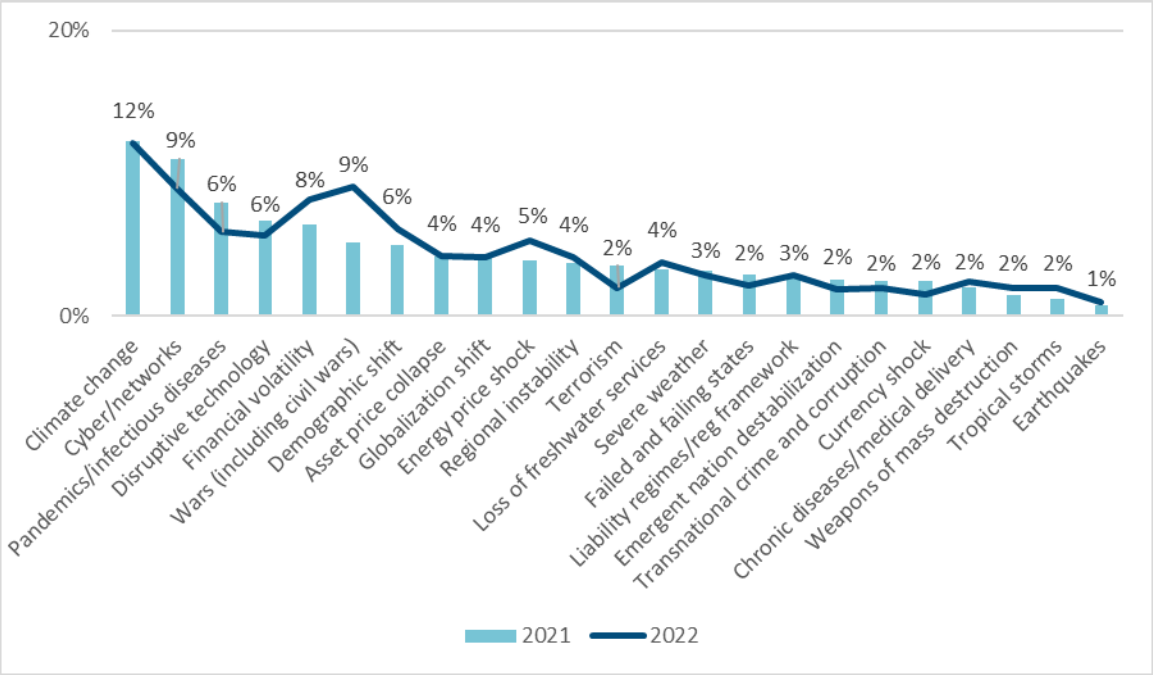
EMERGING RISK TRENDS: TECHNOLOGICAL RISKS

% of Total Responses



Some of the recent differences are highlighted in figure 26. It is interesting to see how certain risks change between years. The data labels presented are from 2022, with risks sorted based on 2021 results. While pandemics and some types of technology fell off risk managers' radars, the current survey reflects increases in several risks that were ranked previously in the top ten.

Figure 26
YEAR-OVER-YEAR EMERGING RISKS (UP TO FIVE RISKS CHOSEN)
% of Responses in Given Year



4.5.2 TOP EMERGING RISK: CLIMATE CHANGE

Respondents were asked to state the single emerging risk, from the group of five they selected in the previous question, they expected to have the greatest impact. The responses to this question can be volatile between years based on recent events. The Environmental category maintained the top ranking, with the Economic category maintaining second place. *Climate change*, at 28%, would be the leading category by itself and is well ahead of second place, *Financial volatility*. The largest drop was *Cyber/networks*, from 13% to 7%. The largest increase was *Financial volatility*, increasing from 10% to 15%.

Table 6
TOP RANKED EMERGNG RISK BY CATEGORY

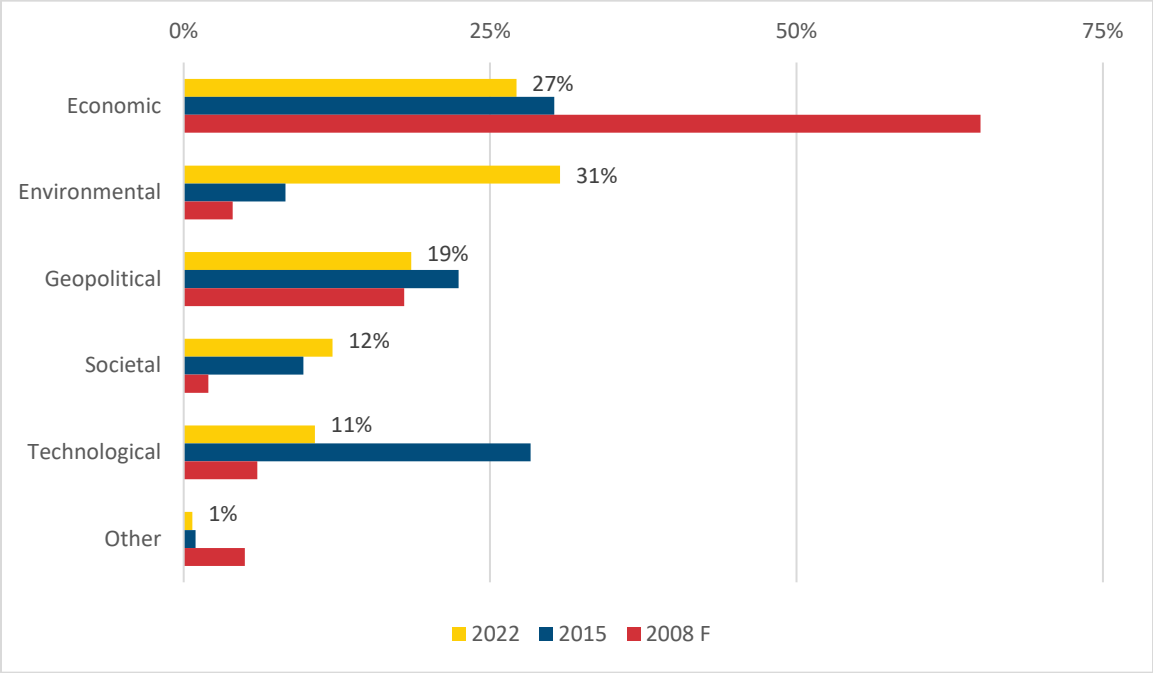
		2022	2021	2020
1	Environmental	**31%**	27%	29%
2	Economic	**27%**	23%	15%
3	Geopolitical	**19%**	10%	19%
4	Societal	**12%**	16%	16%
5	Technological	**11%**	19%	18%

Figure 27 compares the top emerging risks at the category level for the fall 2008, 2015 and 2022 surveys to show variation in results over the period of the survey. The chart shows how risk categories have trended, although there has been a lot of volatility along the way, both in total and within specific risks (see Appendix II). Risk perceptions in the Economic category have fallen dramatically, feeding increases over time for the Environmental, Societal and Technological categories. The Geopolitical category has been stable most of the time in total.

Figure 27

EMERGING RISK WITH GREATEST IMPACT, BY CATEGORY

% of Responses in Given Year



The top emerging risk in this iteration of the survey remained *Climate change*, which dominates each of the survey questions asking about emerging risks. *Financial volatility* is second, with the top four responses consistent with the prior year. Here are the top four leading responses (three risks are tied for fifth), with results indicated for 2022–2020:

Table 7

TOP RANKED EMERGING RISK

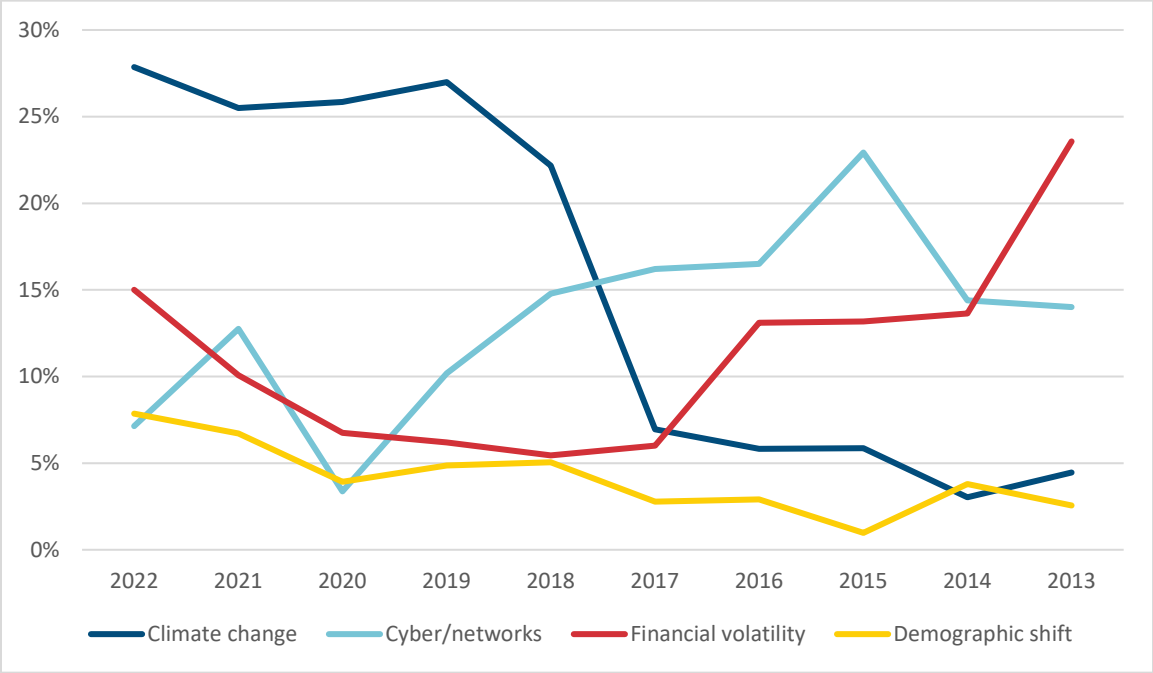
		2022	2021	2020
1	*Climate change*	**28%**	26%	26%
2	*Financial volatility*	**15%**	10%	7%
3	*Demographic shift*	**8%**	7%	4%
4	*Cyber/networks*	**7%**	13%	3%

Although the leading responses for the top emerging risk do not vary a lot between years, the numerical results are more volatile than the other questions. *Climate change* spiked in 2018 and has been stable since. *Financial volatility* rebounded after dropping from earlier high levels following the financial crisis that was just starting when the survey began. *Cyber/networks* and *Disruptive technology* steadily increased and now have regressed. *Demographic shift* has bounced around but reached a new high in each of the last two surveys.

Figure 28

TOP EMERGING RISK, 10-YEAR TREND FOR TOP FOUR RESPONSES

% of Responses in Given Year



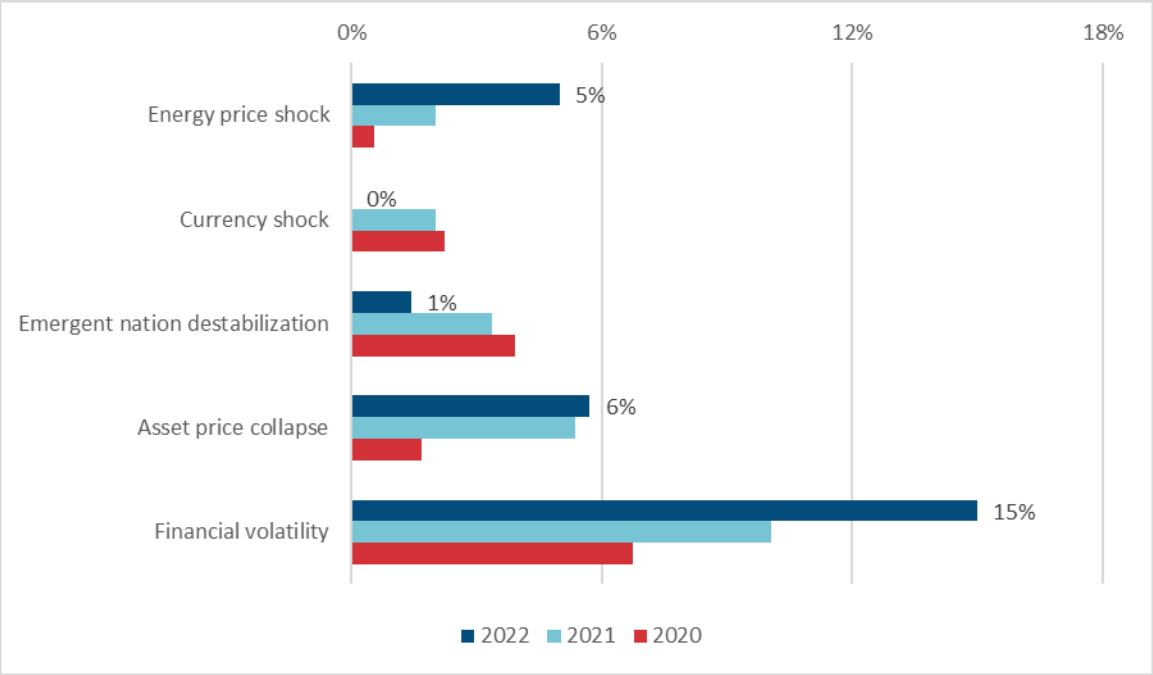
For each risk category, figures 29 through 33 show how respondents answered the top emerging risk question within the category for the most recent three surveys. Note that the horizontal axis for each chart is chosen to highlight the data and is not consistent among categories. Data labels are rounded to the nearest percentage point and are shown for the most recent survey. The length of the individual bar has not been rounded.

As shown in figure 29, the Economic category showed the highest result for *Energy price shock* since 2010 and the highest result in the *Financial volatility* risk since 2013. *Emergent nation destabilization* saw its lowest rate in the history of the survey but, overall, respondents seem to be aware of a growing concern around economic risks. Perhaps the low responses for *Currency shock* and *Emergent nation destabilization* should be monitored as contrarian indicators.

Figure 29

TOP EMERGING RISKS—ECONOMIC

% of Total Responses

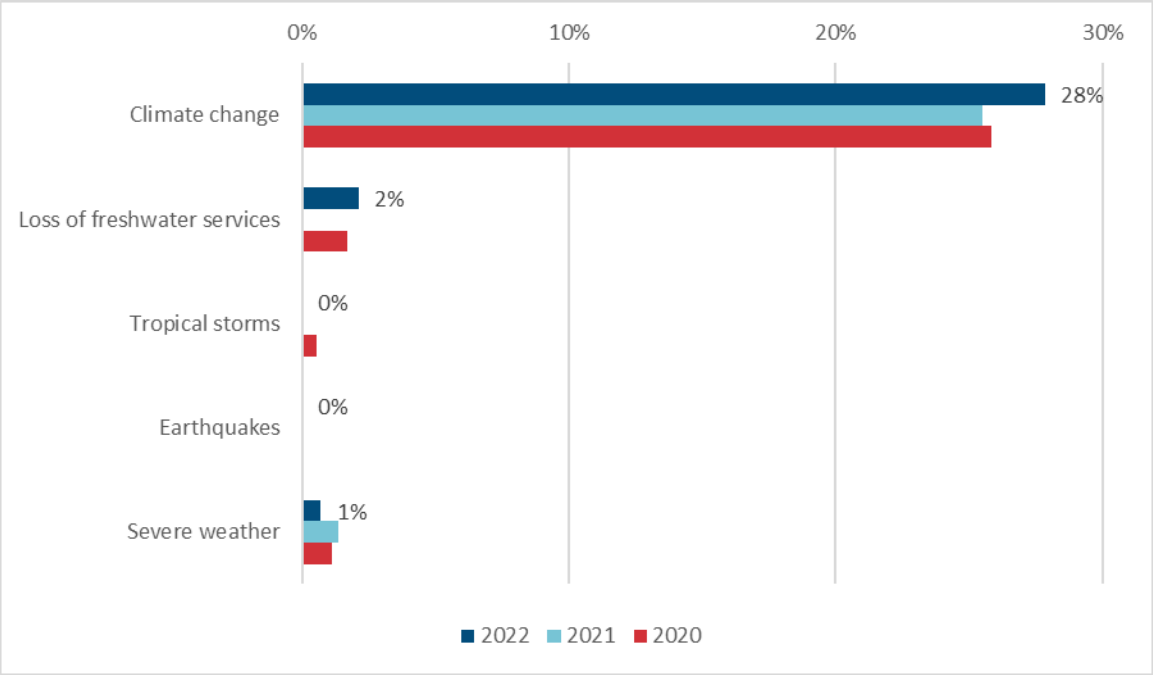


Environmental category risks, shown in figure 30, remain small, except for *Climate change*, which remains the top overall risk for the fifth consecutive year. In addition to the quantitative responses, several respondents mentioned *Loss of freshwater services* in the open-ended questions so should be monitored as a possible mover in the future.

Figure 30

TOP EMERGING RISKS—ENVIRONMENTAL

% of Total Responses

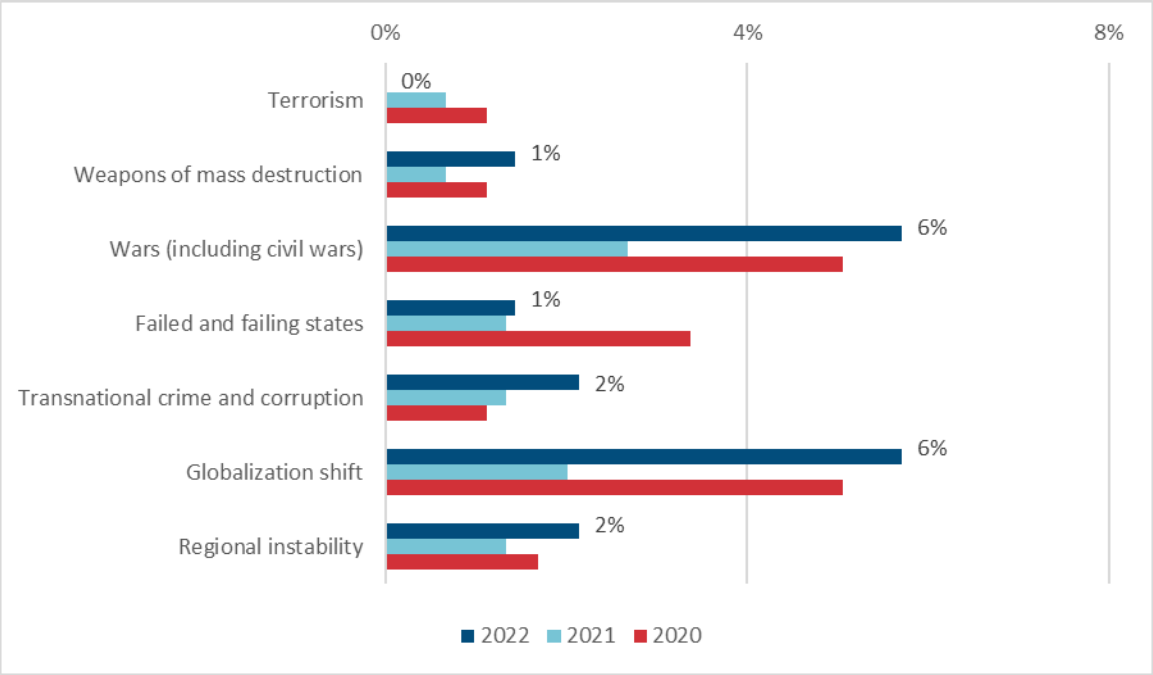


Geopolitical risks tended to be the most volatile in the survey, so it is not surprising to see in figure 31 that many of these risks whipsaw, with 2022 an up year overall. *Terrorism* recorded its lowest result in the survey's history and *Wars (including civil wars)* had its highest result.

Figure 31

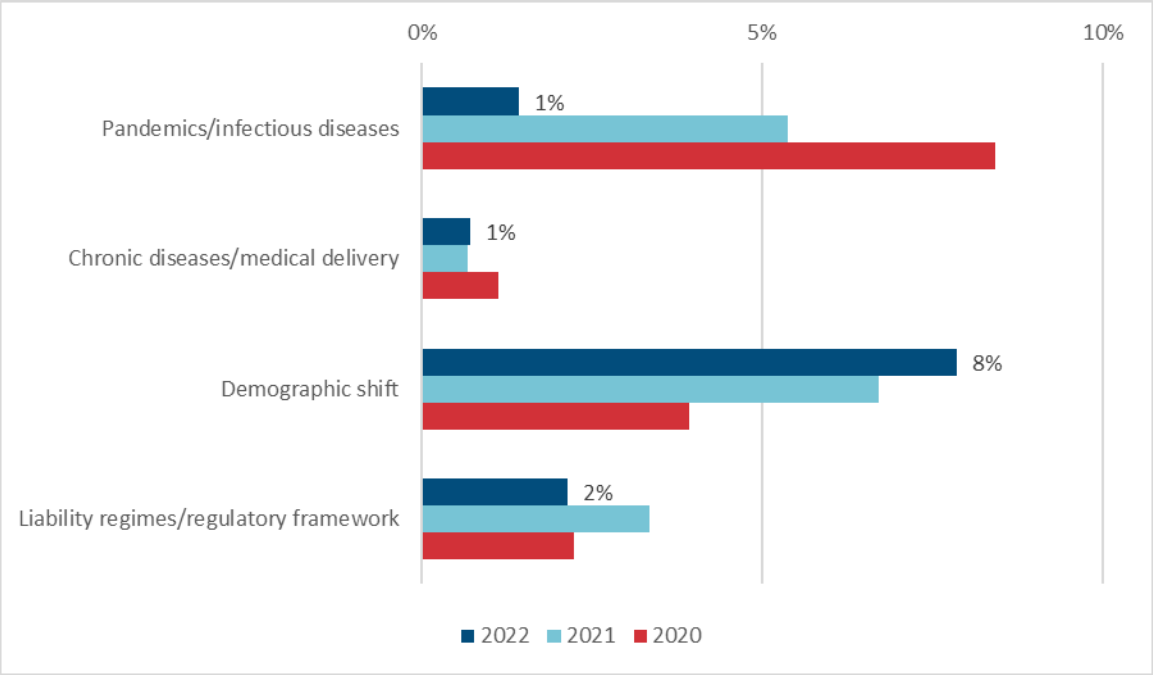
TOP EMERGING RISKS—GEOPOLITICAL

% of Total Responses



As shown in figure 32, the Societal category saw an increase in the *Demographic shift* risk to its highest level for the second consecutive year, offsetting a drop from 5% to 1% in the *Pandemics/infectious diseases* risk.

Figure 32
TOP EMERGING RISKS—SOCIETAL
% of Total Responses



In the Technological category, shown in figure 33, both *Cyber/networks* and *Disruptive technology* fell.

Figure 33
TOP EMERGING RISKS—TECHNOLOGICAL
% of Total Responses

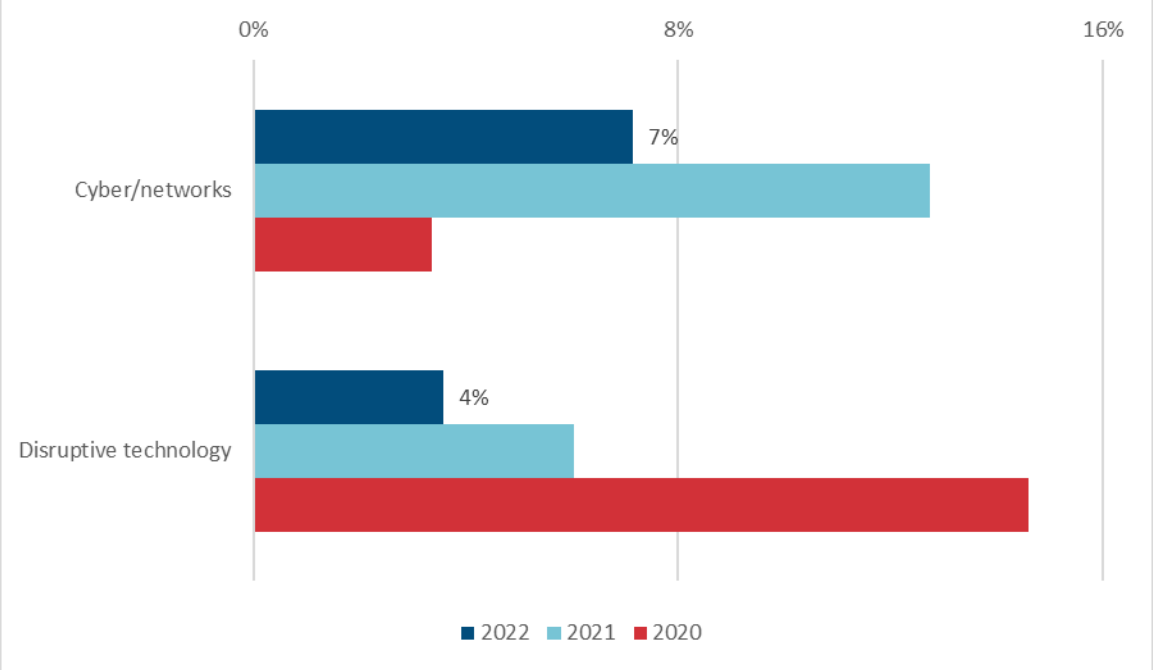
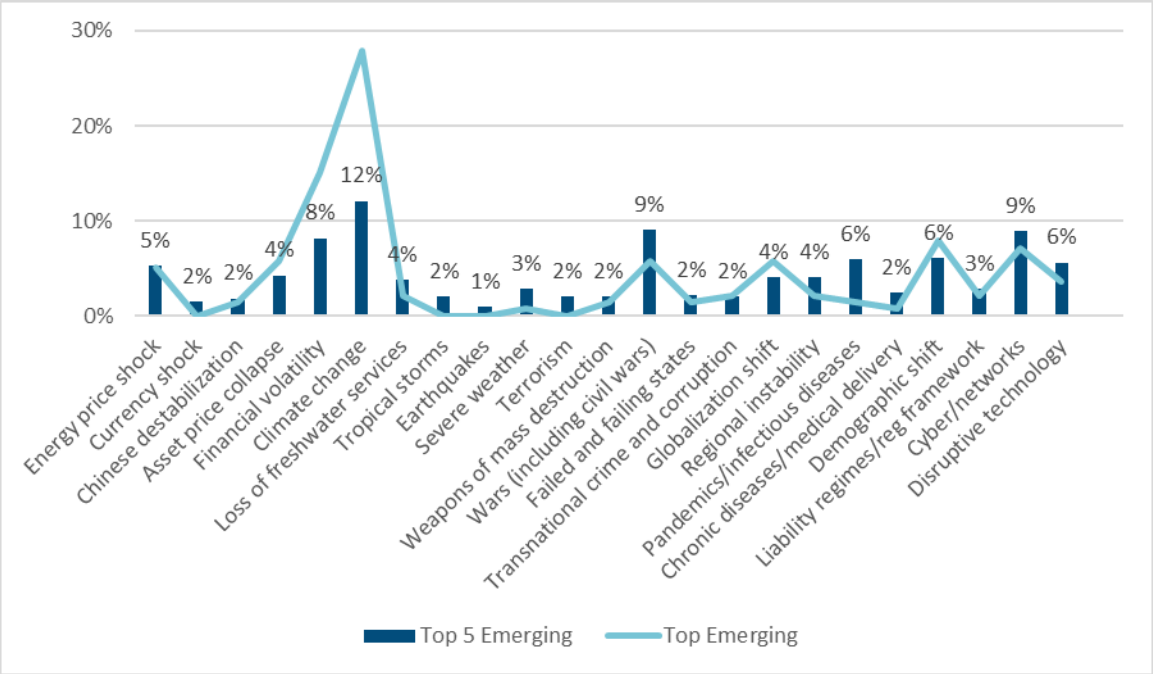


Figure 34 compares the percentages selecting each risk as the top emerging risk with the percentages selecting each risk as one of the five top emerging risks. For several risks, these two measures of perceived importance vary. If we use the highest absolute positive differential to mark the importance of being the top overall risk relative to inclusion in the top five list, that risk was again *Climate change*, at 16%. The greatest negative differential is *Pandemics/infectious diseases* at −3%.

Figure 34

EMERGING RISKS SELECTED FOR TOP FIVE AND TOP RISK

% of Responses to Given Question



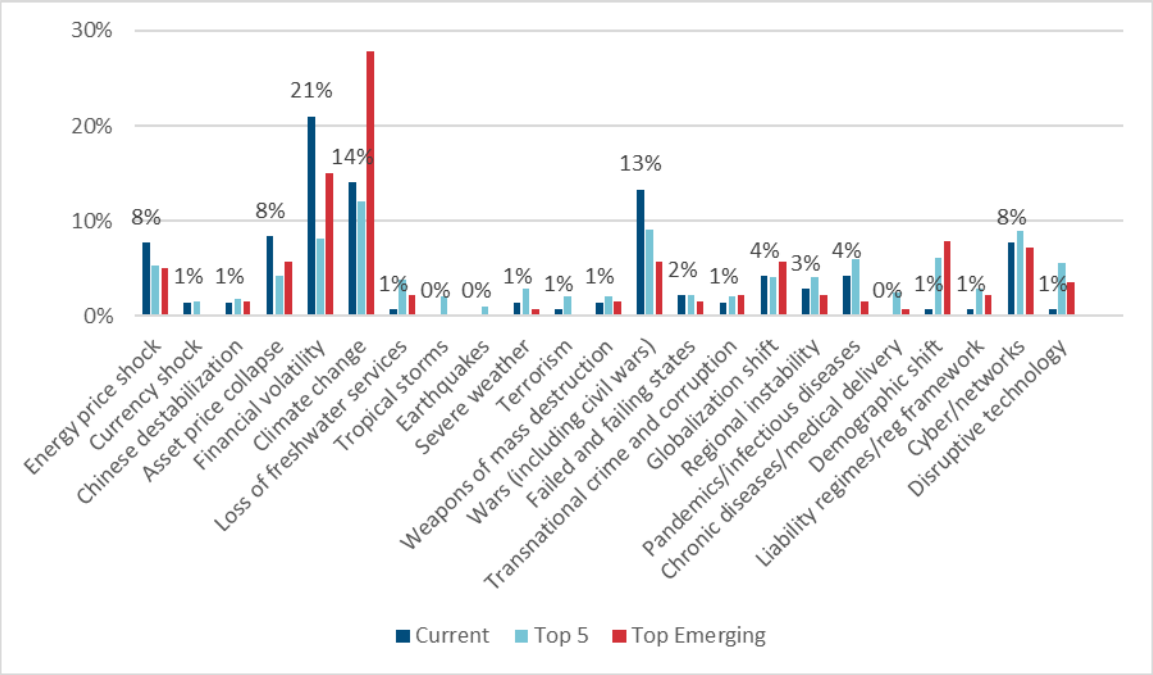
A comparison of the top current risk and top emerging risk suggests which risks are expected to be relatively more important in the future. The largest absolute negative differential (current less than top emerging risk) is *Climate change*, at 14%, followed by *Demographic shift* at 7%. The largest absolute positive differentials, suggesting an expectation of lower risk in the future, are *Wars (including civil wars)* at 8% and *Financial volatility* at 6%.

Another interesting characteristic of a particular risk is to have the top five response be the highest of the three measures of its perceived risk. This could reflect a risk that respondents are worried about, but they cannot quite get their heads around being the most important risk. As shown in figure 35, this characteristic is seen with 15 of the 23 risks. More interesting is which risks have their maximum score outside the top five emerging risk question. For current risk, the four risks where it is the top score across the three questions include *Energy price* shock, Asset *price collapse*, *Financial volatility* and *Wars (including civil wars)*. The risks where the top emerging risk is the top score include four risks: *Climate change*, *Transnational crime and corruption*, *Globalization shift* and Demographic *shift*.

Figure 35

RISK PERCEPTION, BY RISK AND QUESTION

% of Responses to Given Question



4.5.3 RISK COMBINATIONS

Risks interact with each other. Higher-order interactions can result in tipping points that generate a regime shift to a new distribution. The risk combination question allows practitioners to share their perceptions with peers. What is included, and what is not, is interesting and can then be qualitatively monitored over time.

The outcomes of risk interactions are hard to plan for. When multiple risks are correlated, or randomly occur at about the same time, companies are at risk if they haven't proactively planned for a liquidity event and managed leverage.

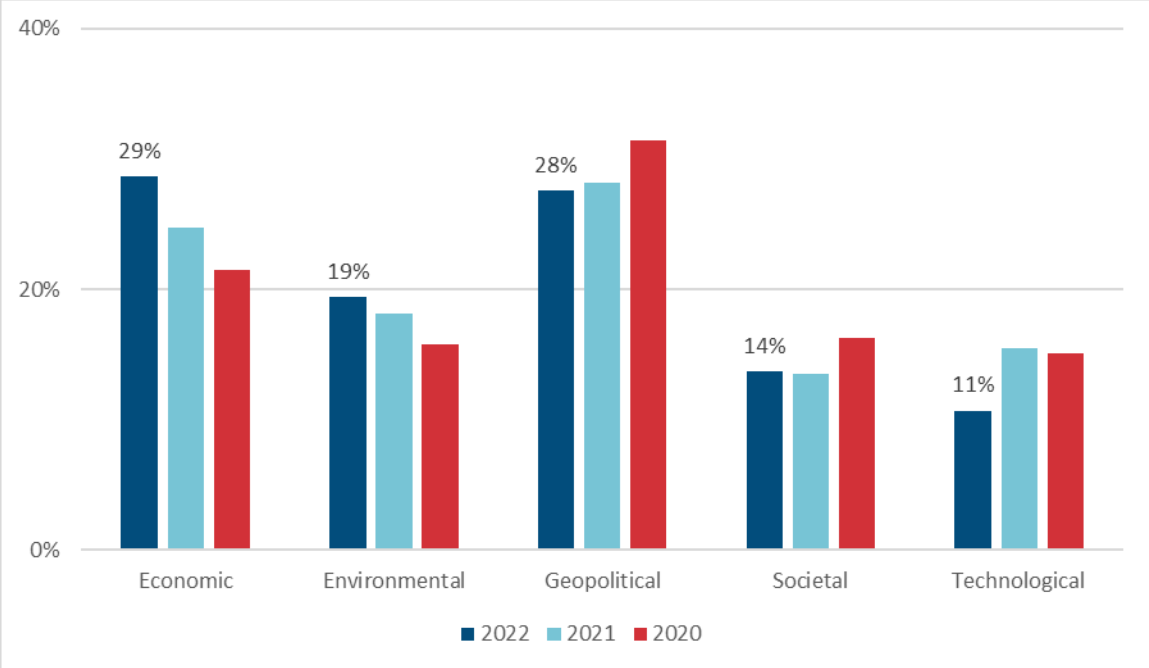
To explore this issue, the survey asked each respondent to choose up to three combinations of two risks they believe will have a large impact over the next few years, either concurrently or sequentially. Appendix II includes a grid showing how many of each combination were chosen.

Even though the question is about combinations of risks, it is helpful to look first at the distribution of categories from which the risks were chosen. The Economic and Geopolitical categories are the most frequent response categories, with an increase in the Environmental category offsetting a decrease in Technological. Figure 36 provides a graphical representation of the results that follow.

Table 8
TOP RANKED RISK COMBINATIONS BY CATEGORY

		2022	2021	2020
1	Economic	**29%**	25%	21%
2	Geopolitical	**28%**	28%	31%
3	Environmental	**19%**	18%	16%
4	Societal	**14%**	13%	16%
5	Technological	**11%**	16%	15%

Figure 36
MOST IMPACTFUL RISK COMBINATIONS, BY RISK CATEGORY
% of Responses Selected from Category in Given Year



The term, threat multiplier, was coined by the U.S. military to describe a risk that interacts with other risks and amplifies the impact. Climate change is often the example cited, but it seems reasonable to apply the term here to risks that are concerns when thought of in combination with other risks. The individual risks most often selected for combinations were *Financial volatility*, *Climate change* and *Wars (including civil wars)*.

Table 9
TOP RANKED RISKS IN COMBINATION

		2022	2021	2020
1	*Financial volatility*	**11%**	8%	9%
2	*Climate change*	**11%**	11%	9%
3	*Wars (including civil wars)*	**10%**	7%	7%
4	*Asset price collapse*	**7%**	6%	6%
5	*Cyber/networks*	**6%**	9%	8%

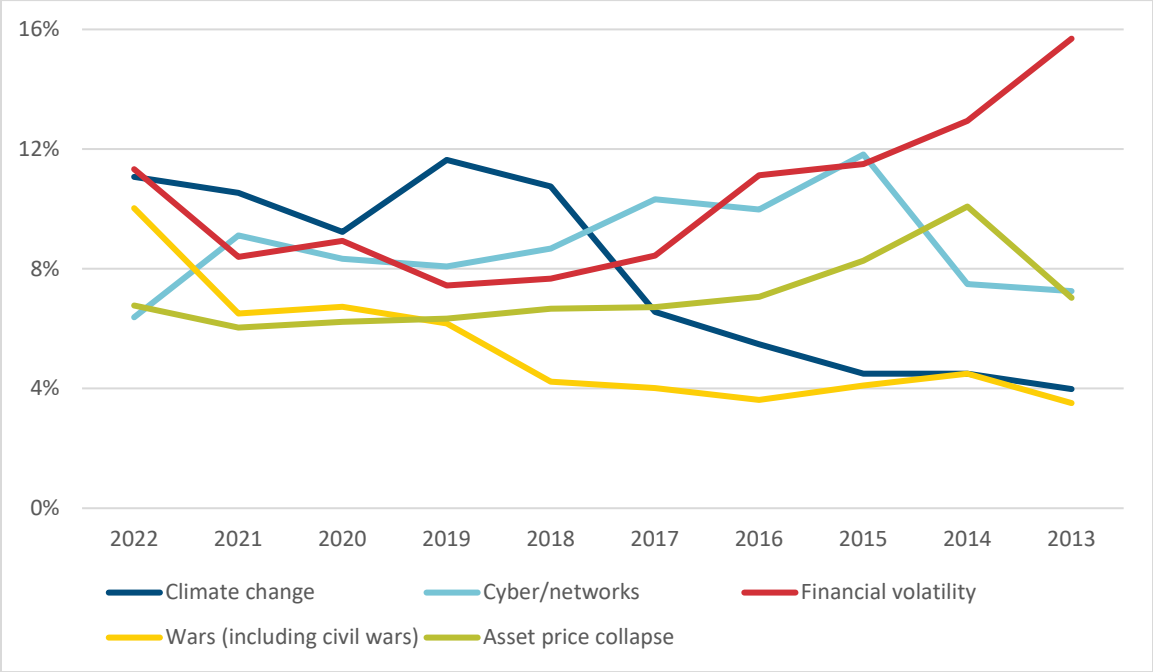
It is easy to be tricked into thinking about reversion to the mean in the trend results for the top risk combinations, but each of the five top responses has its own story. As with the other questions, *Climate*

change has stabilized, *Financial volatility* is strengthening and *Wars (including civil wars)* recorded its peak result. *Terrorism* and *Failed and failing states* recorded new lows.

Figure 37

TOP RISK COMBINATIONS, 10-YEAR TREND FOR TOP FIVE RESPONSES

% of Responses in Given Year



The top risk combinations chosen continue to show a broad dispersion. The difference drops off quickly when combinations are ranked based on the percentage choosing them. The top five combinations among the 421 responses were as follows:

16 responses 4%, no. 4

Climate change

Loss of freshwater services

15 responses 4%, no. 1 in previous survey

Cyber/networks

Disruptive technology

15 responses 4%, no. 5

Climate change

Natural catastrophe: severe weather

15 responses 4%, not previously ranked

Energy price shock

Wars (including civil wars)

14 responses 4%, no. 2

Asset price collapse

Financial volatility

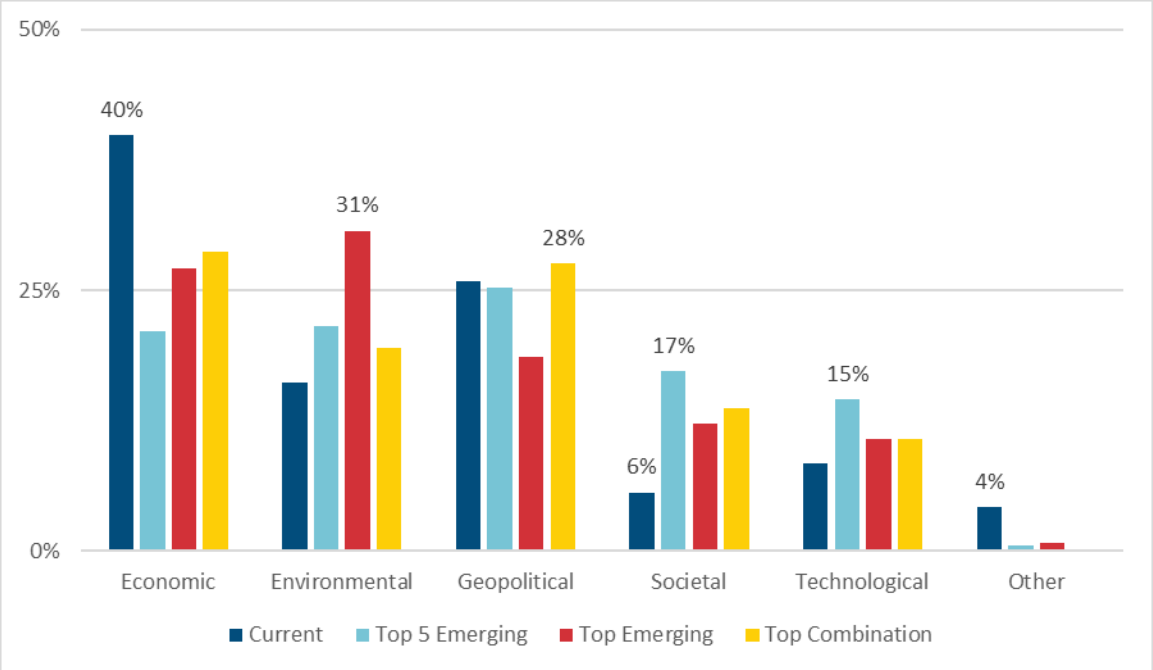
The major category combinations were as follows (with percentages from the current and most recent two prior surveys):

Table 10
RISK COMBINATION PAIRS BY CATEGORY

		2022	2021	2020
Economic	Geopolitical	**17%**	11%	11%
Economic	Economic	**12%**	11%	8%
Environmental	Environmental	**12%**	9%	8%
Geopolitical	Geopolitical	**11%**	15%	14%
Geopolitical	Technological	**7%**	8%	9%
Societal	Societal	**6%**	5%	4%
Economic	Societal	**6%**	6%	9%
Environmental	Societal	**5%**	6%	5%
Economic	Environmental	**5%**	5%	3%
Environmental	Geopolitical	**5%**	5%	6%
Technological	Technological	**4%**	8%	6%
Economic	Technological	**3%**	4%	4%
Geopolitical	Societal	**3%**	3%	7%
Societal	Technological	**2%**	3%	4%
Environmental	Technological	**2%**	1%	1%

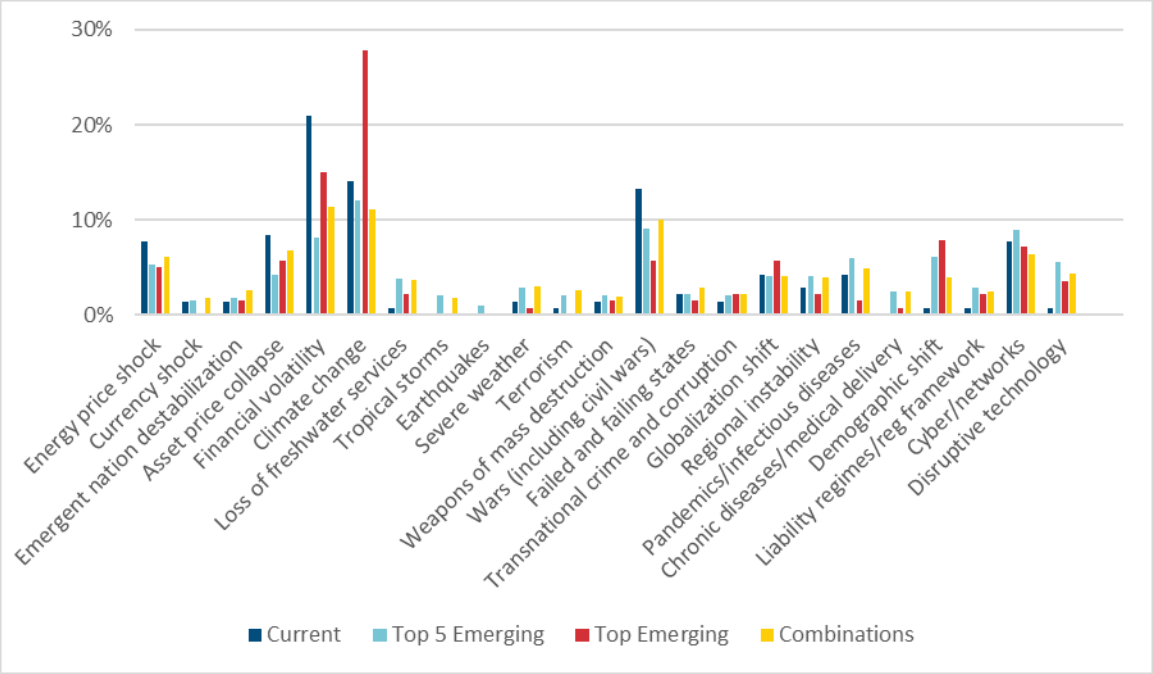
By category, responses don't generally vary by a large amount when viewed across the four major questions. As shown in figure 38, the highest results occur for the Societal category (three of the four risks peak with top five emerging risks), Geopolitical (three of seven peak with combinations), Technological (both risks peak with top five emerging risks), Economic (three of five risks peak with current risk), and Environmental (selection of top emerging risk is high due to the *Climate change* risk).

Figure 38
SELECTION OF RISKS IN CATEGORY, BY QUESTION
% of Responses Selected from Category for Given Question



Risk by risk, there is much more variation, as shown in figure 39, but results for many risks remain in a range across all four questions.

Figure 39
SELECTION OF RISK, BY QUESTION
% of Responses to Given Question



The following risks were most often selected as the top current risk (relative to the other questions):

- *Energy price shock*
- *Asset price collapse*
- *Financial volatility*
- *Wars (including civil wars)*

The following risks were most often selected as one of the top five emerging risks:

- *Loss of freshwater services*
- *Natural catastrophe: tropical storms*
- *Natural catastrophe: earthquakes*
- *Weapons of mass destruction*
- *Regional instability*
- *Pandemics/infectious diseases*
- *Liability regimes/regulatory framework*
- *Cyber/networks*
- *Disruptive technology*

The following risks were most often selected as the top emerging risk:

- *Climate change*
- *Globalization shift*
- *Demographic shift*

The following risks were most often selected as part of a combination:

- *Currency shock*
- *Emergent nation destabilization*
- *Natural catastrophe: severe weather*
- *Terrorism*
- *Failed and failing states*
- *Transnational crime and corruption*
- *Chronic diseases/medical delivery*

There are 253 possible risk combinations. Since the financial crisis in 2008–2009, results have trended toward reduced concentrations as shown in figure 40.

Figure 40
CUMULATIVE DISTRIBUTION OF RISK COMBINATIONS SELECTED

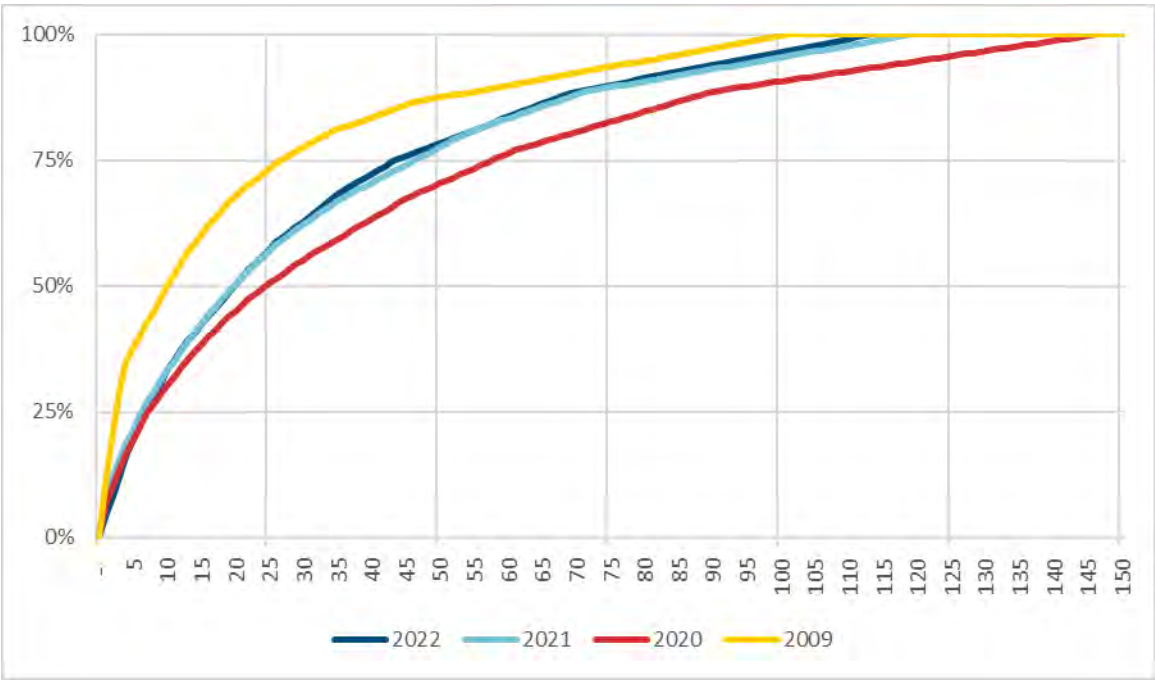
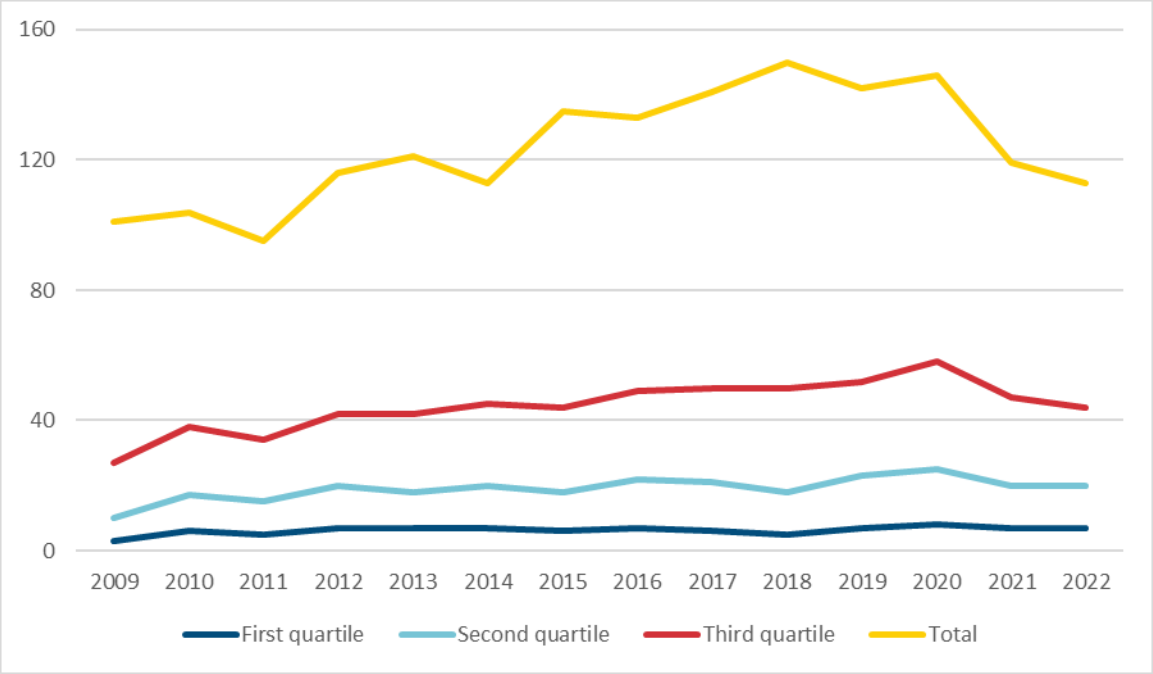


Figure 41 shows the number of combinations selected each year, with data listed cumulatively and the first quartile representing the most frequent responses. The current survey suggests a continued shift toward more concentrated risks. Fewer than half of the possible two-risk combinations were selected. With so many large risk events during the year, respondents had lots to think about and seem to be focusing in on the risks that matter to them.

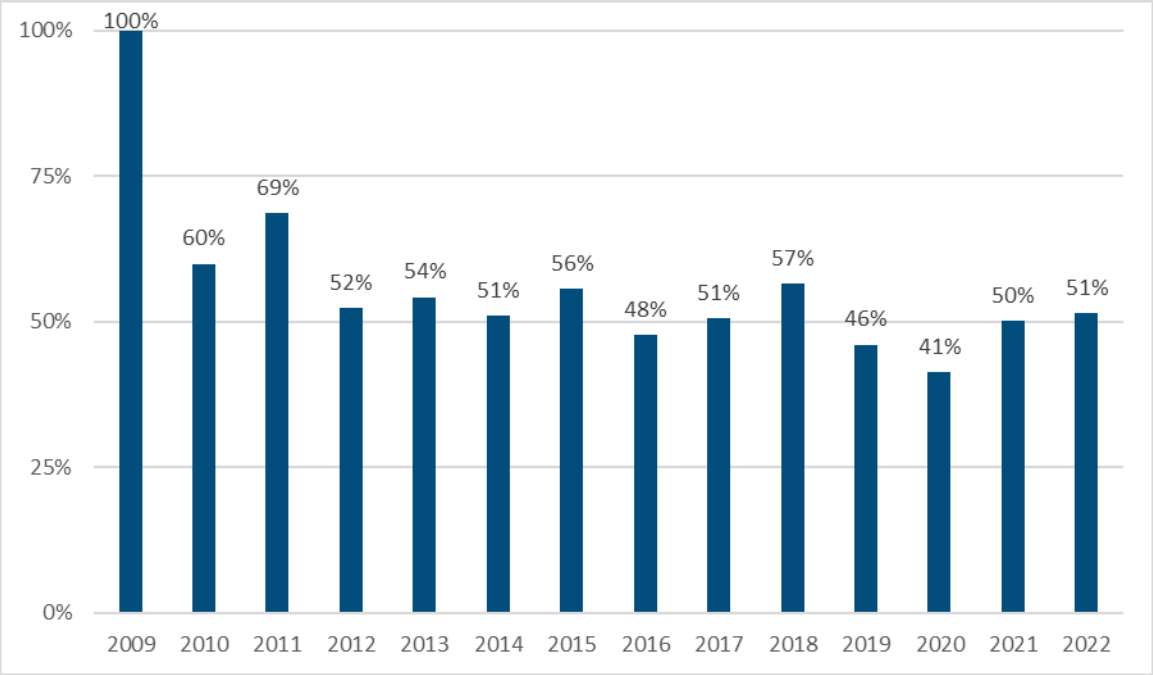
Figure 41
NUMBER OF RISK COMBINATIONS SELECTED, BY YEAR



The level of concentration can be considered an indicator of the current risk environment, with each quartile being considered against the extreme example of 2009 and then averaged across the three quartile results.[6] Shown in figure 42, this year's risk concentration ratio of 51% is typical of rates found from 2012–2019.[7]

[6] It is an average of averages. For each quartile result, the number of risks it takes to reach the threshold is divided by the same result for 2009. These three quartile results are then used to calculate an average.
[7] The risk concentration ratio is calculated by comparing the ratio at each of the three quartiles (2009 result divided by current year result) and averaging them. A lower number shows broader results, while 100% would recreate the 2009 survey. This generates a relative concentration ratio.

Figure 42
RISK CONCENTRATION RATIO
Base 2009 = 100%



4.5.4 SEGMENTED RESULTS BASED ON GREATEST STRATEGIC RISK

It would, of course, be interesting to break down every question by every demographic variable, but that would only be useful if it provided statistically significant results. This was a survey, not a double-blind study, which made it useful without overpromising the output ramifications. Responses were lower than generally would be statistically analyzed; early questions received over 140 responses and it reduced in later sections, so splitting a question further would make those numbers even lower. That's one of the reasons a multi-year trend is analyzed, to see if results in one year are consistent with those in another (they generally are). Given that shortcoming, the survey looked at results based on one question in this iteration of the survey. The numbers aren't large, but present a result that is interesting so is presented here.

Each of us interprets risk in our own way. This is a form of diversification and helps a risk team be greater than the sum of its parts as differences of opinion about frequency, severity, velocity and correlations, along with potential scenarios and excesses, can lead to great discussions that improve analysis and conclusions. The first question in the survey asked respondents for their definition of greatest strategic impact. By segregating the responses between the 38% who chose financial impact versus the 62% who chose disruption, we can see the result of multiple opinions. (Ed. note: Results shown do not add to 100% since the Other category was not included.)

Figure 43 shows, for top current risk, the differentials by risk category. Not surprisingly, those who focus on the financial impact of strategic risks were more likely to choose economic risks and those who focus on disruption chose geopolitical and environmental risks.

Figure 43
TOP CURRENT RISK SEGREGATED BY GREATEST STRATEGIC IMPACT
% of Responses

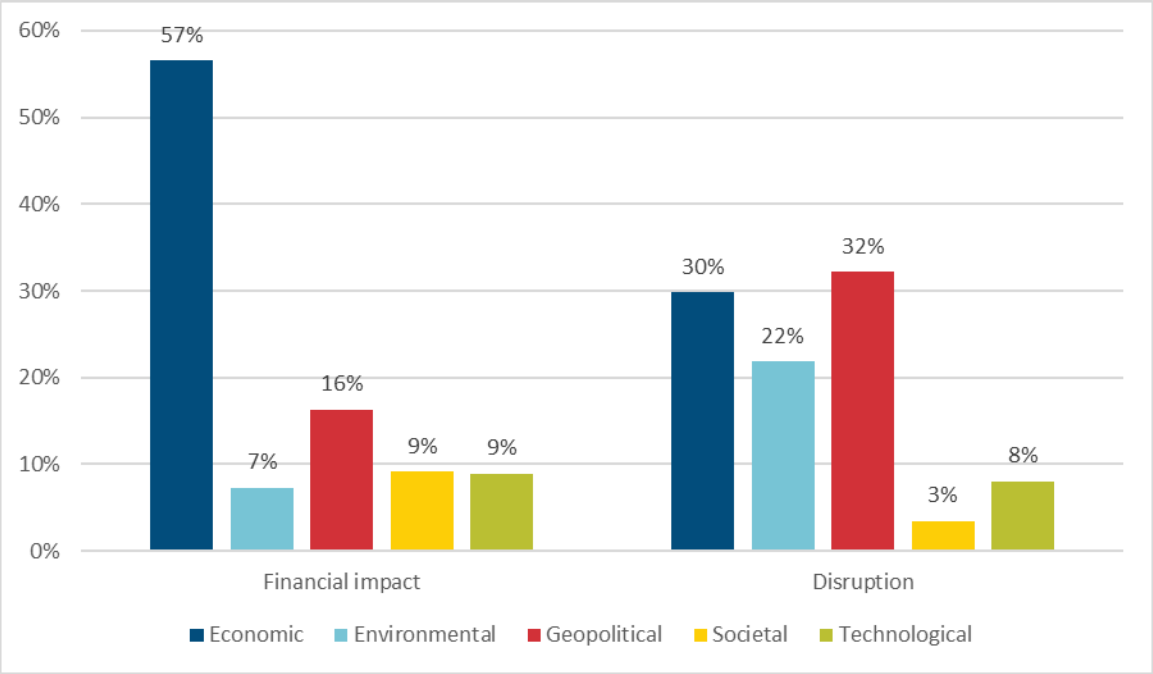


Figure 44 shows, for the top five emerging risks, the differentials by risk category. Similar to the top current risk, those who focus on the financial impact of strategic risks also choose economic risks and those who focus on disruption are more likely to choose environmental risks among their top five emerging risks.

Figure 44
TOP FIVE EMERGING RISKS SEGREGATED BY GREATEST STRATEGIC IMPACT
% of Responses

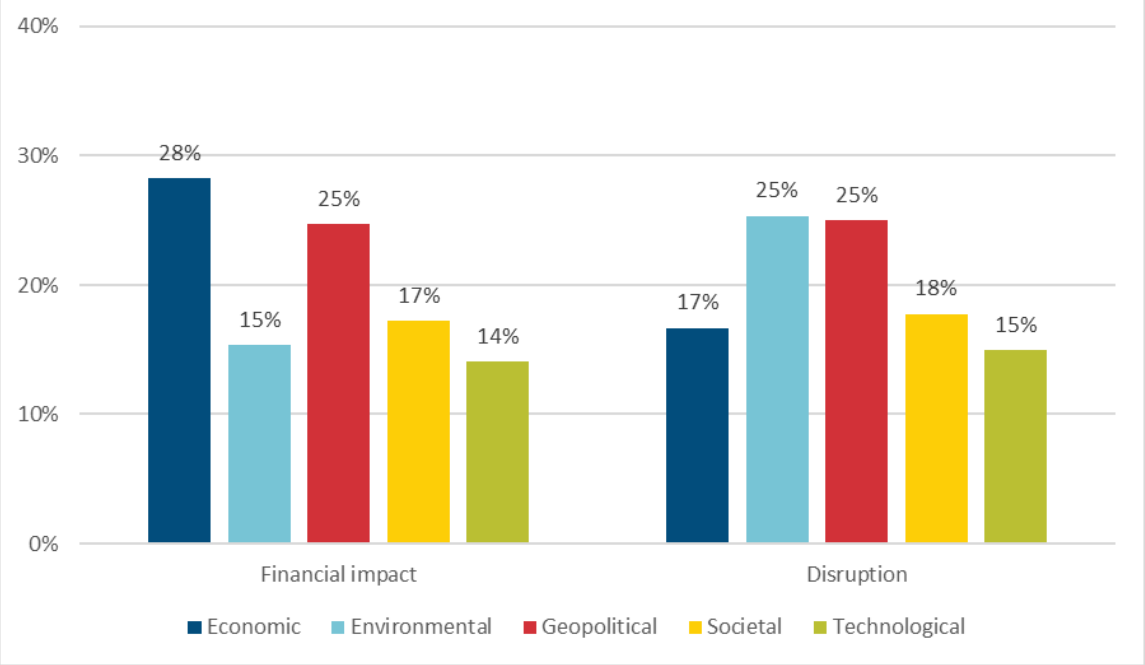


Figure 45 shows, for the top emerging risk, the differentials by risk category are more distinct. Those who focus on the financial impact of strategic risks are more likely to also choose economic risks (+28%). Those who focus on disruption are more likely to choose environmental risks (+26%) as their top emerging risk.

Figure 45

TOP EMERGING RISK SEGREGATED BY GREATEST STRATEGIC IMPACT

% of Responses

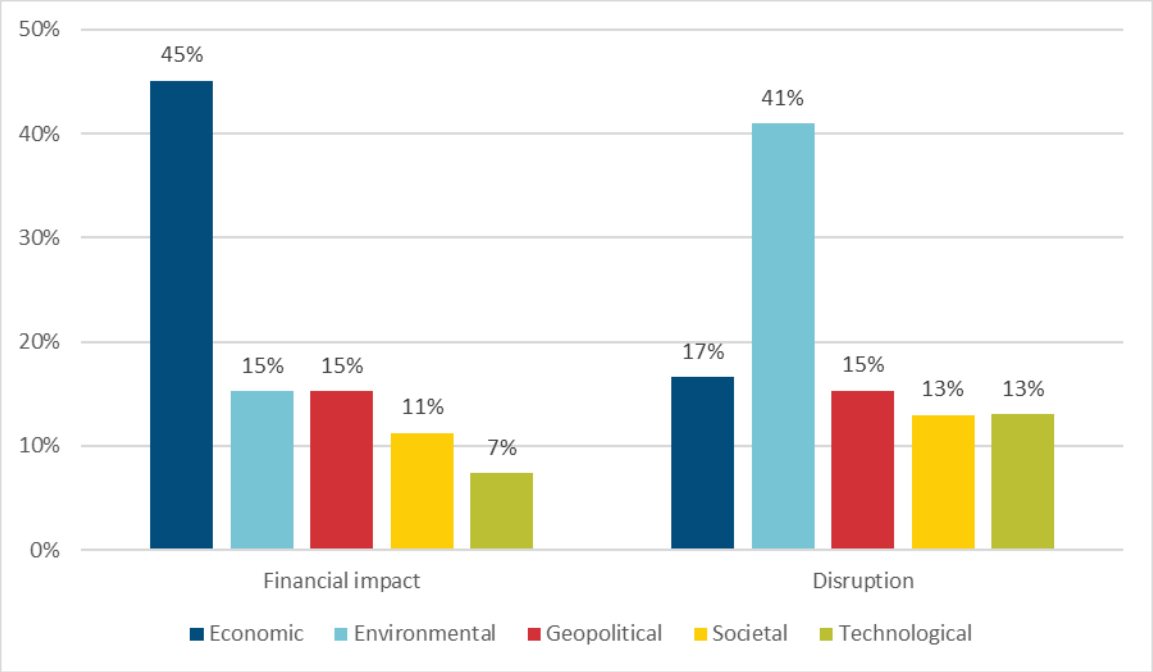
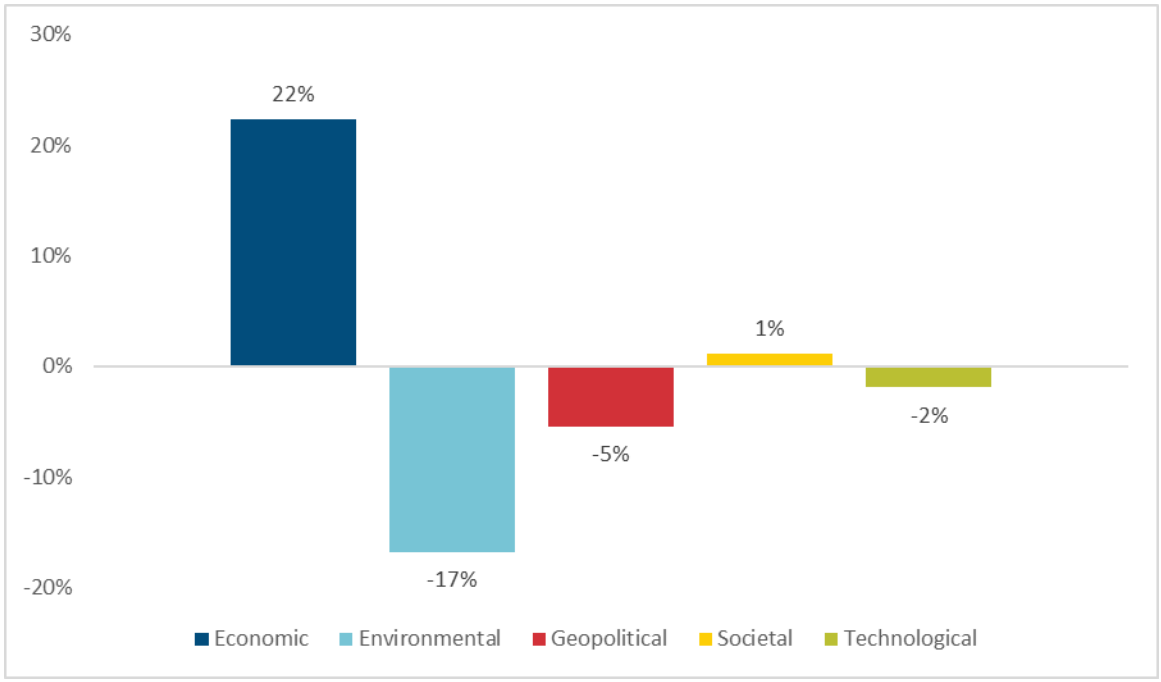


Figure 46 shows the net result (impact less disruption) across three questions. Again, you see higher results for the Economic category if financial impact was used to define greatest strategic impact and Environmental risks if disruption was preferred.

Figure 46

GREATEST STRATEGIC IMPACT SEGREGATED RESULTS: AVERAGE NET (IMPACT LESS DISRUPTION)

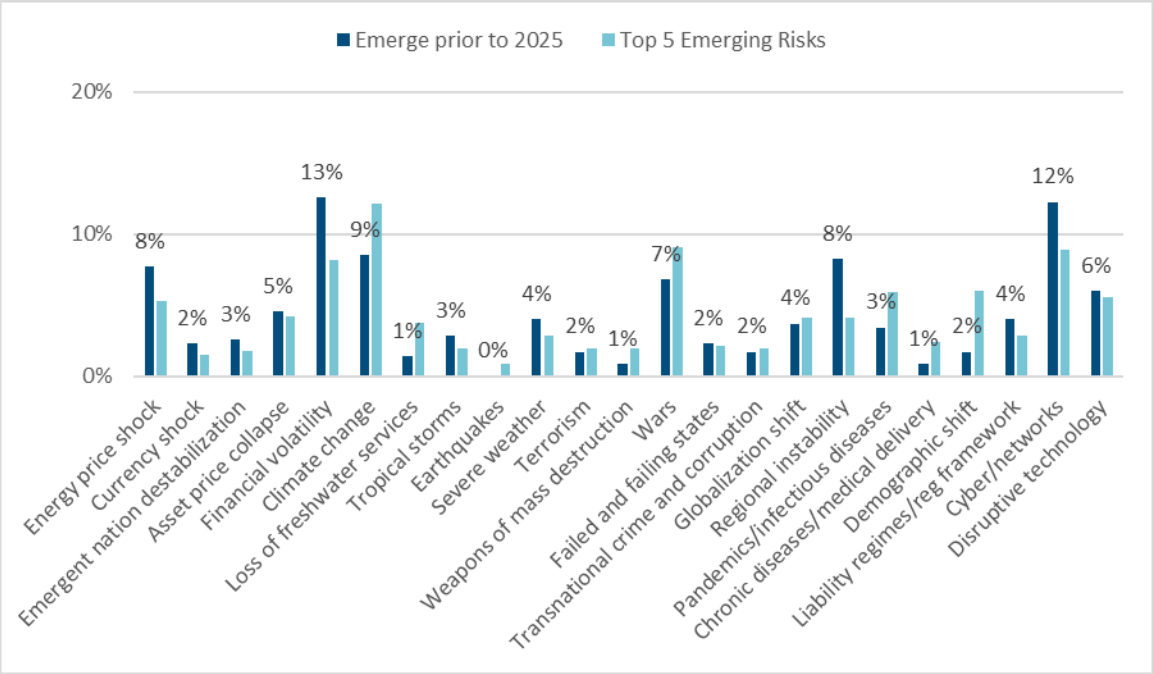
% of Responses



4.5.5 EMERGING RISKS BEFORE 2025

Respondents were asked to share up to three risks most likely to evolve or emerge before 2025; in effect, which ones should be on a tactical time horizon. The top responses were *Financial volatility* (37%) and *Cyber/networks* (36%), with top categories, Economic (30%) and Geopolitical (25%). Figure 47 shows how risks expected to emerge before 2025 compared to the top five emerging risks. Risks where this result was higher than the top five emerging risks included *Energy price shock*, *Financial volatility*, *Regional instability* and *Cyber/networks*. Longer time horizons are anticipated for *Climate change*, *Loss of freshwater services*, *Wars (including civil wars)* and *Demographic shift*.

Figure 47
RISKS LIKELY TO EVOLVE OR EMERGE BEFORE 2025 COMPARED TO TOP FIVE EMERGING RISKS
% of Responses



4.5.6 ADDITIONAL RISKS

The final question in this section asked for suggestions of risks that are not included in the current set of 23 (defined in Appendix I). Each respondent could suggest up to two additional risks. The best of these responses will be used to modify the risk definitions (see Appendix I for examples) in future survey iterations to incorporate risk nuances. Here are some typical suggestions:[8]

- *Speed of societal risks driven by social media platforms*
- *Systemic liability as a result of chemicals, microplastics, hazardous waste*
- *Long term remote / hybrid work environments*
- *Misinformation*
- *Disinformation*
- *Decaying infrastructure*

While some responses could lead to qualitative scenarios, many of the others on this list do cause one to pause and think about whether these 23 risks are complete. Several suggestions deal specifically with inequality and social unrest, while others consider the impact of social media and disinformation. These suggestions also help to drive future qualitative questions.

[8] Direct comments from respondents have been slightly edited throughout the paper.

4.6 SECTION B: ENTERPRISE RISK MANAGEMENT (ERM)

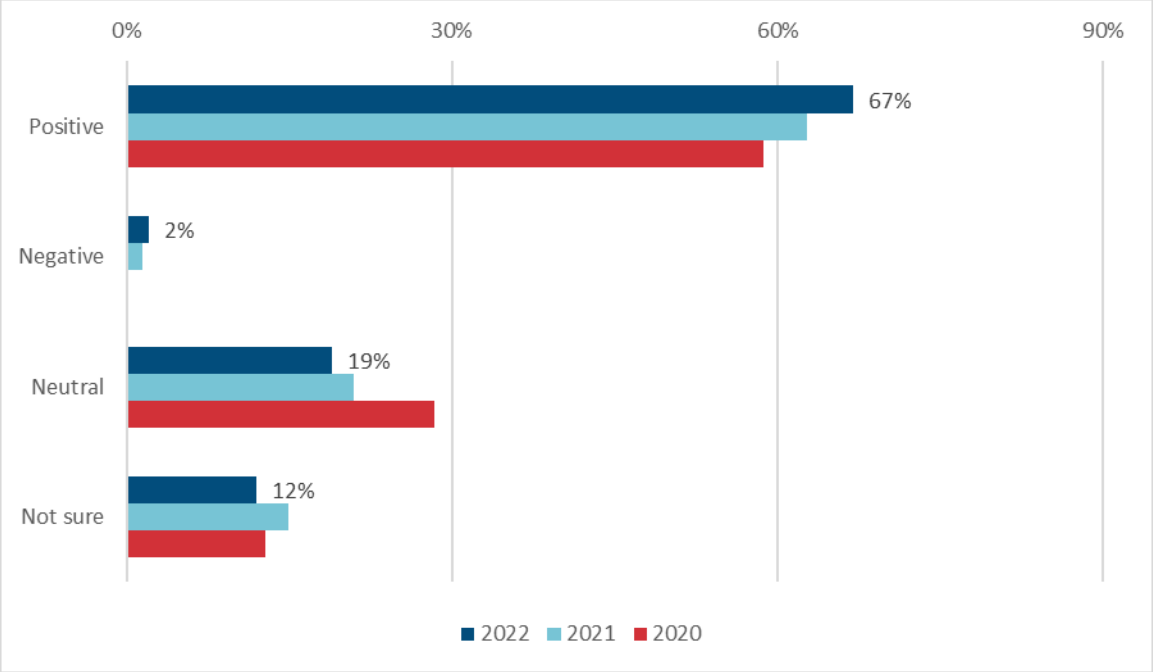
This section solicits input from practitioners on the overall health of ERM practice. Several open-ended questions complement the emerging risk trends asked about in Section A. Each risk management program is unique. The reader's experience will differ from that of the researcher, so will pick out and interpret comments in unique ways. The reader is encouraged to scan all the comments for topics of interest found in Appendix II. They suggest possible future development paths of an ERM process for those at various levels of maturity.

The first question in this section asked respondents whether "enterprise risk management has had a positive, negative or neutral effect in your company/industry." As figure 48 shows, a majority (67%, up from 63%) responded that the effect has been positive. This result has increased each year during the pandemic since a low of 54% in 2019. The number of *Neutral* or *Not sure* responses (31%) is also telling but has also reduced each of the last three years. ERM continues to evolve toward company-specific levels consistent with unique governance goals and company risk culture.

Figure 48

EFFECT OF ERM IN RESPONDENT'S COMPANY/INDUSTRY

% of responses in Given Year



An open-ended question asked respondents to share an example from the past year where an event occurred that could have been avoided if proactive ERM planning had been in place. Typical comments referenced hiring practices, capital allocation, inflation expectations, asset allocation and governmental understanding of the current environment. The comments included the following:

- *Senior Management only gathered input from itself*
- *New business opportunity*
- *Poor succession planning*
- *Over-aggregation of leased aircrafts in Russia*
- *Inflation*
- *Asset sale strategies in advance of rising interest rates*
- *Miscalculation of lapse rates recently that caused the stock to drop massively*
- *Rising interest rate environment led to large debt service payments*

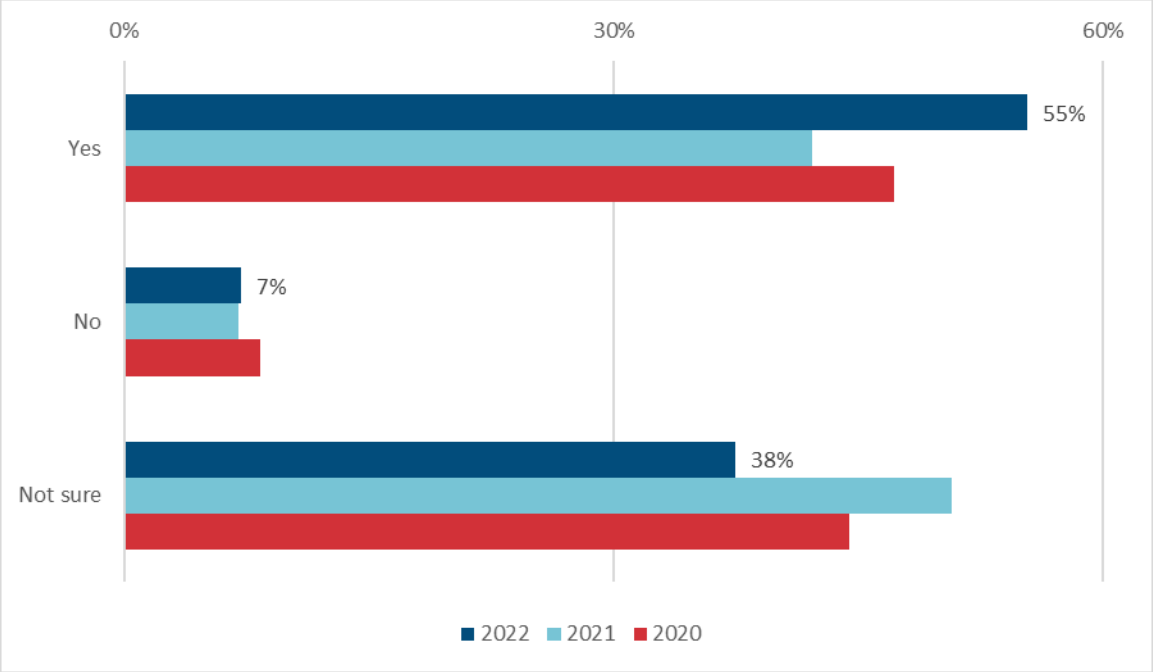
- *British government and the missteps of Liz Truss could have been avoided*
- *The collapse of crypto-currencies*
- *British LDI pensions*
- *Sri Lanka*

Balancing risk and return are hard. When times are good, management's risk appetite grows only to be surprised when the cycle turns. The survey asked, "Does implementing ERM improve company returns relative to the amount of risk?" Results as shown in figure 49 indicate an increase for *Yes* (42%) at the expense of *Not sure* (38%). This may reflect a recognition of the value of ERM during the pandemic. Splitting the comments out by how the question was answered provides additional clarification. This question has many well-thought-out responses. Readers are encouraged to read all of them in Appendix II.

Figure 49

WHETHER ERM IMPROVES RETURNS RELATIVE TO RISK

% of Responses in Given Year



Among those stating that ERM does improve returns relative to risk, comments in this year's survey make it clear that ERM has become part of the strategic planning process at many firms:

- *Proactively identifying risks allows for better planning.*
- *Reduction of risk can reduce the number of financial surprises and increase income.*
- *Good ERM increases both expected returns and decreases the volatility of returns.*
- *It's more about protecting the downside risk than improving returns.*
- *Creates awareness of risk (and opportunities) so that mitigation can be proactively put in place.*
- *A clearer understanding of the type of magnitude of potential risks allows for greater focus on risk-adjusted returns.*
- *ERM helps a company develop a risk/return strategy that is consistent with its risk appetite by forcing it to dive deeply into its risk exposure and really consider the broad picture.*
- ***How could it be otherwise? Cost benefit is a form of ERM, especially when capital management and liquidity are considered.***

- *Implementing ERM processes and embedding it in decision making is relatively cheap compared to its possible benefits and losses it might avert.*

Respondents who said ERM does not improve returns relative to risk indicated that ERM is not accepted equally at all firms and likely interacts with the firm's risk culture. Comments included the following:

- *Mostly seems like it's simply added administrative burden.*
- *ERM is a tool to be used by decision-makers, but only one of many. Improved returns depend on the whole, not on any one particular part.*
- *It is quite difficult to quantify the return as attribution analysis is hard to sell.*

Some of the most thoughtful comments came from those who were not sure if ERM has added value. Representative comments included:

- *Too many words, not enough thinking about implementation.*
- *It could in some cases lower returns but decrease volatility of returns.*
- *I think it probably does over the long -term, but thinking on any shorter-term (quarterly or annual basis) it's hard to see.*
- *Return relative to risk is just one measure & not necessarily the most important.*
- *Effective ERM is really a form of insurance. Focusing on company returns is a flawed metric. Instead, the focus should be on the potential cost/disruption of an event with/without strong ERM practices in place.*
- *I hope so, but I'm not sure I've seen evidence either way. After however many years, it strikes me that much of ERM either is window-dressing, misses the forest for the trees, or does a poor job of forecasting consequences.*
- *Difficult to quantity return attribution to ERM.*

Two new open-ended questions were asked this year. In the first, respondents were asked how scenarios were used to manage a company's changes as inflation and interest rates rose in 2022. A few noted that their existing scenarios did not need to be changed, with others reacting to high lapses and volatility. Others shared their view of the future, with narrative scenarios and clustering. The following are a few examples:

- *Greater uncertainty*
- *More focus on shock analysis.*
- *Stress scenarios of how inflation impacts loss reserves have increased loss reserves and reduce loss reserve risk.*
- *Increased focus on policyholder assumptions*
- *Two-sided interest rate volatility is back to being real.*
- *They have not changed. These are regularly tested and a well-run company should not have needed to alter them.*
- *We should see base case scenarios that include high/low interest rates, high inflation, pandemic. They should all be narrative scenarios, where various metrics are aligned (like SSPs). Multiple negative scenarios should be combined to see how many events can occur before insolvency.*
- *Volatility. Most folks today weren't born during the Carter years. This is all new to them.*
- *Inflation has made all long-range strategic planning obsolete.*
- *Slowed hiring.*

The second question asked how current risks like the pandemic and rising interest rates had changed a risk team's regular duties. Several noted the increased importance of emerging risks. No one has been asked to do less than previously but some sense a lost opportunity. The following are examples of their responses:

- *A greater focus on unknowns, and a greater openness to consider possibilities outside of everyday experience.*
- *Pandemic and climate have shown the challenges in crafting board scenarios.*
- *More focus on shock analysis.*
- *More time spent on evaluating investment risk and business continuity planning.*
- *Did not change, which is unfortunate.*
- *More frequent interaction with the business, often in a coordinating role.*
- *More "what if" analysis rather than standard reporting.*
- ***Broadened their view to reflect emerging risks and risk interdependencies.***
- ***Evolving focus on operational disruption versus simply financial cost.***
- *Looking at product opportunities and policyholder behavior assumptions in a higher interest rate environment.*
- *Focus was on optimal asset allocation given current conditions.*
- ***Management is more interested in hearing my thoughts about tail scenarios.***

4.7 SECTION C: CURRENT TOPICS

Now approaching 15 years after the global financial crisis, the 16th survey in this series continues to reflect on that period. Now other global events seem to be happening with greater frequency after a long period of stability as Hyman Minsky hypothesized. The Current Topics section reflects this, showing altered expectations.

Asked their expectations about the global economy in 2023, respondents were much more negative than in the previous year, with 60% having a moderate outlook and only 14% a good outlook (none selected strong outlook), as shown in figure 50. Poor expectations nearly doubled from 15% to 26%. As can be seen in figure 51, the net result, adding good and strong, and subtracting poor, fell to a new low.

Figure 50

GLOBAL ECONOMIC EXPECTATIONS

% of Responses in Given Year

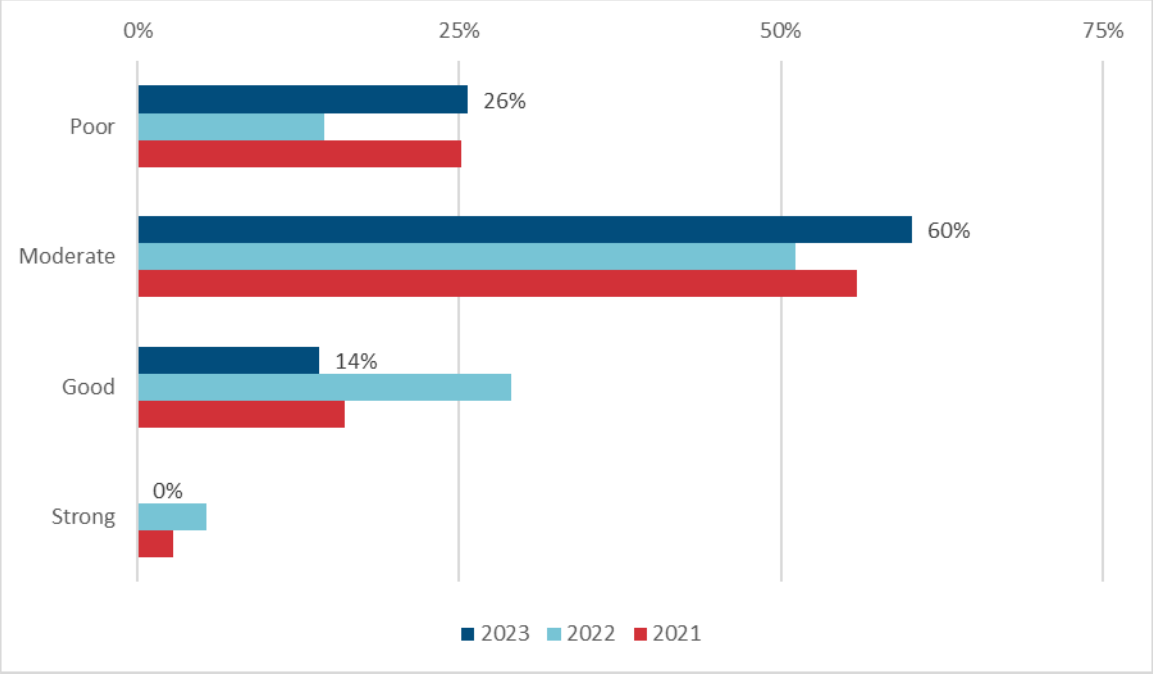
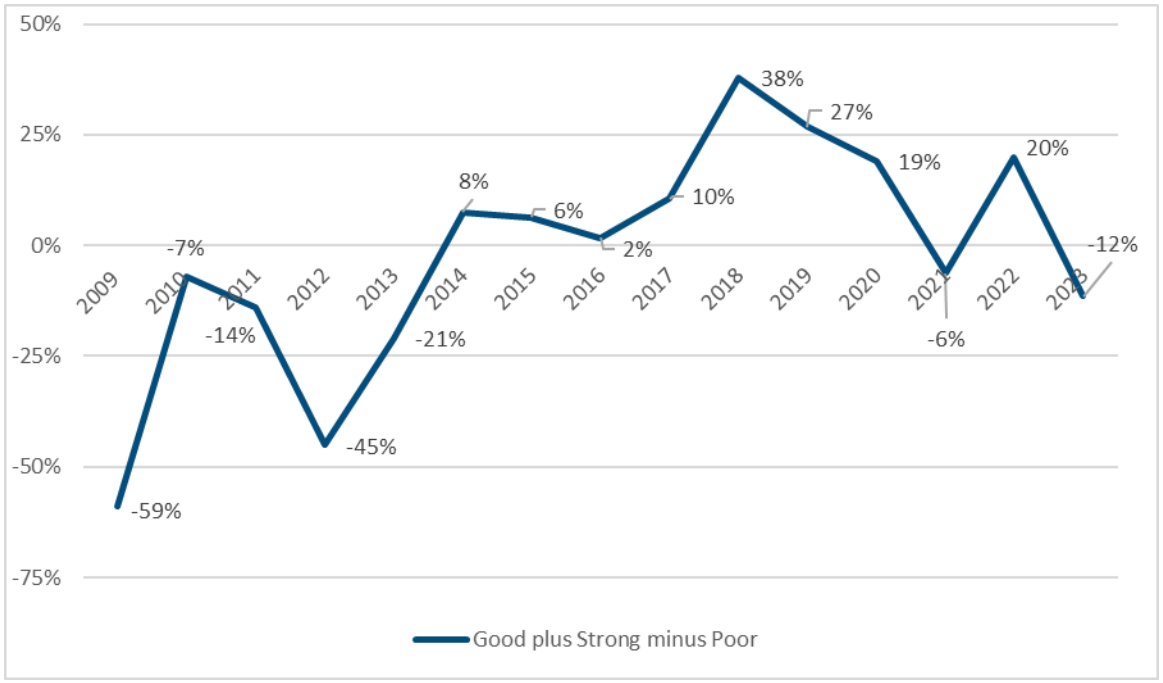


Figure 51

NET EXPECTATIONS FOR THE GLOBAL ECONOMY (GOOD + STRONG – POOR), 2009–2023

% of Responses in Given Year

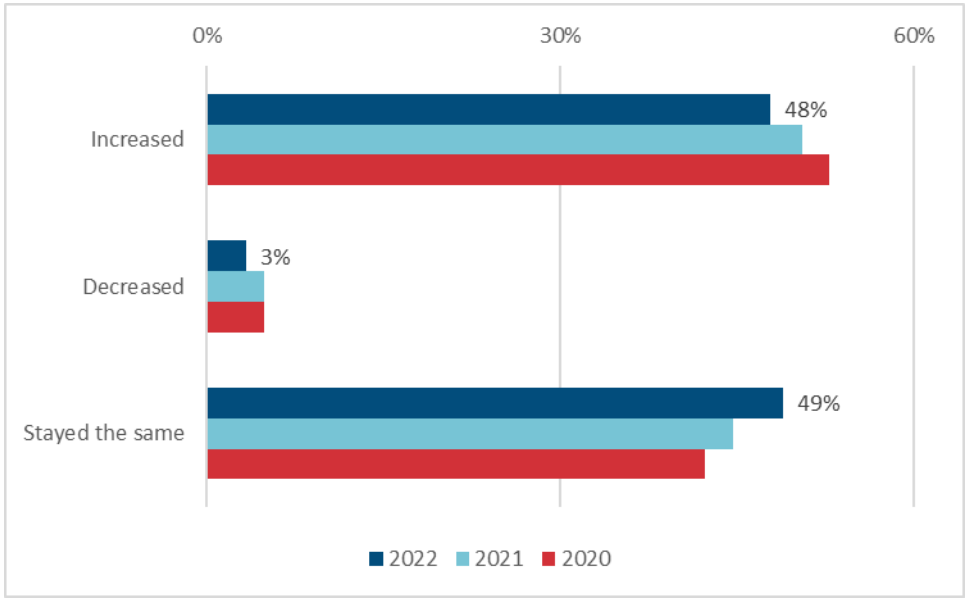


Nearly half of risk managers (48%) reported increased ERM activity in 2022, as shown in figure 52.

Figure 52

PERCEIVED LEVEL OF ERM ACTIVITY

% of Responses in Given Year

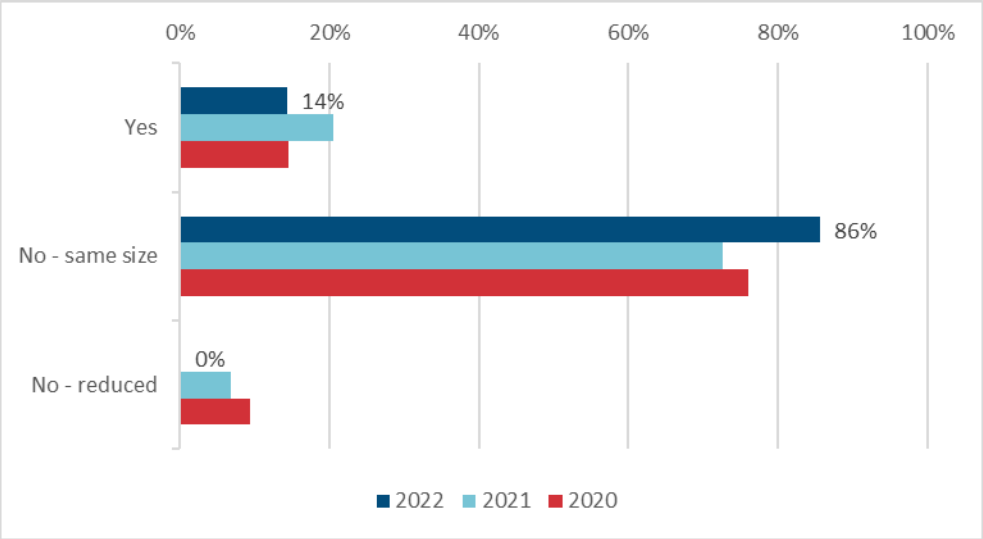


Higher ERM activity led to internal staff growth for 14% (down from 20%) of the respondents in 2022, as shown in figure 53. No one saw their staff decrease in size.

Figure 53

ERM INTERNAL STAFF GROWTH

% of Responses in Given Year

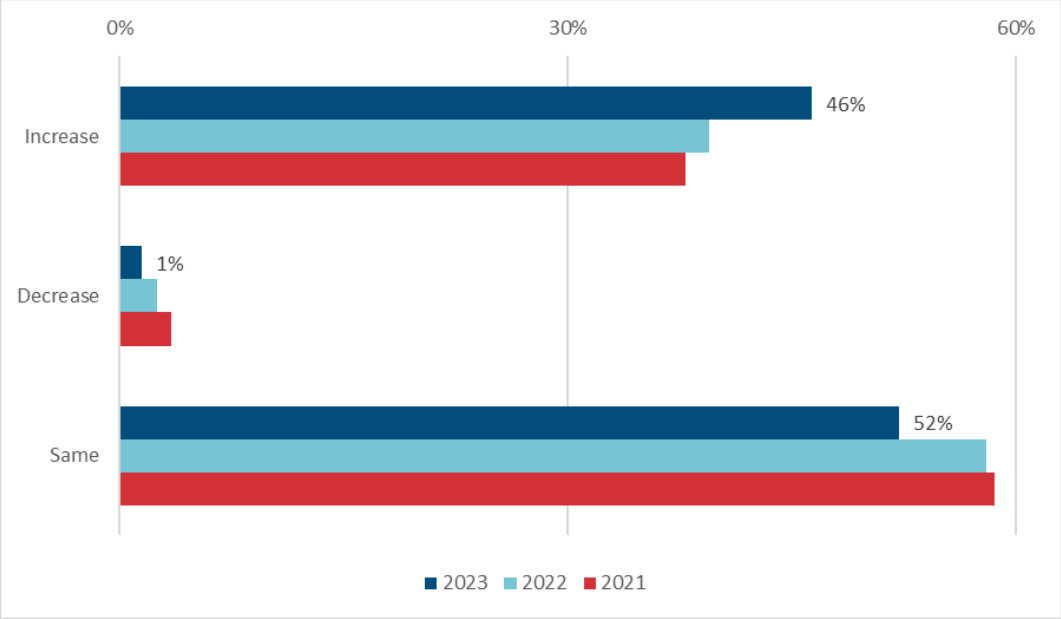


ERM activity is expected to increase for 46% of the respondents in 2023, as shown in figure 54, with only 1% expecting ERM activity to decrease. This is consistent with the responses in the previous section where risk teams were being asked to do more and enjoyed a rising profile.

Figure 54

ERM ACTIVITY GROWTH

% of Responses in Given Year

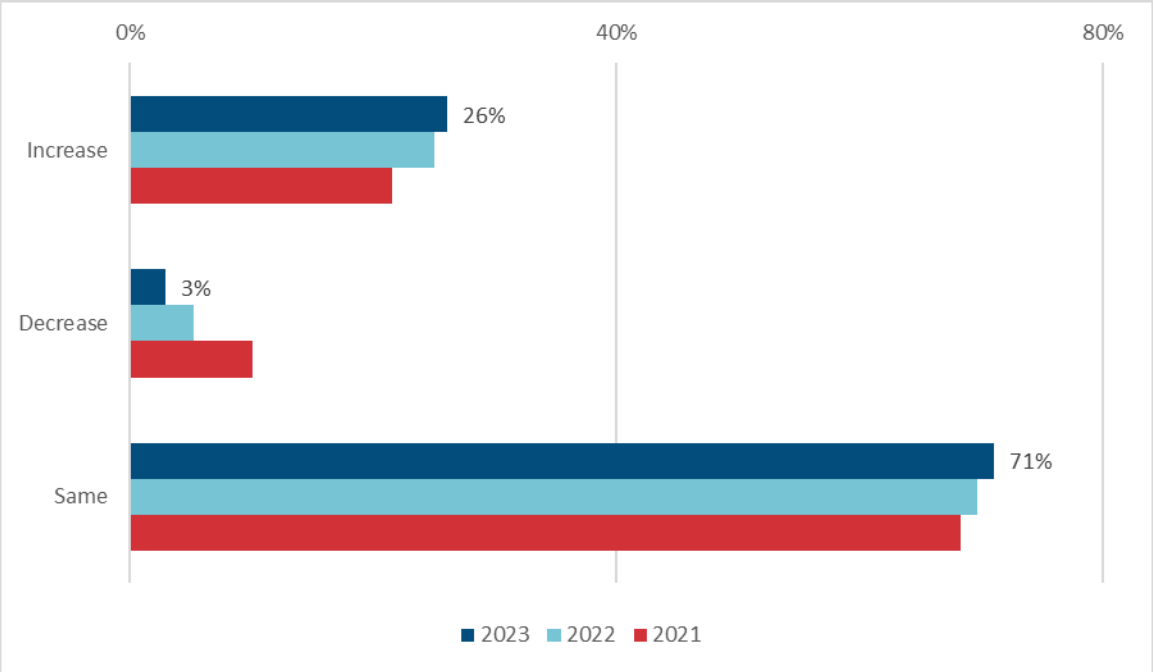


Respondents indicated that levels of funding for ERM are expected to slightly increase in 2023. Figure 55 shows that only 3% expect funding to decrease for the upcoming year.

Figure 55

ANTICIPATED LEVELS OF ERM FUNDING

% of Responses to Given Question

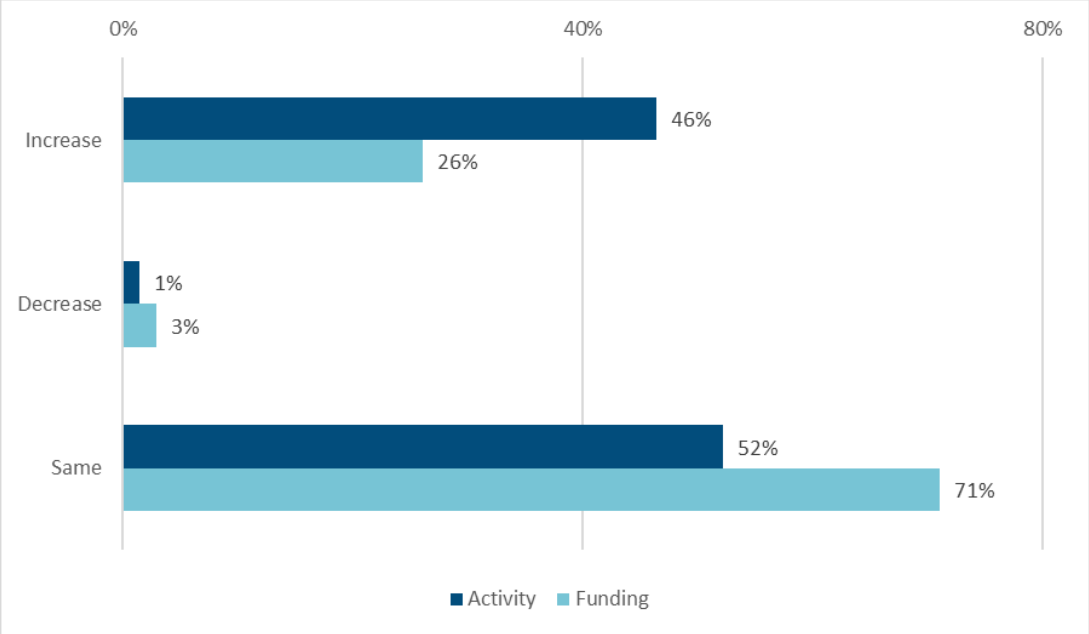


In figure 56, respondents show that activity levels are expected to increase in 2023 more than funding. This is disappointing but consistent with prior surveys.

Figure 56

ANTICIPATED LEVELS OF ERM ACTIVITY AND FUNDING IN 2022

% of Responses to Given Question



Technological risks have grown in importance in this survey over the years. Earlier in the survey, *Disruptive technology* had a lower response rate for some questions. The survey asked about specific scenarios used to analyze the positive aspects of this risk. Many responses considered interactions with customers at all points in the sales and client cycle. They include:

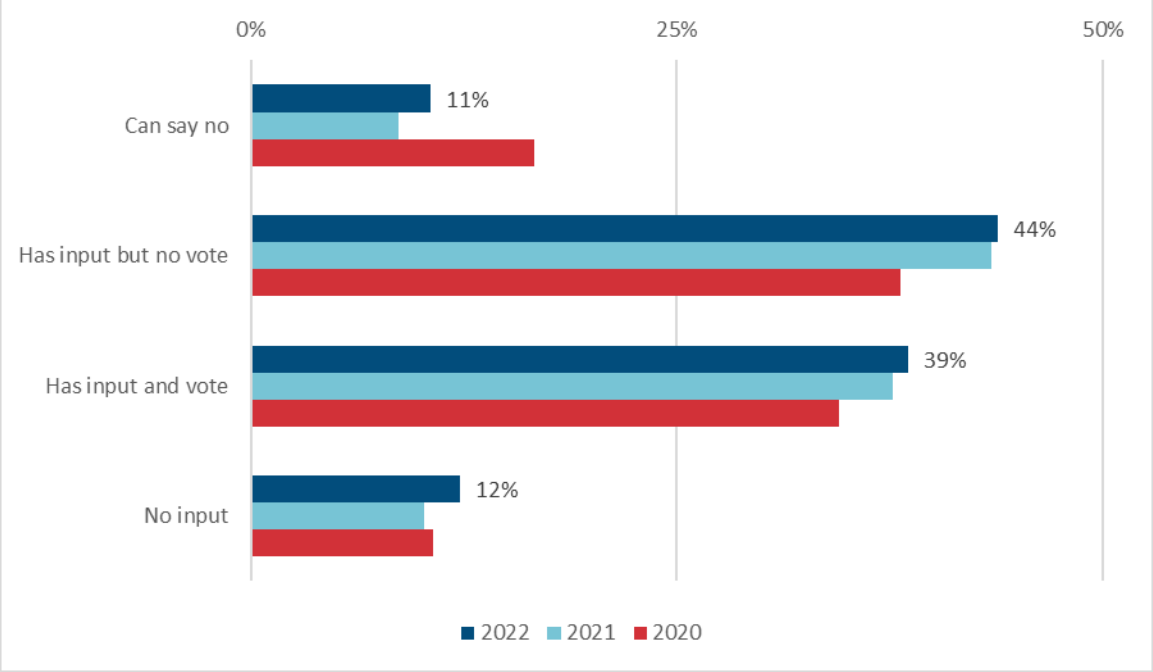
- *Complete change in distribution channels given all new fintech technology.*
- *Predictive analytics*
- *Automated underwriting*
- *AI, continuous monitoring, robotics*
- *Attempt to look at automation in customer experience including any apps.*
- *Broader use of smartphones; ability to increase electronic payments*
- *Looking at ways insurers and customers interact.*
- *Autonomous vehicles reducing accident frequency and severity*

The survey asked how the ERM team is used when a strategic opportunity is presented to a firm. As illustrated in figure 57, 88% of respondents said they provide input to strategic opportunities. Within the group that has input, more (12%) can unilaterally say no to an opportunity. One respondent noted that strategic decisions are the purview of the Board at their firm, so no department gets a vote.

Figure 57

USE OF ERM TEAM FOR A STRATEGIC OPPORTUNITY

% of Respondents in Given Year



Respondents were asked to describe actions they have taken to build resilience in case an emerging risk event occurs. Many had expanded their modeling, recognition and communication regarding emerging risks. The responses included:

- *The key is a focus on the communication channels available, to ensure that the right people are informed.*
- *Proactive discussions with clients on risk scenarios*

- *Strengthened our business continuity planning*
- *Improved cooperation among top managers.*
- *Formed emerging risk committee*
- *Tabletop exercises*
- *Developed risk capital models that factor in emerging risks*
- *Built up position of cash and Treasuries. Reduced concentration of some exposures.*
- *Increased geographic and product line diversity.*
- *Improved weather catastrophe models.*
- *New non-weather risk modeling*
- *Primarily contract focused*

Some risk managers seek ways to exploit risk by finding opportunities that are mispriced or provide diversification. Respondents were asked which, if any, emerging "opportunities" they monitor:

- *We will purchase reinsurance if priced advantageously based on risk modeling*
- *Strategic asset risk allocation.*
- *New and underserved markets within the life insurance and annuity space*
- *Energy shocks -- associated implications*
- *Assets with limited liquidity*

Respondents were asked if they had identified bubbles. A variety of responses were received, along with several who did not understand the term "bubble." Since stress tests are created by the risk team, this could be a problem for their firms and clients in the future if they assume that assets and liabilities are always priced correctly. The comments included:

- *The "Green" movement and "free education" has wasted billions of dollars*
- *Condo Reconstruction/Maintenance*
- *There is an 'inflation bubble' at the moment.*
- *U.S. Federal Debt*
- *Risk concentration*
- *Not exactly sure what you mean by "bubbles"*
- *Cryptocurrency*
- *Tech sector*
- *Home prices in many countries. Just about everything (prices, policies) in China. PE insurers.*
- *Pandemic uncertainties*

Respondents were also asked to share an unknown known, where there is historical data, but it is not predictive, along with how it is managed. Only a few shared how the risk was managed, and several did not understand the question. An example of an unknown known is wildfire risk in California following a drought or possibly aggregated debt issued during a stable period for credit to ensure minimal defaults. The responses included:

- *The Pandemic – We have historical data, but it is meaningless. This could still go on for another decade or more, unless serious action is taken on a global basis to eradicate it.*
- *Global health crisis (pandemic or otherwise)*
- *Global cyber breakdown*
- *Evolution of mortality on old cohorts of Life insurance products*
- *Unclear request*

- *Incident management – type and nature of incidents is always evolving – we have adjusted our processes to better identify those linked to third parties so that can be considered when assessing our third-party performance*
- *Credit risk.*
- *Hurricane frequency and intensity; run scenarios presuming various patterns in the future.*
- *Pandemic. Contingent plans and proper reinsurance.*
- *Climate change – I try to use delta (first differences) analysis using recent periods (e.g., look at last 10 years/last 20 years and assume the same delta in total)*

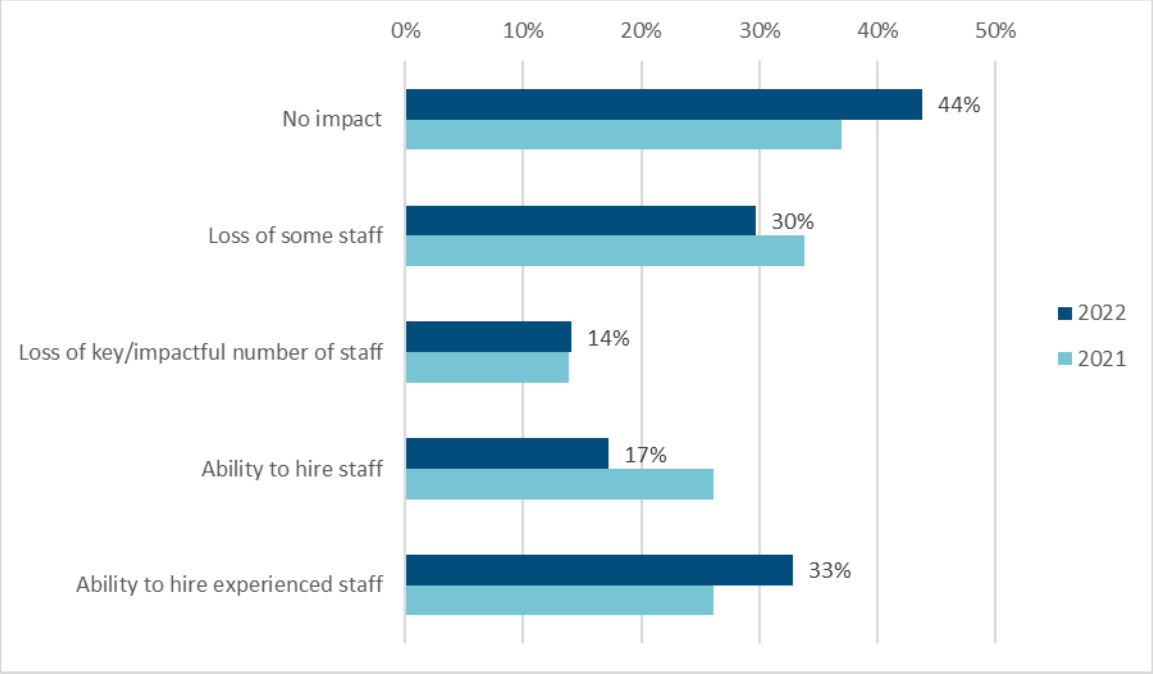
In the time since the start of the pandemic, many workers have revisited their work goals. Early on, there was unemployment insurance and stimulus benefits that allowed time to absorb the new situation. In what became known as the Great Resignation, many workers resigned even if they did not have another job lined up. Even now, help-wanted ads are plentiful for many jobs. The survey asked employees at insurance companies how this has impacted the ERM function in their situation. The survey found that 56% of respondents had been impacted by the issue in some way, and 11% had been impacted by more than one.

With no baseline to work from, it's not known what these results would have been in the past. This question could be asked periodically going forward to determine if 2021 was a temporary high point (similar to concentration of combinations during the great financial crisis), consistently stable level, or something else. Nearly 30% of those reporting an impact had lost staff, as shown in figure 58 while, for 33%, the ability to hire experienced staff was impacted. On the positive side, the ability to hire staff improved with only 17% impacted.

Figure 58

IMPACT OF THE GREAT RESIGNATION TO ERM FUNCTION

% of Respondents



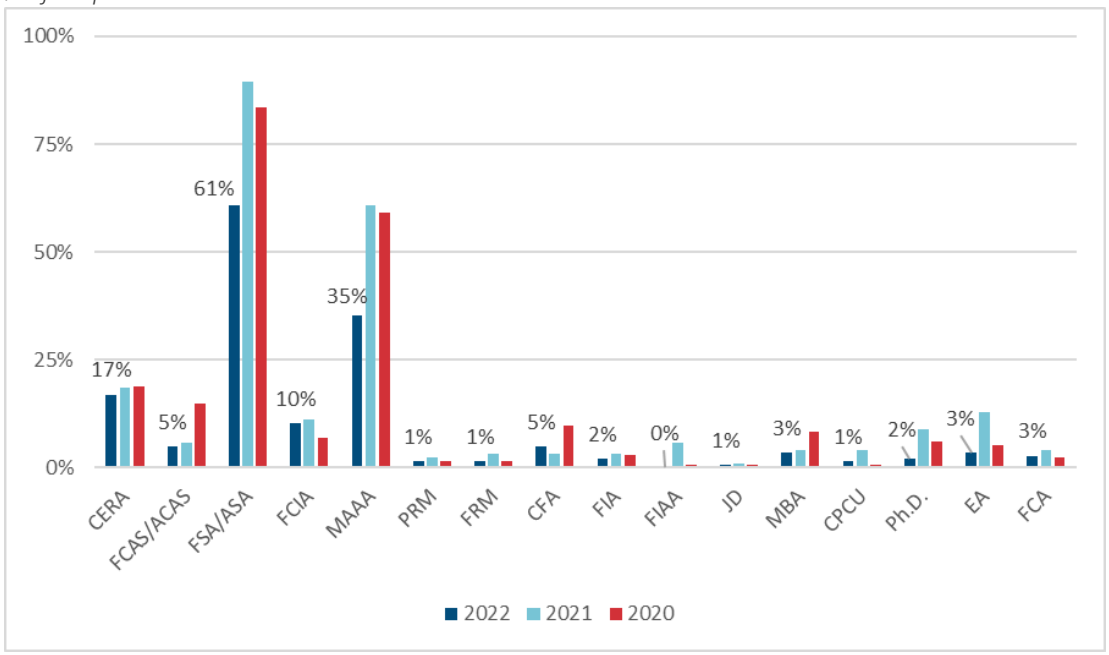
4.8 SECTION D: DEMOGRAPHICS

Each year, the *Emerging Risk Survey is* distributed using targeted emails and social media. For this survey, 51% reported filling out the survey in the past. Those holding the CERA credential from an actuarial organization represented 17% of the total. One of the sponsors, the Joint Risk Management Section (JRMS), was well represented in the survey, with 61% of respondents holding a credential from the SOA, 5% from the CAS and 10% from the CIA (see figure 59). Other groups strongly represented were CFA charter holders (5%) and those with an MBA (3%). Many respondents held multiple credentials.

Figure 59

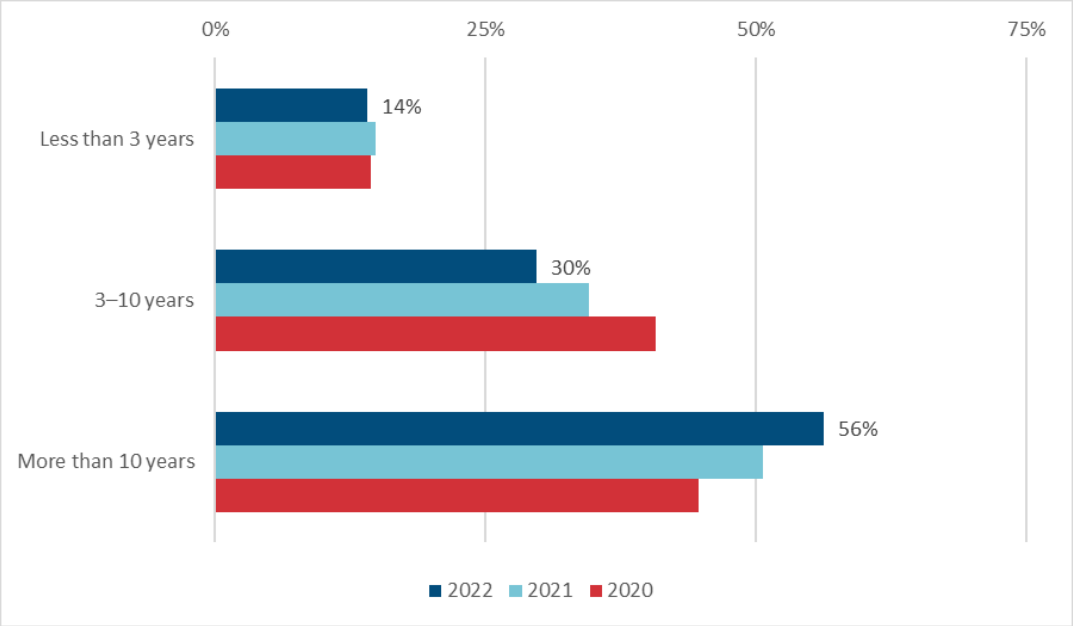
CREDENTIALS HELD BY RESPONDENTS

% of Responses in Given Year



This year's survey was completed by more experienced practitioners, with 56% having more than ten years of experience as risk managers (see figure 60). The researcher is again indebted to respondents who share their experiences. Most respondents work at an insurer/reinsurer (64%) or as a consultant (23%).

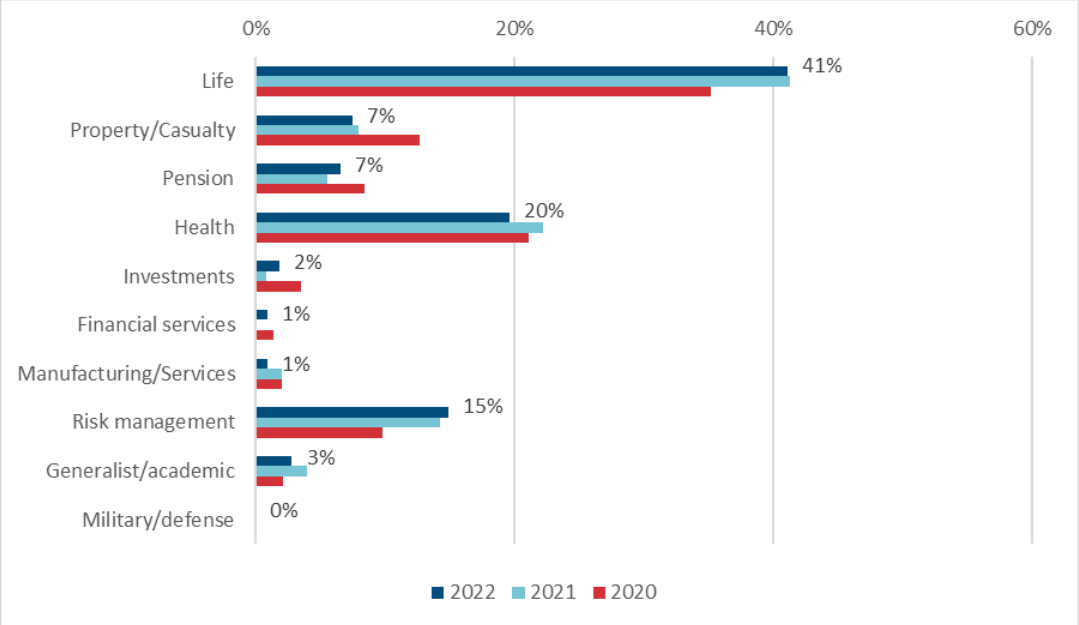
Figure 60
RESPONDENTS' RISK MANAGEMENT EXPERIENCE
% of Responses in Given Year



The survey continued to be dominated by North Americans (87%), with a significant minority coming from Europe (5%) and Asia (5%). This year, surveys were also completed by risk managers in the Middle Eastern and Caribbean/Bermuda regions.

As illustrated in figure 61, the primary areas of practice were led by life insurance, health, risk management, property/casualty and pensions.

Figure 61
RESPONDENTS' PRACTICE AREAS
% of Responses in Given Year



A final survey question asked for sources respondents use to scan for emerging risks. The ideas are the most valuable part of this report for some. Respondents shared news services, newspapers (e.g., *Wall Street Journal*, Financial Times, NY Times, Guardian), magazines (e.g., Foreign Affairs, The Economist, InsuranceERM), reinsurer and consultant publications, rating-agency reports, LOMA, professional actuarial organizations (e.g., the IAA, IFOA, CAS, SOA and CIA), GARP, WEF, the CDC, IPCC and WHO, books (the Bible, books by Michael Lewis and Neil Howe), websites (e.g., YouTube, Twitter, Reddit, Bloomberg Virtual Capitalist, Our World in Data), actuarial consulting firms (e.g., Horizon) and the CRO Forum. Others spoke with peers, reviewed academic papers and participated in risk surveys (internal and external). This survey was referenced by several respondents as a good source, meeting the hopes of the researcher.

Section 5: Future Recommendations

This survey should continue to use open-ended questions to learn from practitioners. Using the experience of the Project Oversight Group (POG) has worked well to develop questions and should continue. The survey should seek to expand distribution beyond North America and outside the insurance industry. Here are specific suggestions made by the researcher, POG and respondents:

- Try to split out inequality and polarization
- Add chart comparing last two surveys for top emerging risk and risk combinations
- Consider:
  - Question - what types of narrative scenarios do you consider?
  - Include pollution in climate change risk definition
  - Currency shock risk definition–include risk of Bretton Woods–type overhaul or de-dollarization
  - Massive mortality event
  - Speed of societal risks driven by social media platforms
  - Systemic liability as a result of chemicals, microplastics, hazardous waste
  - Long-term remote work / hybrid work environments
  - Misinformation
  - Disinformation
  - Red tide
  - Decaying infrastructure
  - Separate impact of infectious diseases on demographics from fertility and mortality rates.
  - Add something like consumer sentiment index to Intro section https://www.bls.gov/wsp/ metrics on strike

Section 6: Acknowledgments

The researchers' deepest gratitude goes to those without whose efforts this project could not have come to fruition: the Project Oversight Group for their diligent work overseeing, reviewing and editing this report for accuracy and relevance. Any errors remain the responsibility of the author.

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Appendix I: Glossary of Risks

These 23 risks and a description of each form the core of the Emerging Risk Survey.

ECONOMIC RISKS

- Energy price shock—Price instability and extremes of energy prices.
- Currency shock—Material disruptions to currency equilibrium, including central bank devaluations (currency wars) and digital currencies.
- Emergent nation destabilization—Fast growing country's economic growth slows, potentially as a result of protectionism, demographics, internal politics or economic difficulties.
- Asset price collapse—The value of assets such as housing and equities collapses.
- Financial volatility—Price instability and extremes of sectors, including commodities, equities or interest rates.

ENVIRONMENTAL RISKS

- Climate change—Change in climate patterns generates both extreme events and gradual changes, impacting infrastructure, agricultural yields, soil degradation, ecosystem biodiversity (e.g., insects, shellfish) and human lives. Drivers of physical and transition risks include, but are not limited to, space weather and human influence.
- Loss of freshwater services—Water shortages impact agriculture, businesses and human lives. Drivers include, but are not limited to, climate change and human influence (e.g., pollution).
- Natural catastrophe: tropical storms—Hurricanes, typhoons and cyclones lead to disruption, catastrophic economic losses, and/or high human loss of life.
- Natural catastrophe: earthquakes—Strong seismic/volcanic activity leads to disruption, catastrophic economic losses and/or high human loss of life.
- Natural catastrophe: severe weather—Meteorological phenomena lead to disruption, catastrophic economic losses, and/or high human loss of life. Includes inland flooding, tornados, thunderstorms, drought, wildfires, high winds, snowstorms and dust storms.

GEOPOLITICAL RISKS

- Terrorism—Attacks lead to disruption, catastrophic economic losses, and/or high human loss of life.
- Weapons of mass destruction—nuclear, biological, radiological or chemical technologies lead to disruption, catastrophic economic losses, and/or high human loss of life.
- Wars (including civil wars)—Wars erupt between or within countries, leading to disruption, catastrophic economic losses, and/or high human loss of life.
- Failed and failing states—The trend of a widening gap between order and disorder or widening social rifts.
- Transnational crime and corruption—Corruption is endemic. Non-state entities successfully penetrate the global economy.
- Globalization shift—Preference changes to imports and immigration. Changes include populism, democracy, socialism, communism, religiosity and political uncertainty. Countries retrench and become more nationalistic and protectionist or open up their economies to outsiders. Inequality, privacy and food insecurity challenge the concept of fairness and egalitarianism.
- Regional instability—Unstable regions cause widespread political and other crises.

SOCIETAL RISKS

- Pandemics/infectious diseases—A pandemic emerges with high mortality/incidence of diseases such as HIV/AIDS, Ebola, coronavirus or influenza. Antimicrobial resistance becomes common.
- Chronic diseases/medical delivery—Diseases such as obesity, diabetes, cardiovascular and substance abuse become widespread or treatments appear. Material changes to medical delivery or financing.
- Demographic shift—Evolving population size and mix (e.g., age, size, race, migration trends, skills) drive changes in economic growth and levels of governmental intervention.
- Liability regimes/regulatory framework—Costs increase faster than GDP, with increases in the spread and size of litigiousness (e.g., social inflation, climate litigation) and speed of regulatory revisions. Material changes in tax policy.

TECHNOLOGICAL RISKS

- Cyber/networks—A major disruption of the availability, reliability and resilience of critical information infrastructure caused by cyber risks, terrorist attack or technical failure. Results are felt in supply chains and major infrastructure: power distribution, water supply, transportation, telecommunication, emergency services or finance.
- Disruptive technology—Unintended consequences of technology lead to abrupt change (e.g., drones, self-driving cars, additive manufacturing, internet of things, nanoparticles). Models become more complex but less descriptive over long time horizons.

EVOLUTION OF RISKS

The survey has attempted to maintain consistent risk definitions as much as possible. Many changes have been made based on suggestions from respondents and POG members, along with the researcher.

Spring 2008—23 risks generated by the WEF's *Global Risks 2007*

Fall 2008—No change to risks, minor changes to definition wording.

2009—No changes

2010—Some definitional changes:

- Changed *Oil price shock/energy supply interruptions* to *Oil price shock.*
- Changed *U.S. current account deficit/fall in U.S. dollar* to *Fall in value of US$.*
- Changed *Blow up in asset prices/excessive indebtedness* to *Blow up in asset prices.*
- Changed *Middle East instability—The Israel–Palestine conflict and Iraqi civil war continue* to *Regional instability* (a variety of hot spots are prevalent around the world. These include the Middle East and the Korean Peninsula).
- Changed *Infectious diseases in the developing world* to *Infectious diseases.*
- Changed *Chronic disease in the developed world* to *Chronic disease.*
- Changed *Emergence of risks associated with nanotechnology* to *Nanotechnology.*

2011—More substantive changes, but with an attempt to maintain trends and simplify:

- Moved *Fiscal crises caused by demographic shift* from the Economic to Societal category and renamed it *Demographic shift*; updated trend data to make it consistent going forward.
- Added *Financial volatility—price instability of core products such as commodities, energy or currency* to the Economic category.
- Combined *Pandemic* and *Infectious diseases* to make *Pandemics/infectious diseases* (A pandemic emerges with high mortality/incidence of diseases such as HIV/AIDS spreads geographically.)

- Changed *Breakdown of critical information infrastructure (CII)* to *Cybersecurity/interconnectedness of infrastructure.*
- Changed *Nanotechnology* (Studies indicate health impairment due to unregulated exposure to a class of commonly used nanoparticles—used in paint, nanocoated clothing, cosmetics or health care—exhibiting unexpected, novel properties and easily entering the human body.) to *Technology/space weather* (Health is impaired due to exposure to nanoparticles, unintended consequences of technology or disruptions caused by geomagnetic storms, meteorites and other phenomena originating from beyond the earth.)
- Changed definition of *International terrorism* from "Attacks disrupt economic activity, causing major human and economic losses. Indirectly, attacks aid retrenchment from globalization" to "Attacks disrupt economic activity, causing major human and economic losses."
- Changed the definition of *Regional instability* from "A variety of hot spots are prevalent around the world. These include the Middle East and the Korean peninsula" to "Certain unstable areas may cause widespread political and other crises. These include, but are not limited to, the Middle East and the Korean peninsula."
- Changed definition of *Liability regimes* from "U.S. liability costs rise by multiples of GDP growth, with litigiousness spreading to Europe and Asia" to "Liability costs rise by multiples of GDP growth, with the spread of litigiousness."

2012—No changes

2013—Changes to two definitions:

- Changed *Natural catastrophe: inland flooding* to *Natural catastrophe: severe weather (except tropical storms)* and the definition to "Meteorological phenomena with the potential to cause significant economic losses, fatalities and disruption. Includes inland flooding from all causes, tornados, thunderstorms, drought, wildfires, high winds, snowstorms and dust storms."
- Changed *Liability regimes* to *Liability regime and regulatory framework*, and the definition to "Costs rise by multiples of GDP growth, with the spread of litigiousness and regulatory revisions."

2014—Changes to the names of two risks:

- Changed *Fall in value of US$* to *Currency trend.*
- Changed *Blow up in asset prices* to *Asset price collapse.*

2015—Changes to the names of four risks:

- Changed *Currency trend* to *Currency shock.*
- Changed *Climate change* to *Climate change (includes space weather).*
- Changed *International terrorism* to *Terrorism.*
- Changed *Technology/space weather* to *Technology* to reflect that space weather is a cause of cyclical climatic variations.

2016—Changes to the names of two risks and updates to the definitions of eight risks, mainly to adopt a consistent method of describing the negative results of a risk. Definition changes were meant to add clarity. Specifically, *Demographic shift* added migration as a specific factor:

- Changed definition of *Natural catastrophe: tropical storms* from "A hurricane or typhoon passes over heavily populated areas, leading to catastrophic economic losses and/or high human death tolls" to "A hurricane or typhoon leads to disruption, catastrophic economic losses, and/or high human loss of life."

- Changed *Natural catastrophe: earthquakes* from "Strong earthquake(s) occurs in heavily populated areas" to "Strong earthquake(s)/volcanic eruptions lead to disruption, catastrophic economic losses and/or high human loss of life."
- Changed *Natural catastrophe: severe weather (except tropical storms)* from "Meteorological phenomena with the potential to cause significant economic losses, fatalities and disruption. Includes inland flooding from all causes, tornados, thunderstorms, drought, wildfires, high winds, snowstorms and dust storms" to "Meteorological phenomena lead to disruption, catastrophic economic losses, and/or high human loss of life. Includes inland flooding, tornados, thunderstorms, drought, wildfires, high winds, snowstorms and dust storms."
- Changed *Terrorism* from "Attacks disrupt economic activity, causing major human and economic losses" to "Attacks lead to disruption, catastrophic economic losses, and/or high human loss of life."
- Changed both name and definition from *Proliferation of weapons of mass destruction (WMD)*—"Treaty on the non-proliferation of Nuclear Weapons is no longer effective, leading to the spread of nuclear technologies" to *Weapons of mass destruction*—"Nuclear, biological, radiological and chemical technologies are held by unstable groups, leading to disruption, catastrophic economic losses, and/or high human loss of life."
- Changed *Demographic shift* from "Aging populations in developed economies drive economic stagnation by forcing governments to raise taxes or borrow" to "Evolving populations (e.g., age, size, migration trends) drive economic stagnation and governmental interventions."
- Changed both name and definition from *Cybersecurity/interconnectedness of infrastructure*—"A major disruption of the availability, reliability and resilience of a critical information infrastructure caused by cybercrime, terrorist attack or technical failure. Results are felt in the major infrastructure: power distribution, water supply, transportation, telecommunication, emergency services and finance" to *Cyber/interconnectedness of infrastructure*—"A major disruption of the availability, reliability and resilience of critical information infrastructure caused by cyber risks, terrorist attack or technical failure. Results are felt in major infrastructure: power distribution, water supply, transportation, telecommunication, emergency services, and finance." Comments in previous surveys had noted that cybersecurity did not cover all cyber risks.
- Changed *Technology* from "Health is impaired due to exposure to nanoparticles or unintended consequences of technology" to "Includes drones, self-driving cars, additive manufacturing (3-D printing), the internet of things, exposure to nanoparticles, or other unintended consequences of technology that lead to disruption and/or catastrophic economic losses."

2017—Changes to the names of two risks and update to the definitions of seven risks, partly to show risk as two-sided:

- Changed both name and definition from *Climate change (includes space weather)*—"Climate change generates both extreme events and gradual changes, impacting infrastructure, agricultural yields and human lives. (Drivers are unspecified; examples include space weather and human influence.)" to *Climate change*—"Change in climate patterns generates both extreme events and gradual changes, impacting infrastructure, agricultural yields and human lives. (Drivers include, but are not limited to, space weather and human influence.)"
- Changed the definition of *Natural catastrophe: tropical storms* from "A hurricane or typhoon leads to disruption, catastrophic economic losses, and/or high human loss of life" to "Hurricanes and typhoons lead to disruption, catastrophic economic losses, and/or high human loss of life."
- Changed the definition of *Natural catastrophe: earthquakes* from "Strong earthquake(s)/volcanic eruptions lead to disruption, catastrophic economic losses, and/or high human loss of life" to "Strong earthquake(s)/seismic activity lead to disruption, catastrophic economic losses, and/or high human loss of life."
- Changed the definition of *Weapons of mass destruction* from "Nuclear, biological, radiological and chemical technologies are held by unstable groups, leading to disruption, catastrophic economic

losses, and/or high human loss of life" to "Nuclear, biological, radiological or chemical technologies are held by unstable groups, leading to disruption, catastrophic economic losses, and/or high human loss of life."
- Changed both the name and definition from "*Retrenchment from globalization*—Rising concerns about cheap imports and immigration sharpen protectionism in developed countries. Countries become more nationalistic and state-oriented" to "*Globalization shift*—Preference changes to imports and immigration. Countries retrench and become more nationalistic and protectionist or open up their economies to outsiders."
- Changed the definition of *Demographic shift* from "Evolving populations (e.g., age, size, migration trends) drive economic stagnation and government interventions" to "Evolving populations (e.g., age, size, migration trends) drive changes in economic growth and levels of government intervention."
- Changed the definition of *Technology* from "Includes drones, self-driving cars, additive manufacturing (3-D printing), the internet of things, exposure to nanoparticles, or other unintended consequences of technology that lead to disruption and/or catastrophic economic losses" to "Unintended consequences of technology leads to disruption and/or catastrophic economic losses (e.g., drones, self-driving cars, additive manufacturing, the internet of things, exposure to nanoparticles)."

2018—Changes to the names of two risks and update to the definitions of six risks:

- Changed definition for *Natural catastrophe: earthquakes* to reflect seismic/volcanic activity rather than earthquake/seismic to clarify that volcanic activity should be included with this risk.
- Changed name from *Chinese economic hard landing* to *Chinese destabilization.*
- Changed definition of *Transnational crime and corruption* to refer to non-state entities rather than organized crime.
- Definition of *Globalization shift* adds "Inequality challenges the concept of fairness and egalitarianism."
- Definition of *Pandemics/infectious diseases* expanded to include "Antimicrobial resistance becomes common."
- Definition of *Demographic shift* adds race as an example of an evolving population.
- Changed name of *Cyber/interconnectedness of infrastructure* to *Cyber/network infrastructure.*
- Changed definition of *Technology* to list nanoparticles rather than exposure to nanoparticles.

2019—Changes to the names of five risks and update to the definitions of six risks:

- Changed definition of *Chinese destabilization* to include demographics.
- Changed definition of *Climate change* to include ecosystem biodiversity (e.g., insects, shellfish).
- Changed name of *Natural catastrophe: severe weather (except tropical storms)* to *Natural catastrophe: severe weather.*
- Changed name and definition of *Interstate and civil wars* to clarify that all wars were included. The risk is now called *Wars (including civil wars).*
- Definition of *Globalization shift* adds "Political uncertainty."
- Updated name and definition of *Chronic diseases* to incorporate medical delivery (e.g., change to single-payer system).
- Changed definition of *Liability regimes/regulatory framework* to include increases in the spread and size of litigiousness.
- Changed name of *Cyber/network infrastructure* to *Cyber/networks*, but definition is unchanged.
- Changed name of *Technology* to *Disruptive technology* due to suggestions in prior survey.

2020—No changes to the names of any risks but updates to the definitions of seven risks:

- Definition of *Currency shock* added "Central banks may engage in currency wars."
- Definition of *Loss of freshwater services* added "(Drivers include climate change and human influence.)"
- Definition of *Wars (including civil wars)* added wording to be consistent with *Weapons of mass destruction*…"leading to disruption, catastrophic economic losses, and/or high human loss of life."
- Definition of *Failed and failing states* added "or widening social rifts."
- Definition of *Globalization shift* specifically added references to populism, trade wars and food insecurity.
- Definition of *Pandemics/infectious diseases* added reference to coronavirus.
- Definition of *Liability regimes/regulatory framework* added example of social inflation under litigiousness.

2021—Change to the name of one risk and updates to definitions of four risks:

- Definition of *Currency shock* added reference to digital currencies.
- Name of *Chinese destabilization* modified to *Emergent nation destabilization* to reflect other potentially disruptive nations.
- Definition of *Climate change* expanded to specifically list TCFD (Task force on Climate-related Financial Disclosures) categories of physical and transition risks.
- Definition of *Chronic diseases/medical delivery* expanded to include substance abuse.
- Definition of *Demographic shift* list of examples expanded to include skills shortages.

2022—Change to the name of no risks and updates to definitions of 12 risks:

- Definition of *Energy price shock* changed from "Energy prices change abruptly" to "Price instability and extremes of energy prices."
- Definition of *Climate change* updated to include soil degradation and incorporate physical and transition risks directly.
- Definition of *Loss of freshwater services* updated to reference pollution.
- Definition of *Weapons of mass destruction* updated so possession is not limited to unstable groups.
- Definition of *Transnational crime and corruption* simplified from "continues to be endemic" to "is endemic."
- Definition of *Globalization shift* increased examples to include democracy, socialism, communism and religiosity. Privacy was added to inequality and food insecurity as a concept of fairness and egalitarianism.
- Definition of *Regional instability* updated from "unstable areas" to "unstable regions."
- Definition of *Chronic diseases/medical delivery* updated to include treatments. The term "material trends" was updated to "material changes."
- Definition of *Demographic shift* was clarified by adding size and mix prior to the examples, and "skill shortages" was shortened to "skills."
- Definition of *Liability regimes/regulatory framework* was expanded to add climate litigation and tax policy.
- Definition of *Cyber/networks* was expanded to include supply chains.
- Definition of *Disruptive technology* was clarified by changing "the internet of things" to "internet of things."

Appendix II: 16th Survey Results (Compiled Fall 2022)

This appendix includes the survey as well as the responses. There were 143 respondents. Not all the respondents answered every question. The percentages reflect the number of responses received, divided by the number who answered that specific question. Totals may not add to 100% due to rounding. All tables of response percentages for recurring questions include the most recent results, starting with the current survey and working backward through the given number of surveys.

Responses to open-ended questions have been lightly edited, but original intent is unchanged. Occasionally, a comment is highlighted using boldface type to reflect those the researcher found particularly thought-provoking. Comments are identified using *italics*.

Many of the charts and tables contain only the most recent data. The accompanying Tableau data includes all data points, which is often 16 years.

The following text introduced the survey to recipients via email.

> ## Participate in the 16th Emerging Risk Survey
>
> Take this online survey to help us understand individual risk managers' perspectives on emerging risks. The Joint Risk Management Section of the Canadian Institute of Actuaries, the Casualty Actuarial Society, and the Society of Actuaries (SOA) will oversee this 16th annual survey of emerging risks. We value insights from all levels of experience and background and invite you to participate in this annual survey.
>
> **Please complete this survey by Nov. 21st**. The survey should take about 15 minutes to complete. We encourage you to share your thoughts and experiences in the comment boxes too. **Responses from more than one risk manager within the same company are encouraged.** All responses are anonymous.
>
> If you have questions about the survey, please contact Jan Schuh at the SOA Research Institute.
>
> Thank you for your participation.

Once inside the survey, the respondent is greeted with the following.

> Emerging risks have either not previously occurred or have not occurred for so long that they are not considered possible. The lack of credible historical data creates a formidable challenge for risk managers. While completing the survey, please consider a time horizon that extends beyond a business plan time frame (often 3–5 years).
>
> This survey is sponsored by Joint Risk Management Section of the Canadian Institute of Actuaries, Casualty Actuarial Society and the Society of Actuaries. The complete results will be available at https://www.casact.org/ and www.soa.org.
>
> Responses are anonymous and multiple responses from an organization are encouraged.
>
> As you complete the four sections of the survey, keep in mind that you cannot use the "back" button in your browser to review prior answers. Use the "Previous" button at the bottom of each page to navigate back to already answered questions. Upon completion of the survey, you will be provided a printable report of your survey responses. If you are having challenges entering information in the survey, please clear the browsing history as it may resolve the issue. Also, make sure that the open text boxes are your responses when answering.

Please respond no later than **Nov. 21, 2022**.

A glossary of terms is available for reference: Glossary of risks 2022. [Ed. Note: this is Appendix I.]

Thanks for participating!

****

The following data is not presented to the respondents but is useful in the analysis since recency bias has been identified as a contributing factor to the results.

Table 11
MACROECONOMIC TRENDS

Date	Survey Date	S&P 500	Oil Price	Currency
End of April	Spring 2008	1,385.59	113.70	1.56
End of October	Fall 2008	968.75	68.10	1.27
December 11	Fall 2009	1,106.41	77.04	1.48
October 15	Fall 2010	1,176.19	84.49	1.40
End of September	Fall 2011	1,131.42	78.93	1.34
End of September	Fall 2012	1,440.67	92.18	1.29
End of September	Fall 2013	1,681.55	102.36	1.35
End of September	Fall 2014	1,972.29	91.17	1.26
End of October	Fall 2015	2,079.36	46.60	1.10
End of October	Fall 2016	2,126.15	46.83	1.10
End of October	Fall 2017	2,575.26	54.36	1.16
End of October	Fall 2018	2,711.74	65.31	1.14
End of October	Fall 2019	2,976.74	54.09	1.09
End of October	Fall 2020	3,269.96	35.64	1.16
End of October	Fall 2021	4,605.38	83.50	1.16
End of October	Fall 2022	3,871.98	86.54	0.99

Sources:
S&P 500 https://fred.stlouisfed.org/series/SP500
Oil price ($ per barrel) www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=D
EUR/USD http://www.federalreserve.gov/releases/h10/Hist/dat00_eu.htm

The initial survey was completed in April 2008, soon after Bear Stearns lost its independence. At that time, the S&P 500 stood at 1,385.59, the price of a barrel of oil was US$113.70 and one euro cost US$1.56. The price of oil was high, the stock markets were at then record levels and the dollar was cheap relative to the euro. The table had been set for the financial crisis that soon followed. Today's survey reflects a near tripling of the S&P 500, much lower prices for oil and the strongest U.S. dollar since before the survey began.

Default Question Block

Strategic impact can be thought of using time horizon. There are current risks that require immediate action, tactical risks that are accounted for in a 3–5-year plan, and strategic risks that are not expected to occur until after that time horizon but remain important. Previous surveys have found that respondents tend to be anchored in the present with their responses. It is thought that knowledge of this cognitive bias will help to understand and compensate for it, so we will start by asking you about today's current risks. The following questions will ask you to identify current and emerging risks that you expect to have the greatest strategic impact currently and in the future.

The original list of risks was developed by the World Economic Forum (WEF) for their inaugural *Global Risks* survey in 2007. There is a balance required between keeping the list current and being able to show trends. The WEF has regularly updated its list, despite a stated time horizon of 10 years, and recent reports include

about 30 risks across the same five categories. The *Survey of Emerging Risks* has tried to maintain stability for trending purposes, although the list has evolved over time, as described in Appendix I.

Question 1. Greatest strategic impact related to risk can have various meanings. How do you define it?

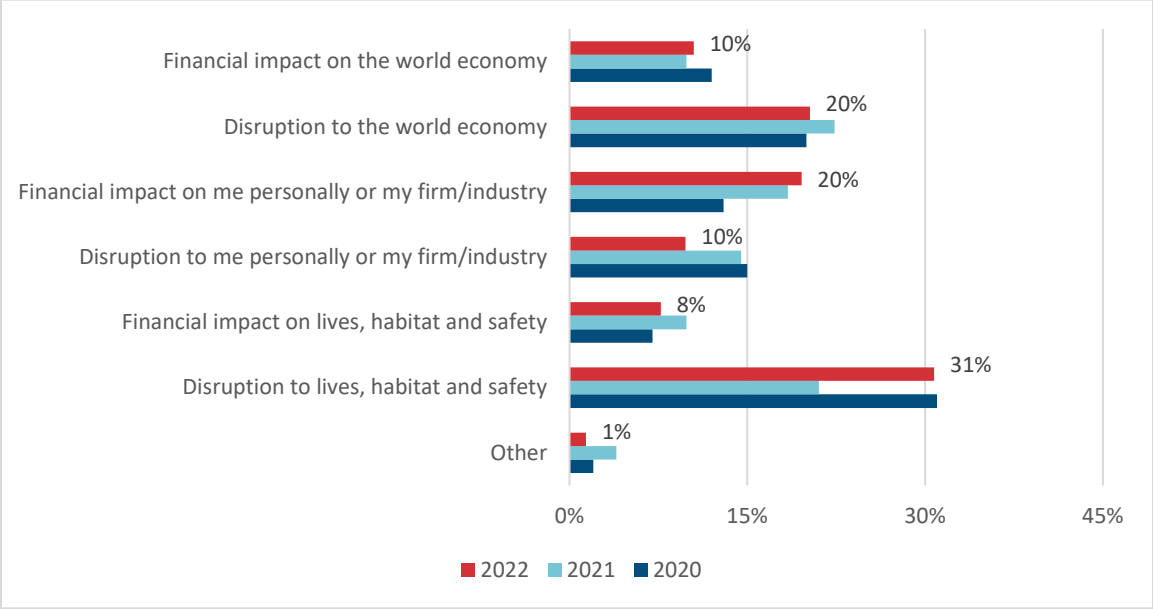
143 total responses

	Responses	2022	2021	2020
Financial impact on the world economy	15	10%	10%	12%
Disruption to the world economy	29	20%	22%	20%
Financial impact on me personally or my firm/industry	28	20%	18%	13%
Disruption to me personally or my firm/industry	14	10%	14%	15%
Financial impact on lives, habitat and safety	11	8%	10%	7%
Disruption to lives, habitat and safety	44	31%	21%	31%
Other	2	1%	4%	2%

Other

- *Impact of having a faulty strategy or not achieving the strategy*
- *It depends on the question/company/person/problem that the strategic plan is related to…if you are asking about greatest strategic impact to my company, the industry, me?*

Greatest Impact

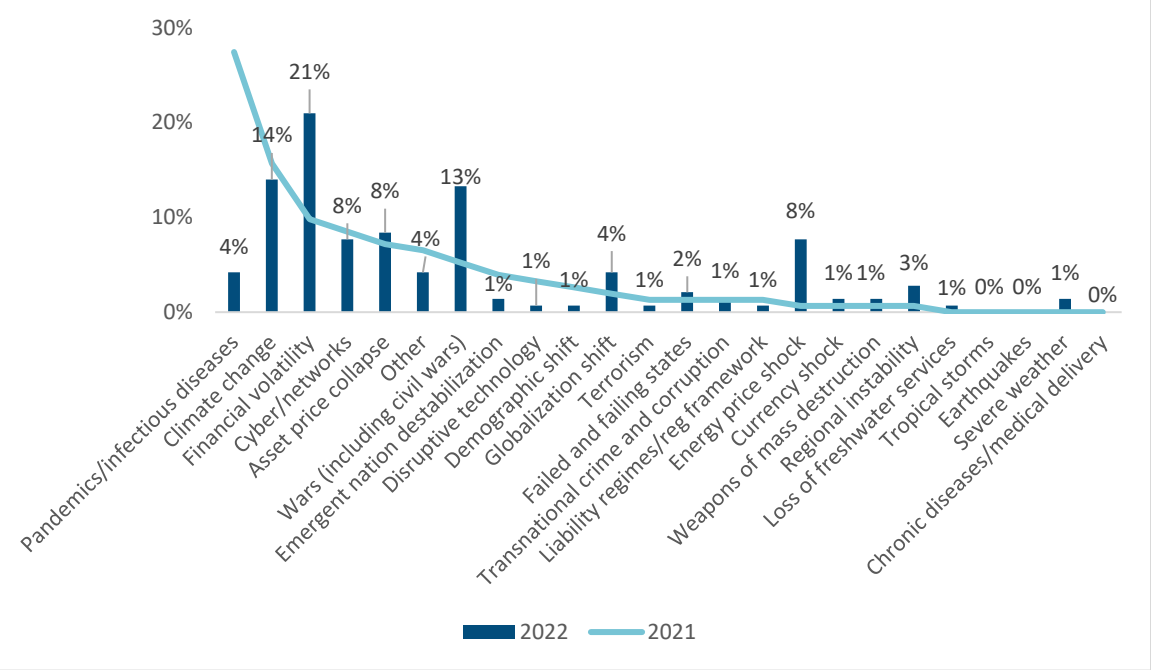


Later in this analysis, some of the survey results will be segregated between how respondents answered this question.

Question 2. What is the risk that currently has the greatest impact? (Please select one.)

The 23 risks shown have been adapted from those developed by the World Economic Forum in 2007. [Ed. note: Detailed definitions of these risks can be found in Appendix I, along with how the definitions have evolved over time.]

Top Current Risk, Year Over Year



In the following tables of responses, for the current year's results, yellow highlight is used to indicate a five-percentage-point increase or doubling, and green highlight indicates a five-percentage-point decrease or halving (when above 2% in previous year).

153 total responses

The rankings for the top current risks are:

1. Financial volatility - 21%
2. Climate change - 14%
3. Wars (including civil wars) - 13%
4. Asset price collapse - 8%
5. Cyber/networks - 8%
5. Energy price shock - 8%

	2022	2021	2020	2019	2018
Economic	40%	22%	13%	25%	24%
Energy price shock	8%	1%	1%	0%	0%
Currency shock	1%	1%	2%	1%	2%
Emergent nation destabilization	1%	4%	1%	5%	3%
Asset price collapse	8%	7%	4%	9%	8%
Financial volatility	21%	10%	6%	10%	11%

	2022	2021	2020	2019	2018
Environmental	**16%**	16%	13%	19%	17%
Climate change	**14%**	16%	11%	16%	12%
Loss of freshwater services	**1%**	0%	1%	0%	1%
Natural catastrophe: tropical storms	**0%**	0%	0%	1%	3%
Natural catastrophe: earthquakes	**0%**	0%	0%	1%	0%
Natural catastrophe: severe weather (except tropical storms)	**1%**	0%	2%	1%	2%

	2022	2021	2020	2019	2018
Geopolitical	**26%**	12%	12%	26%	24%
Terrorism	**1%**	1%	1%	2%	4%
Weapons of mass destruction	**1%**	1%	1%	2%	3%
Wars (including civil wars)	**13%**	5%	4%	5%	3%
Failed and failing states	**2%**	1%	3%	4%	5%
Transnational crime and corruption	**1%**	1%	1%	3%	2%
Globalization shift	**4%**	2%	3%	5%	5%
Regional instability	**3%**	1%	0%	3%	3%

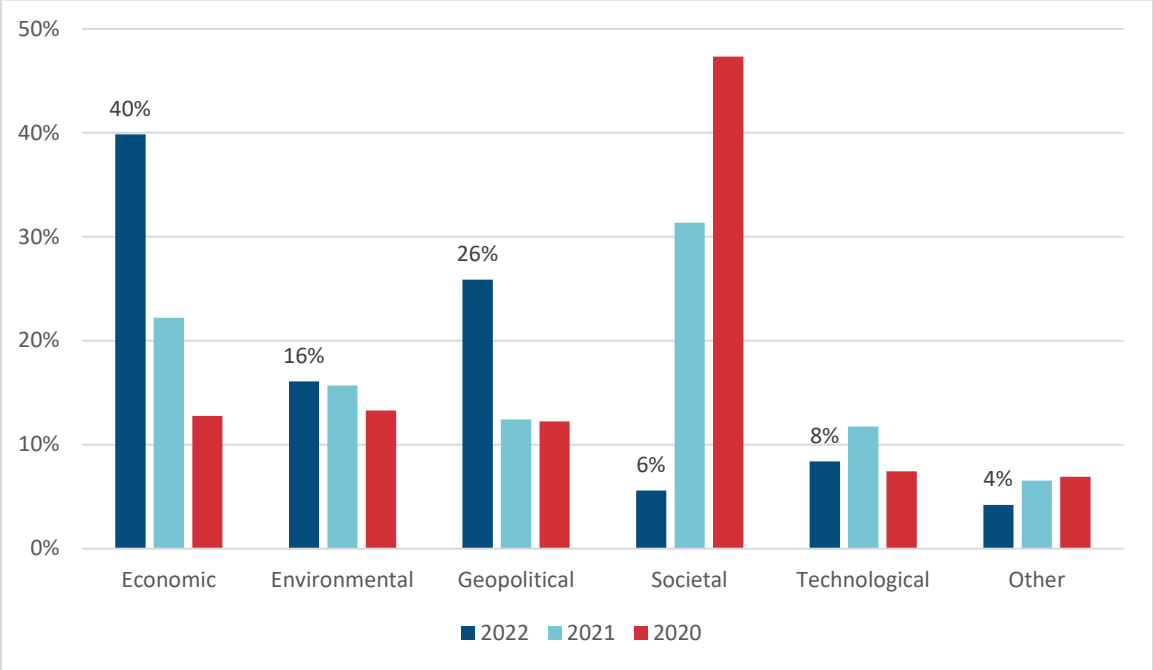
	2022	2021	2020	2019	2018
Societal	**6%**	31%	47%	10%	11%
Pandemics/infectious diseases	**4%**	27%	45%	2%	2%
Chronic diseases/medical delivery	**0%**	0%	1%	3%	2%
Demographic shift	**1%**	3%	0%	3%	4%
Liability regimes/regulatory framework	**1%**	1%	2%	2%	3%

	2022	2021	2020	2019	2018
Technological	**8%**	12%	7%	14%	19%
Cyber/networks	**8%**	8%	4%	8%	12%
Disruptive technology	**1%**	3%	3%	6%	7%

Other (4%/7%/7%/6%/5%)

- *Societies turning away from God*
- *Inflation*
- *Economic environment (interest rates inflation, asset values)*
- *The generally lower educational level of the populace*
- *The emergence of transgender ideology*
- *US education system – losing competitive advantage. Not even trying to compensate for 2 "lost" years of remote learning. No to homework, no to tests, no to merit-based promotions.*

Current Risk with Greatest Impact



Section A: Emerging Risks

Question 1. Please choose up to five (5) emerging risks that you feel will have the greatest strategic impact in the future. (please select no more than five)

662 total responses from 140 surveys

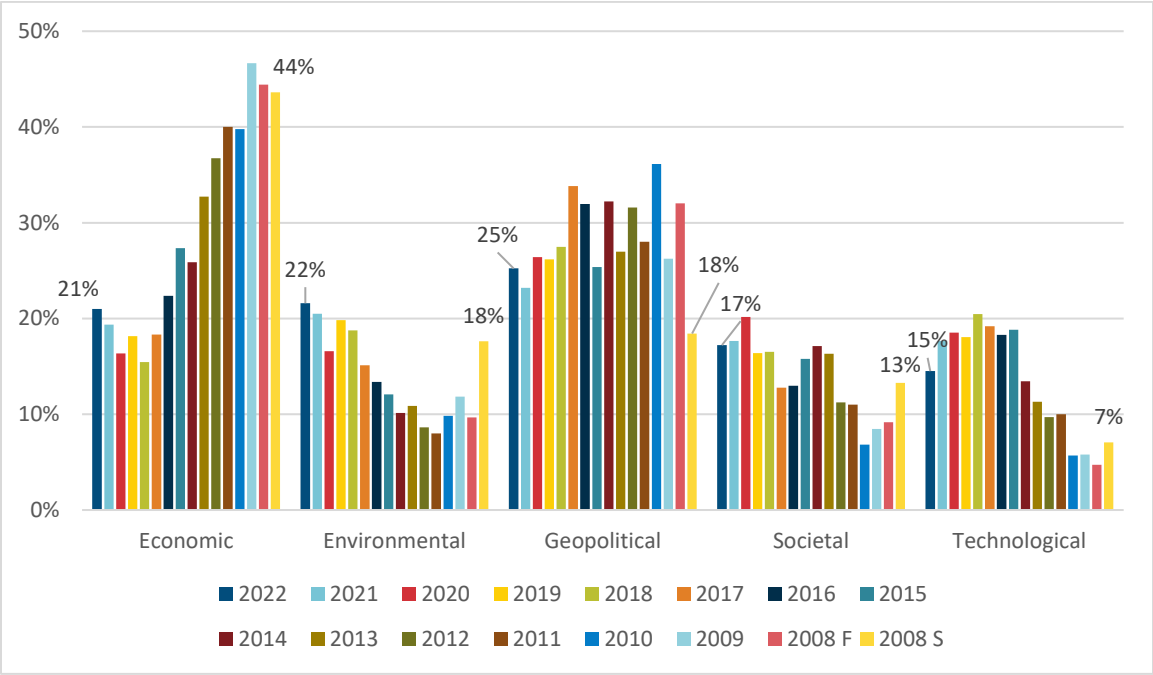
Average of 4.73 risks selected per survey (4.72 in prior survey)

Divisor in percentages for major categories is 662; for individual risks, it is 140. Note that, due to multiple responses, the sum of all percentages is materially greater than 100%.

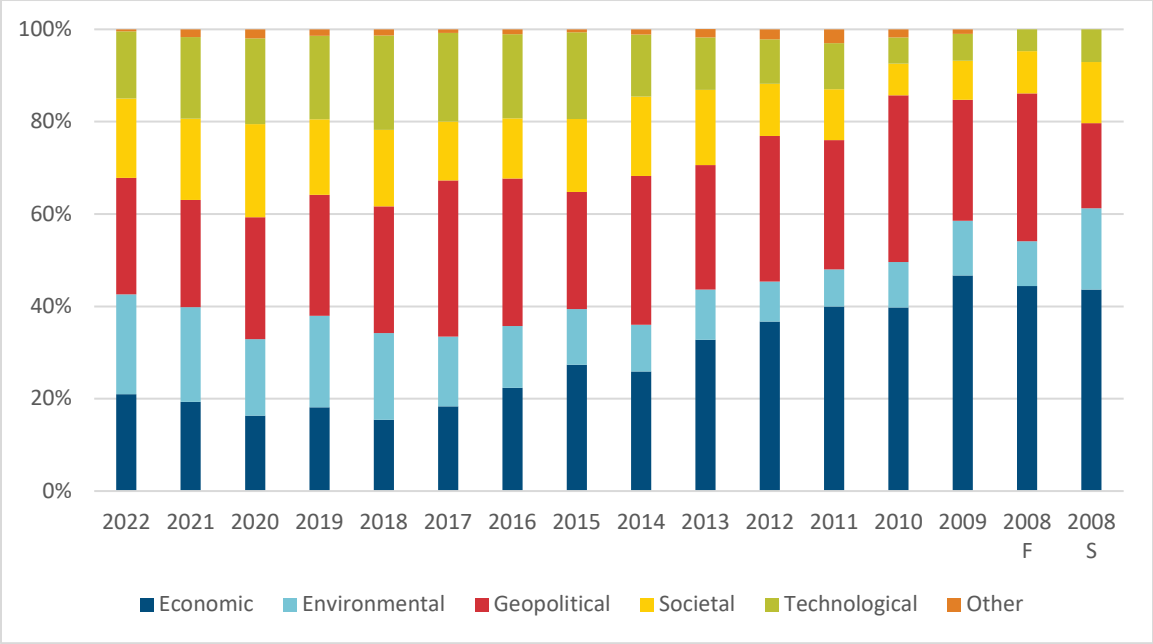
Number of responses selected (maximum of 5):

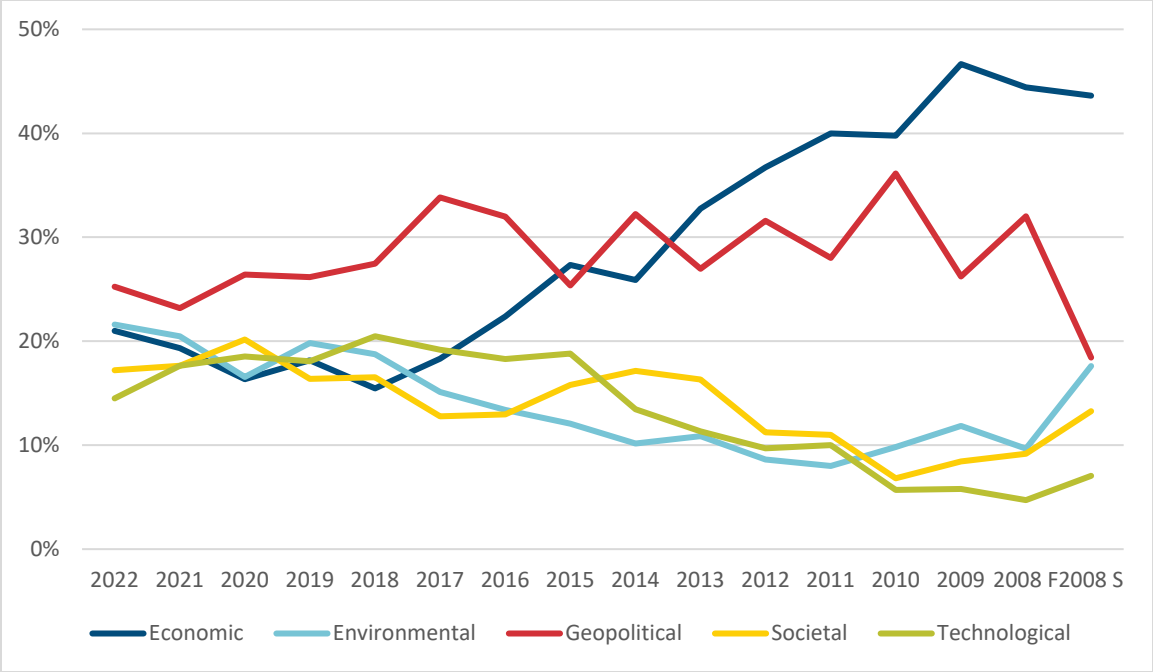
- 1: 0 surveys (0%)
- 2: 0 surveys (0%)
- 3: 10 surveys (7%)
- 4: 18 surveys (13%)
- 5: 112 surveys (80%)

Emerging Risks by Category (Up to Five Risks Chosen per Survey)



Ed. Note: In 2008, the survey was collected in both the spring (S) and fall (F).





The rankings for the top five emerging risks are:

1. *Climate change* - 57%
2. *Wars (including civil wars)* - 43%
3. *Cyber/networks* - 42%
4. *Financial volatility* - 39%
5. *Demographic shift* - 29%

	2022	2021	2020	2019	2018
Economic	**21%**	19%	16%	18%	15%
Energy price shock	**25%**	18%	4%	7%	6%
Currency shock	**7%**	11%	7%	7%	7%
Emergent nation destabilization	**9%**	12%	15%	23%	15%
Asset price collapse	**20%**	19%	20%	21%	19%
Financial volatility	**39%**	30%	31%	29%	27%

	2022	2021	2020	2019	2018
Environmental	**22%**	20%	17%	20%	19%
Climate change	**57%**	58%	50%	54%	49%
Loss of freshwater services	**18%**	15%	8%	12%	13%
Natural catastrophe: tropical storms	**9%**	5%	7%	8%	8%
Natural catastrophe: earthquakes	**4%**	3%	2%	4%	6%
Natural catastrophe: severe weather (except tropical storms)	**14%**	15%	11%	16%	12%

	2022	2021	2020	2019	2018
Geopolitical	**25%**	23%	26%	26%	27%
Terrorism	**9%**	17%	19%	17%	23%
Weapons of mass destruction	**9%**	7%	8%	9%	13%
Wars (including civil wars)	**43%**	24%	25%	25%	18%
Failed and failing states	**10%**	13%	18%	19%	25%
Transnational crime and corruption	**9%**	11%	11%	12%	12%
Globalization shift	**19%**	19%	20%	20%	20%
Regional instability	**19%**	17%	17%	22%	18%

	2022	2021	2020	2019	2018
Societal	**17%**	18%	20%	16%	17%
Pandemics/infectious diseases	**28%**	38%	45%	22%	25%
Chronic diseases/medical delivery	**11%**	9%	12%	12%	8%
Demographic shift	**29%**	23%	25%	33%	32%
Liability regimes/regulatory framework	**14%**	13%	13%	11%	12%

	2022	2021	2020	2019	2018
Technological	**15%**	18%	19%	18%	20%
Cyber/networks	**42%**	52%	47%	51%	56%
Disruptive technology	**26%**	32%	40%	35%	40%

Other (2%/2%/2%/1%/1%)

- *Mail-in ballots*
- *Inflation*
- *Developed Nation Destabilization*

Another way to review this data is as a percentage of the total responses. For example, *Climate change* had 80 responses in this survey. In the previous analysis just shared, 80/140 = 57%. In the following tables, we will look at 80/662 = 12% and compare the results with the average across previous surveys. This will allow consistent analysis against other questions in the current survey. **Yellow highlight** signifies higher than the average in the current survey, and **green highlight** signifies lower than the average.[9]

[9] Note that charts show actual results, while labels are rounded to the nearest percentage point. In some instances, the bar in the graph has positive length but the label says 0%.

Results are presented with the average across all 16 surveys first, then listing each result starting with the most recent survey.

	Avg	2022	2021	2020	2019	2018
Economic	**30%**	**21%**	19%	16%	18%	15%
Energy price shock	**5%**	**5%**	4%	1%	1%	1%
Currency shock	**5%**	**2%**	2%	2%	1%	1%
Emergent nation destabilization	**5%**	**2%**	3%	3%	5%	3%
Asset price collapse	**6%**	**4%**	4%	4%	4%	4%
Financial volatility	**9%**	**8%**	6%	6%	6%	6%

	Avg	2022	2021	2020	2019	2018
Environmental	**14%**	**22%**	20%	17%	20%	19%
Climate change	**7%**	**12%**	12%	11%	11%	11%
Loss of freshwater services	**2%**	**4%**	3%	2%	3%	3%
Natural catastrophe: tropical storms	**2%**	**2%**	1%	2%	2%	2%
Natural catastrophe: earthquakes	**1%**	**1%**	1%	0%	1%	1%
Natural catastrophe: severe weather (except tropical storms)	**2%**	**3%**	3%	2%	3%	3%

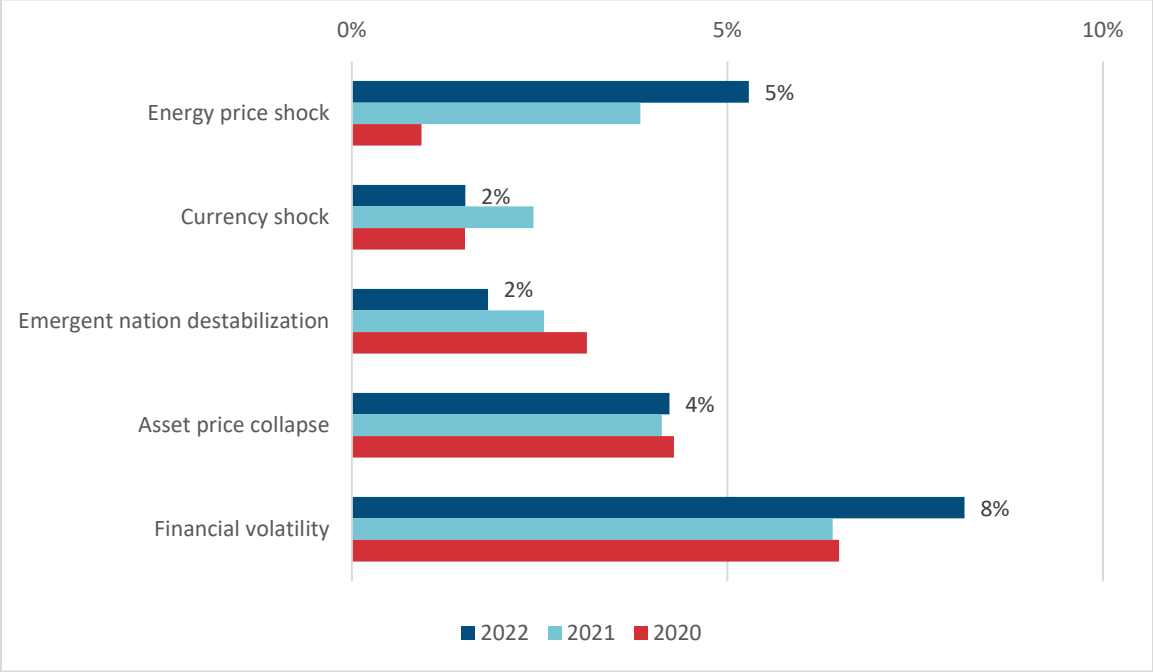
	Avg	2022	2021	2020	2019	2018
Geopolitical	**28%**	**25%**	23%	26%	26%	27%
Terrorism	**6%**	**2%**	4%	4%	4%	5%
Weapons of mass destruction	**2%**	**2%**	1%	2%	2%	3%
Wars (including civil wars)	**3%**	**9%**	5%	5%	5%	4%
Failed and failing states	**5%**	**2%**	3%	4%	4%	5%
Transnational crime and corruption	**2%**	**2%**	2%	2%	3%	2%
Globalization shift	**4%**	**4%**	4%	5%	4%	4%
Regional instability	**6%**	**4%**	4%	4%	5%	4%

	Avg	2022	2021	2020	2019	2018
Societal	**14%**	**17%**	18%	20%	16%	17%
Pandemics/infectious diseases	**5%**	**6%**	8%	10%	5%	5%
Chronic diseases/medical delivery	**2%**	**2%**	2%	3%	3%	2%
Demographic shift	**6%**	**6%**	5%	5%	7%	7%
Liability regimes/regulatory framework	**3%**	**3%**	3%	3%	2%	3%

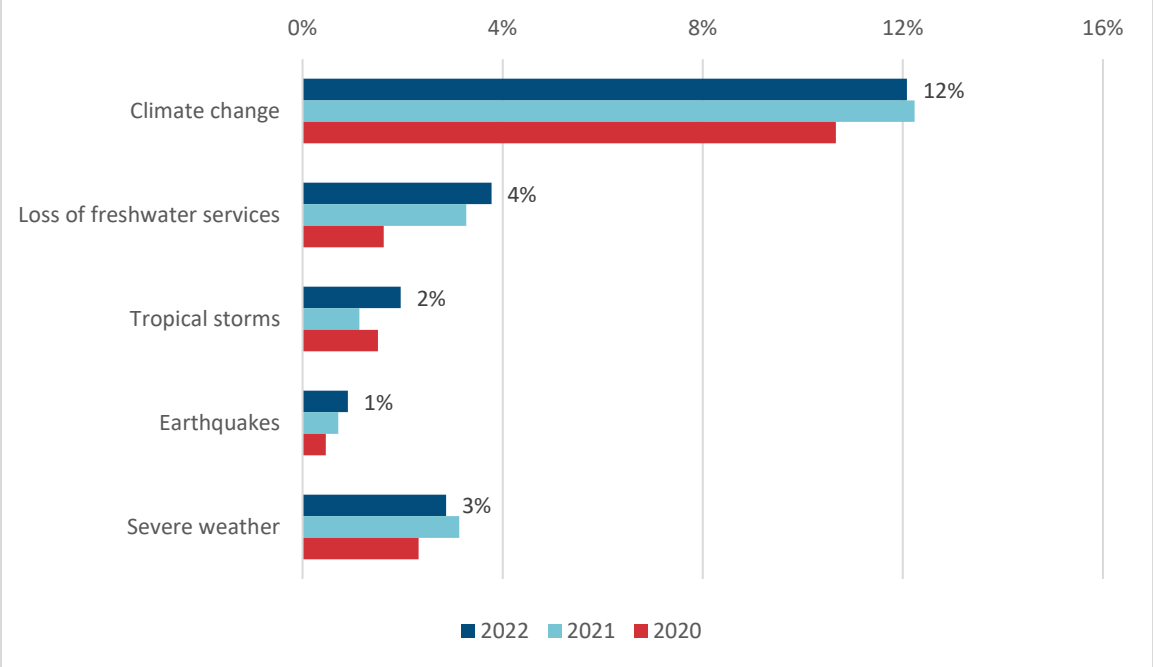
	Avg	2022	2021	2020	2019	2018
Technological	**13%**	**15%**	18%	19%	18%	20%
Cyber/networks	**9%**	**9%**	11%	10%	11%	12%
Disruptive technology	**4%**	**6%**	7%	9%	7%	9%

Other—Avg 1% (0%/2%/2%/1%/1%)

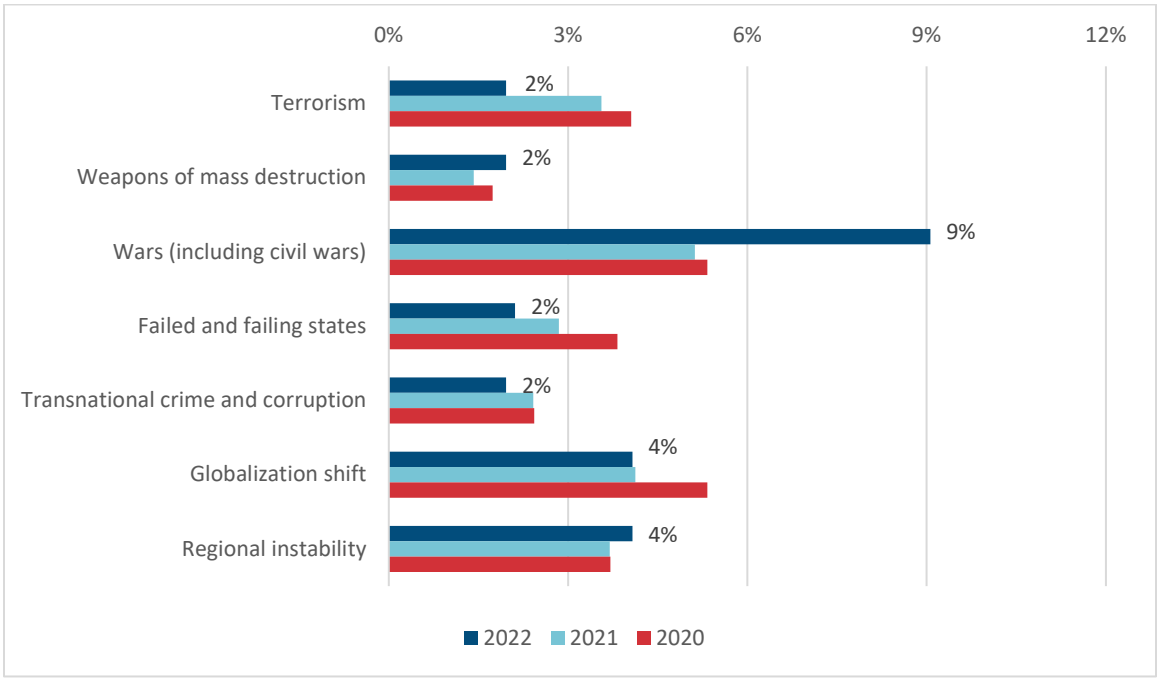
Emerging Risk Trends—Economic (% of Total)



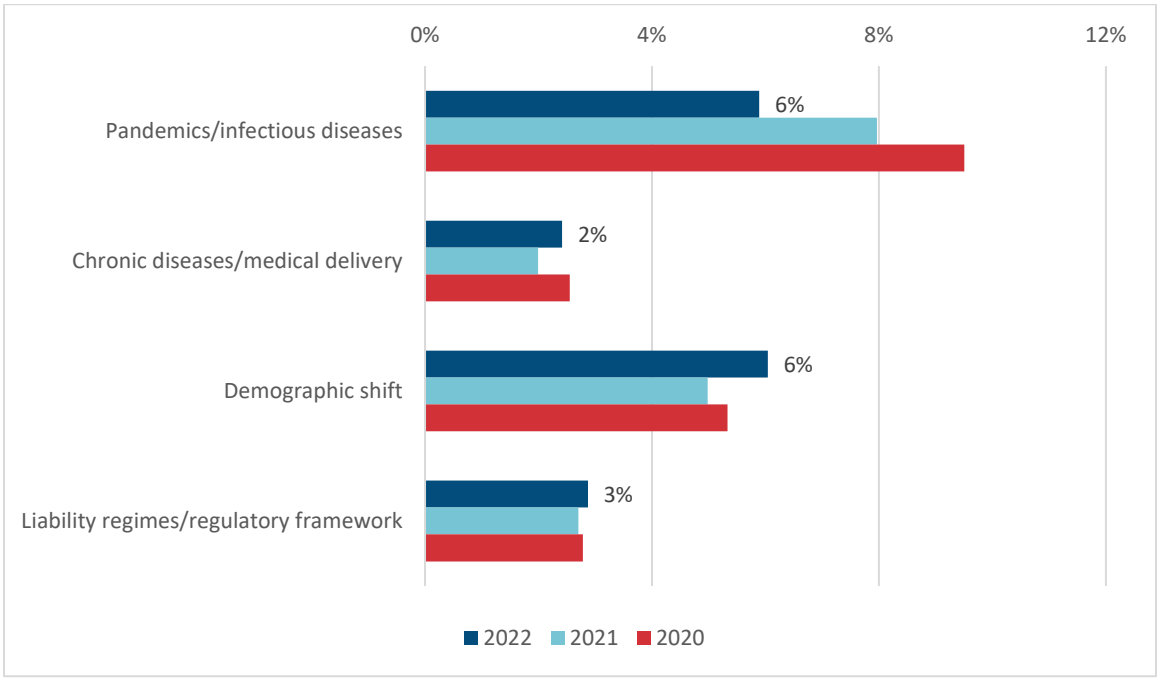
Emerging Risk Trends—Environmental (% of Total)



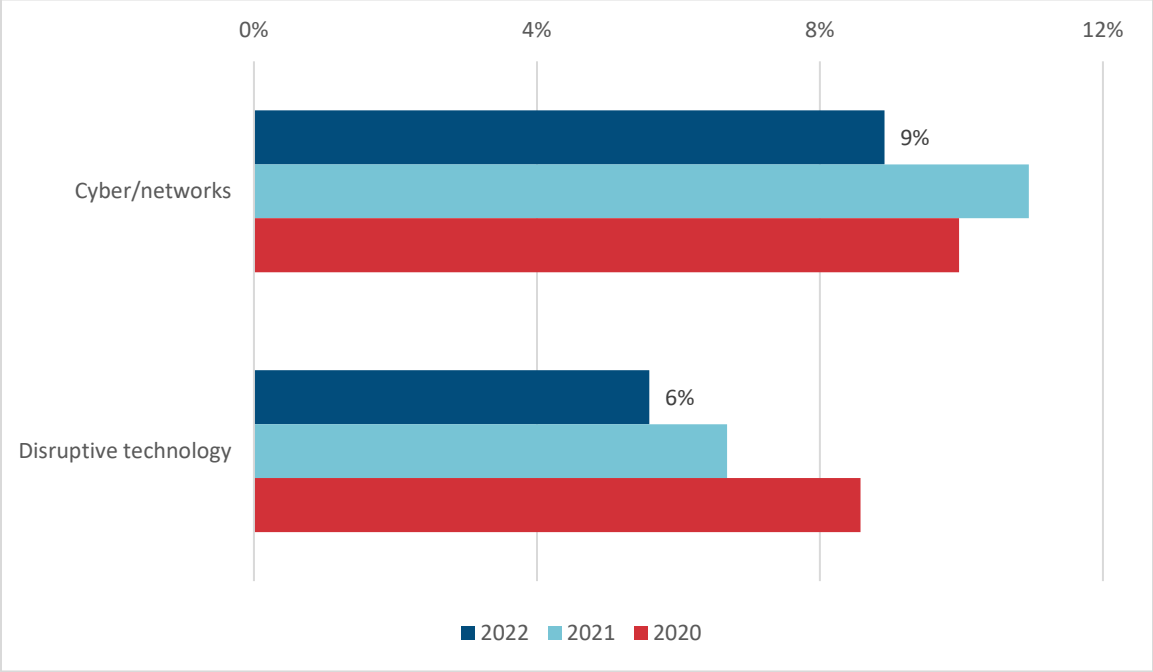
Emerging Risk Trends—Geopolitical (% of Total)



Emerging Risk Trends—Societal (% of Total)



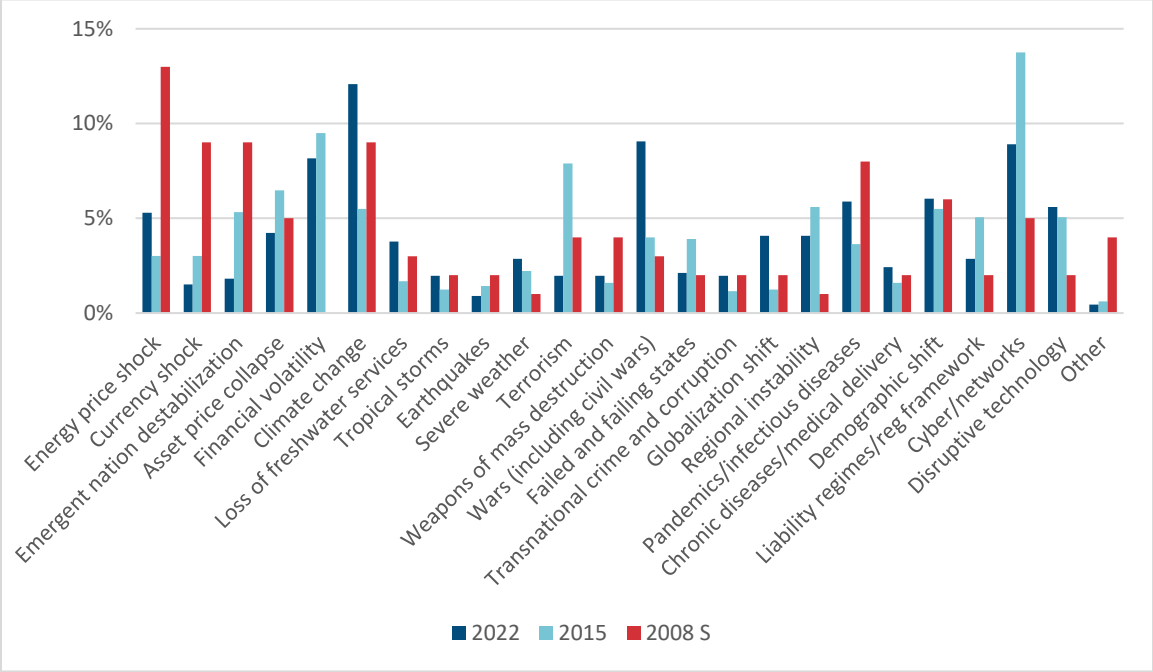
Emerging Risk Trends—Technological (% of Total)



Top Five Emerging Risks as Percentage of Total

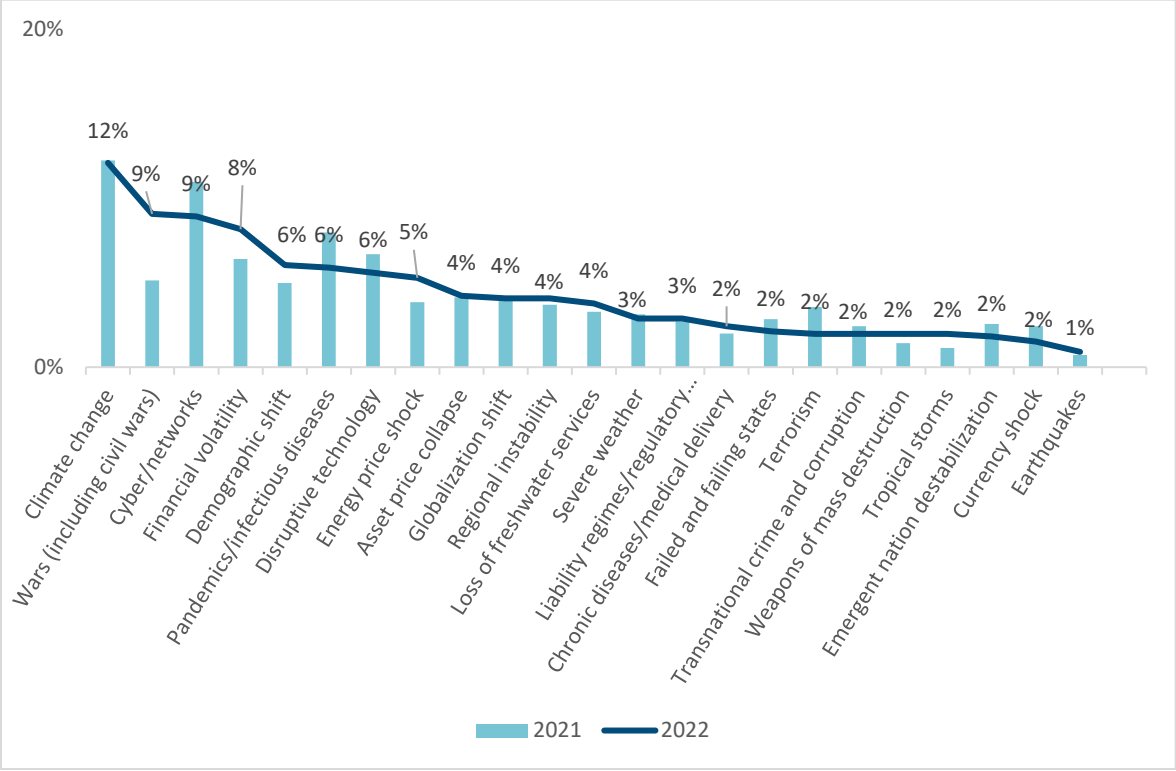
Risk	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	F 2008	S 2008	Average
Energy price shock	5%	4%	1%	1%	1%	1%	2%	*3%*	3%	2%	6%	7%	9%	10%	8%	13%	5%
Currency shock	2%	2%	2%	1%	1%	1%	2%	*3%*	1%	6%	5%	6%	10%	14%	10%	9%	5%
Emergent nation destabilization	2%	3%	3%	5%	3%	3%	4%	*5%*	6%	6%	7%	7%	9%	7%	6%	9%	5%
Asset price collapse	4%	4%	4%	4%	4%	6%	5%	*6%*	7%	7%	5%	5%	6%	10%	14%	5%	6%
Financial volatility	8%	6%	6%	6%	6%	6%	9%	*9%*	9%	13%	13%	15%					9%
Climate change	12%	12%	11%	11%	11%	6%	6%	6%	4%	4%	4%	3%	5%	6%	5%	9%	7%
Loss of freshwater services	4%	3%	2%	3%	3%	2%	2%	2%	2%	2%	2%	1%	2%	2%	2%	3%	2%
Tropical storms	2%	1%	2%	2%	2%	3%	2%	1%	1%	2%	1%	1%	1%	2%	1%	2%	2%
Earthquakes	1%	1%	0%	1%	1%	1%	2%	1%	1%	1%	0%	1%	1%	1%	1%	2%	1%
Severe weather	3%	3%	2%	3%	3%	2%	2%	2%	2%	2%	0%	1%	0%	1%	0%	1%	2%
Terrorism	2%	4%	4%	4%	5%	9%	8%	8%	9%	6%	6%	4%	9%	6%	6%	4%	6%
Weapons of mass destruction	2%	1%	2%	2%	3%	4%	2%	*2%*	2%	1%	3%	2%	4%	3%	3%	4%	2%
Wars (including civil wars)	9%	5%	5%	5%	4%	4%	3%	4%	4%	3%	3%	2%	2%	2%	2%	3%	4%
Failed and failing states	2%	3%	4%	4%	5%	3%	4%	*4%*	6%	6%	7%	9%	8%	4%	6%	2%	5%
Transnational crime and corruption	2%	2%	2%	3%	2%	3%	2%	*1%*	2%	2%	1%	1%	3%	2%	2%	2%	2%
Globalization shift	4%	4%	5%	4%	4%	4%	6%	*1%*	2%	3%	3%	2%	5%	4%	5%	2%	4%
Regional instability	4%	4%	4%	5%	4%	7%	5%	6%	8%	6%	9%	7%	5%	6%	7%	1%	5%
Pandemics/infectious diseases	6%	8%	10%	5%	5%	3%	3%	*4%*	6%	4%	3%	3%	5%	6%	7%	8%	5%
Chronic diseases/medical delivery	2%	2%	3%	3%	2%	2%	1%	2%	1%	1%	1%	2%	1%	1%	1%	2%	2%
Demographic shift	6%	5%	5%	7%	7%	5%	5%	6%	5%	6%	6%	7%	6%	6%	5%	6%	6%
Liability regimes/regulatory framework	3%	3%	3%	2%	3%	3%	3%	5%	5%	5%	2%	2%	1%	1%	1%	2%	3%
Cyber/networks	9%	11%	10%	11%	12%	11%	11%	14%	12%	10%	8%	8%	5%	4%	3%	5%	9%
Disruptive technology	6%	7%	9%	7%	9%	8%	7%	5%	1%	1%	1%	1%	1%	1%	1%	2%	4%
Other	0%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	3%	2%	1%	4%	4%	2%

Top Emerging Risks (Choose Up to Five)

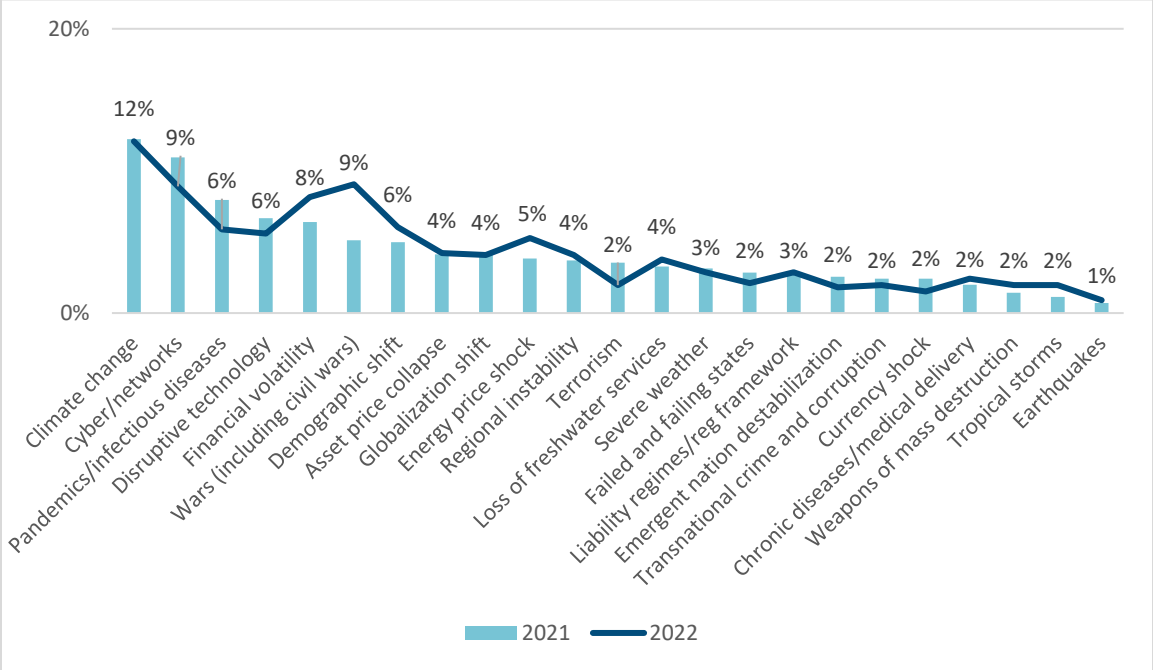


What follows are two versions of the same chart, with the first one sorted based on the prior survey's results. The data labels in the first chart reflect 2022 results.

Year-Over-Year Emerging Risks (Up to Five Risks Chosen per Survey)



Year-Over-Year Emerging Risks (Up to Five Risks Chosen per Survey)



Question 2. Of the emerging risks selected in the previous question, what one (1) would you rank number one as having the greatest strategic impact in the future? (Please select one.)

149 total responses

Answers in yellow highlight are up at least three percentage points; those in green highlight are down at least three percentage points.

The rankings for the top emerging risk are:

1. *Climate change* - 28%
2. *Financial volatility* - 15%
3. *Demographic shift* - 8%
4. *Cyber/networks* - 7%
5. *Asset price collapse* - 6%
5. *Wars (including civil wars)* - 6%
5. *Globalization shift* - 6%

	2022	2021	2020	2019	2018
Economic	27%	23%	15%	18%	13%
Energy price shock	5%	2%	1%	1%	0%
Currency shock	0%	2%	2%	0%	1%
Emergent nation destabilization	1%	3%	4%	4%	2%
Asset price collapse	6%	5%	2%	6%	5%
Financial volatility	15%	10%	7%	6%	5%

	2022	2021	2020	2019	2018
Environmental	**31%**	27%	29%	32%	26%
Climate change	**28%**	26%	26%	27%	22%
Loss of freshwater services	**2%**	0%	2%	3%	2%
Natural catastrophe: tropical storms	**0%**	0%	1%	0%	1%
Natural catastrophe: earthquakes	**0%**	0%	0%	0%	0%
Natural catastrophe: severe weather (except tropical storms)	**1%**	1%	1%	2%	1%

	2022	2021	2020	2019	2018
Geopolitical	**19%**	10%	19%	18%	18%
Terrorism	**0%**	1%	1%	2%	2%
Weapons of mass destruction	**1%**	1%	1%	1%	1%
Wars (including civil wars)	**6%**	3%	5%	3%	3%
Failed and failing states	**1%**	1%	3%	5%	3%
Transnational crime and corruption	**2%**	1%	1%	2%	2%
Globalization shift	**6%**	2%	5%	3%	4%
Regional instability	**2%**	1%	2%	2%	3%

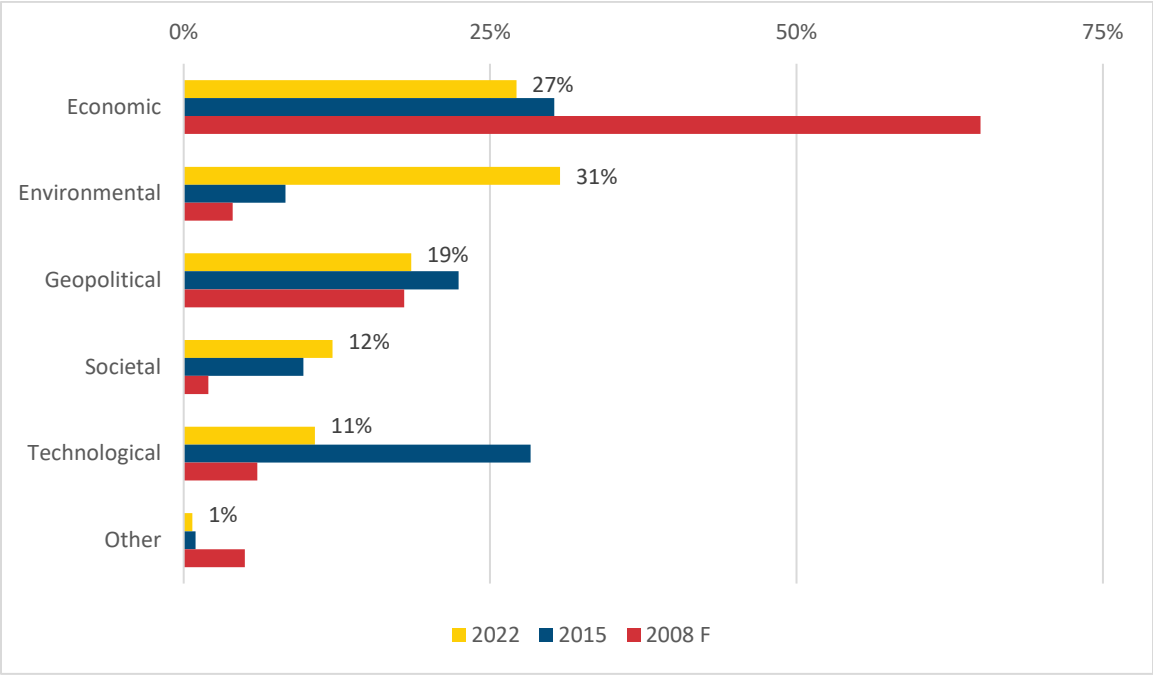
	2022	2021	2020	2019	2018
Societal	**12%**	16%	16%	9%	12%
Pandemics/infectious diseases	**1%**	5%	8%	2%	4%
Chronic diseases/medical delivery	**1%**	1%	1%	0%	2%
Demographic shift	**8%**	7%	4%	5%	5%
Liability regimes/regulatory framework	**2%**	3%	2%	2%	2%

	2022	2021	2020	2019	2018
Technological	**11%**	19%	18%	21%	28%
Cyber/networks	**7%**	13%	3%	10%	15%
Disruptive technology	**4%**	6%	15%	11%	13%

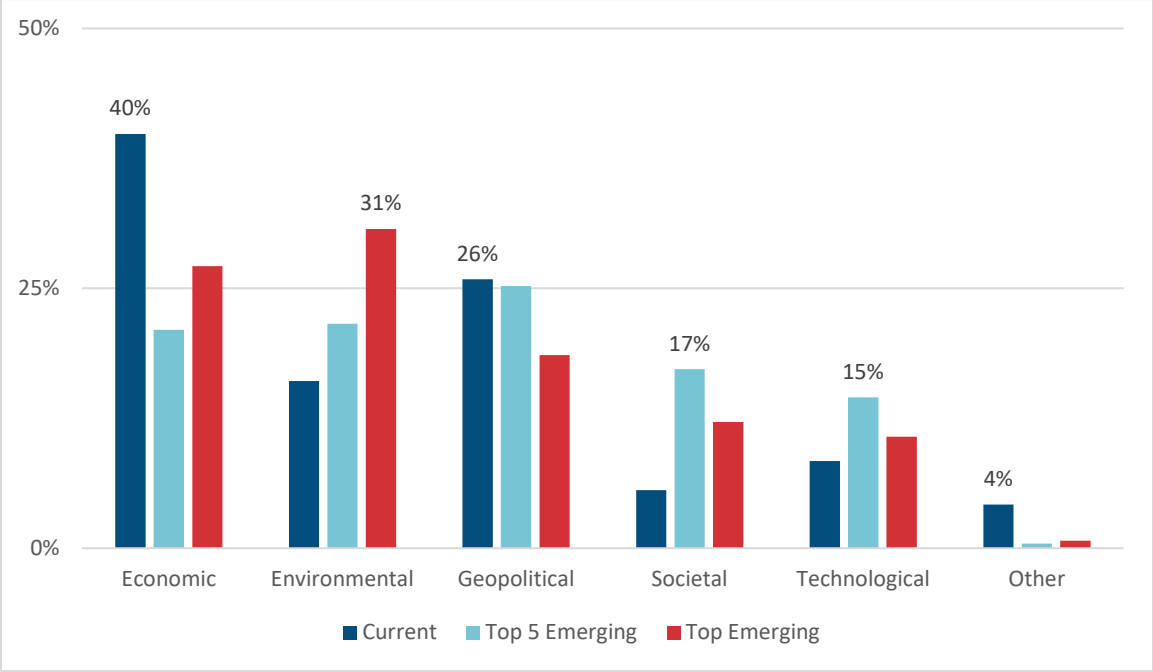
Other (0%/5%/3%/3%/3%)

There were no comments left for the Other response.

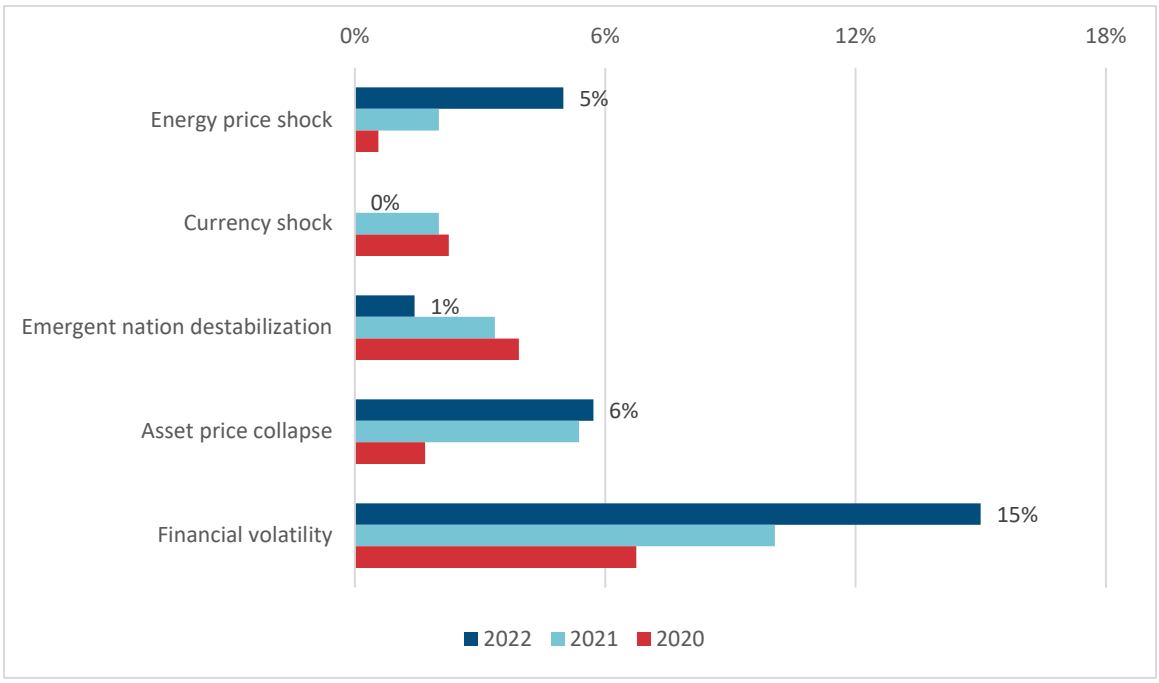
Top Emerging Risks by Category—Single Greatest Impact



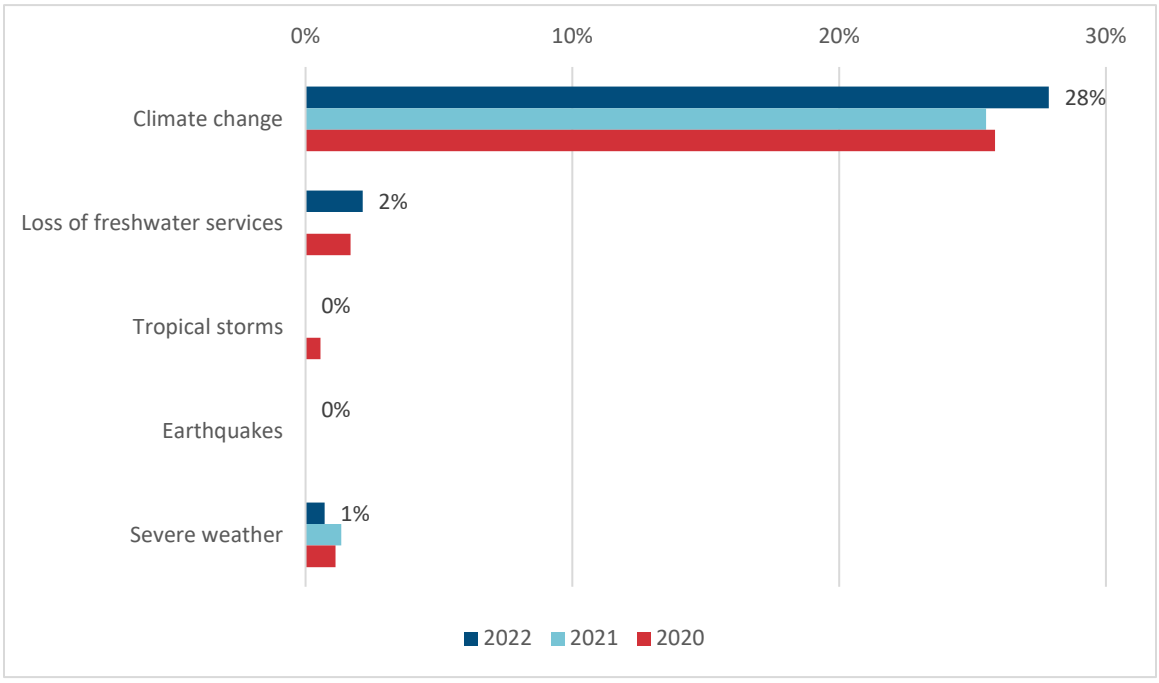
Category Comparison Across Three Questions



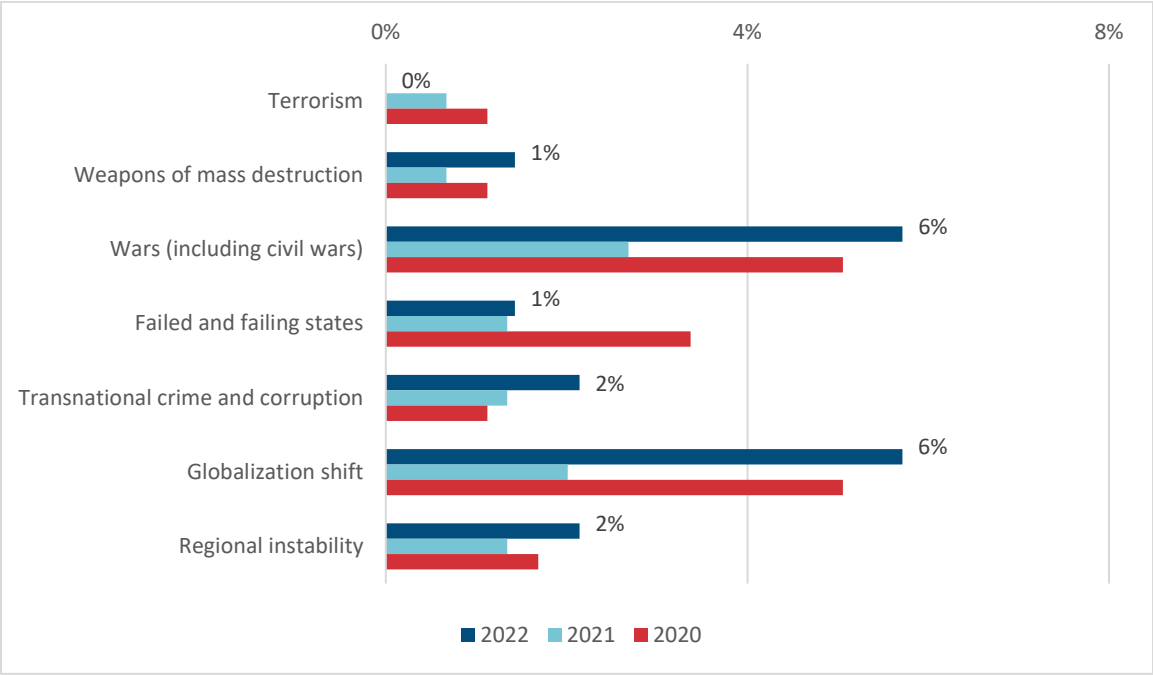
Top Emerging Risks—Economic (% of Total)



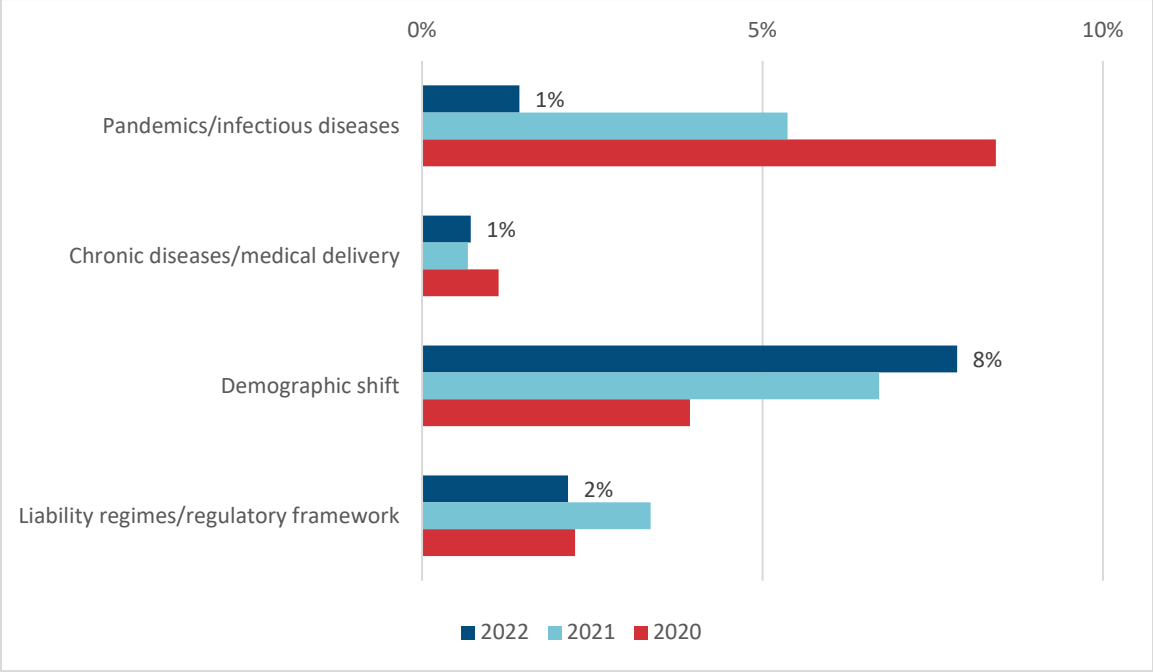
Top Emerging Risks—Environmental (% of Total)



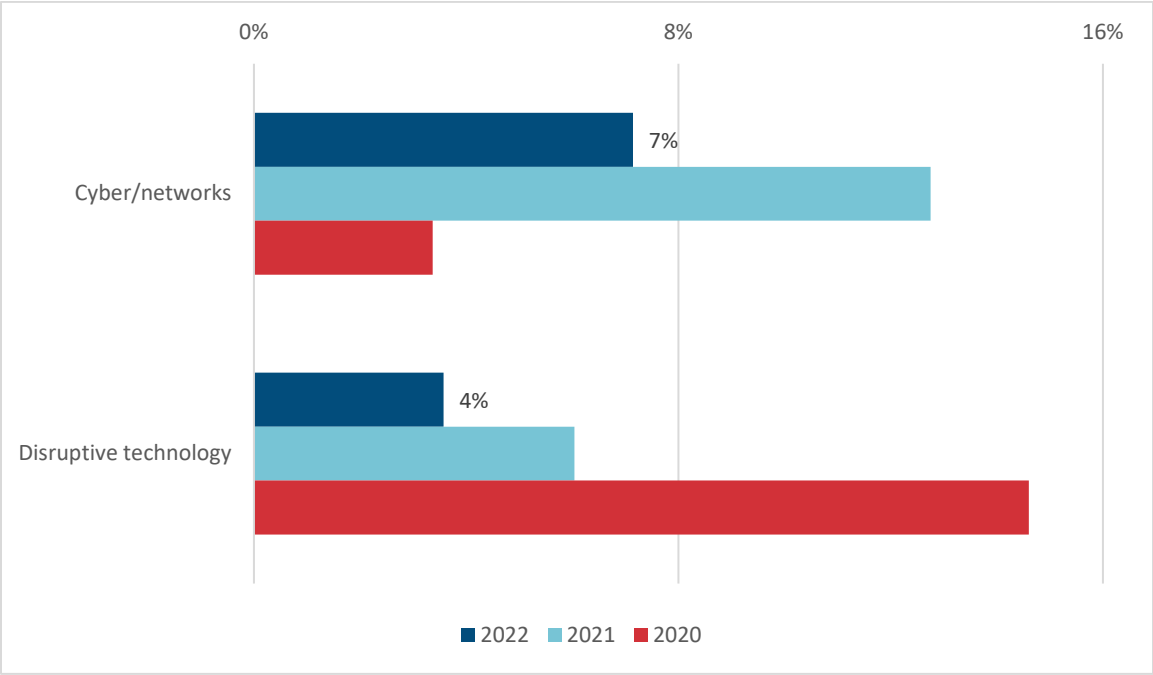
Top Emerging Risks—Geopolitical (% of Total)



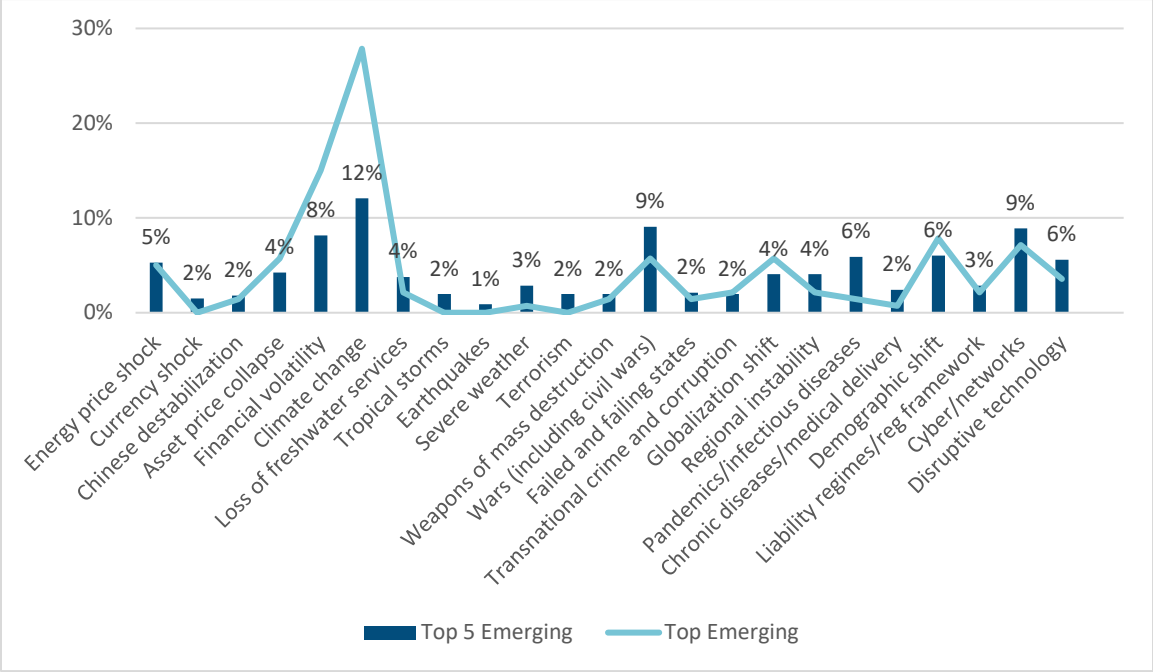
Top Emerging Risks—Societal (% of Total)



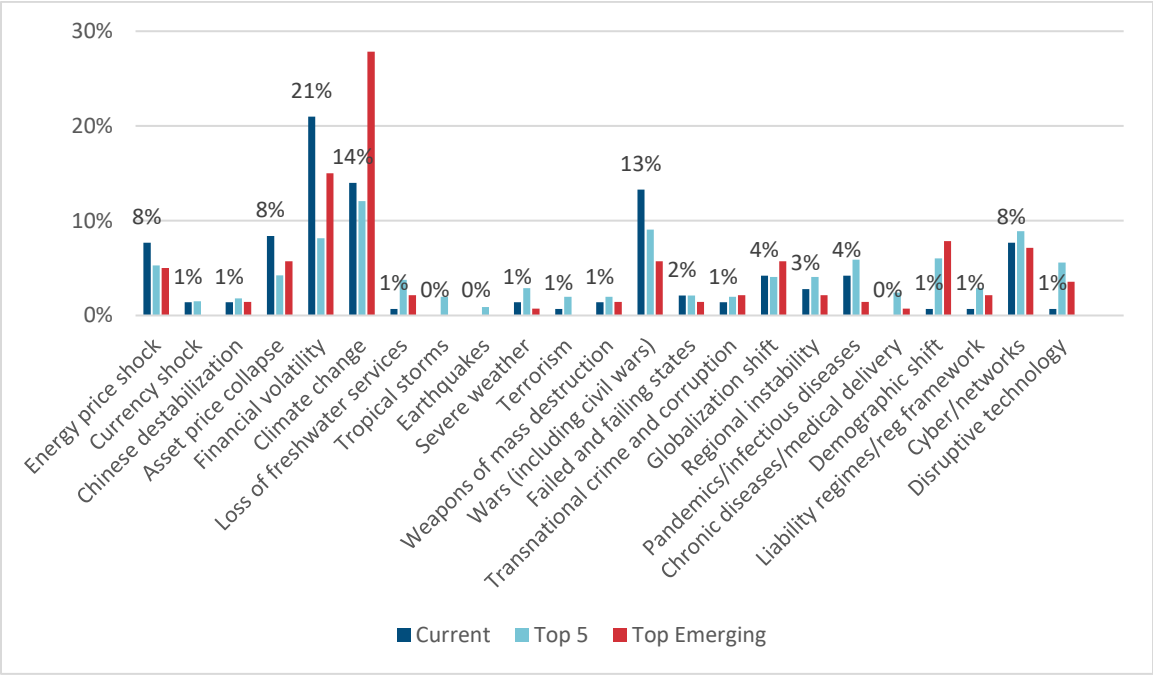
Top Emerging Risks—Technological (% of Total)



Emerging Risks



Risk Comparison Across Three Questions



Questions 3, 4 and 5. Questions 3, 4 and 5 should be considered at the same time. Of the 23 emerging risks, are there combinations that you believe will have a large strategic impact in the future? These could occur at the same time (concurrent) or follow each other (sequential). Please select a combination of TWO risks for each response.

Two-risk combinations—**380 total responses (mean across all surveys is listed first)**

The rankings for combination risks are:

1. *Financial volatility* - 11%
2. *Climate change* - 11%
3. *Wars (including civil wars)* - 10%
4. *Asset price collapse* - 7%
5. *Cyber/networks* - 6%

	Avg	2022	2021	2020	2019	2018
Economic	**33%**	**29%**	25%	21%	23%	22%
Energy price shock	**5%**	**6%**	5%	2%	2%	2%
Currency shock	**5%**	**2%**	3%	1%	2%	2%
Emergent nation destabilization	**5%**	**3%**	2%	3%	5%	3%
Asset price collapse	**7%**	**7%**	6%	6%	6%	7%
Financial volatility	**12%**	**11%**	8%	9%	7%	8%

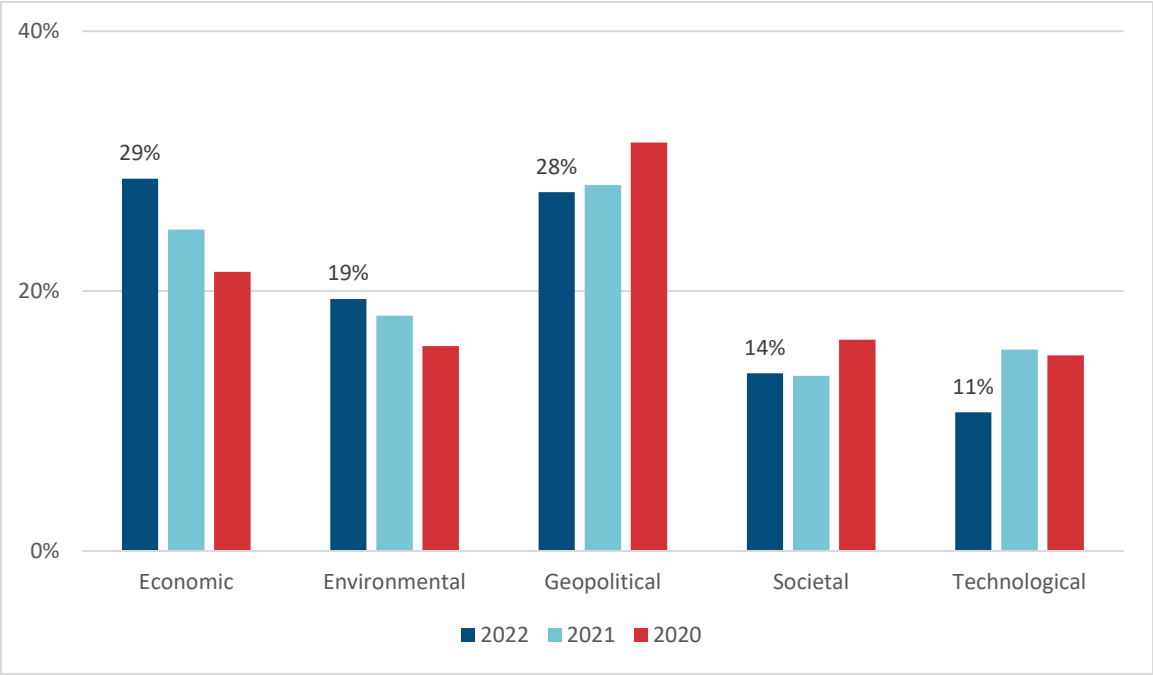
	Avg	2022	2021	2020	2019	2018
Environmental	**14%**	**19%**	18%	16%	20%	21%
Climate change	**6%**	**11%**	11%	9%	12%	11%
Loss of freshwater services	**2%**	**4%**	3%	2%	3%	3%
Natural catastrophe: tropical storms	**2%**	**2%**	2%	2%	2%	3%
Natural catastrophe: earthquakes	**1%**	**0%**	0%	0%	0%	1%
Natural catastrophe: severe weather (except tropical storms)	**2%**	**3%**	3%	2%	3%	3%

	Avg	2022	2021	2020	2019	2018
Geopolitical	**31%**	**28%**	28%	31%	30%	30%
Terrorism	**7%**	**3%**	4%	4%	5%	5%
Weapons of mass destruction	**3%**	**2%**	2%	2%	2%	3%
Wars (including civil wars)	**4%**	**10%**	7%	7%	6%	4%
Failed and failing states	**6%**	**3%**	4%	6%	5%	6%
Transnational crime and corruption	**2%**	**2%**	3%	3%	2%	3%
Globalization shift	**4%**	**4%**	3%	5%	4%	4%
Regional instability	**6%**	**4%**	5%	4%	6%	5%

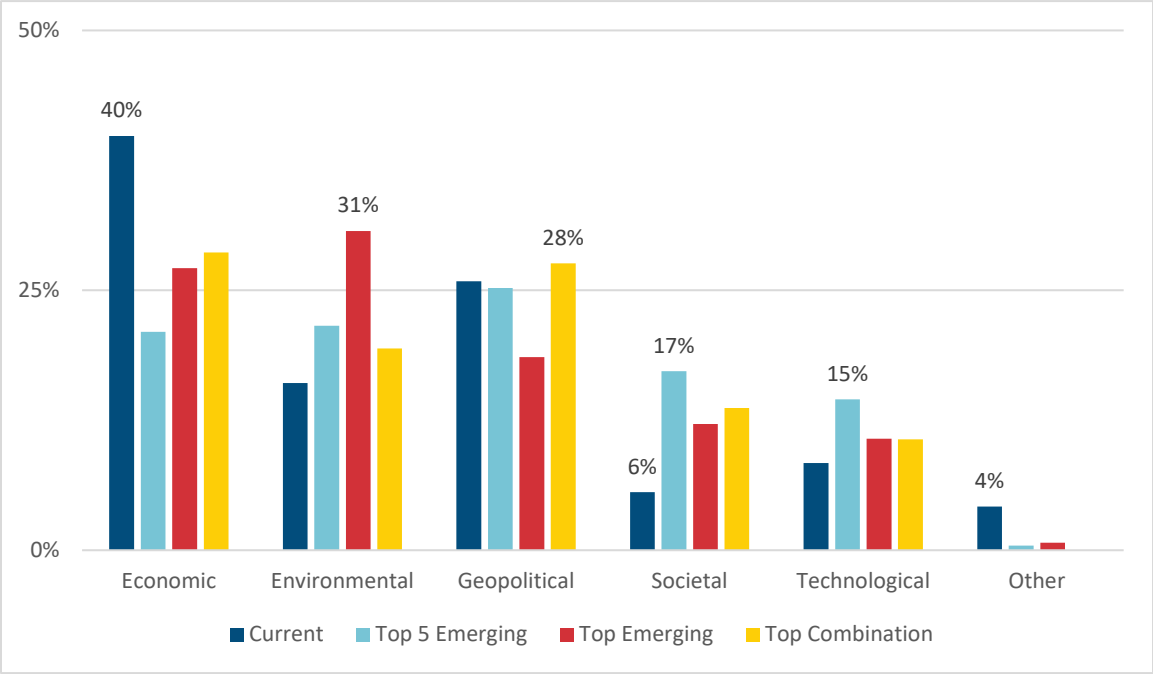
	Avg	2022	2021	2020	2019	2018
Societal	**11%**	**14%**	13%	16%	12%	12%
Pandemics/infectious diseases	**4%**	**5%**	6%	7%	3%	4%
Chronic diseases/medical delivery	**1%**	**2%**	3%	3%	2%	2%
Demographic shift	**4%**	**4%**	3%	4%	5%	4%
Liability regimes/regulatory framework	**2%**	**2%**	2%	2%	2%	1%

	Avg	2022	2021	2020	2019	2018
Technological	**11%**	**11%**	16%	15%	15%	15%
Cyber/networks	**8%**	**6%**	9%	8%	8%	9%
Disruptive technology	**4%**	**4%**	6%	7%	7%	7%

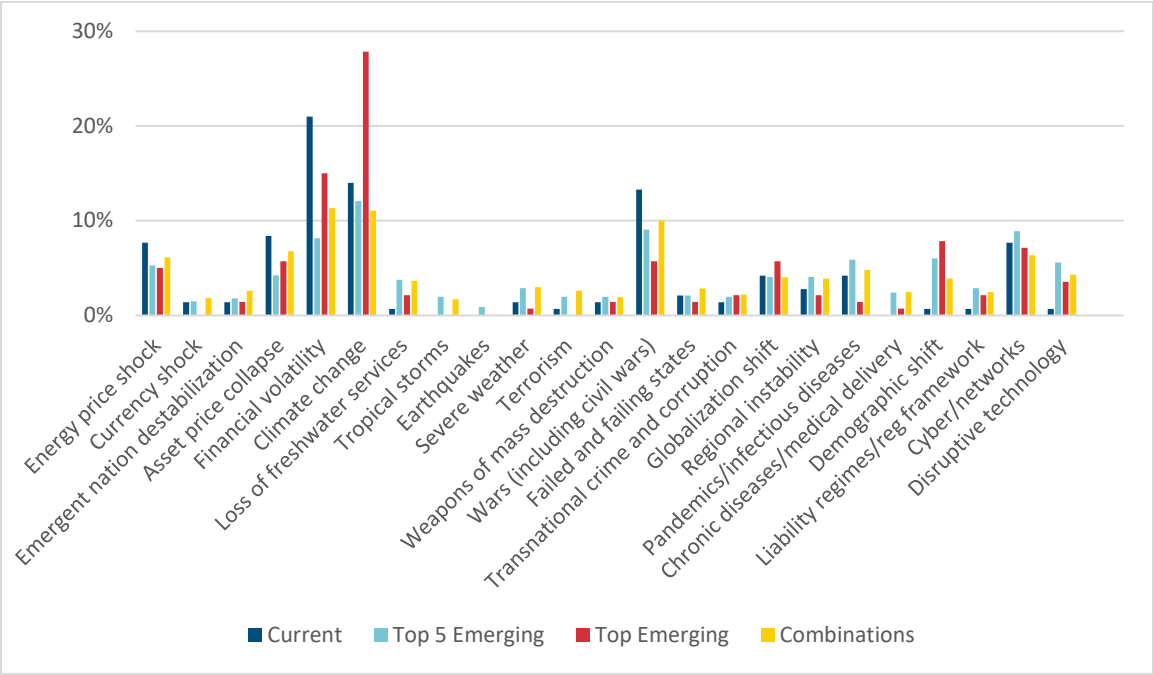
Risk Combinations



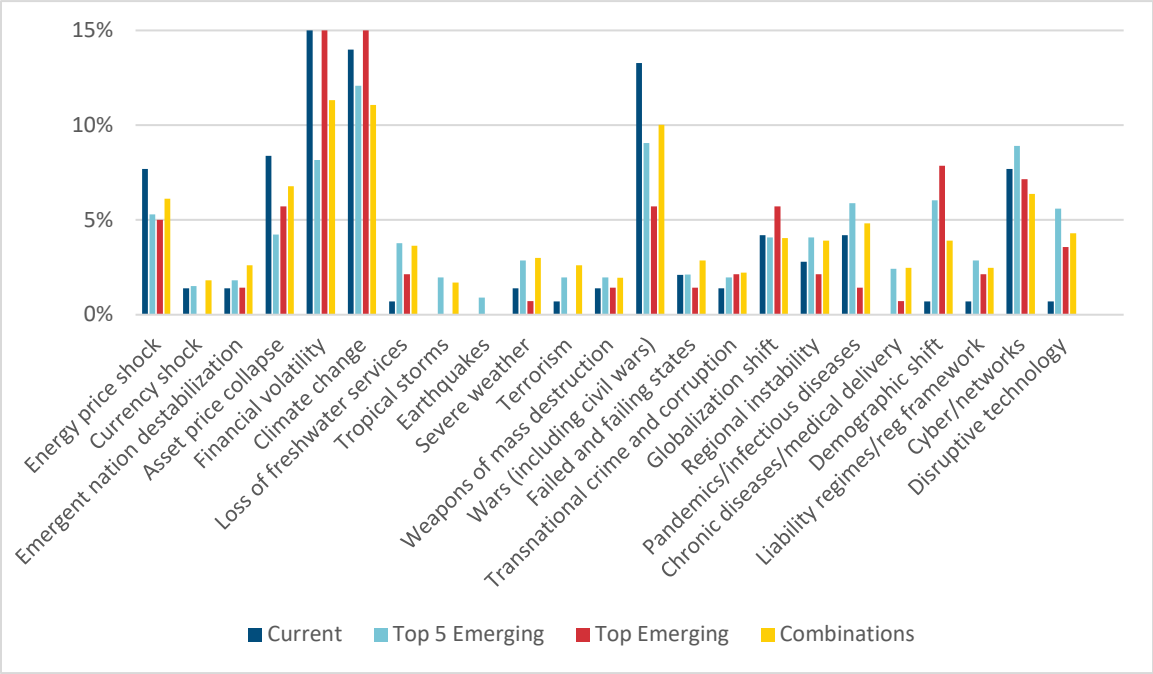
Category Comparison Across Four Questions



Risk Comparison Across Four Questions



Risk Comparison Across Four Questions (restricted y-axis)



In the next table, a yellow highlight shows the highest result among the first three questions, and the red highlight shows where risk combination is the highest result.

Comparison Across Four Questions

Comparison Across Four Questions	Current 2022	Top 5 2022	Top 2022	Combos 2022
Energy price shock	7.7%	5.3%	5.0%	6.1%
Currency shock	1.4%	1.5%	0.0%	1.8%
Emergent nation destabilization	1.4%	1.8%	1.4%	2.6%
Asset price collapse	8.4%	4.2%	5.7%	6.8%
Financial volatility	21.0%	8.2%	15.0%	11.3%
Climate change	14.0%	12.1%	27.9%	11.1%
Loss of freshwater services	0.7%	3.8%	2.1%	3.6%
Tropical storms	0.0%	2.0%	0.0%	1.7%
Earthquakes	0.0%	0.9%	0.0%	0.0%
Severe weather	1.4%	2.9%	0.7%	3.0%
Terrorism	0.7%	2.0%	0.0%	2.6%
Weapons of mass destruction	1.4%	2.0%	1.4%	2.0%
Wars (including civil wars)	13.3%	9.1%	5.7%	10.0%
Failed and failing states	2.1%	2.1%	1.4%	2.9%
Transnational crime and corruption	1.4%	2.0%	2.1%	2.2%
Globalization shift	4.2%	4.1%	5.7%	4.0%
Regional instability	2.8%	4.1%	2.1%	3.9%
Pandemics/infectious diseases	4.2%	5.9%	1.4%	4.8%
Chronic diseases/medical delivery	0.0%	2.4%	0.7%	2.5%
Demographic shift	0.7%	6.0%	7.9%	3.9%
Liability regimes/regulatory framework	0.7%	2.9%	2.1%	2.5%
Cyber/networks	7.7%	8.9%	7.1%	6.4%
Disruptive technology	0.7%	5.6%	3.6%	4.3%
Other	4.2%	0.5%	0.7%	

Comparison Across Four Questions where differentiation between questions is present

Comparison Across Four Questions	Current 2022	Top 5 2022	Top 2022	Combos 2022	C-top5	C-top	C-combo	Top5-top	Top 5-combos	Top-combos
Energy price shock	7.7%	5.3%	5.0%	6.1%	2.4%	2.7%	1.6%	0.3%	-0.8%	-1.1%
Currency shock	1.4%	1.5%	0.0%	1.8%	-0.1%	1.4%	-0.4%	1.5%	-0.3%	-1.8%
Emergent nation destabilization	1.4%	1.8%	1.4%	2.6%	-0.4%	0.0%	-1.2%	0.4%	-0.8%	-1.2%
Asset price collapse	8.4%	4.2%	5.7%	6.8%	4.2%	**2.7%**	1.6%	-1.5%	-2.5%	-1.1%
Financial volatility	21.0%	8.2%	15.0%	11.3%	12.8%	**6.0%**	9.7%	-6.8%	-3.2%	3.7%
Climate change	14.0%	12.1%	27.9%	11.1%	1.9%	**-13.9%**	2.9%	**-15.8%**	1.0%	16.8%
Loss of freshwater services	0.7%	3.8%	2.1%	3.6%	-3.1%	-1.4%	-2.9%	1.6%	0.1%	-1.5%
Tropical storms	0.0%	2.0%	0.0%	1.7%	-2.0%	0.0%	-1.7%	2.0%	0.3%	-1.7%
Earthquakes	0.0%	0.9%	0.0%	0.0%	-0.9%	0.0%	0.0%	0.9%	0.9%	-0.0%
Severe weather	1.4%	2.9%	0.7%	3.0%	-1.5%	0.7%	-1.6%	2.2%	-0.1%	-2.3%
Terrorism	0.7%	2.0%	0.0%	2.6%	-1.3%	0.7%	-1.9%	2.0%	-0.6%	-2.6%
Weapons of mass destruction	1.4%	2.0%	1.4%	2.0%	-0.6%	0.0%	-0.6%	0.5%	0.0%	-0.5%
Wars (including civil wars)	13.3%	9.1%	5.7%	10.0%	4.2%	7.6%	3.3%	3.3%	-1.0%	-4.3%
Failed and failing states	2.1%	2.1%	1.4%	2.9%	0.0%	0.7%	-0.8%	0.7%	-0.7%	-1.4%
Transnational crime and corruption	1.4%	2.0%	2.1%	2.2%	-0.6%	-0.7%	-0.8%	-0.2%	-0.2%	-0.1%
Globalization shift	4.2%	4.1%	5.7%	4.0%	0.1%	-1.5%	0.2%	-1.6%	0.0%	1.7%
Regional instability	2.8%	4.1%	2.1%	3.9%	-1.3%	0.7%	-1.1%	1.9%	0.2%	-1.8%
Pandemics/infectious diseases	4.2%	5.9%	1.4%	4.8%	-1.7%	2.8%	-0.6%	4.5%	1.1%	-3.4%
Chronic diseases/medical delivery	0.0%	2.4%	0.7%	2.5%	-2.4%	-0.7%	-2.5%	1.7%	-0.1%	-1.8%
Demographic shift	0.7%	6.0%	7.9%	3.9%	-5.3%	-7.2%	-3.2%	-1.8%	2.1%	4.0%
Liability regimes/regulatory framework	0.7%	2.9%	2.1%	2.5%	-2.2%	-1.4%	-1.8%	0.7%	0.4%	-0.3%
Cyber/networks	7.7%	8.9%	7.1%	6.4%	-1.2%	**0.5%**	1.3%	1.8%	2.5%	0.8%
Disruptive technology	0.7%	5.6%	3.6%	4.3%	-4.9%	**-2.9%**	-3.6%	**2.0%**	1.3%	-0.7%
Other	4.2%	0.5%	0.7%		3.7%	3.5%		-0.3%		

Combinations

2022 chart (top 5 are highlighted)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1		5	4	6	6	6	0	0	0	0	0	0	**15**	0	0	2	2	0	0	0	0	0	1
2			1	4	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
3				3	0	0	1	0	0	0	3	1	3	2	0	1	0	0	0	0	0	1	0
4					**14**	1	0	0	0	0	1	2	4	1	2	2	0	0	0	0	4	2	2
5						**10**	0	1	0	0	0	1	**10**	0	0	**11**	6	5	1	2	8	2	4
6							**16**	**10**	0	**15**	0	0	8	1	0	1	3	5	0	4	2	1	2
7								0	0	1	0	0	4	0	0	1	1	1	0	2	0	1	0
8									0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
9										0	0	0	0	0	0	0	0	0	0	0	0	0	0
10											0	0	0	0	0	0	1	2	0	1	0	2	0
11												3	1	2	2	1	0	0	0	0	0	6	1
12													6	1	0	0	0	0	0	0	0	1	0
13														6	2	4	6	2	0	0	0	5	1
14															2	0	3	1	0	2	0	0	0
15																1	1	0	0	0	0	6	1
16																	1	0	0	4	0	1	1
17																		2	0	2	0	1	1
18																			**10**	4	0	2	2
19																				7	1	0	0
20																					0	0	1
21																						3	1
22																							**15**
23																							

Leading combinations were as follows:

16 responses 4%, no. 4

Climate change

Loss of freshwater services

15 responses 4%, no. 1 in previous survey

Cyber/networks

Disruptive technology

15 responses 4%, no. 5

Climate change

Natural catastrophe: severe weather

15 responses 4%, not previously ranked

Energy price shock

Wars (including civil wars)

14 responses 4%, no. 2

Asset price collapse

Financial volatility

11 responses 3%, not previously ranked

Financial volatility

Globalization shift

10 responses 3%, no.3

Pandemics/infectious diseases

Chronic diseases/medical delivery

10 responses 3%, no. 8

Climate change

Natural catastrophe: tropical storms

10 responses 3%, not previously in top 10

Financial volatility

Climate change

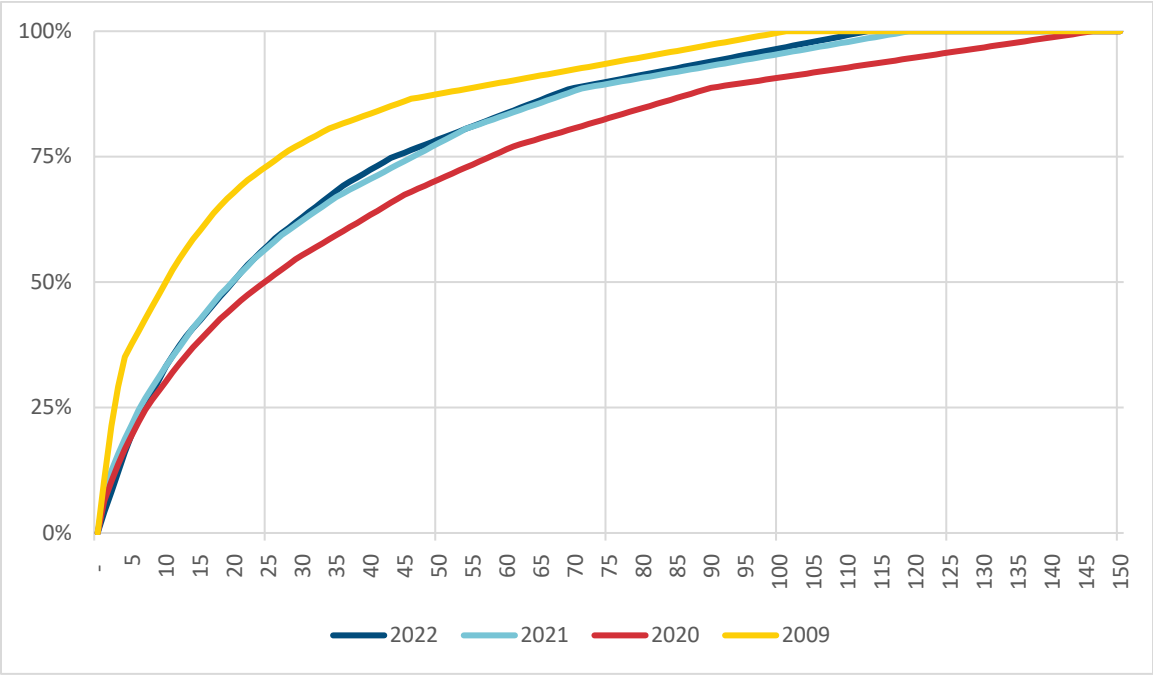
10 responses 3%, not previously ranked

Financial volatility

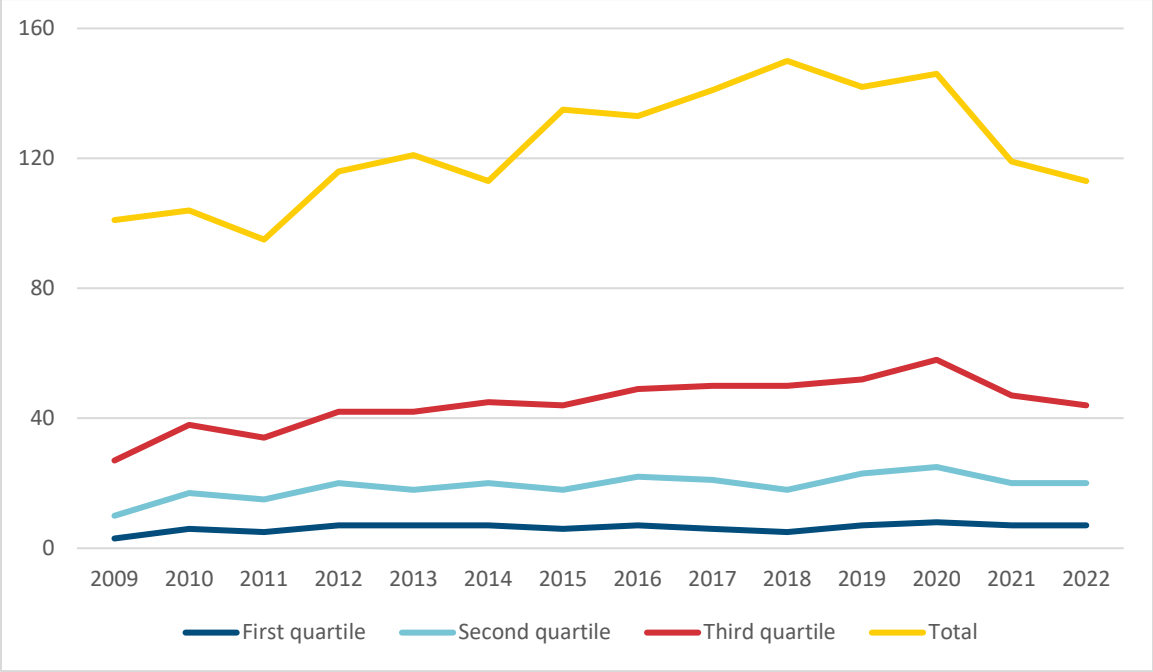
Wars (including civil wars)

Ed. note: The combinations question was added in the second iteration of the survey in fall 2008.

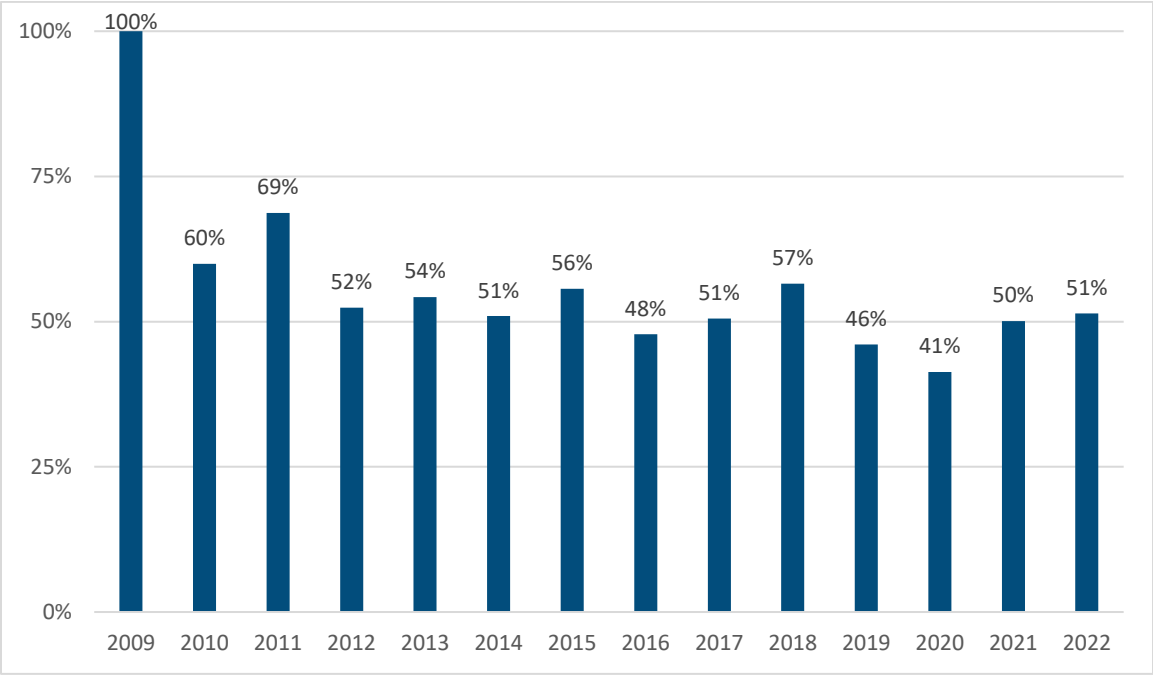
Cumulative Distribution of Combinations (253 total possible)



Risk Combinations



Risk Concentration Ratio (Base 2009 = 100%)

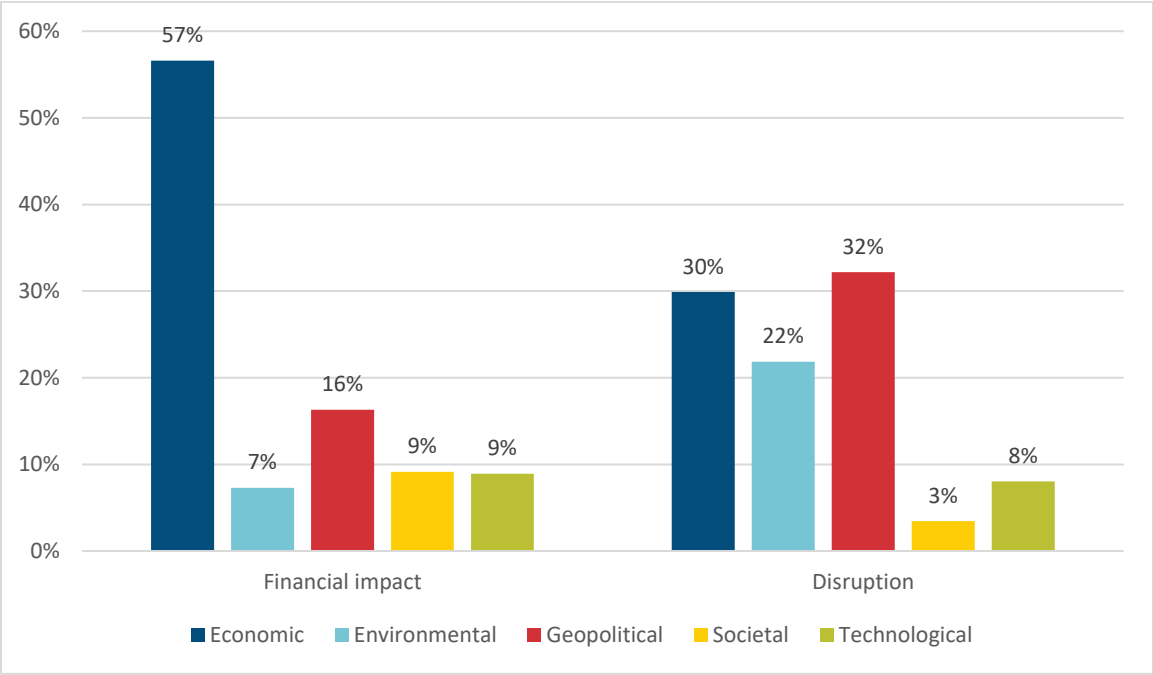


It was suggested that questions be segregated by their response to *Greatest strategic impact related to risk can have various meanings. How do you define it?* A grid of six responses combined two categories: split two ways between financial impact and disruption and split three ways as follows:

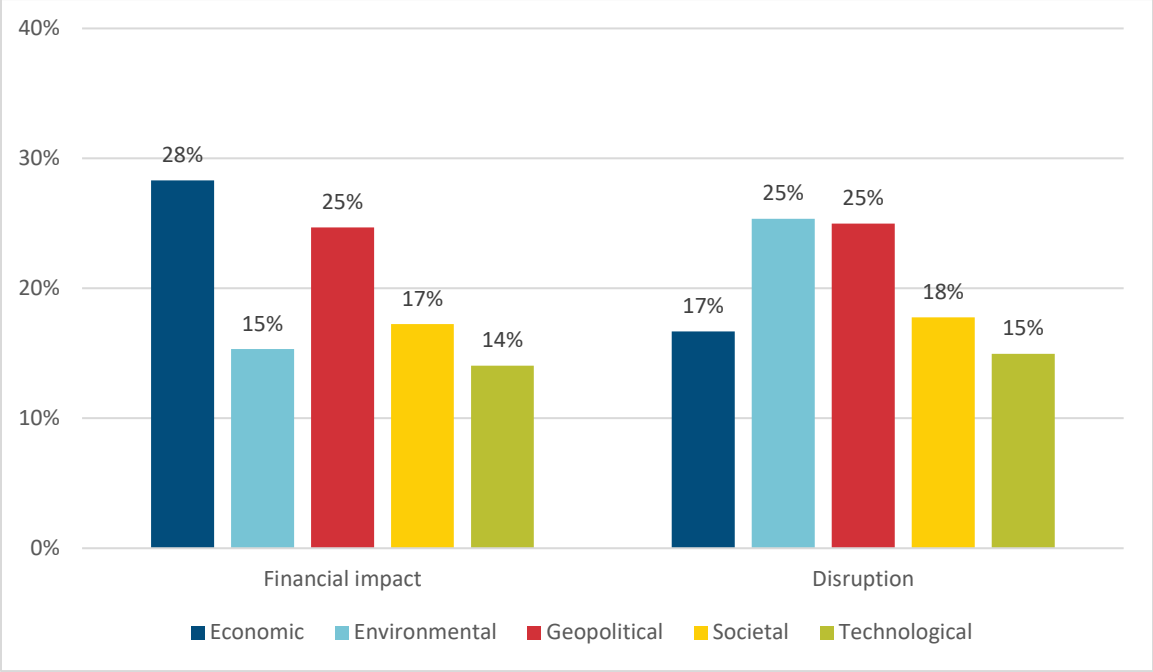
- World economy
- Me personally or my firm/industry
- Lives, habitat and safety

While the numbers are too small to be statistically significant, some interesting differentiation is apparent when separating results between financial impact and disruption.

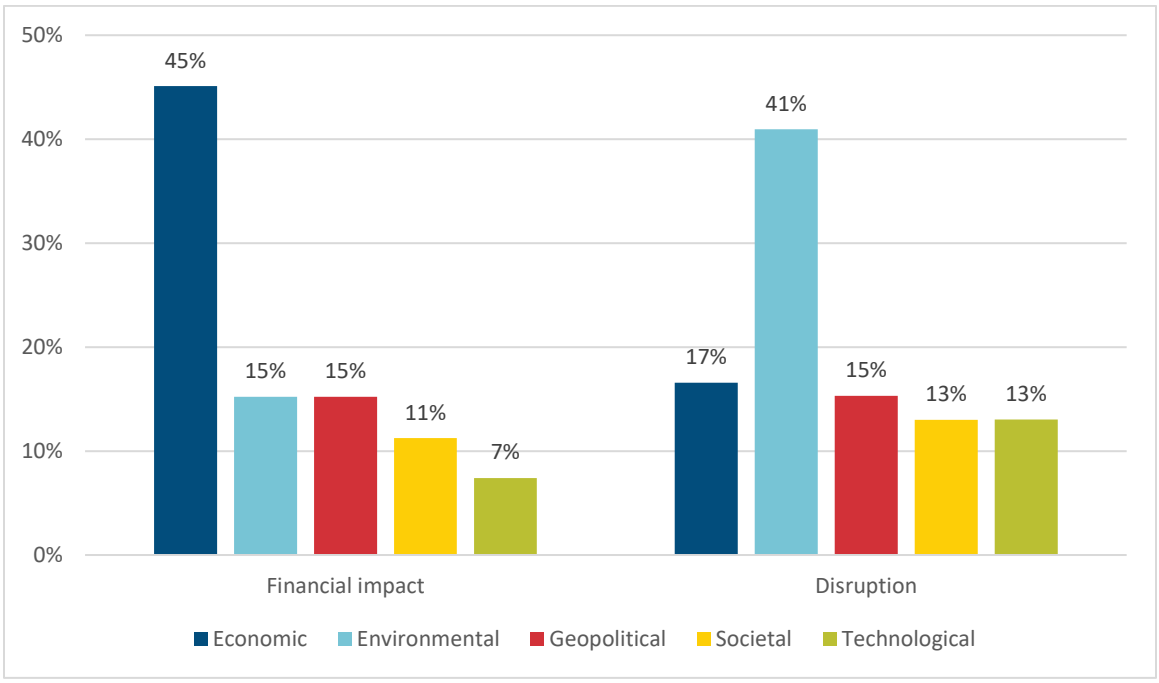
Top Current Risk Aggregated by Greatest Strategic Impact



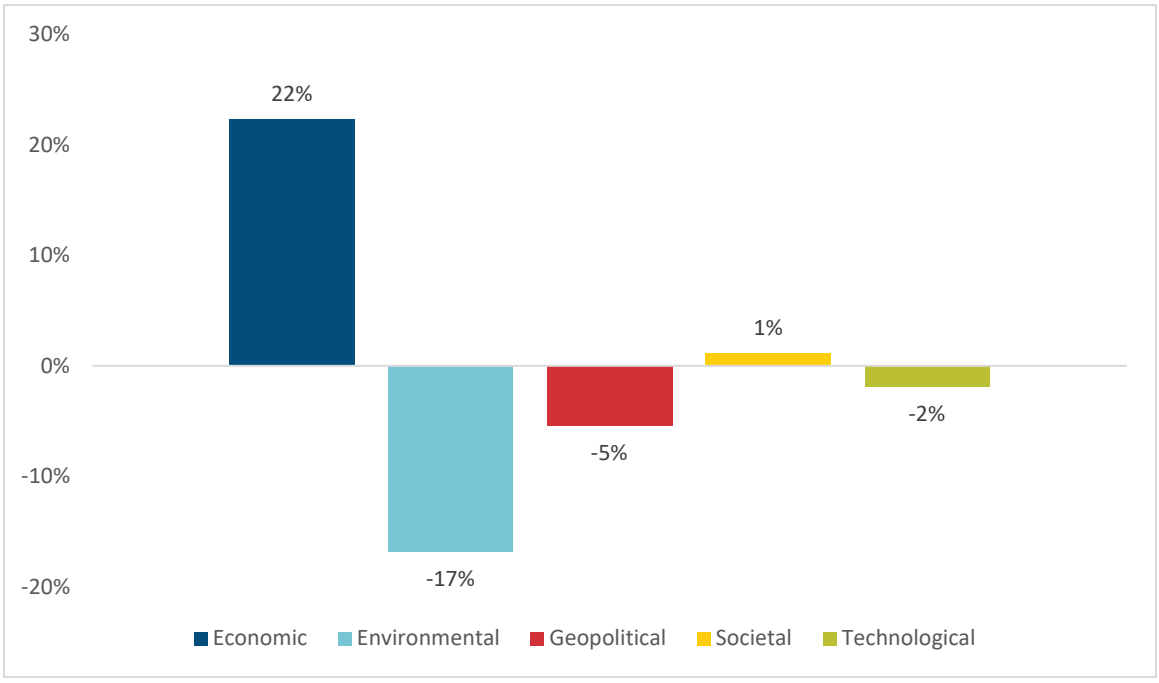
Top Five Emerging Risks Aggregated by Greatest Strategic Impact



Top Emerging Risk Aggregated by Greatest Strategic Impact



Average Net Result: Financial Impact less Disruption



Each year, a specialty question is asked. Traditionally the question has not been repeated in subsequent surveys, but some may cycle through periodically.

Question 6. What three emerging risks are most likely to evolve or emerge before 2025? (please select no more than three)

A total of 119 respondents chose at least one risk, for a total of 351 responses (average of 2.95 risks selected per survey that selected at least one).

The top rankings for risks likely to emerge before 2025 are (percentages reflect number of respondents answering)

1. *Financial volatility* - 37%
2. *Cyber/networks* - 36%
3. *Climate change* - 25%
4. *Regional instability* - 24%
5. *Energy price shock* - 23%

Category (percentages reflect total responses)

Economic	30%
Environmental	17%
Geopolitical	25%
Societal	10%
Technological	18%

Risk

Economic	
Energy price shock	8%
Currency shock	2%
Emergent nation destabilization	3%
Asset price collapse	5%
Financial volatility	13%

Environmental	
Climate change	9%
Loss of freshwater services	1%
Natural catastrophe: tropical storms	3%
Natural catastrophe: earthquakes	0%
Natural catastrophe: severe weather (except tropical storms)	4%

Geopolitical	
Terrorism	2%
Weapons of mass destruction	7%
Wars (including civil wars)	1%
Failed and failing states	2%
Transnational crime and corruption	2%
Globalization shift	4%
Regional instability	8%

Societal	
Pandemics/infectious diseases	3%
Chronic diseases/medical delivery	1%
Demographic shift	2%
Liability regimes/regulatory framework	4%

Technological	
Cyber/networks	12%
Disruptive technology	6%

Question 7. Please elaborate on your response(s) to the previous question.

- *We're becoming increasingly reliant on cyber and it becomes a bigger target*
- *Pandemic is still costing lives and how much longer will it keep doing that?*
- *I think climate change will cause and therefore overlap with natural disasters, e.g., hurricanes, droughts, deadly heat waves, flooding, etc.*
- *The potential for global market collapse is higher than it was in 2008.*
- *Changes in climate are a fundamental driving force to many of the other items.*
- *Cyber attacks will lead to regional instability. Energy prices rise quickly following any significant regional instability.*
- *Wars can bring about big changes including destabilization among combating nations. A regional conflict can escalate to a larger scale involving many other nations. In particular, waring nations have important natural resources like oil and agricultural products. This can result in disruption on oil and food supply, eventually financially volatile economy.*
- *The war in Ukraine could expand and have more devasting consequences. Rising energy costs can increase inflation. Cyber risks continue to grow as attackers get more sophisticated.*
- *Climate changes will continue with other episodes of severe weather all across the globe. We rely heavily on technology and there is always a risk that disruption will impact us. The previous two and the fact we are exiting a pandemics (although not an emerging risk by itself on my radar), we will go through the consequences of pandemics with financial volatility,*
- *Population growth in several poor countries will lead to failed states, wars among these states and other states and destabilize world order.*
- *n/a*
- *Both seem to currently already be evolving and will continue to do so*
- *Geopolitical risks are escalating with the Russian invasion of Ukraine and the difficult relations with China as a major power.*
- *possible new strains of COVID, always some kind of weather disaster happening, inflation issues expected in the near future*

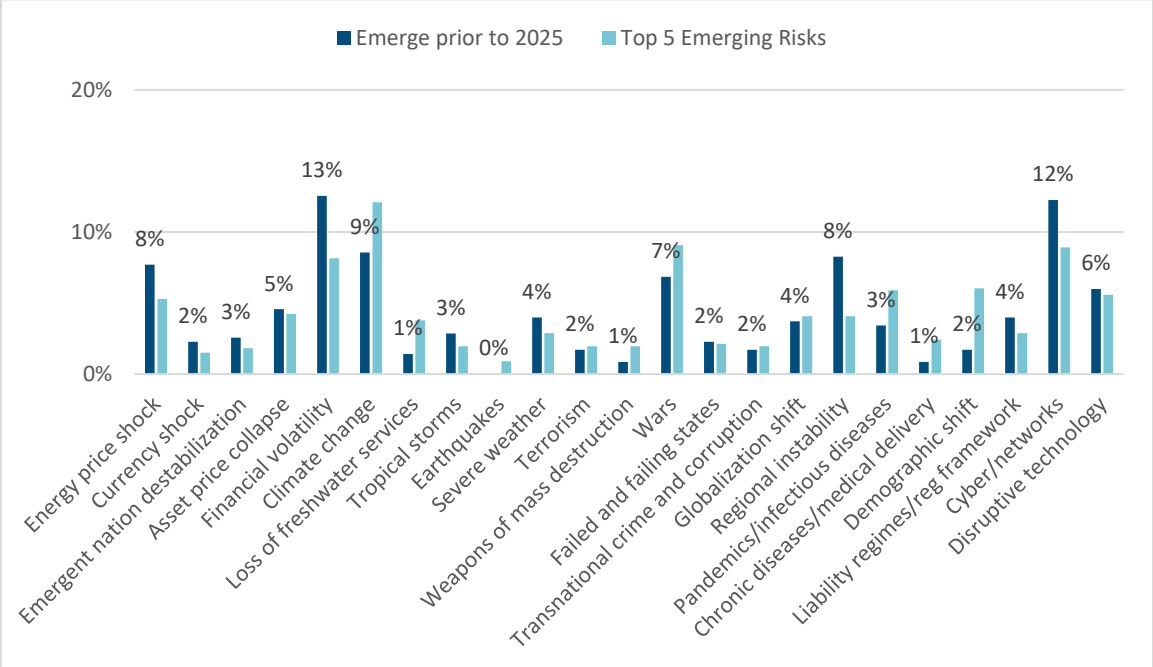
- *N/A*
- *already occurring*
- *We have yet to see the full consequences of the rise in interest rates in 2022*
- *pandemics, energy price increases and the war in Ukraine are already happening.*
- *Any time when one party owns all three - The House, The Senate, and the Presidency - there is a high risk of new crazy laws, hence the risk of regulatory framework. We experience financial volatility now, and the regulatory risk could only add fuel to the fire. Cyber attacks are a risk nowadays too.*
- *Threats of war are increasing at alarming rate, as well as threat of using nuclear weapons*
- *Those 3 are already at a somewhat advanced stage compared to the others*
- *Recession is a near certainty and will create financial volatility. Climate change will result in natural disasters, the most likely which is tropical storms. Regional instability is a certainty due to conflicts, economics, COVID, and supply chain disruptions.* ***Everything is connected! Cannot say one thing happens in isolation.***
- *Both climate change and cyber attacks will increase before they hopefully level off or decrease in the future.*
- *Continued instability in international affairs is contributing to cyber risk and international crime through degradation of international cooperation.*
- *Given current economic situation worldwide, the chance of asset price collapse is high. We are already seeing energy prices (and the lack of solid infrastructure to support non-fossil fuels) and I expect this is going to continue. All of this will impact the desire and ability to follow through on climate change commitments*
- *Technology has the potential to evolve quickly with positive and negative strategic implications. Post-pandemic and given China's objectives in the world, there is likely to be a reassessment of supply chain partnerships and networks.*
- *For emergent risks, I think that in the next 3 or so years having a major tropical storm hit is fairly likely, and could be a problem given rising Gulf of Mexico water temperatures relating to increased storm severity. In a modern age of technology, it's likely that something will come about in the short term that disrupts the world in some way. I would argue tik tok is a current example of something like this. Lastly, the stock markets are down and home prices have been very high for a few years now. With banks buying more and more CDOs it seems like we could be in a new housing bubble so a worldwide asset collapse seems to be an emerging risk to consider*
- *Regional impacts quickly lead to financial volatility given the global nature of risk and increased reliance on technology is vulnerable to cyber/network risks.*
- *Globalization and civil unrest are reaching a tipping point that could cause major global conflicts from cyber-terrorism to corruption. More and more globalizing companies with access to emerging technology can offer similar or superior goods and services with greater convenience that may end up being a disaster for those unable to adapt. Technology (especially social media) is pushing people to be further apart and both global and regional frictions will be increased as a result.*
- ***The question illustrates how the timescales of the emerging risks are widely different. While risks like demographic change, climate change and globalization shift seem to be broad trends that have long timeframes and are rather the triggers of other specific risks, risks such as energy price shocks, currency fluctuations and asset price collapses seem to occur at shorter timeframes and tend to fluctuation more rapidly.***
- *These three are already occurring but could become worse*
- *The continued polarization of wealth creates more instability reflected by failed or falling states with governments gone off track by the greedy control for profits (USA prime example) leading to widespread terrorism and threats to those speaking out for truth, honesty and ethics. Then climate related disasters create more instability making money a figment of the imagination. Does the USA just print more USD?*

- *Regional instability is already causing energy price shocks due to supply disruptions. Technology disruptors in all sectors have been increasing in volume and impact over time and there are no signs of this stopping.*
- *Too many undisciplined nations with WMDs, Climate change accelerating, Volatility from a number of factors.*
- *Many of these we are already seeing (crypto collapses, hurricanes and wars) and I don't see any letting up.*
- *Populations are moving. First world countries are accepting younger (on average) individuals. This shift coupled with the dwindling resources is going to cause greater instability and change from the norm.*
- *Financial volatility could stick around a few years. Global tensions are simmering and could lead to additional wars - and extend financial volatility. Cyber risk controls may not keep up with evolving attacks.*
- *globalization shifts - relocation of critical supply chains (may cause some disruption). cyber / network (e.g., uncertainty around direction of Twitter, Meta). Chronic diseases - heart, cancer etc. may have more impact, new treatment may be needed*
- *Central banks are recklessly expanding the money supply faster than actual wealth, leading to hyperinflation that will shock currencies and depress asset values. This will lead to black markets, dominated by cyber criminals who bribe and blackmail corrupt government officials.*
- *All three have already emerged. Their impacts will continue to worsen over the next 3 years.*
- *"Financial volatility due to inflation leading to a recession.*
- *Wars with the ongoing conflicts in Russia and other potential crisis around the globe.*
- *Cyber - given not only Wars, but other means which certain general information security incidents are disrupting at all levels/layers (new means by which to gather data)."*
- *Loss of freshwater sources is a global problem and will fuel conflict over dwindling resources leading to various other problems/risks identified*
- *Disruption to current supply chains with the globalization shift can have short term adverse impact on inflation. Demographic shift is still a big risk to labor force shortage for developed countries. Financial volatility can elevate given so many uncertainties of next economic cycle.*
- *Regulatory changes of ESG and political conflict are rapidly emerging*
- *Disruptive technologies and financial volatility continue to evolve and impact us daily.*
- ***The world is moving very quickly. Many risks will be changing over the next few years as we pass through the current 4th turning. Before I remembered that 3 was the limit, I had 17.***
- *Risks with liability regimes & regulatory framework amplify almost every other risk, with bad actors not sufficiently subject to liability creating more dangerous levels of risk than necessary. Natural catastrophes will continue to amplify, and financial volatility may strike overvalued tech firms especially hard.*
- *Disruptive technology and cyber pose the most immediate risks.*
- *Like it or not, governing does make a difference. Of/by /and for has worked in the past but seems to have been forgotten.*
- *Many risks I think of as most likely to evolve wouldn't be considered emerging - e.g., financial volatility, asset price collapse. Others that I think of as true emerging risks are not likely to have great impact by 2025. Geopolitical risks are as high as they have been in my lifetime, but still the risk of the US entering or being drawn into a nuclear confrontation, or of truly global ramifications of failed states, are still considered unthinkable and, therefore, emerging.*
- *Stage is set for a global recession. This will lead to price disruption. Will be contributed to, and reacted to, by regulation and lawmaking that most likely will make things worse. During that time, cyber threat actors will see volatile period as an opportunity due to management distraction.*
- *We are already dealing with the effects of climate change. Without intervention it will surely get worse over the next 5, 10, 20+ years. Intervention will likely lead to energy price shock in that wealthy nations will transition to more cost effective (near free) forms like solar and wind, while poorer nations may not have the infrastructure or ability to do so. Additionally, the shift to green*

energy (solar, wind, etc.) will likely cause disruptive technologies to occur in those spaces, not to mention the possibility of autonomous vehicles and AI robots at some point in the (probably) not too distant future (e.g., within the century).

- *Tropical storms are always a potential issue, though it can be relatively quiet; the energy price shock is because a bunch of countries have been choking energy sources, causing the price shock - it could get unshocked, but a lot of it is policy decisions; we already see regional instability surrounding Russia, but could also have around Brazil & China*
- *Aggressive Fed internet rate rises are likely to cause continuing asset vol, reduction in asset values and negative impacts on developing countries*
- *Cyber risks are far-reaching.*
- *There is no shortage to the issues going on in energy. As demand continues to increase for natural gas/LNG, oil, and all hydrocarbons, we are now on the backside of the shale boom in the US. With no known technology improvements, inflation in OFS, disincentives from governments, misallocation of investment into clean energy, and the impairment of relations with Russia, the price of energy will be prohibitively higher over the next decade.*
- *carbon emission targets would require long term planning to achieve. As international standards and regulations emerge, it will reshape the ecosystem of the industry. For companies that failed to manage climate risk, not only it will face adverse financial risks but more importantly reputational and operational risks.*
- *Globalization paradigm uncertainty should have settled by 2025.*
- *The evolution of Covid and Long Covid will have become chronic diseases observed and understood by 2025.*
- *The world's course in response to climate change and commitments will be clearer by 2025.*

Risks Likely to Evolve or Emerge before 2025



Question 8. No list of risks is ever complete. Are there additional emerging risks you feel are significant that should be considered for future surveys? For reference, here is the current glossary: Glossary of risks 2022.

As noted in the introductory paragraphs of this appendix, some responses are in boldface to signify that they are particularly thought-provoking to the researcher. Two entries were allowed for this question.

Suggestion 1

- *Distrust in civil institutions because of excessive mail-in ballots*
- *chronic disease/medical delivery*
- *Disintermediation*
- *Massive mortality event*
- *China's expansionist dreams.*
- *Rise of China*
- *Continued inequality, which stems from many of the risks you have noted (lack of clean water, financial instability, climate risk) and also spurs on some of the risks, as well (regional instability, financial instability)*
- *Collapse of crypto currency*
- *Inflation*
- *Geopolitical risk*
- *population growth among Asian and African countries*
- *speed of societal risks driven by social media platforms*
- *Societal Risks*
- *regulation risk - tighter government regulations on the economy/business*
- *Inequality*
- *Opacity of Chinese policymaking*
- *Biodiversity loss*
- *New U.S. laws that are intended to hurt insurance industry*
- *Systemic liability as a result of chemicals, microplastics, hazardous waste*
- *Political unrest and upheaval.*
- *Workforce Changes*
- *Long term remote / hybrid work environments*
- *Telemedicine & the impact on underwriting*
- *ESG*
- *Living in a world that is becoming less Godly.*
- *Natural disasters: fire. Things are getting hotter, drier, and bam*
- *Social Changes*
- *Misinformation*
- *Private Corporations influence on society and culture*
- *Biodiversity loss*
- *Food supply constraints (due to climate change, loss of agriculture, energy cost, and demographic change)*
- *Threat from space*
- *the wealthy controlling governments*
- *Worker skills and availability*
- *Educational Degradation*
- *Global food insecurity*
- *Political unrest*
- *Transgender ideology*
- *Workforce disruption at the intersection of instability in work environments (nobody knows the new normal) and leverage employers may have with coming recession risk*

- *Destabilization of gov'ts and democratic institutions through disinformation and AI generated deep fakes.*
- *Modern Slavery*
- *Extreme consumer stance from regulators*
- *Quality Food Production Shortages (land; yield; etc.)*
- *Monetary decentralization*
- *Inadequate priorities*
- *Political entrenchment*
- *developing markets*
- *Government transparency*
- *Long-haul Covid*
- *food insecurity/systemic agricultural risks*
- *red tide*
- *Government absorption of larger portion of economy by taking over industries, leading to much higher taxation and much lower productivity*
- *Autonomy (vehicles, AI robots, etc.)*
- *Public finance strain - sovereign or muni bankruptcies, different in nature from Asset price collapse*
- *Drought*
- *Destabilization of Developed Nations*
- *Monetary decentralization*
- *Distrust of govt./leaderships*
- *Attitude towards work: increasing proportion of the population does not value hard work and monetary rewards, and instead prefer leisure and unstressful life.*

Suggestion 2

- *Immorality that encourages children to cut off body parts by convincing them they are transgender*
- *Lack of food on a large scale; a shutdown of transportation systems*
- *disruptive technology*
- *Socialism/Marxism Take over*
- *Fall of Russia*
- *Failure of democratic countries*
- *Technological Risk*
- *Loss of diversity*
- *Migration from Africa and Latin America*
- *Decaying infrastructure*
- *U.S. Political Changes*
- *aging population means fewer workers to support necessary retiree programs*
- *Inflation*
- *Biases*
- *Government influence on bill of rights freedoms*
- *Resource scarcity*
- *AI Revolution*
- *rogue politicians and no quick mechanism to remove an expensive disaster*
- *Governmental Dependency*
- *Weakening of the family*
- *Biodiversity*
- *Trade/Supply Chain Disruption*
- *People risk*
- *supply chain*
- *Worker shortage*

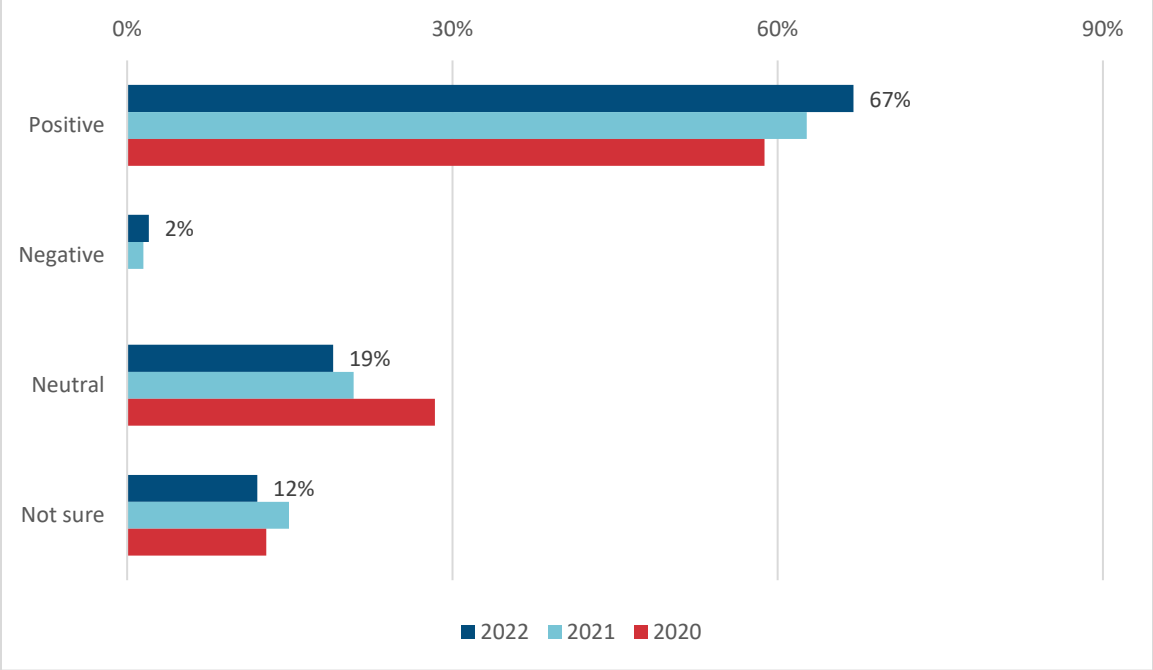
- *democracy vs. autocracy shift*
- *Blue snow*
- *Food and fuel shortages caused by overdone restrictions on fossil fuels*
- *Inflation*
- *People risk*
- *Ever changing rules/regulations reducing innovation*

Section B: Enterprise Risk Management

Question 1. Has enterprise risk management had a positive, negative or neutral effect in your company/industry?

	2022	2021	2020
Positive	**67%**	63%	59%
Negative	**2%**	1%	0%
Neutral	**19%**	21%	28%
Not sure	**12%**	15%	13%

ERM Effect



Question 2. Please share an example from the past year, if applicable, where an event occurred that could have been avoided if proactive ERM planning had been in place.

- *Senior Management wanted a list of potential risks that could impact the company, focusing on the risks that could be significant and couldn't be seen coming. The problem was that Senior Management only gathered input from itself, not the entire company.*
- *New business opportunity may have been rejected if presented to ERM function.*
- *We do have a proactive ERM planning, so it helped.*
- *Poor succession planning led to a crisis at the top management.*
- *None*
- *None*

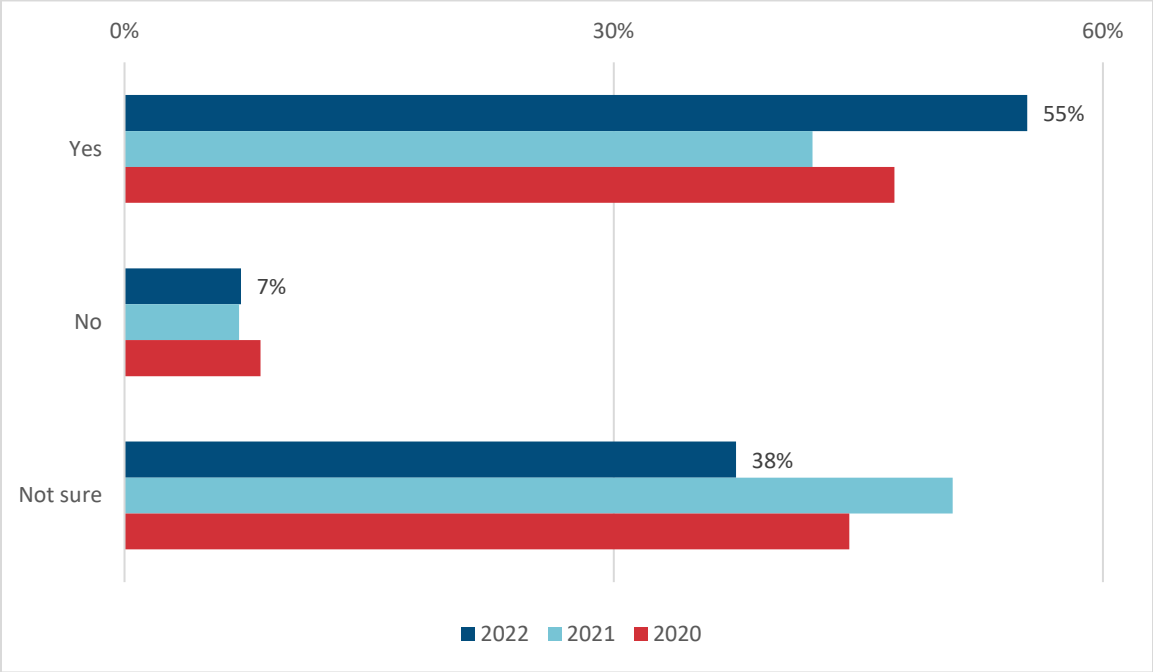
- *Investment risk appetite*
- *Claims trend guarantees were set far before the effective year and did not take the current state of inflation into account.*
- *Direct investment to area of global importance*
- *Decline in tech stock values*
- *No events occurred*
- *Privacy lawyers ban the company from using real data in testing any project. Mock data was not prepared well. As a result, project was delayed by many months, causing costly workarounds.*
- *Over-aggregation of leased aircrafts in Russia*
- *better planning would help us with office/overhead expenses. This especially relates to the pandemic, but in general as well.*
- *Government spending-induced inflation*
- *We could have had more proactive discussions regarding asset sale strategies in advance of rising interest rates.*
- *Rapid collapse of certain crypto-currency exchanges*
- *Well I'm a student studying actuarial science - maybe catching LFG's miscalculation of lapse rates recently that caused the stock to drop massively*
- *Not applicable*
- *Women leaving the workforce at an increasing rate. Proper slack of human capital could have been implemented to absorb irregular turnover rates.*
- *My previous employer (the United Nations climate change secretariat) has not exactly had a systematic ERM arrangement in place. Rather, the approach to ERM has been rather reactive. While the organization's mission is to help the world deal with one significant long term risk, there has been limited focus on considering how the its role and the future is impacted by other risks. Of particular importance could be e.g. difficulties in government finances globally as a result of currency fluctuations, which make it more difficult for member states to pay UN membership fees, or e.g. the distractions created by other more immediate risks such as the Ukraine conflict, the global energy crisis and inflation. But obviously some public institutions, in particular international ones, have to follow fairly strict mandates, and thus have less flexibility to modify their operations on the basis of emerging risks than private organizations.*
- *Rising interest rate environment led to large debt service payments*
- *almost every system could be better off with ERM. Instead all world systems disintegrating in spite of having actuaries on the workforce.*
- *failure of FTX*
- *Narrowing of "performance lock" in annuity products to certain indexes and situations, rather than the whole gamut.*
- *Don't think of ERM on the governmental level, but seems like British government and the missteps of Liz Truss could have been avoided with better "ERM-type" advise.*
- *Risk Management was able to educate decision makers appropriately to adequately address certain issues within the organization.*
- *FTX failure*
- *Rogers network outage*
- *The collapse of crypto-currencies caused big losses for many people and firms. Proactive ERM could have shown the hidden risks behind crypto-currency and led to less exposure among those firms and investors that were heavily invested in it.*
- *Variety of operational incidents.*
- *Inflation surge leading to pressure on internal labor costs & retention*
- *I am not aware of any such event.*
- *Nil*
- *British LDI pensions, FTX (no audit?), Sri Lanka*

- *Seeing several examples in other industries where firms have overhired and then laid off workers due to undisciplined growth projections where better ERM could temper those projections.*
- *N/A*
- *None, I'm retired*
- *While not in my industry, FTX collapse and potential for Twitter collapse.*
- *COVID Vaccine Mandates*
- *None - proactive ERM is in place*
- *Asset devaluation*
- *Cyber focus*

Question 3. Does implementing ERM improve company returns relative to the amount of risk? (Please select one.)

	2022	2021	2020
Yes	**55%**	42%	47%
No	**7%**	7%	8%
Not sure	**38%**	51%	44%

Does ERM Improve Returns Relative to Risk?



Question 4. Why or why not?

For those who answered *Yes*:

- *Yes - Proactively identifying risks allows for better planning to try to address and mitigate the risk.*
- *If it is commented to action, yes.*
- *Implementing ERM can eliminate or reduce financial loss partially.*
- *ERM aids in risk mitigation than can reduce risk. ERM aids optimal placement of reinsurance balancing risk and reward. Reduction of risk can reduce the number of financial surprises and increase income.*

- *Although it is impossible to predict all risks, if we implement strong ERM practices, we will have prepared for a similar risk and be better prepared when it happens.*
- *In fact, it does not improve returns, it is more a defensive approach by reducing losses when a risk materializes."*
- *Increased expected returns and prevents unexpected losses*
- *Good ERM increases both expected returns and decreases the volatility of returns*
- *Understanding risk tolerance and the tail risks of investments is necessary in volatile markets.*
- *Company returns are improved because ERM can hedge against the negative consequences of certain risks.*
- *At the very least ERM provides management/the board with greater information on how the business is run - helping them to make better decisions.*
- *Investments line up with company principles*
- *Improvement of ERM helps to channel the proper information flow across teams while laying down a proper risk culture for issues to be raised across the company.*
- *Strategic planning always helps.*
- *It helps the first line of defense in ensuring that the correct premium is charged for the amount of risk taken*
- *It's been more about protecting the downside risk than improving returns through calculated risk taking. Limits, clear risk appetite & tolerances, all help protect from negative returns.*
- *Using an ERM framework and economic capital models helps you quantify risk-adjusted returns.*
- *Creates awareness of risk (and opportunities) so that mitigation can be proactively put in place. Reactionary activities cost time and/or money and hurt returns*
- *A clearer understanding of the type of magnitude of potential risks allows for greater focus on risk-adjusted returns. However, I do think there is a belief that "bailouts" reduce the moral hazard for taking outsize risks that lead to systemic shocks.*
- *Creates a framework for risk review and mitigation development.*
- *Done well, ERM increases the ability of the organization to pursue higher-risk opportunities while staying within the chosen risk appetite. At the same time, it reduces the risk of existing opportunities.*
- *Company is less likely to implement whatever someone comes up with. If they do that, they tend to try to offer anything that anyone invents without enough vetting to know whether the feature works or whether it is easily administered or whether it fits with the company. With ERM there is a much stronger rationale for what happens.*
- *Should prevent companies from making large mistakes, and prepare for low probability but high impact events.*
- *Reduces chances of interrupting events*
- *ERM helps a company develop a risk/return strategy that is consistent with its risk appetite by forcing it to dive deeply into its risk exposure and really consider the broad picture. It should lead to good controls, scenario-analysis, and ways to prevent optimistic group-think within product development. ERM does have a cost because it requires time to develop controls, safety systems, and some redundancy in resources (e.g., back-up generators). It takes discipline, but it is time and money well spent.*
- *Successful ERM identifies risks that may not have been seen or understood. Risk treatment can mitigate impacts and reduce losses.*
- *Providing a 2nd line lens in regard to oversight/challenge.*
- *Better understanding of the risk exposure and how to manage it.*
- ***How could it be otherwise? Cost benefit is a form of ERM, especially when capital management and liquidity are considered.***
- *Risk appetite and capitol optimization*
- *Define "returns". ERM is here for the long run*
- *Proactive vs reactive planning yields preparedness.*

- *Understanding that interest will be increasing, cash or cash equivalents increased.*
- *ERM weaves its way into every business plan.*
- *Implementing ERM processes and embedding it in decision making is relatively cheap compared to its possible benefits and losses it might avert.*

For those who answered *No*:

- *Mostly seems like it's simply added administrative burden.*
- *ERM is a tool to be used by decision-makers, but only one of many. Improved returns depend on the whole, not on any one particular part.*
- *ERM focuses on preventing improper access to the company's computer systems. But there is so much more to risk!*
- *It is quite difficult to quantify the return as attribution analysis is hard to sell.*

For those who answered *Not sure*:

- *Lack of knowledge on ERM - can't respond*
- *Too many words, not enough thinking about implementation.*
- *it could in some cases lower returns but decrease volatility of returns*
- *It depends on how well the company was managed prior to introduction of the framework, and the quality of ERM implementation. Implementing ERM well should improve the company returns relative to the amount of risk over the long term.*
- *Risk is uncertain. I think the goal is to hope the erm strategies improve company returns based on that risk*
- *actuaries tend to build systems in safe spaces. Don't think they recognize / appreciate diverse socio economic conditions and effect of crime and corruption. It is not about DE&I. Looking internally at actuarial associations first.*
- *I think it probably does over the long -term, but thinking on any shorter-term (quarterly or annual basis) its hard to see.*
- *Return relative to risk is just one measure & not necessarily the most important. While you can improve a process or more accurately assign a value to risk, that does not mean the return has improved or gotten worse. It means you just didn't accurately assess it. While that is an improvement in view, it is not a betterment or detraction of return on risk.*
- *Effective ERM is really a form of insurance. Focusing on company returns is a flawed metric. Instead, the focus should be on the potential cost/disruption of an event with/without strong ERM practices in place.*
- *Well managed companies have always managed risk well. In these cases, "Implementing" ERM doesn't really change things, it can often be just a label wrapped around activities that have always existed.*
- *Response may be industry-specific. Increasing tendency for regulator/tax payer "bailouts" increase a type of moral hazard risk in that protecting the institution does not necessarily provide a competitive advantage -- might actually be a disadvantage by incurring costs, limits, etc. with the goal of managing through risk events when competitors are not....and doing so is not valued by customers, owners, or other stakeholders. Note TARP; airline support during pandemic; federal policies during pandemic; etc., etc.*
- *Implementing ERM may or may not improve returns. It depends on what risk management regime was in place prior to implementing ERM and the nature / scope of the risks faced by the insurance org. In other words, every situation is different and there is no universal answer to this Q.*
- *difficult to perform risk and return attribution of erm*
- *The largest risks, typically financial, are already managed by specialized risk managers, and ERM has little effect for these. If ERM can help manage non-financial risks, particularly operational risk,*

effectively, then they can improve company returns. But most firms struggle to measure the impact of operational risk on financial results, leading to poor management of this risk.

- *I hope so, but I'm not sure I've seen evidence either way. After however many years, it strikes me that much ERM either is window-dressing, misses the forest for the trees, or does a poor job of forecasting consequences.*
- *More visibility of risk combined with natural risk-aversion of boards and execs can lead to better sleep but lower risk-adjusted returns*
- *There is a trade off between risk and reward. Companies that don't have good ERM may not know how much risk they have based on reward so it is difficult to make rigorous comparisons.*
- *Difficult to quantity return attribution to erm*

Question 5. How have scenarios, both deterministic and stochastic, used to manage a company changed as inflation and interest rates have risen in 2022?

- *Valuations should now be based on assumptions that are quite different than, say, 2 years ago.*
- *We may be terminating more defined benefit frozen plans*
- *More aggressive assumptions are now being used.*
- *Greater uncertainty*
- *More focus on shock analysis.*
- *scenarios adjusted with inflation and/or interest rate rise can let the company see the financial impact so that the company can initiate preventive and/or risk reducing strategies.*
- *Stress scenarios of how inflation impacts loss reserves have increased loss reserves and reduce loss reserve risk. Scenarios reflecting higher inflation and interest rate volatility have illustrated the higher investment risk and used to modify investment strategy.*
- *Moderately*
- *Too early to call*
- *Assisted in projections*
- *We use higher interest rates in projections*
- *More emphasis on risk appetite.*
- *wider range in possible results, less certainty*
- *Reflected current market downturn*
- *Not much - we tend to look in the rear view mirror*
- *Not applicable*
- *Did not change*
- *Performed more scenario analysis; increased focus on policyholder assumptions*
- *Still being determined*
- *Two-sided interest rate volatility is back to being real. Interest rate scenarios are significantly more examined than in the last few years.*
- *More frequent review; higher implied volatility*
- *Scenarios can be run with greater investment return volatility.*
- *Larger interest rate sensitivity analysis, more focus on level of lapses*
- *Scenarios were used to develop an investment playbook (strategy) for a rising interest environment.*
- *Scenarios always need to be reviewed - biggest change is to make sure the size of the shocks is appropriate to the environment.*
- *little yet*
- *Idk*
- *More frequent review has been made.*
- *My previous employer has not used scenarios to manage risks related to inflation. Given its nature as an international organization, this has not been considered necessary. Though changes in interest rates and inflation, and in particular currency fluctuations can have a major impact on the*

finances of international institutions, those impacts are not as immediate and existential as for private enterprises.

- *Market risk more important*
- *internal and external risks accounted for? company not an isolated entity.*
- *I am not involved directly in scenario testing but expect that scenarios are becoming more adverse and broad, testing more extreme events and the interdependencies of risks.*
- *Risen with the rates*
- *More scenarios to be aware of and test. More historical data to include in models in more 'extreme' rising interest rate situations.*
- *They have not changed. These are regularly tested and a well run company should hot have needed to alter them.*
- *We've experienced a shock up scenario, and we've added a couple more extreme shifts along with the New York 7 we've been using.*
- *No explicit change.*
- *Economic scenario generators have had to reconsider mean reversion points, and the likelihood of more sever "up" scenarios. Another thing to consider is whether high inflation is short-term or longer-term. And is there any correlation between interest rates and equity returns?*
- *Different mean reversion parameters. Changed view on rate shocks.*
- *Unable to answer this as not directly applicable to current role.*
- *Additional volatility will result, leading to a wider range of outcomes.*
- *Uncertain. Envision that scenario updates have been slow to adopt -- comment is based upon belief that extended period of lower rate volatility has clouded perspective on true stresses and scenario breadth.*
- *Scenarios have changed to reflect the now-current environment, but otherwise are not fundamentally different -- scenarios include both rising and falling rates, in some scenarios, by significant amounts for lengthy time periods.*
- *While we did not expect the sudden rise of inflation, the stochastic scenarios slows us to quantify the risk and not provide much inflation indexed benefits*
- *Visibility of extreme situations and facilitate investment and capital planning*
- *We should see base case scenarios that include high/low interest rates, high inflation, pandemic. They should all be narrative scenarios, where various metrics are aligned (like SSPs). Multiple negative scenarios should be combined to see how many events can occur before insolvency.*
- *Still in wait and see mode, reluctant to make large changes just yet.*
- *Scenarios run on yearly basis to incorporate changes in inflation and interest rates and impacts to capitol.*
- *Volatility. Most folks today weren't born during the Carter years. This all new to them*
- *Re-evaluating prior scenarios*
- *Presumably, scenario interest rates have shifted up.*
- *Inflation has made all long range strategic planning obsolete.*
- *Stochastic models have long included wide range of inflation and interest rate scenarios. No change.*
- *Scenarios provide greater context in quantifying what is possible, allowing for a more comprehensive discussion around risk and the return for taking those risks.*
- *More attention on rapidly rising rates*
- *Assuming inflation rate will eventually back to 2% in less than three years. Short term interest rate will be reduced in the next three years.*
- *Slowed hiring.*
- *Facilitate investment and capital planning*
- *Expected Volatility has increased. Range of probable scenarios has widened.*

Question 6. How have current risks like the pandemic and rising interest rates changed a risk team's regular duties?

- *Valuations*
- *Much more uncertainty - but we disclose that we are unsure of affects until further study can be done*
- *A greater focus on unknowns, and a greater openness to consider possibilities outside of everyday experience.*
- *Pandemic and climate have shown the challenges in crafting board scenarios*
- *More focus on shock analysis, as noted above.*
- *Running more sensitivities to include the pandemic and rising interest rate changes.*
- *More time spent on evaluating investment risk and business continuity planning.*
- *Moderately - helps to better quantify scenarios*
- *too early to call*
- *focus on emerging risks*
- *We focus more on emerging risks*
- *increased level of monitoring and control testing*
- *Not sure but it should.*
- *more attention on risk, more analysis on drivers of risk*
- *Requires additional scenarios*
- *Increased amount of work and analysis*
- *Just a reminder that things can happen*
- *Business will need to do make quick and proactive decisions to react to the pandemic/interest environment, and the Risk team will have to conduct assessments on them.*
- *Did not change, which is unfortunate*
- *Diverted time and modeling to these risks*
- *More frequent interaction with the business, often in a coordinating role*
- *More "what if" analysis rather than standard reporting*
- *Pandemic duties have decreased;*
- *Both have required time resources which lessens time available for other risk activities.*
- *More stress testing, more involvement in ALM discussions, more questions from management regarding capital levels*
- *Interest rates were already a big part of our program. The pandemic reinforced the need for increased oversight of things like security (due to working from home), business continuity and other operational risks*
- *It probably introduces a whole another aspect of erm that the risk team has to consider*
- *Shifted focus to these emerging or continued risks.*
- *forced them to think.*
- ***broadened their view to reflect emerging risks and risk interdependencies***
- *Enhanced reviews and/or development of new processes.*
- *No*
- *Adds to the realities of what can happen. These things also mean management asks more of risk teams.*
- *Nothing has changed. These were risks planned for by the Department and built into the processes prior to them happening. Again, a well run company should not have been caught off-guard by these events.*
- *Having to explain to senior management how these are impacting our risk profile.*
- *More focus on these topics; less time for others*
- ***Evolving focus on operational disruption versus simply financial cost.***
- *After several years or low rates of interest and inflation, risk teams need to confront the new reality and ask what changes need to be made to their scenarios to account for this. They need to realize*

that they don't know the future, so they need to develop sensitivity tests to account for several possible futures that just last year seemed remote.

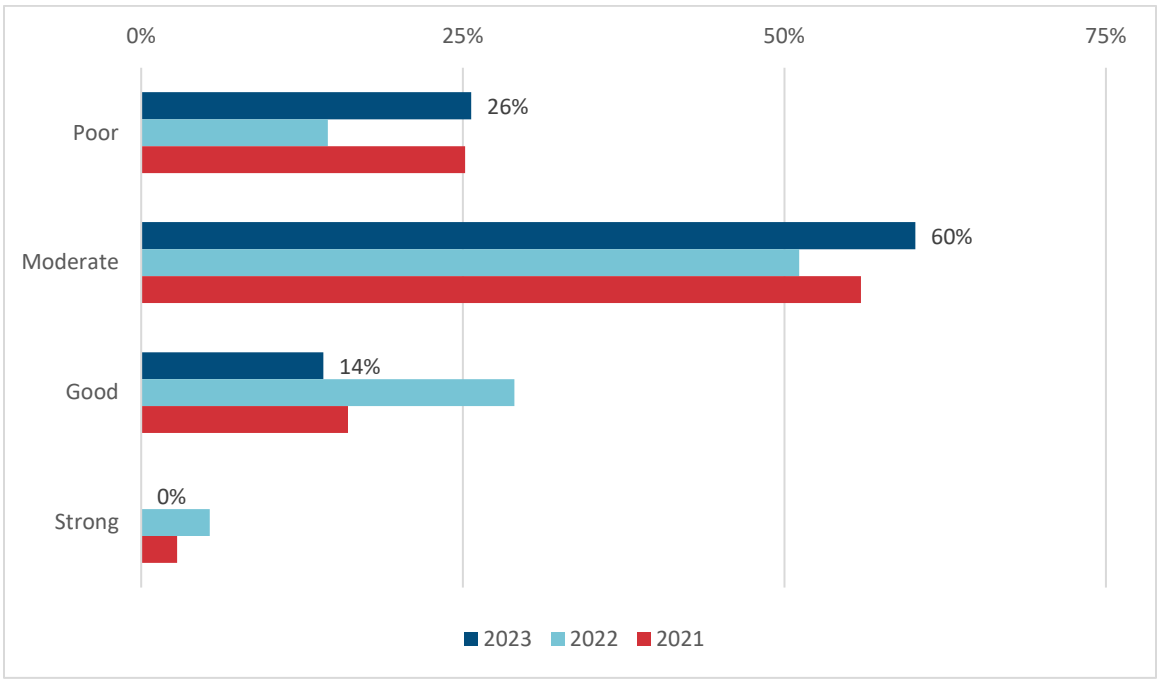
- *More ad hoc analysis*
- *Participation in topical working groups have been introduced.*
- *Looking at product opportunities and policyholder behavior assumptions in a higher interest rate environment*
- *It has caused companies to pause and make sure they are looking at the right things.*
- *Active measurement of now "known"/experienced risks; heightened intensity of assessment turnaround times.*
- *No change.*
- *Its almost like Business Continuation Plan Scenario. It showed how we were able to adapt to survive. A lot of sessions learnt to be used for such future developments*
- *Focus was on optimal asset allocation given current conditions.*
- *More frequent monitoring (up to daily if needed)*
- ***Management is more interested in hearing my thoughts about tail scenarios.***
- *The large impacts of these items have helped force reconsideration to how profitability and capital usage are measured and managed, particularly with regard to time span.*
- *Significant contributions from operational risk and investments team oversight on models and rising interest rate environment.*
- *Probably a lot, much more detailed*
- *Broadened the risk team's role*
- *Don't know.*
- *Rising interest rates have made companies more conservative with investment in R&D.*
- *ERM team is doing deeper and more frequent reporting internally and externally*
- *Looking at different types of risk scenarios, closer attention to potential asset market dysfunction*
- *Focus on what if situations and the responses.*
- *Focus on reducing costs to offset inflation.*
- *Heightened frequency of these risks, like up to daily monitoring*
- *Analysis of Scenarios has increased.*

Section C: Current Topics

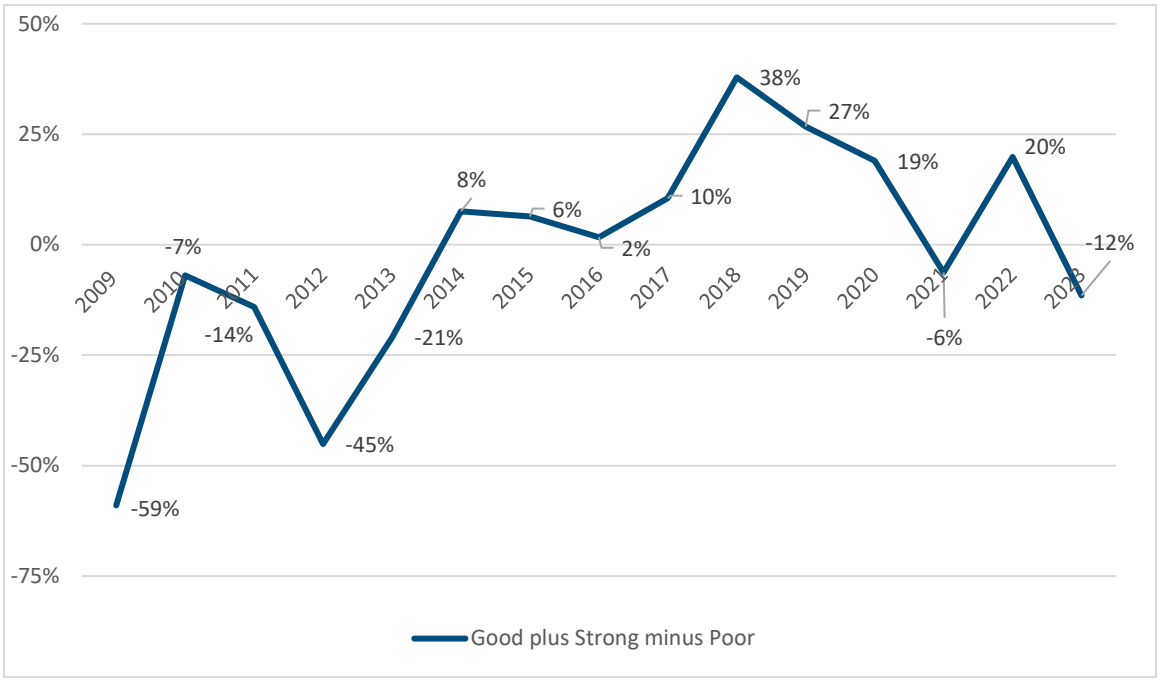
Question 1. Your expectation for the 2023 global economy is:

	2023	2022	2021
Poor	**26%**	15%	25%
Moderate	**60%**	51%	56%
Good	**14%**	29%	16%
Strong	**0%**	5%	3%

Global Economic Expectations



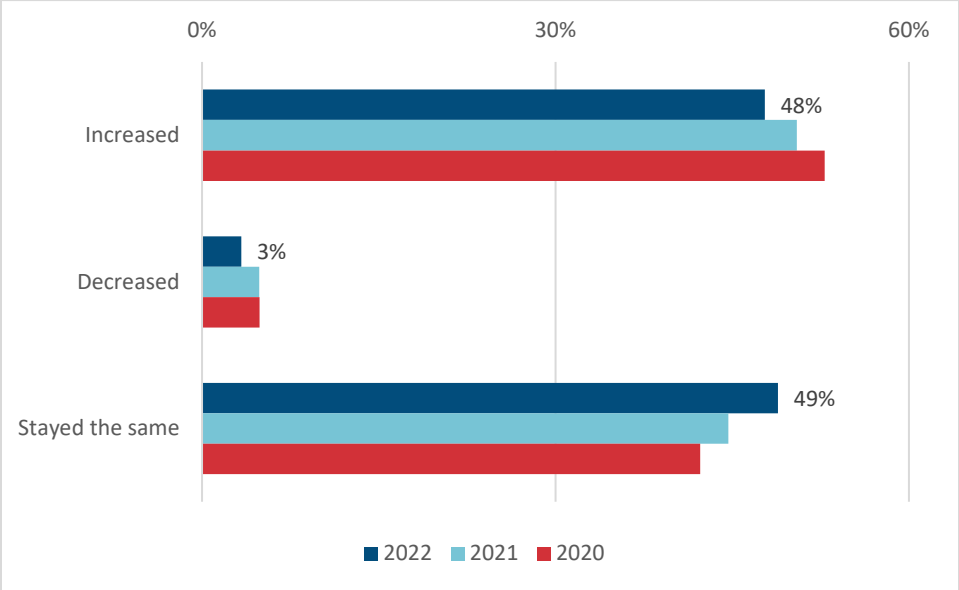
Combined Net (Good + Strong – Poor) Economic Expectations



Question 2. Did you experience a change in the level of ERM-focused activities for your organization or clients in 2022?

	2022	2021	2020
Increased	**48%**	50%	53%
Decreased	**3%**	5%	5%
Stayed the same	**49%**	45%	42%

ERM Activity

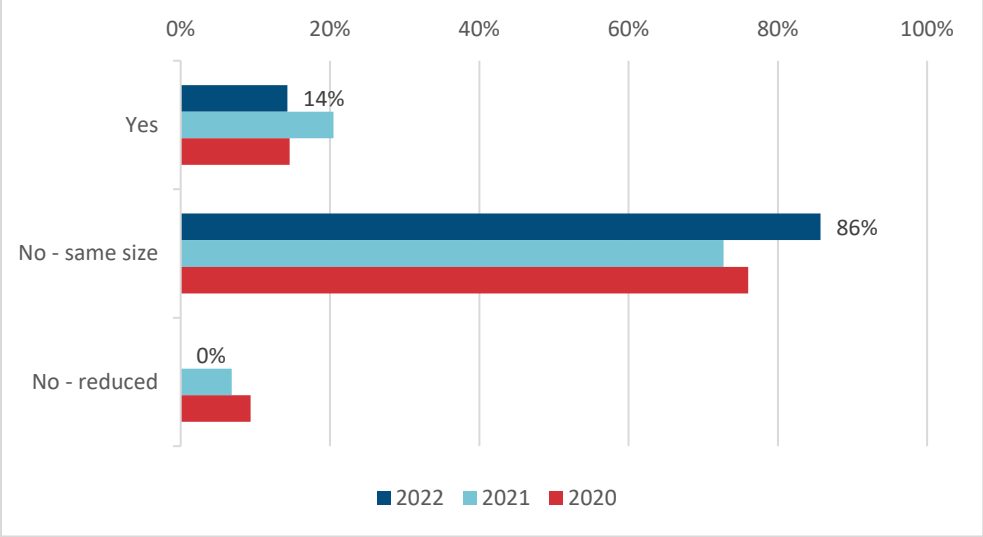


Question 3. Did your internal ERM staff increase in 2022?

(Ed. note: Responses to this question were updated in 2020, so earlier comparisons are not available.)

	2022	2021	2020
Yes	**14%**	20%	15%
No—same size	**86%**	73%	76%
No—reduced	**0%**	7%	9%

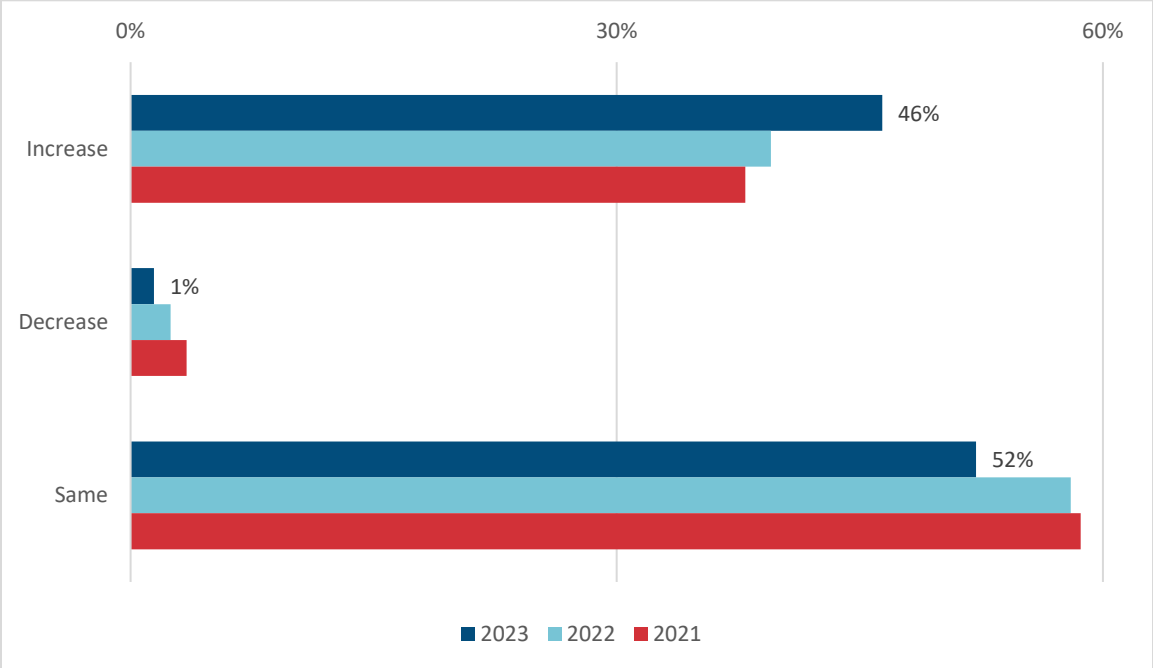
ERM Internal Staff Growth



Question 4. Do you anticipate a change in the level of ERM-focused activities for your organization or clients in 2023 relative to 2022?

	2023	2022	2021
Increase	**46%**	40%	38%
Decrease	**1%**	2%	3%
Stay the same	**52%**	58%	59%

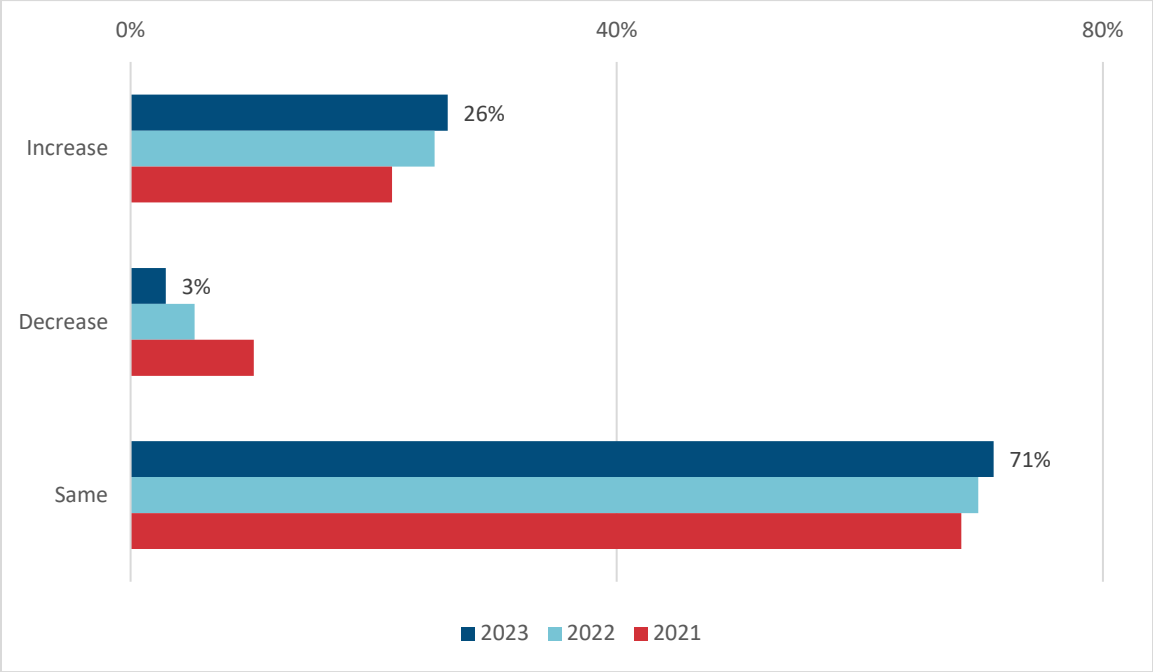
Future Expectations—Activity



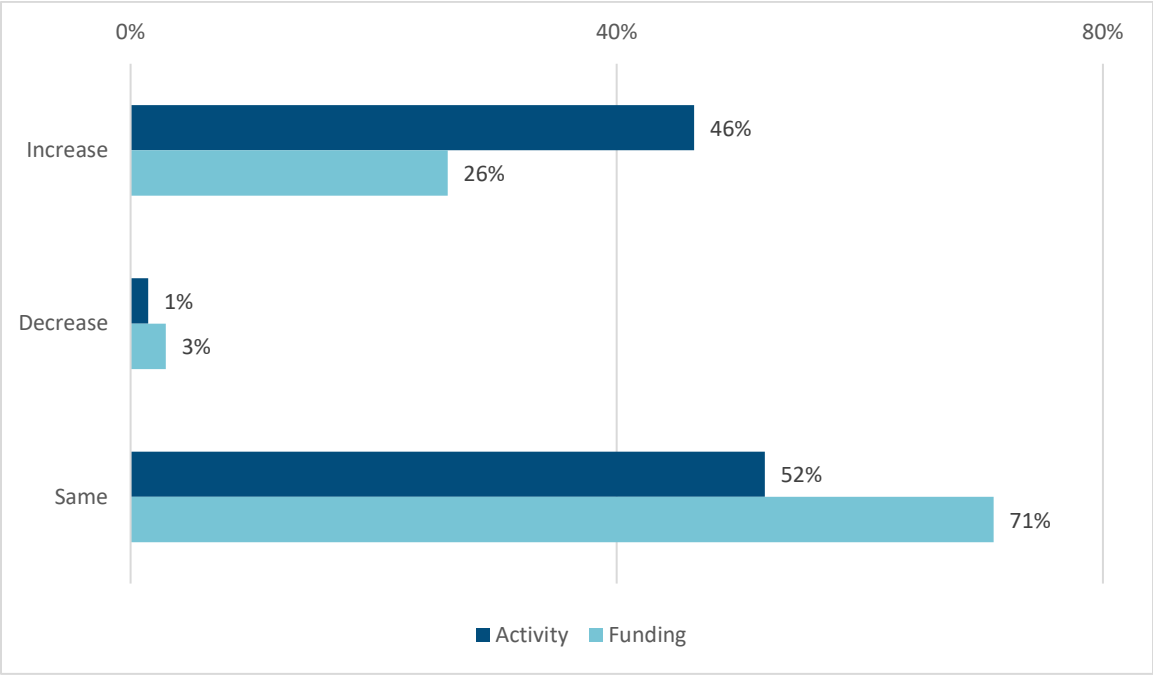
Question 5. Do you anticipate a change in the level of funding dedicated to ERM-focused activities for your organization or clients in 2023 relative to 2022?

	2023	2022	2021
Increase	**26%**	25%	22%
Decrease	**3%**	5%	10%
Stay the same	**71%**	70%	68%

Future Expectations—Funding



2023 Anticipated ERM Levels



Question 6. What types of Disruptive technology scenarios that have positive implications do you analyze?

- *Digital underwriting*
- *Cyber-attacks are the most common. Could include Malware, Bots, etc.*
- *none*
- *Not in my scope at work*
- *Complete change in distribution channels given all new fintech technology.*
- *Cyber*
- *Cyber*
- *ALS studies have increased scenario testing.*
- *none currently*
- *Value added analysis*
- *Predictive analytics*
- *None*
- *product delivery*
- *Automation of IT and non-IT processes*
- *Greater automation of processes and aggregation of data of multiple sources.*
- *Automated underwriting and the use of data within that process*
- *We don't have specific scenarios addressing this but rather continue to engage with IT to understand infrastructure needs, emerging architecture practices, security, etc. As part of that process, we are able to challenge IT to consider broader implications.*
- *None*
- *AI, continuous monitoring, robotics*
- *Attempt to look at automation in customer experience including any apps and other aspects. This tends to be positive.*
- *None that i can think of*
- *There is a large gambit reviewed.*
- *Distribution related technology that could lower costs per sale.*
- *broader use of smartphones; ability to increase electronic payments*

- *None*
- *Looking at ways insurers and customers interact. Opportunities for general IT modernization.*
- *Blockchain implications*
- *Continued improvements in fast and accurate life/health underwriting.*
- *Continued adoption of digital delivery of content including the sales process.*
- *Improved risk assessment using individual client info if allowed by regulators.*
- *Qualitative scenarios where longevity is materially increased through technology.*
- *Artificial intelligence focused on optimization of marketing and processing efficiencies.*
- *N/A*
- *Increasing the use of technology to replace existing systems. Disruptive technologies means reviewing everything we do to ensure optimum output.*
- *Autonomous vehicles reducing accident frequency and severity*
- *Monitoring technology reducing property claim frequency/severity.*
- *Managed detection and response to help offset staffing challenges.*
- *Nil*

Question 7. The true measure of an ERM program is how it is received by the board and senior management. Which of these is true in your situation? (Please select all that apply.)

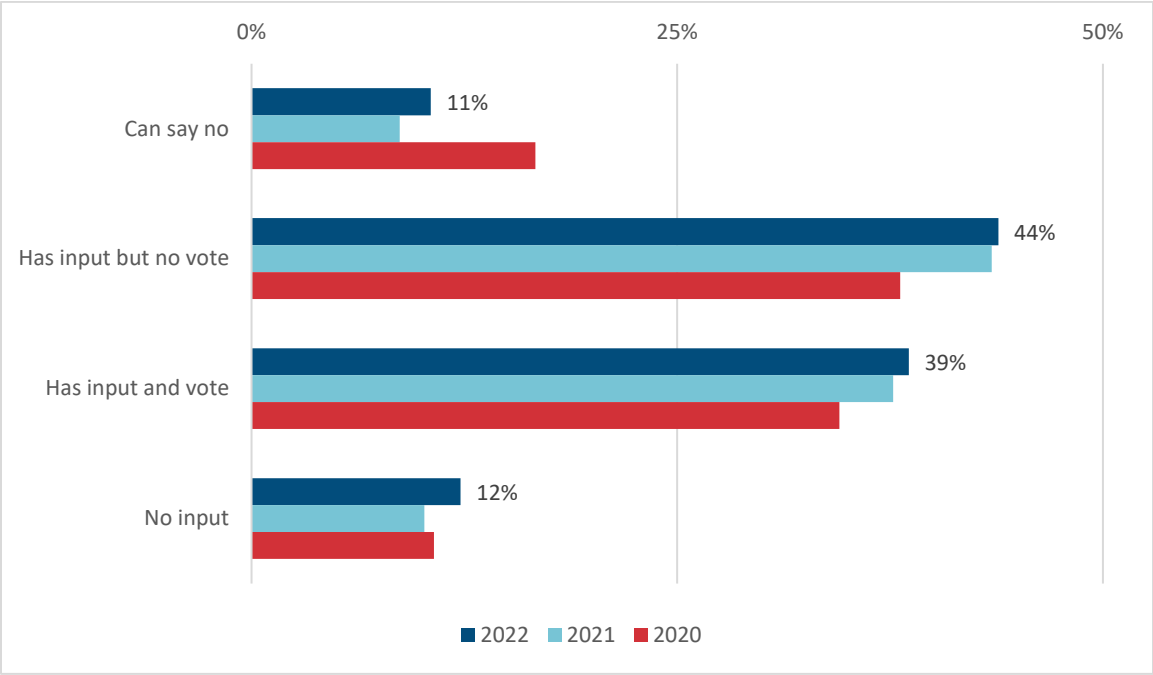
Percentages back out respondents who stated that the question is not applicable to them.

	2022	2021	2020
Our ERM function can say no to a strategic opportunity	**11%**	9%	17%
Our ERM function has input but not a vote when a strategic opportunity is being considered	**44%**	43%	38%
Our ERM function has input and a vote when a strategic opportunity is being considered	**39%**	38%	35%
Our ERM function has no input when a strategic opportunity is being considered	**12%**	10%	11%

Comments/Examples:

- *Pension Advisory Board*
- ***Strategic Decisions are the purview of the Board. The ERM function is to adequately prepare them. Neither it nor any other department should get a vote.***
- *Many decisions have strategic risk implications. Appropriate management, not necessarily "ERM functions" often make decisions.*

Strategic Opportunity



Question 8. What actions have you taken to build resilience in case an emerging risk event occurs?

- ***The key is a focus on the communication channels available, to ensure that the right people are informed.***
- *Proactive discussions with clients on risk scenarios; better representation of CMA variance in scenarios*
- ***Strengthened our business continuity planning. Created business impact analysis. Evaluation, communication, and planning of management of emerging risks.***
- *Not in my scope at work*
- *Improved cooperation among top managers.*
- *Formed emerging risk committee, agile response as warranted. Have provided senior leaders with Change management training.*
- *Formed emerging risk committee, agile response.*
- *Have given senior leaders formalized training in change management.*
- *Monitoring investment manager. Hiring an external consultant.*
- *more conservative assumptions*
- *Focus on investments that address global issues*
- *Regular horizon scanning*
- *Allowing everyone within the company to be sensitive and react accordingly to risk events*
- *Tabletop exercises in areas of cyber and disaster recovery*
- *Mitigation actions have been agreed for every emerging risk that has been identified*
- *consider multiple different scenarios in risk assessment and business impact analyses; cross functional team committed to convene in urgent situations to analyze and respond*
- *The focus over the last 2 years has been on operational resilience for a hybrid work environment.*
- *We have developed an emerging risk register that we update at least quarterly - part of that process involves reach out to areas potentially most impacted to understand processes in place that would assist or processes that would be needed if the risk did emerge*
- *Decentralized ERM function.*
- *n/a*

- *Work in a virtual environment currently. Run stress tests for effects.*
- *We regularly scan for potential events. Any that could have marginal impact are accounted for in the Business Continuity Process.*
- *Developed risk capital models that factor in emerging risks*
- *Ensuring open lines of communications with employees, customers and the public*
- *Strong capital position; review of BCM framework underway.*
- *Cross-functional collaboration. Information sharing.*
- *Increased use of scenario planning; capital monitoring attention increase*
- *Confidential.*
- *Contingent plans such as disaster recovery sites. Analysis of options if emerging risks become true.*
- *Built up position of cash and Treasuries. Reduced concentration of some exposures.*
- *Process level end-to-end resiliency planning.*
- *Contingency planning in case of realized risks.*
- *Increased geographic and product line diversity*
- *Improved weather catastrophe models*
- *New non-weather risk modeling*
- *Primarily contract focused -- i.e., tighten up our contracts due to gaps in risk.*
- *shift to stronger governance*

Question 9. Some risk managers seek ways to exploit risk by finding opportunities that are mispriced or provide diversification. Which, if any, emerging "opportunities" do you monitor?

- *The impact of rising interest rates have not yet occurred. We are only at the beginning of the re-pricing cycle.*
- *Rising interest rates*
- *We will purchase reinsurance if priced advantageously based on risk modeling. We monitor inflation, recession, climate, interest rates, cyber, catastrophes, underwriting profitability, UW diversification.*
- *Plan to evaluate our reinsurance book of business over the next years*
- *None*
- *Strategic asset risk allocation.*
- *We monitor Strategic Asset Allocation using the Efficient Frontier.*
- *Quarterly reporting of risk matrices and immediate reporting of non-compliance.*
- *company is always looking out for mergers or acquisitions*
- *Decrease volatility*
- *N/A*
- *On the asset side of the balance sheet*
- *n/a*
- *reinsurance*
- *New and underserved markets within the life insurance and annuity space*
- *We try to consider risk in the context of presenting opportunities at all times*
- *None*
- *Rise of RILA (Registered Index-Linked Annuities).*
- *None at this time*
- *M&A activity*
- *Cyber insurance market opportunities.*
- *Investment opportunities*
- *Energy shocks -- associated implications*
- *See answers to #5 above.*
- *Assets with limited liquidity may be chosen if price is attractive, after due diligence.*

- *I am watching equities for cheap prices. I am watching home prices and mortgage rates - implications for main street.*
- *Our investment portfolio is more balanced and optimized decisioning to leverage volatility in the market.*
- *None.*
- *Geographic and product line diversity*
- *N/A*
- *Nil*

Question 10. Are there bubbles that you have identified in today's environment?

- *The "Green" movement and "free education" has wasted billions of dollars*
- *Condo Reconstruction/Maintenance.*
- *There is an 'inflation bubble' at the moment*
- *U.S. Federal Debt*
- *Risk concentration. Need to better refine this measure*
- *None*
- *Unsure what is a bubble.*
- *It is unclear what a bubble is.*
- *NA*
- *housing*
- *no*
- *N/A*
- *n/a*
- *Not exactly sure what you mean by "bubbles"*
- *No*
- *No.*
- *None at this time*
- *No*
- *cryptocurrency*
- *No.*
- *Real estate (commercial & residential); asset prices (due to extended low rate environment)*
- *yes.*
- *Tech sector*
- *Home prices in many countries. Just about everything (prices, policies) in China. PE insurers. Crypto.*
- *Emerging markets*
- *Food and cost of living are forcing employees to reevaluate their employment options with the goal of driving higher salaries.*
- *Equity market was in a bubble. Changing lately*
- *Pandemic uncertainties*
- *Nil*

Question 11. List an unknown known (where you have historical data, but it is not predictive) and how you adjust to manage the risk.

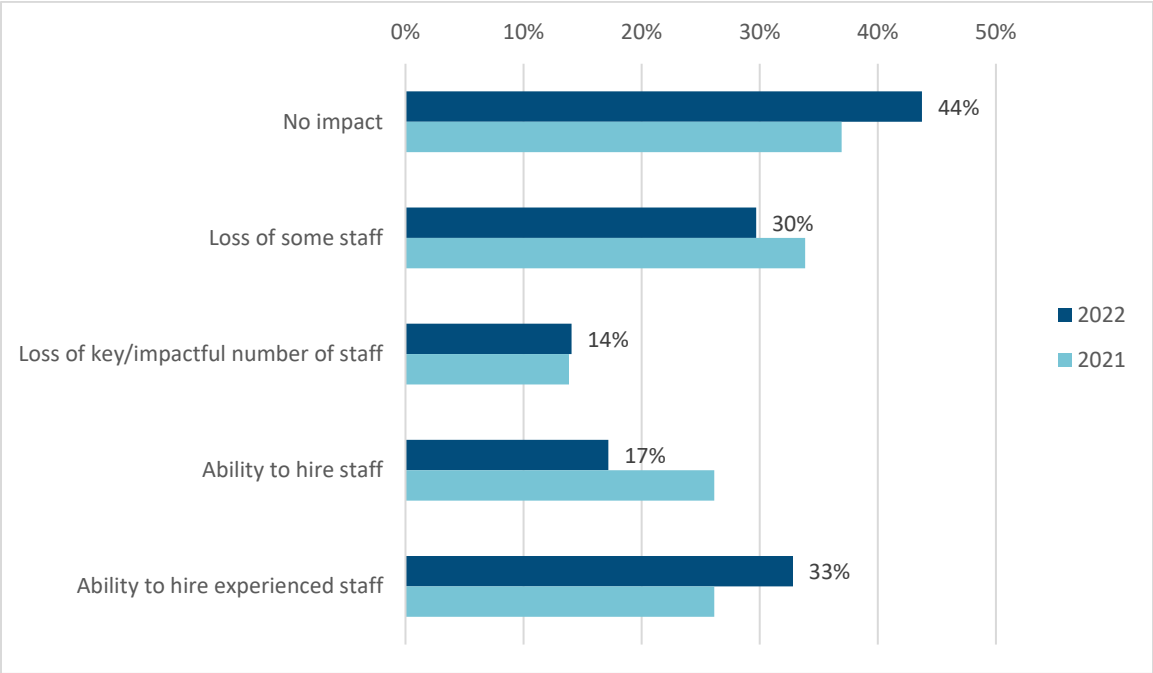
- *The Pandemic - We have historical data, but it is meaningless. This could still go on for another decade or more, unless serious action is taken on a global basis to eradicate it.*
- *Global health crisis (pandemic or otherwise); global cyber breakdown*
- *none*
- *Evolution of mortality on old cohorts of Life insurance products. Will work on this in the near future*

- *Information gap between management and data providers.*
- *unclear ask*
- ***Unclear request***
- *Asset liability studies.*
- *pandemic affecting cost and trend - implement techniques to account for this*
- *response to market changes in economic downturn*
- *N/A*
- *n/a*
- *Climate risk*
- *Incident management - type and nature of incidents is always evolving - we have adjusted our processes to better identify those linked to third parties so that can be considered when assessing our third-party performance*
- *Not applicable*
- ***Climate Change, not linear at all.*** *Not a very direct effect on business currently.*
- *none at this time.*
- ***Credit risk - can only compare to what we've seen in the past.***
- *hurricane frequency and intensity; run scenarios presuming various patterns in the future*
- *N/A*
- *N/A*
- *Pandemic. Contingent plans and proper reinsurance*
- *Climate change - I try to use delta (first differences) analysis using recent periods (e.g., look at last 10 years/last 20 years and assume the same delta in total)*
- *Climate risk*
- *Inflation spikes.*
- *N/A*
- *Nil*

Question 12. How is the great resignation currently impacting the ERM function in your firm? (Please select all that apply)

	2022	2021
No impact	**44%**	37%
Loss of some staff	**30%**	34%
Loss of key/impactful number of staff	**14%**	14%
Ability to hire staff	**17%**	26%
Ability to hire experienced staff	**33%**	26%

Great Resignation



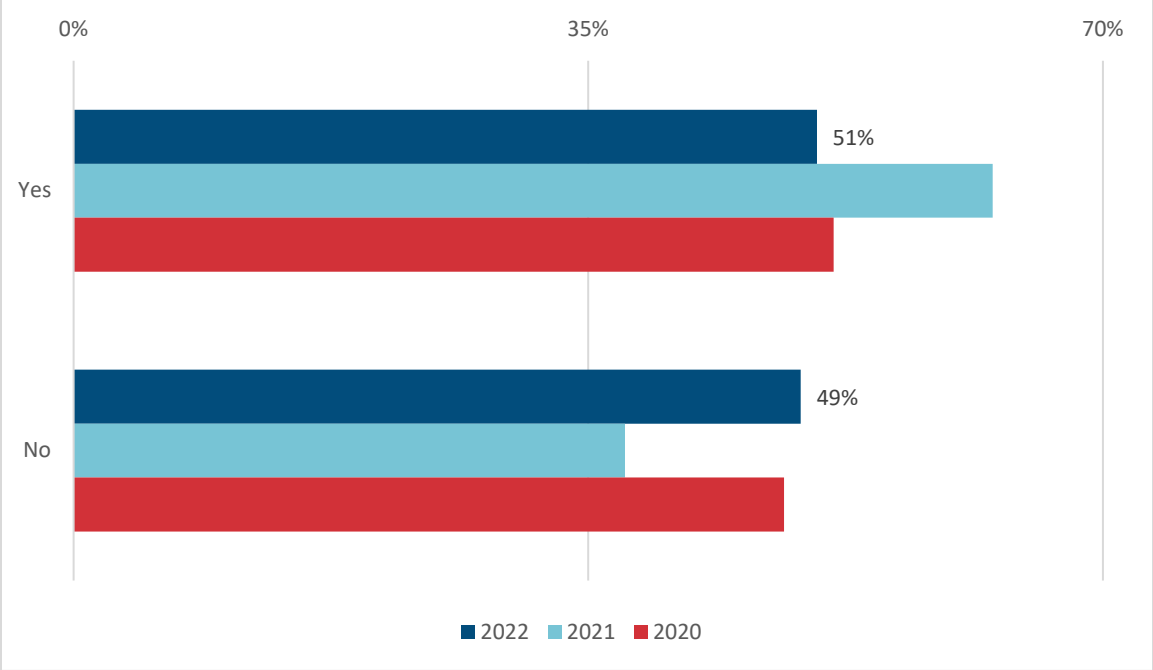
Section D: Demographics

If you are no longer part of a risk team, respond based on your most recent career path.

Question 1. Have you completed this survey in the past?

	2022	2021	2020
Yes	**51%**	63%	52%
No	**49%**	38%	48%

Previous Survey Participant



Question 2. What credentials do you currently hold? (Please select all that apply.)

297 responses from 125 surveys (average of 2.4 responses per survey)

Percentages are based on 125 surveys.

	2022	2021	2020
CERA	**17%**	18%	19%
FCAS/ACAS	**5%**	6%	15%
FSA/ASA	**61%**	90%	84%
FCIA	**10%**	11%	7%
MAAA	**35%**	61%	59%
PRM	**1%**	2%	1%
FRM	**1%**	3%	1%
CFA	**5%**	3%	10%
FIA	**2%**	3%	3%
FIAA	**0%**	6%	1%
JD	**1%**	1%	1%
MBA	**3%**	4%	8%
CPCU	**1%**	4%	1%
Ph.D.	**2%**	9%	6%
EA	**3%**	13%	5%
FCA	**3%**	4%	2%

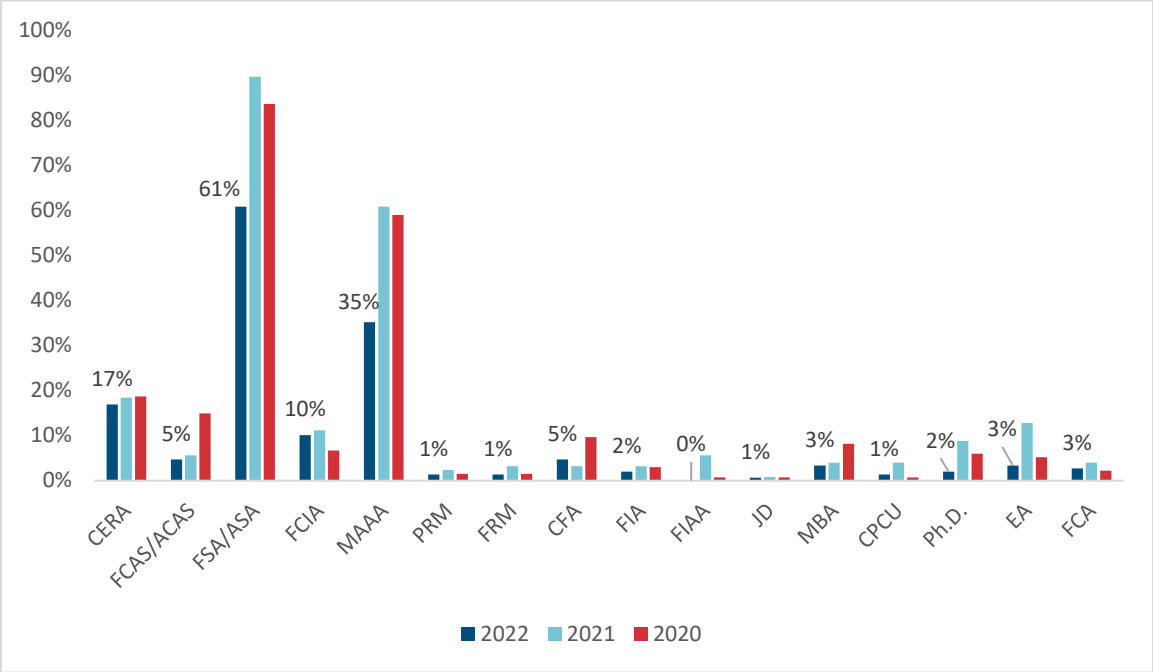
Other actuarial credentials

- *IFRI*
- *Fellow of Hellenic Actuarial Society*
- *IFRI, ERUD*
- *Predictive Analytics Cert from SOA*

Other non-actuarial credentials

- *FLMI/M*
- *CIA, CRMA*
- *CLU, LLIF,FLMI*
- *CLU, ChFC*
- *MS Statistics*
- *FLMI*
- *CRM*
- *AU*
- *ABCP*
- *FLMI, RHU*
- *None*

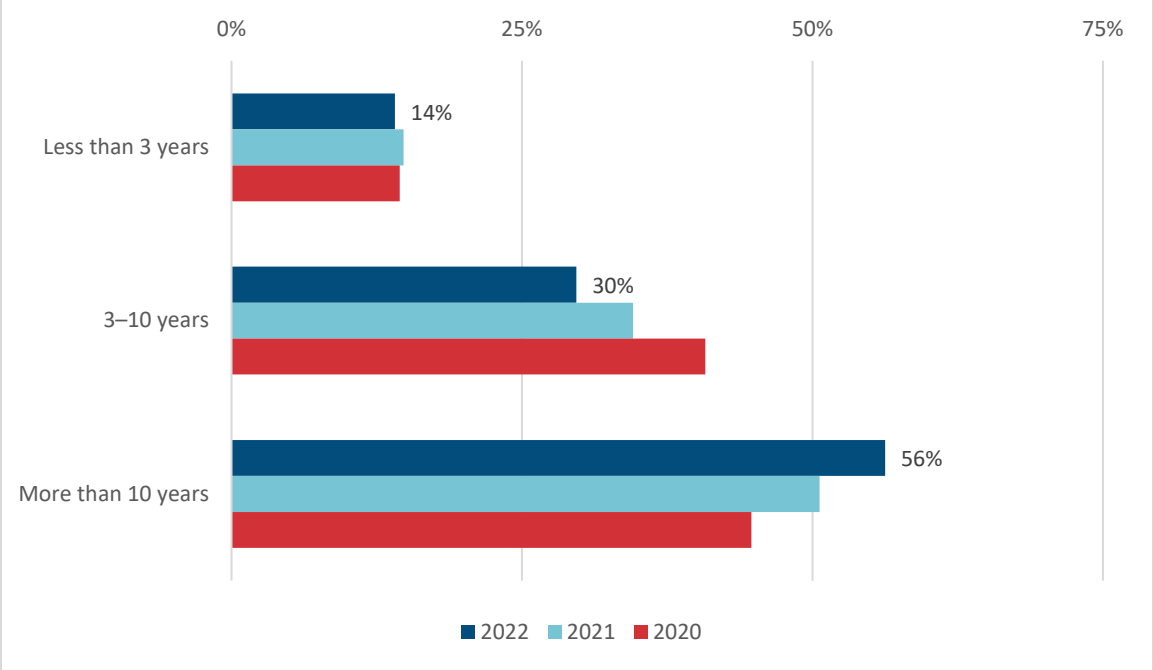
Credentials



Question 3. How long have you been a risk manager?

	2022	2021	2020
Less than 3 years	**14%**	15%	14%
3–10 years	**30%**	35%	41%
More than 10 years	**56%**	51%	45%

Experience



Question 4. Employer type (please select all that apply).

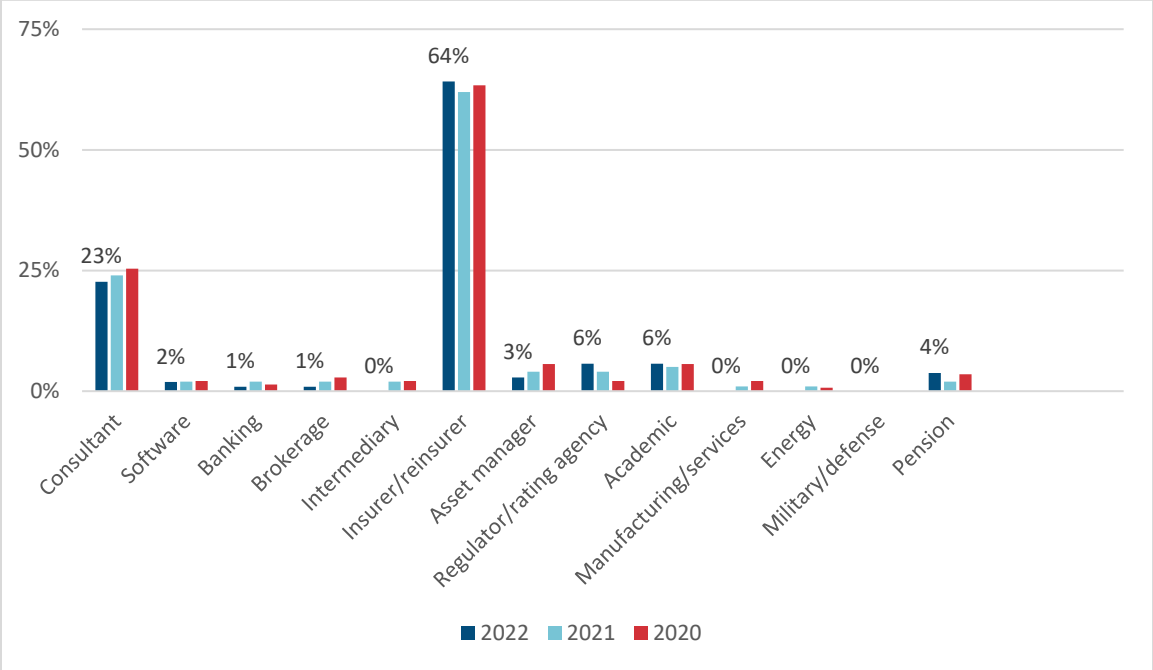
	2022	2021	2020
Consultant	**23%**	24%	25%
Software	**2%**	2%	2%
Banking	**1%**	2%	1%
Brokerage	**1%**	2%	3%
Intermediary	**0%**	2%	2%
Insurer/reinsurer	**64%**	62%	63%
Asset manager	**3%**	4%	4%
Regulatory/rating agency	**6%**	4%	4%
Academic	**6%**	5%	5%
Manufacturing/Services	**0%**	1%	1%
Energy	**0%**	1%	1%
Military/Defense	**0%**	0%	0%
CRO (or acting CRO) at CRO Council firm	**0%**	2%	2%
CRO (or acting CRO) at CRO Forum firm	**0%**	0%	0%
Pension fund	**4%**	2%	2%

Other

- *CRO at insurance company*
- *Pension Board Member*

- *International organization*
- *research / advisory*
- *Third Party Administrator*

Employer Type



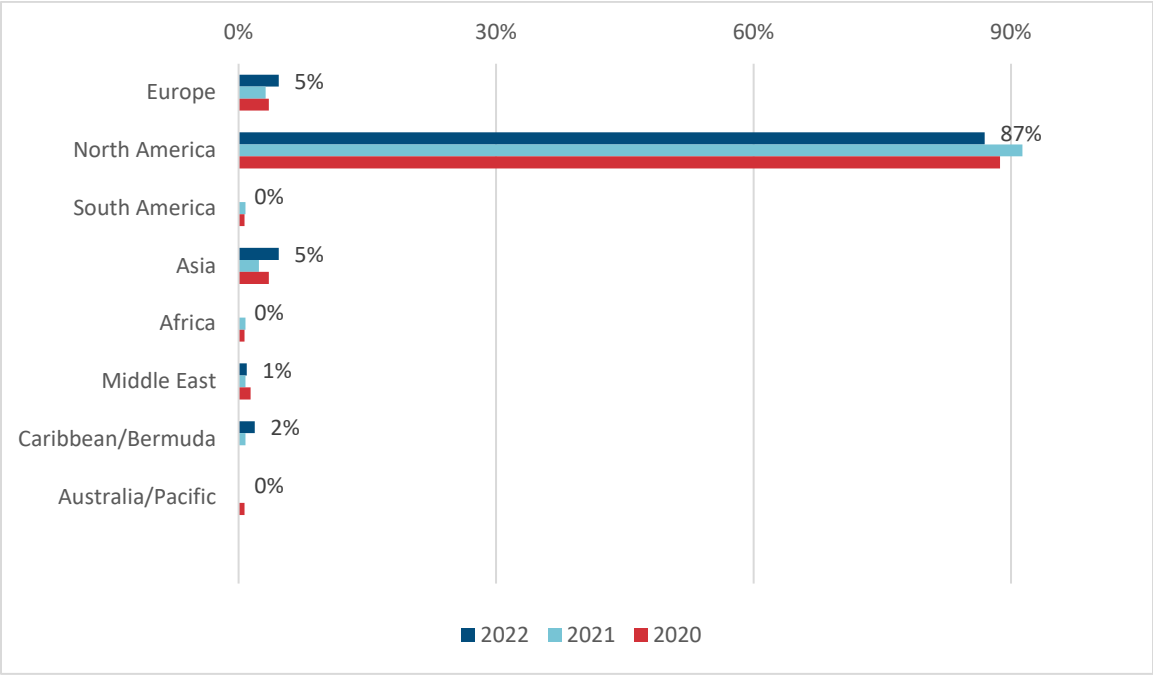
Question 5. Primary region (please select one).

	2022	2021	2020
Europe	**5%**	3%	4%
North America	**87%**	91%	89%
South America	**0%**	1%	1%
Asia	**5%**	2%	4%
Africa	**0%**	1%	1%
Middle East	**1%**	1%	1%
Caribbean/Bermuda	**2%**	1%	0%
Australia/Pacific	**0%**	0%	1%

Other

- *Global*

Region



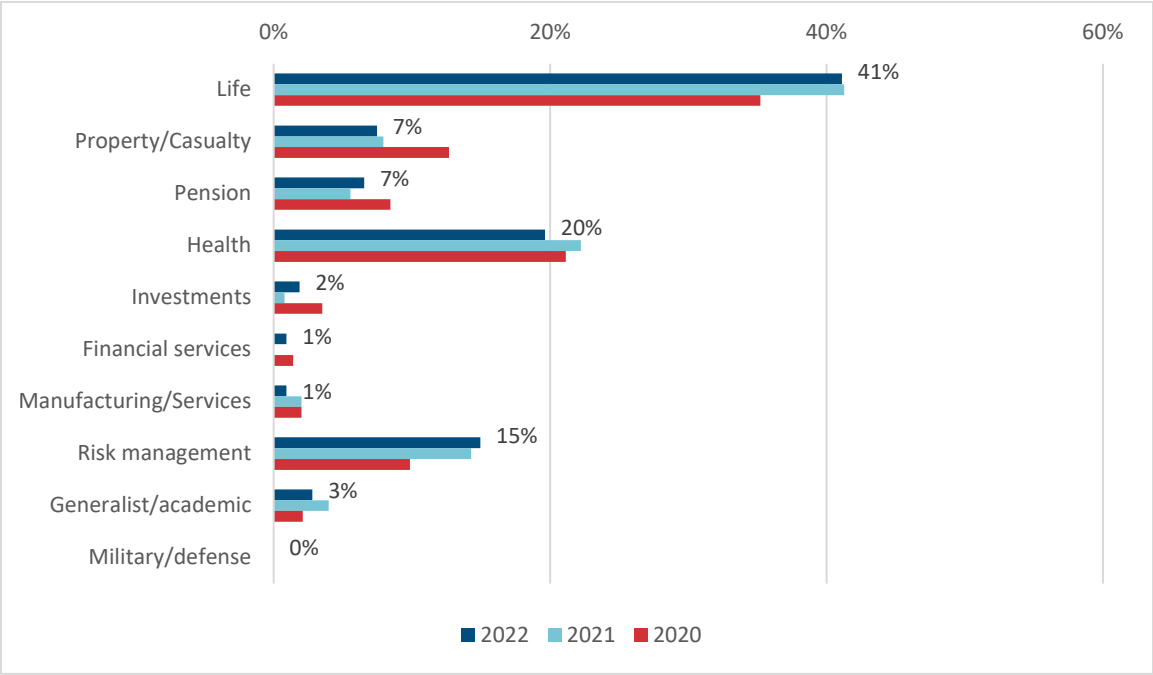
Question 6. Primary area of practice (please select one).

	2022	2021	2020
Life	**41%**	41%	35%
Property/casualty (general insurance, nonlife)	**7%**	8%	13%
Pension	**7%**	6%	8%
Health	**20%**	22%	21%
Investments	**2%**	1%	4%
Financial services (noninsurance)	**1%**	0%	1%
Manufacturing/services	**1%**	2%	2%
Risk management	**15%**	14%	10%
Generalist/academic	**3%**	4%	2%
Military/defense	**0%**	0%	0%

Other

- *Insurance Regulator*
- *Retired. Pension Board Member*
- *Student*
- *International environmental politics*

Practice Area



Question 7. What sources do you find valuable when scanning for emerging risks (list up to three)?

- *Wall Street Journal, YouTube, the Bible*
- *Horizon annual asset return study*
- *General news periodicals.*
- *News Articles, Bloomberg.*
- *Reports from international peers*
- *Foreign Affairs, The Economist, Other broad-view publications*
- *Financial Times and similar news sources; SOA information is also helpful*
- *General news, S&P global, SOA & CAS surveys, APCIA survey, GARP*
- *Reinsurers, SOA / CIA bulletins*
- *Emerging risks will come from out of usual sources. So check the largest number of potential information sources.*
- *LOMA, Industry trade groups, rating agency*
- *Industry trade groups, Rating agency, LOMA*
- *CIA/SOA/IAA*
- *internet, company political contacts, internal emerging results*
- *Twitter*
- *economic journals, market trend magazines*
- *IFoA*
- *FT, The Economist*
- *World Economic Forum, Leading insurers and reinsurers*
- *Gartner; Swiss Re; SOA-CAS*
- *Insurance news, Emerging risk reports, General news*
- *Swiss Re's Sonar Study*
- *This survey*
- *Industry surveys such as LIMRA emerging risk survey, Participation in industry groups such as LOMA Enterprise Risk Committee, Industry publications regarding emerging risks for life insurers*

- *Gartner does a quarterly emerging risk survey; we have also used this survey although timing can be too delayed - we do an internal reach out every quarter as well. Have also used Swiss Re's SONAR survey*
- *www*
- *Not sure*
- *Internal market scanning function.*
- *Internal communications, SOA communications*
- *In my work we mostly process information related to climate risk. The essential sources are the reports by the IPCC, which summarize the state of climate research and projections for future risks due to it.*
- *SOA articles, Reddit, news articles*
- *various*
- *news outlets, internal research group*
- *Fed Watching, General and investment news, Insurance Industry news.*
- *Wall Street Journal, SOA research papers.*
- *I scan anything possible*
- *SOA emerging risk study, LOMA ERM Committee surveys, Google search*
- *Major media publications; NY Times; Guardian*
- *Industry newsletters, consulting firm surveys and studies*
- *general reading, current events*
- *Wall Street Journal, Epoch Times, Hoover Institution Broadcasts*
- *Articles*
- *Internal SME's, Industry publications / knowledge sharing, Current Events*
- *Industry surveys, rating agencies*
- *Industry journals; professional journals; monitoring trending topics in popular space*
- *Confidential*
- *Nil*
- *books - Quammen, Michael Lewis, Jim Grant, Neil Howe, Robert Hagstrom, magazines - Economist, Nat Geo, Smithsonian, people - Dave Ingram*
- *This survey!*
- *ORX, InsuranceERM, general media*
- *WSJ, internet,*
- *CRO forum, PWC Insurance Banana Skins*
- *Fellow professionals, Bloomberg*
  Max Rudolph Financial and Hub International.

Question 8. Do you have any comments or suggestions for future iterations of this survey?

- *Look at some models which are predicting food shortages on a large scale.*
- *Allow for the identification of several key risks (individually), not just one.*
- *Time to give more focus to the #1 risk - climate change. There are so many aspects to the subject.*
- *The questions regarding ERM make it sound like it's assumed to be important. Is it really? If so, is it important from a regulatory point of view, or from a management point of view? If Apple had had a robust ERM function, would the iPhone exist?*
- *none*
- *Include sections that are specific for areas of practice for example Life - mortality, Disability - morbidity, catastrophic events due to climate change and pandemics*
- *better definitions*
- *Explain what bubbles are and unknown known risks.*
- *More education.*
- *Define risk manager - technically all actuaries are risk managers, right?*

- *Keep it up*
- *n/a*
- *Thank you to everyone who helps to make this survey a valuable tool.*
- *It is great that an executive summary is published but it still seems to take awhile to get it out*
- *If I had enough information about the topics involved, maybe. Otherwise no*
- *No.*
- *"'- It might be helpful to do rework the risk typology a bit (the 23 risks). I understand it is based on the WEF 2007 report, with modifications. While the list is fairly comprehensive, you could consider updating it with some more recent risks such as biodiversity loss, resource scarcity, food production and supply chain disruption. One simple source could be to review the recent WEF reports which reflect recent perceptions. Though also it's good not to bandwagon with the trends in the WEF reports, which tend to focus on current issues rather than longer-term thinking. But the option of adding further risks helps in this regard - you could expand that beyond two though.*
    - *Another thing that might be helpful is to categorize the risks a bit more. Right now there are some apples and oranges. For example, some risks are what I'd call slow-moving ""fundamental trends"" (e.g., climate change, demographic change and globalization shift), while others are fairly specific consequences of these trends (e.g., climate change => severe weather / national destabilization => failed states / demographic change + climate change => water scarcity). Another differentiation is that some risks are geographically limited (e.g., regional instability) while others are clearly global (again e.g. climate change and pandemics). But I recognize that such differentiations are difficult to build in. But you could, e.g., use the timeframes introduced at the beginning a bit more systematically (e.g., have a section on current risks (under which the survey would consider things with immediate impacts), followed by tactical risks (3-5 year timeframe) and then strategic risks).*
    - *Also, you might want to consider the value of the broad categorizations into economic, environmental, geopolitical etc. These have two problems: on the one hand, they can replace the specific things that people are actually concerned about with a general buzzword so they actually end up hiding some very interesting information. On the other, it seems the interconnections between risks today make it difficult to apply the categories consistently. Which leads me to one more idea for the report itself: I like the way the information about changes in risk perceptions across time (esp. in figure 6), but you could bring out interesting trends if you did this without the broad categories of economic, environmental, geopolitical, etc. and rather broke them down into the specific risks (including the ones added by the participants). This could be, e.g., a large table that shows the importance of each specific risk in a given year. That way you could see, e.g., what specific risks continue to be most important, where things appear, disappear or maybe reappear (e.g., nobody talks about ""failed states"" anymore, but today we'll probably see things like "polarization", "Russian aggression" and "global supply chain disruptions"), etc. I mean something similar to Figure IV of the 2019 WEF report, but better because that only shows the top 5, so it misses a lot of the fluctuations of risk perception across time.*

  Just a few thoughts from my perspective, which is perhaps a bit too sociological in this context, but hopefully interesting."
- *the risks mentioned are not independent, some are a consequence of others so difficult to choose.*
- *No, I think generically all the potential emerging risks are covered in the survey.*
- *This survey is really about "known" emerging risks and not about true potentially emerging risks. I think it should be phrased that way.*

- *This survey seemed to be mostly focused on economic and political risks. I would suggest that cultural risks can be just as catastrophic. The decline of marriage and family instability are the major determinant of a country's future, as weak families lead to less emotionally stable children who carry these issues into adulthood. The current push to normalize a clearly aberrant transgender ideology will lead to many unhealthy and unhappy adults. Massive lawsuits against the affirming agents within the medical and educational establishment will become a huge liability in the near future. "Woke" corporations will then experience a backlash as they lose the trust of their customers. This survey should be looking at this emerging risk.*
- *No*
- *N/A*
- *No, but I appreciate your conducting this survey every year -- please continue to do so. :-)*
- *Nil*

Thanks for your participation!

Researcher's Notes for Future Surveys

Add questions probing:

- What actions do you take between crises to add value?
- Currency shock—include risk of Bretton Woods–type overhaul

Review definitions:

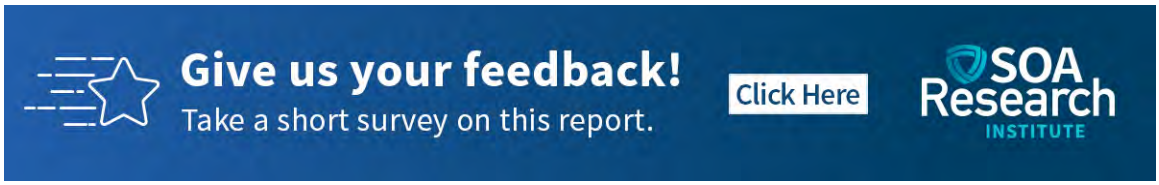
- Clarify where cyber goes – not terrorism and war

Consider ranking four primary questions – 23 points for number 1 down to 1 or 10 points for number 1 and no points for numbers 11 and later.

Consider building a "quilt" of rankings across all years of the survey by risk.

Appendix III: Survey Results 2021 and Earlier

Detailed results for prior surveys can be found at www.soa.org/resources/research-reports/2015/research-emerging-risks-survey-reports/



About the Casualty Actuarial Society

The Casualty Actuarial Society (CAS) is a leading international organization for credentialing and professional education. Founded in 1914, the CAS is the world's only actuarial organization focused exclusively on property and casualty risks and serves over 9,100 members worldwide. CAS members are experts in property and casualty insurance, reinsurance, finance, risk management and enterprise risk management. Professionals educated by the CAS empower business and government to make well-informed strategic, financial and operational decisions.

The purposes of the Casualty Actuarial Society are:

- To advance the body of knowledge of actuarial science applied to general insurance, including property, casualty and similar risk exposures
- To expand the application of actuarial science to enterprise risks and systemic risks
- To establish and maintain standards of qualification for membership
- To promote and maintain high standards of conduct and competence
- To increase the awareness of actuarial science
- To contribute to the well-being of society as a whole

In principle and in practice, the CAS values and seeks diverse participation within the property/casualty actuarial profession. In support of those values, the CAS encourages an inclusive community where differences are celebrated and all have the opportunity to participate to their fullest potential in its success. The CAS commits time and resources to accomplish this objective.

Actuaries are required to adhere to the high standards of conduct, practice and qualifications of the actuarial profession, thereby supporting the actuarial profession in fulfilling its responsibility to the public.

The Casualty Actuarial Society

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About the Society of Actuaries Research Institute

Serving as the research arm of the Society of Actuaries (SOA), the SOA Research Institute provides objective, data-driven research, bringing together tried and true practices and future-focused approaches to address societal challenges and business needs. The institute provides trusted knowledge, extensive experience and new technologies to help effectively identify, predict and manage risks.

Representing the thousands of actuaries who help conduct critical research, the SOA Research Institute provides clarity and solutions on risks and societal challenges. The institute connects actuaries, academics, employers, the insurance industry, regulators, research partners, foundations and research institutions, sponsors and non-governmental organizations, building an effective network which provides support, knowledge and expertise regarding the management of risk to benefit the industry and the public.

Managed by experienced actuaries and research experts from a broad range of industries, the SOA Research Institute creates, funds, develops and distributes research to elevate actuaries as leaders in measuring and managing risk. These efforts include studies, essay collections, webcasts, research papers, survey reports, and original research on topics impacting society.

Harnessing its peer-reviewed research, leading-edge technologies, new data tools and innovative practices, the institute seeks to understand the underlying causes of risk and the possible outcomes. It develops objective research spanning a variety of topics with its strategic research programs: aging and retirement; actuarial innovation and technology; mortality and longevity; diversity, equity and inclusion; healthcare cost trends; and catastrophe and climate risk. The Institute has a large volume of topical research available, including an expanding collection of international and market-specific research, experience studies, models and timely research.

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