

15th Emerging Risks Survey

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15th Survey of Emerging Risks

AUTHOR

Max J. Rudolph, FSA, CFA, CERA, MAAA
Rudolph Financial Consulting, LLC

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15th Survey of Emerging Risks

This survey attempts to track the thoughts of risk managers about emerging risks across time. It is the 15th survey of emerging risks sponsored by the Canadian Institute of Actuaries (CIA), 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 2021, a period that overlapped with the COP26 climate conference in Glasgow, Scotland. While the world's primary risk was COVID-19, which continues to surprise us today with new symptoms and variants, the year also set records for wildfires and extreme weather events.

The last few years seem to be showing the importance of interactions between risk events. Narrative-based scenarios which try to tie everything together are used by climate scientists to great effect. For example, a scenario with large releases of greenhouse gases will also lead to lower economic growth, greater risk of zoonotic diseases (spillover) and antimicrobial resistance. Combined with demographic trends, pressure remains on interest rates to remain low, with periodic spikes when government printing presses are used to create debt, leading to inflationary pressures. These interactions in today's environment create situations we have not seen before. Using historical data, especially when linearity is assumed, will not work. Analysts need to work from first principles and become creative about the future, using foresight that comes from centuries of research around higher-order interactions and tipping points.

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 program¹ 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, 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/EmergingRisks_16571181391190/1_HeatMapTimeSeries?.iid=3

2. Heat Map: One Year at a Time

https://tableau.soa.org/#/site/soa-public/views/EmergingRisks_16571181391190/2_HeatMapOneYearataTime?.iid=3

3. Histogram: Time Series

https://tableau.soa.org/#/site/soa-public/views/EmergingRisks_16571181391190/3_HistogramTimeSeries?.iid=3

4. Histogram: One Year at a Time

https://tableau.soa.org/#/site/soa-public/views/EmergingRisks_16571181391190/4_HistogramOneYearataTime?.iid=3

5. Average

https://tableau.soa.org/#/site/soa-public/views/EmergingRisks_16571181391190/5_Averages?.iid=3

Section 1: Executive Summary

The year 2021 seemed at times like an extension of 2020, with pandemic and environmentally driven events dominating the news and financial stimulus potentially setting the table for economic risks to return. Since the survey closed in November, surges in COVID-19 internationally have been regional but overall remained steady. More data has come into view showing the indirect costs of the pandemic on mortality as lockdowns have their own cost, and additional information is being collected as long COVID is reported. Flooding in Europe, drought in North America, global inflation and the invasion of Ukraine by Russia are already making the 2020s a momentous decade.

This evolution of risks is captured in the *15th Survey of Emerging Risks*, completed in November 2021. These events provide data but, more importantly, serve as an environmental scan of risks where scenarios should be developed to determine what risks matter to a specific block of business. Anticipating how these events interact with other risks is one way a risk manager adds value. Climate change and growing government debt creates conditions where a geopolitical or economic risk may differ in how it plays out than previously. Here is an example. A warming climate is causing glaciers to shrink. These glaciers have historically provided fresh water to people, crops and animals in many countries. Scarce water leads to geopolitical stress and conflict. Forced migration causes societal and economic tensions in countries where the displaced population goes. The movement carries regional endemic diseases to new areas. Tipping points are everywhere, and those who assume linearity are likely to have oversimplified their decision making.

The Great Resignation has been an issue that impacted many firms, and risk management teams were no exception. Concerns about retaining risk team members, as well as recruiting new members to the team, have been challenges.

The responses across all questions show reduced perceived risk from pandemics from the previous survey. Several open-ended questions solicited respondent's experience with planning for a pandemic, both prior to the current event and looking forward. While the previous survey focused on how risk teams had successfully led work-from-home initiatives, responses in the current iteration transition to discuss how the risk team is involved in strategic planning.

1.1 Survey Framework

The survey is completed annually (except in 2008, which included two iterations, spring and fall), generally during 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 select 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 economic inequality, racial inequality and food insecurity.

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*

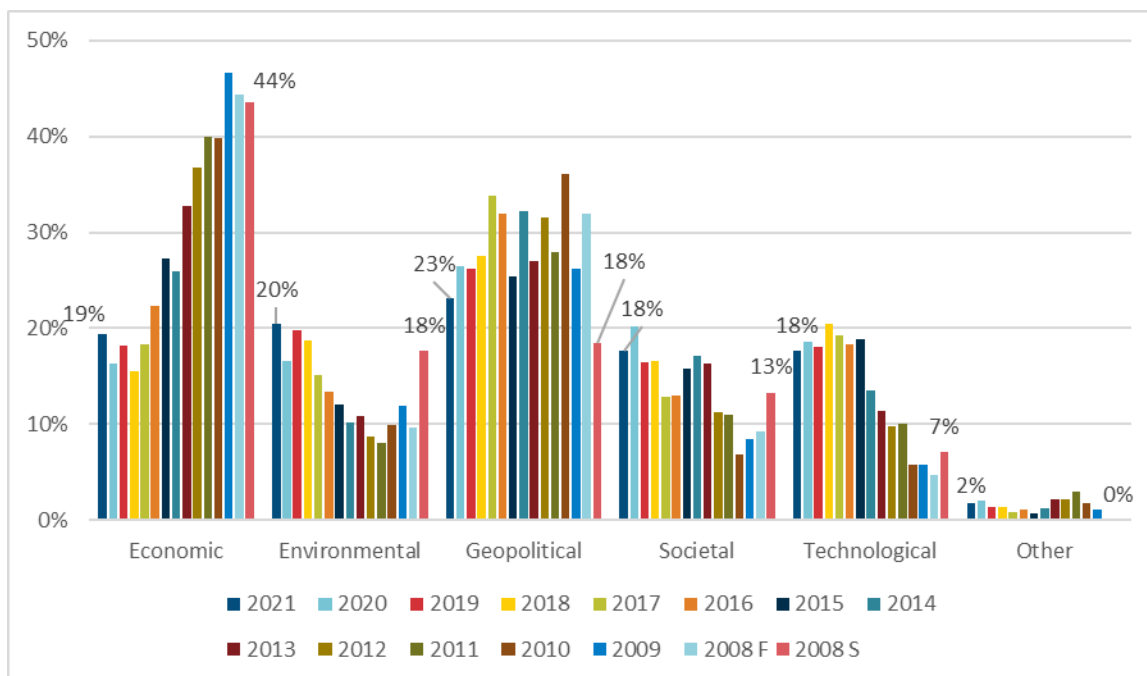
Technological Risks

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

1.2 Top Five Emerging Risks

The results continue to show interesting trends, although some of those trends were broken in this 15th 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 fell 3% from the prior survey (23% of the total chosen when up to five emerging risks were selected) but maintained the top category response, as Environmental moved into second place (20%), just ahead of Economic (19%). While only 5% below the leader, Societal (18%) and Technological (18%) had the lowest response rate. The Economic and Environmental categories each rose by 3%. The uppermost choice (although not ranked among the top five risks overall) from the Geopolitical category was *Wars (including civil wars)* (24% of respondents chose it in their top five, down 1% 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 *Climate change* (58%) and *Loss of freshwater services* (15%). New lows were recorded by *Emergent nation destabilization* (12%) and *Terrorism* (17%). From the prior iteration of the survey, five of the seven Geopolitical risks were lower, and none higher.

Climate change remains the top response to this question, focused on the top five emerging risks for respondents, followed by *Cyber/networks* and *Disruptive technology*.

The evolution of the top five risks chosen provides evidence that trends can be relied on in this survey, and the general continuity between survey iterations adds credibility (the top five are the same as the previous survey). As shown in Table 1, several risks have remained consistently at the top over the past four years.

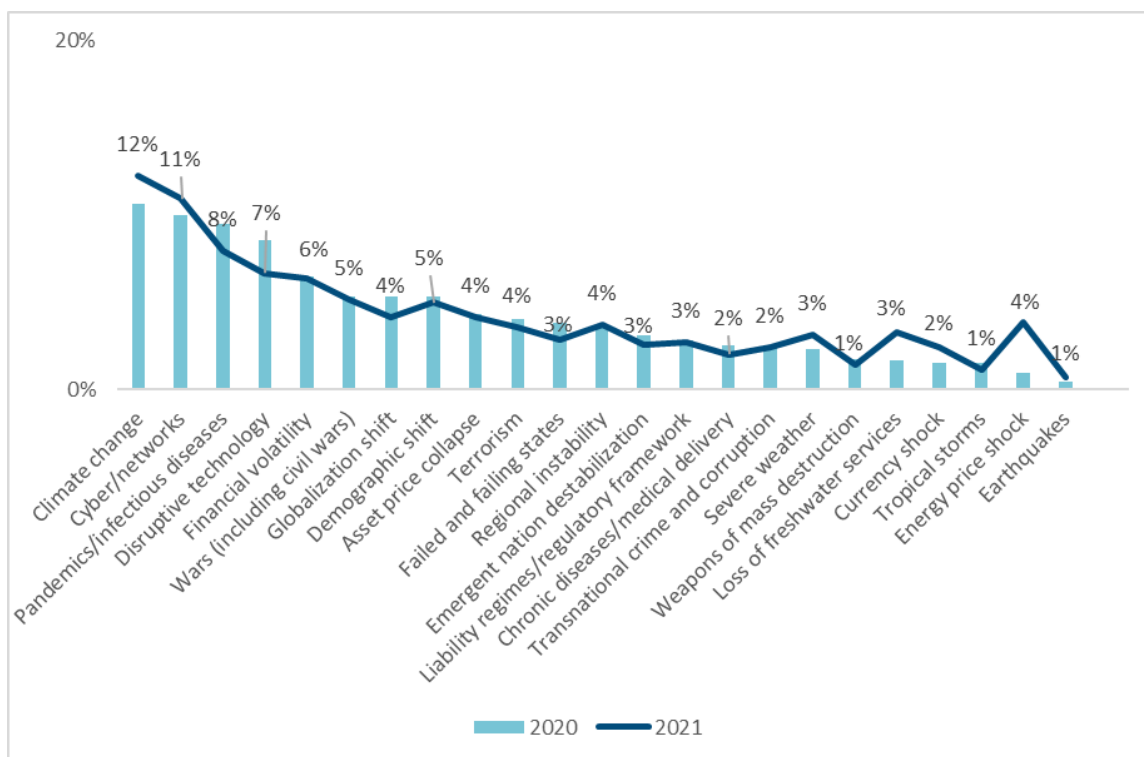
Table 1
Top Five Emerging Risks, 2018–2021

Year	2018	2019	2020	2021
1	Cyber/networks	Climate change	Climate change	Climate change
2	Climate change	Cyber/networks	Cyber/networks	Cyber/networks
3	Disruptive technology	Disruptive technology	Pandemics/ infectious diseases	Pandemics/ infectious diseases
4	Demographic shift	Demographic shift	Disruptive technology	Disruptive technology
5	Financial volatility	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* had the largest increase, from 4% to 18%, *Climate change* was up 8%, *Loss of freshwater services* up 7% and *Cyber/networks* was up 5%. Three risks were down 5% or more, including *Failed and failing states* (5%), *Pandemics/infectious diseases* (7%) and *Disruptive technology* (8%).

Figure 2 shows the results for the top five emerging risks from the most recent two surveys, listed in order of the rankings from 2020, highlighting the volatility between years for a few risks. The increase in many of the bottom seven risks relative to the prior survey gives this question a contrarian feel, especially *Energy price shock* and *Currency price shock*, which have both been active risks recently.

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 *Cyber/networks* increasing by 10% while remaining a distant second.

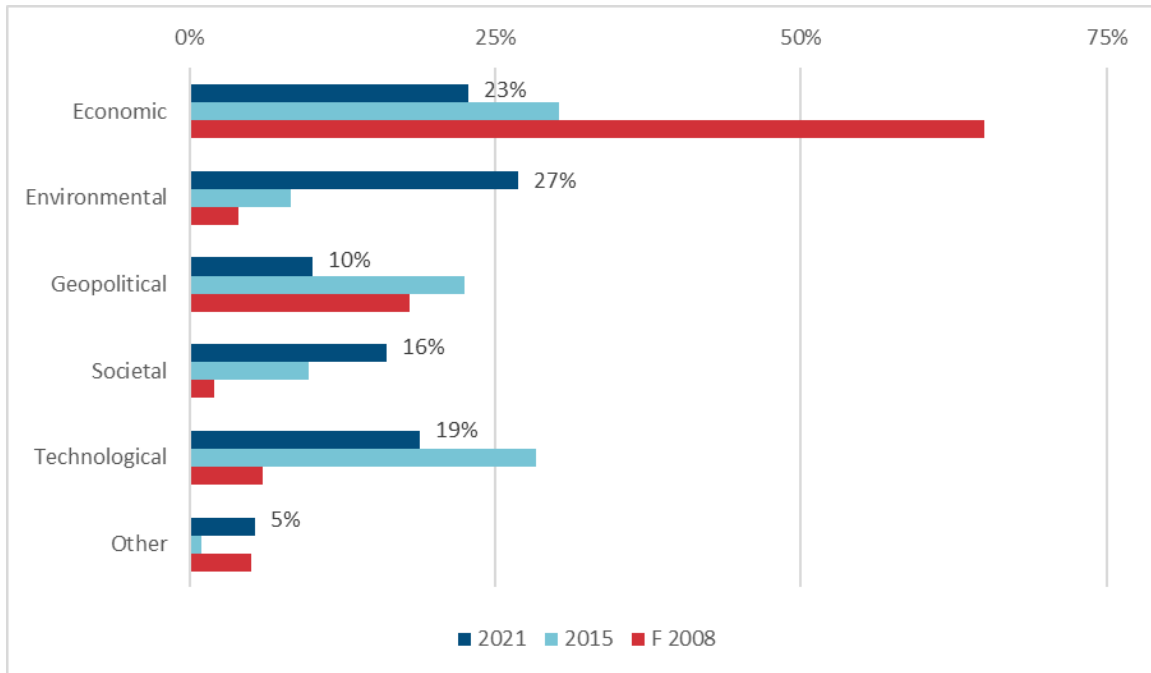
The results for the top emerging risk question were as follows (61% of respondents selected one of the top five, up slightly with the previous survey):

1. *Climate change* (steady at 26%)
2. *Cyber/networks* (13%, up from 3%, and the largest absolute gain)
3. *Financial volatility* (10%, up from 7%)
4. *Demographic shift* (7%, up from 4%)
5. *Disruptive technology* (6%, down from 15%, and the largest absolute loss)

Pandemics/infectious diseases dropped out of the top five, falling from its overall peak of 8% to 5%. Three Environmental risks were the only ones not chosen, *Loss of freshwater services*, *Natural catastrophe: tropical storms* and *Natural catastrophe: earthquakes*. *Climate change* responses kept the Environmental category in a solid lead (27%, down from the previous year's 29%), just ahead of the Economic category (23%, up from 15%, and at its highest level since 2016). The Societal category recorded its highest level, and Geopolitical its lowest, in the history of the survey.

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

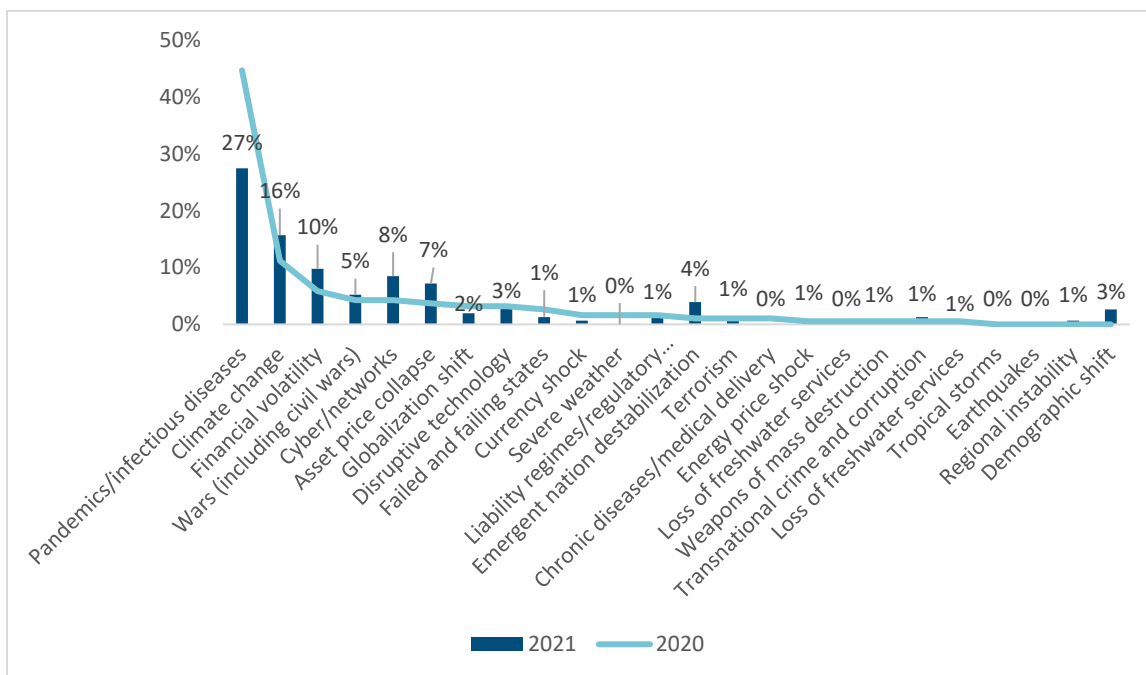
Figure 3
 Top Emerging Risks by Category—Single Greatest Impact
 % of Responses in Given Year



1.4 Top Current Risk

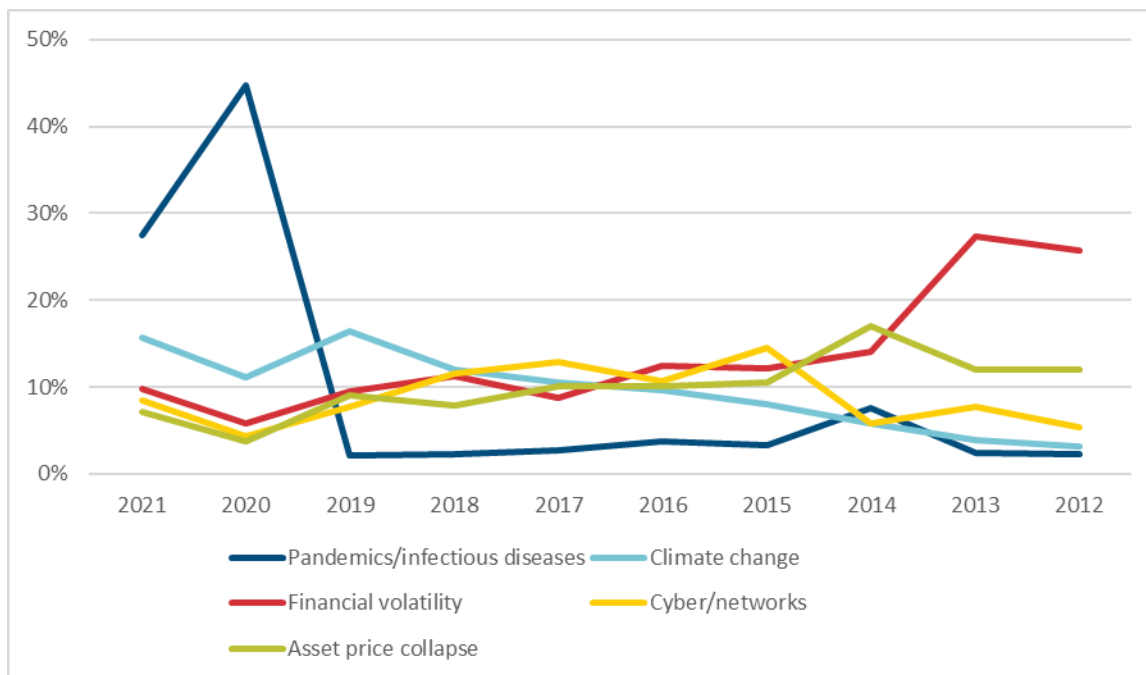
Not surprisingly, the top current risk in 2021 remained *Pandemics/infectious diseases*, but it fell from its survey high of 45% in the prior survey to 27%. Five risks received no support: *Loss of freshwater services*, *Natural catastrophe: tropical storms*, *Natural catastrophes: earthquakes*, *Natural catastrophes: severe weather* and *Chronic diseases/medical delivery*.

Figure 4
 Top Current Risk, Year Over Year
 % of Responses in Given Year



When looking at the 2021 list of top current risks over the last 10 surveys in Figure 5, one can see the stories unfold of a sudden pandemic, slow buildup in realization that climate change will impact traditional actuarial practice areas and the growing distance from the great financial crisis. 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. *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 top three risks chosen in combination were the same as the previous survey, but in a different order: *Climate change*, *Cyber/networks* and *Financial volatility*. Interestingly, no combination of these three risks appears in the top five. Overall, the Economic and Environmental categories moved up and the Geopolitical and Societal categories moved down.

These are the top five combinations that were selected:

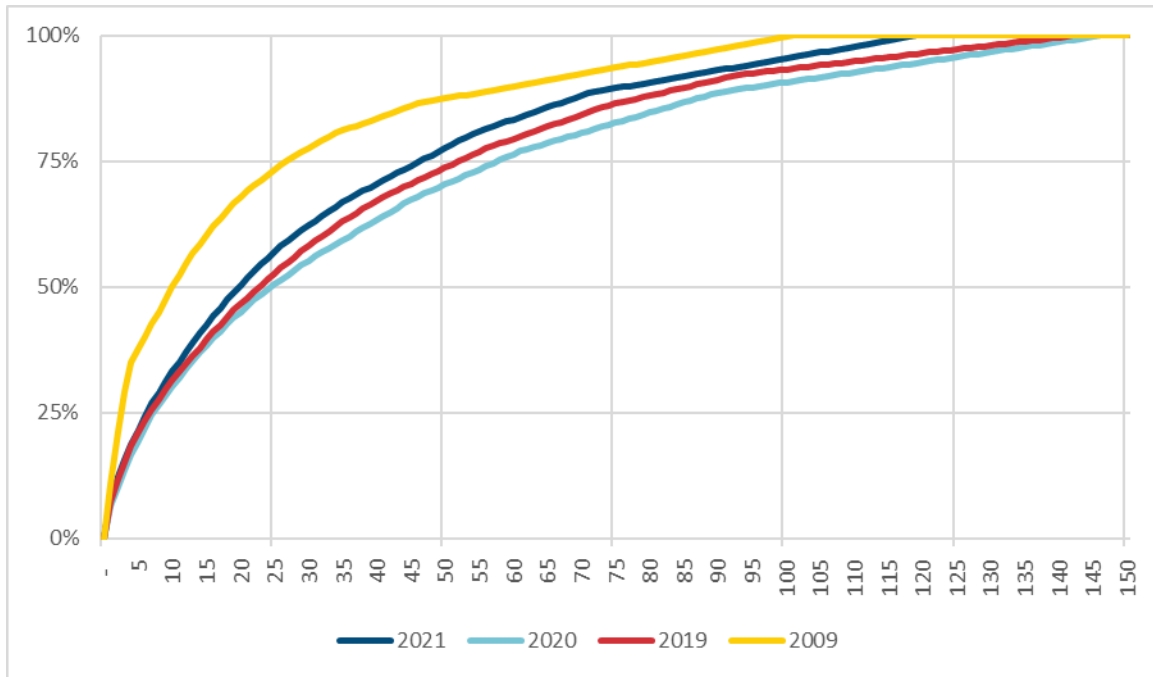
1. *Cyber/networks* and *Disruptive technology*—8%
2. *Asset price collapse* and *Financial volatility*—5%
3. *Pandemics/infectious diseases* and *Chronic diseases/medical delivery*—3%
4. *Climate change* and *Loss of freshwater services*—3%
- 5T. *Climate change* and *Natural disasters: severe weather*—3%
- 5T. *Terrorism* and *Cyber/networks*—3%

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

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 result recorded so far, so we compare the most recent three survey results against it. A curve closer to

2009 is more concentrated, with more risk combinations being chosen by fewer pairs of risks. As shown in Figure 6, the distribution of results was more concentrated than in the prior two surveys.

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 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 risk drives both the top current risks and the top emerging risk categories higher. These results are currently upended by an anomaly driven by the presence of a dominant risk. *Climate change* drives the Environmental category higher for the top emerging risk and *Pandemics/infectious diseases* drives the Societal category higher for the top current risk.

Figure 7
 Category Comparison Across Four Questions
 % of Responses to Given Question

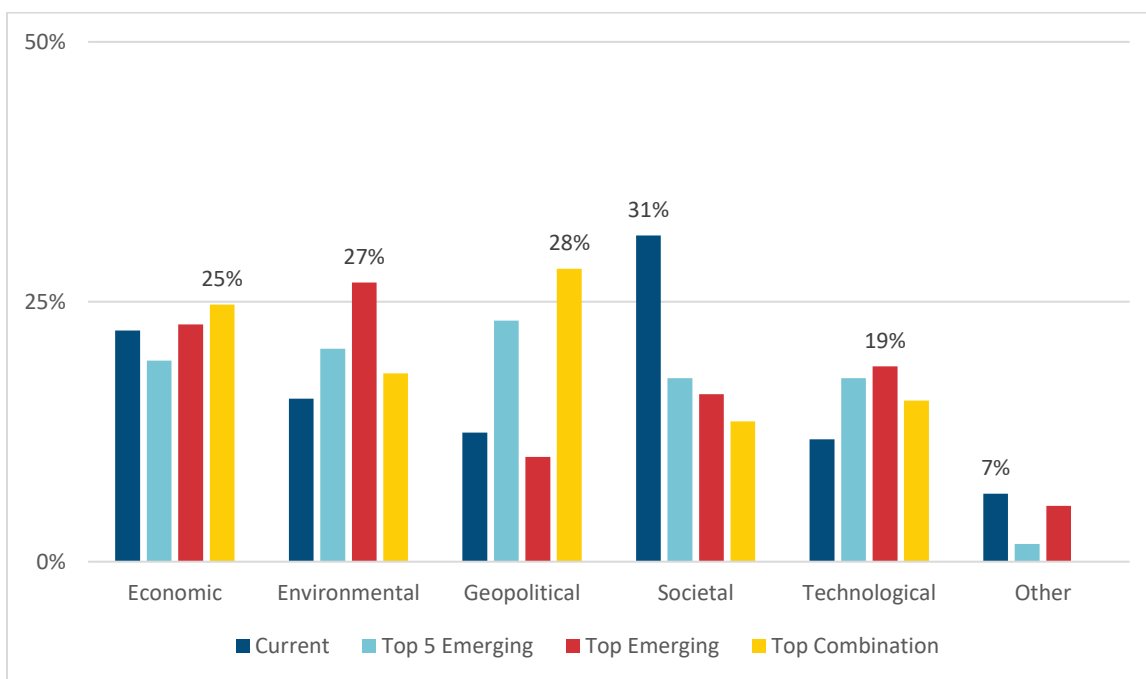
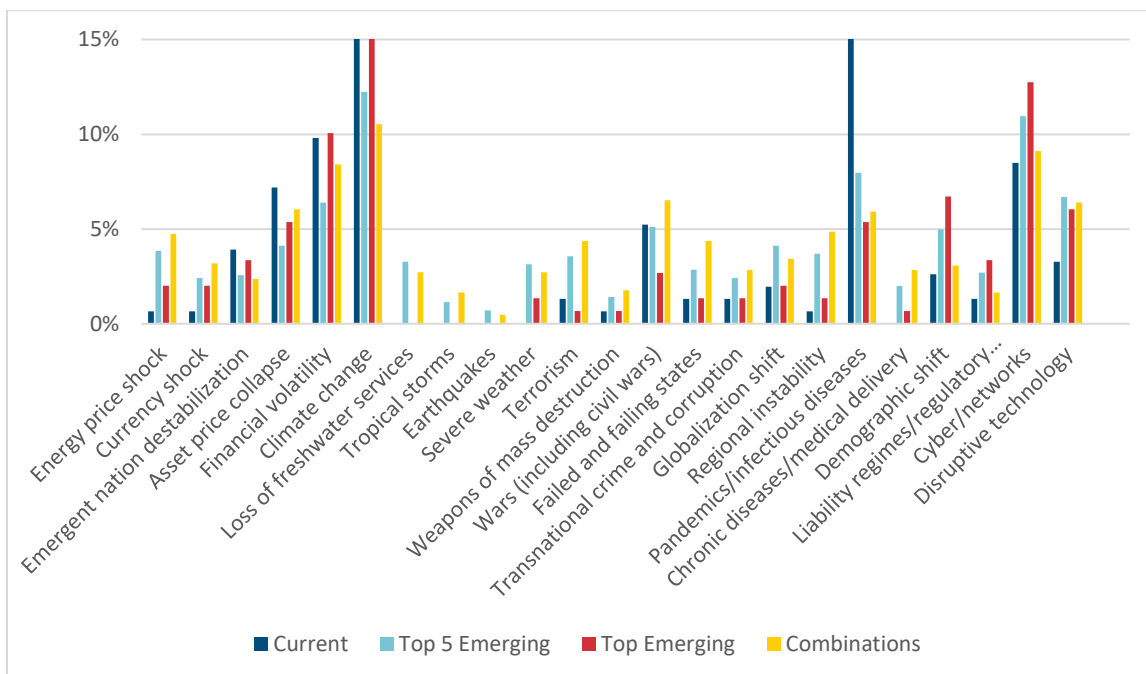


Figure 8 compares the current risk results with the top five emerging risks, top emerging risk and combinations at the individual risk level. Hypothesizing why there are discrepancies is useful, and readers may come to different conclusions. (Ed. note: This chart includes information that is located elsewhere but visually highlights the top risks and those that vary, like *Pandemics/infectious diseases*, 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 between the majority of 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 between results for the four questions. The comments below reflect the researcher’s interpretation; the that of the reader may differ.

- The top risk with the greatest disparity favoring the current risk over the top emerging risk is *Pandemics/infectious diseases* (22.1%). With COVID-19 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* (9.8%). 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 *Loss of freshwater services* (3.3%). 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* (13.3%). 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 *Pandemics/infectious diseases* (19.5%). This risk is likely to have temporarily surged and is expected to mean-revert.
- The top risk with the greatest disparity favoring the top five emerging risk over the top current risk is *Disruptive technology* (3.4%). This risk is important but it’s not yet clear how the risk will evolve.

1.7 Risk Manager Grouping of Results

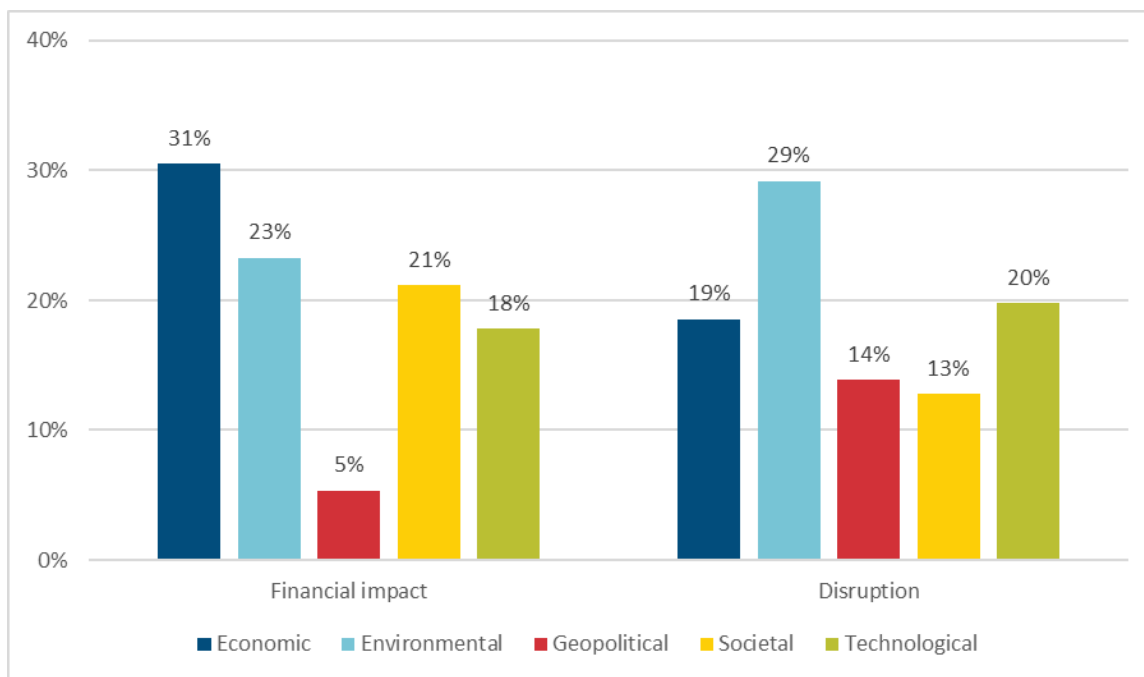
In an initial question, respondents are asked how they define greatest strategic impact. Six options are provided, with three focused on financial impact and three on disruption.

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

- 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

For the first time, the survey looked at results for the four primary questions split between these answers. Provided here (with all questions 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 Geopolitical ones, but it’s 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, you see higher results for the Economic and Societal categories if financial impact is used to define greatest strategic impact and for Geopolitical and Environmental risks if disruption was preferred.

1.8 Impact of COVID-19 Environment on Risk Evaluation and Risk Mitigation

Responding to an open-ended question about how risk evaluation and risk mitigation had changed since the onset of COVID-19, responses focused more strategically than those received in the previous survey to the same question. While some noted the need to fight back against conspiracy theories, most comments

were positive and suggested a growing importance for risk discussions. Specific examples included practical elements of solutions, challenges of contract wording for future events and a need to consider supply-chain risks.

Noticeably absent again were references to asset planning or concerns about liquidity, although the large March 2020 drops in asset values created large liquidity concerns and opportunities. At that time, government stimulus and guarantees stabilized the risk, but growing debt may force those with assets under management to face those risks themselves going forward. Risk mitigation plans based on an assumed bailout should be made transparent. We have seen many financial institution insolvencies that resulted from liquidity issues in combination with other risk issues. For those with previously conservative balance sheets, the pandemic provided an opportunity to be a source of liquidity and benefit from the temporary increase in spreads, with the proverbial babies in the bathwater strategy, where relatively high-quality assets suffered reduced values beyond what is reasonable.

Respondents were asked to share instances where enterprise risk management (ERM) had been used in a positive way. In addition to positive comments about the success of business continuity plans for white-collar employees, examples included electric vehicle disruption, health insurers covering COVID testing and government involvement in unemployment and severance funding. Some found the COVID environment an opportunity to discuss ERM tracking and to demonstrate the value of mitigation efforts, while others recognized risks and lobbied political representatives to mitigate risk.

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 demographics and insurance products that could help with future risks (e.g., voluntary unemployment insurance). Concerns were noted about alternative asset classes where downside correlations were not well understood, while others were looking for climate-driven asset impacts and low leverage on balance sheets.

No respondents argued that there is no such thing as a bubble (that is, market prices are always deemed correct), perhaps for the first time since this question was added to the survey. Respondents identified quite a few potential bubbles, and some noted that the concept could apply to political debate, monetary policy, insurance web portals and staffing shortages. More traditional responses included housing (including private equity buying up rental supply) and certain types of housing (e.g., coastal). Several mentioned alternative asset classes, including cryptocurrencies.

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 “new normal” be post COVID? What assumptions should be made for long-COVID, post-COVID mortality and mortality trends generally. Other concerns related to cyber incidents, changing weather and impact on claims, genetic testing, resiliency for business continuity and low interest rates.

1.11 Leading Indicators

As formal risk appetite policies and regulatory processes stabilize, only 40% of respondents formally identify emerging risks. A large subset of this group identifies leading indicators for some emerging risks, and most who do also have criteria for action based on them. Examples of the process include tracking sales exposure to monitor concentration trends and mortality exposure to frontline workers. One respondent shared that they look out 3–5 years and generate a living heatmap covering 10–12 impactful emerging risks that shows frequency and severity for the current fiscal year.

1.12 Risk Versus Return

In a result not seen since 2016, nearly two-thirds of respondents (63%) said ERM had a positive effect in their company/industry, and 42% noted that ERM improved returns relative to risk (with only 7%, the lowest in the survey, saying it did not). One respondent noted that the discipline inherent in ERM has higher-order benefits that allow for quicker recovery after an event, better control of worst outcomes and higher returns relative to risk when considered across an entire cycle for the risk. A “check box” mentality should be avoided.

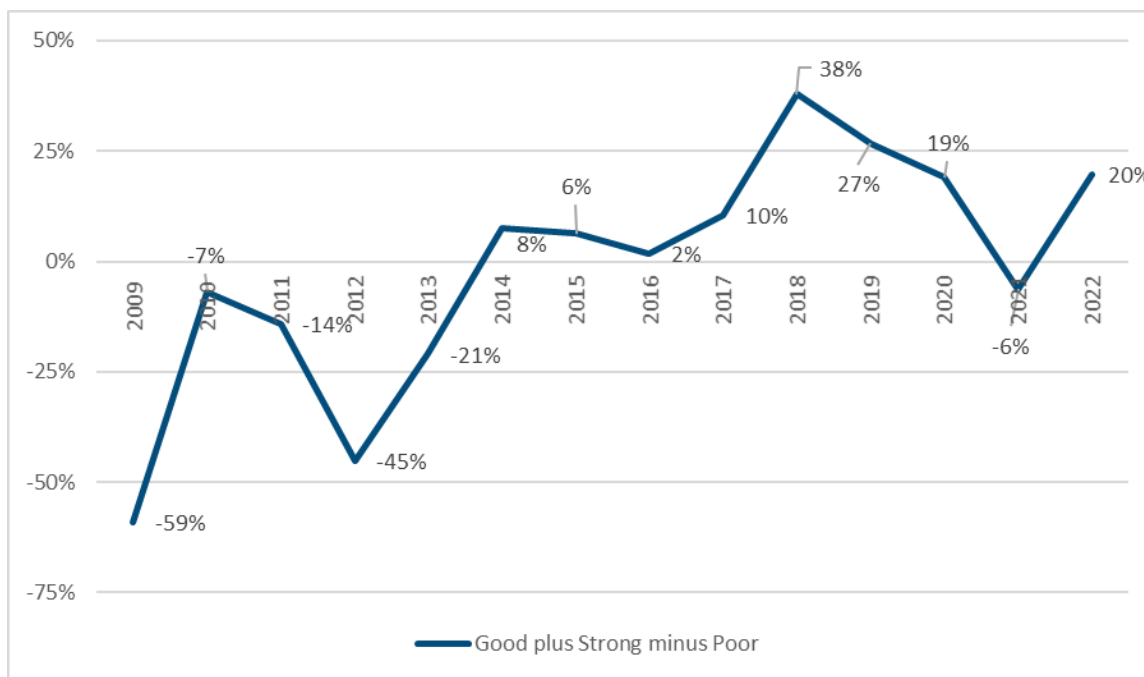
Respondents who stated that ERM does not improve returns relative to risk were concerned that it is too abstract, a fad, and that it puts a firm at a disadvantage until the crisis finally arrives.

The respondents who answered *Not sure* about the effect of ERM at their company noted the importance of avoiding overconfidence that ERM has protected them from all risks. One of the most accurate responses stated that the answer is *Yes* for companies that do it well and *No* for those that do not. Putting the ERM team at the table when opportunities are being discussed is important, moving risk beyond a compliance exercise.

1.13 Economic Expectations

Respondents were more upbeat about global economic expectations for 2022, with a net (Good plus Strong minus Poor) of 20%, up from -6% in the prior survey, as shown in Figure 10. This reverses a three-year downward trend and was higher only in 2018 and 2019. Events since November clearly were hard to anticipate.

Figure 10
 Combined Good + Strong Economic Expectations
 % of Responses

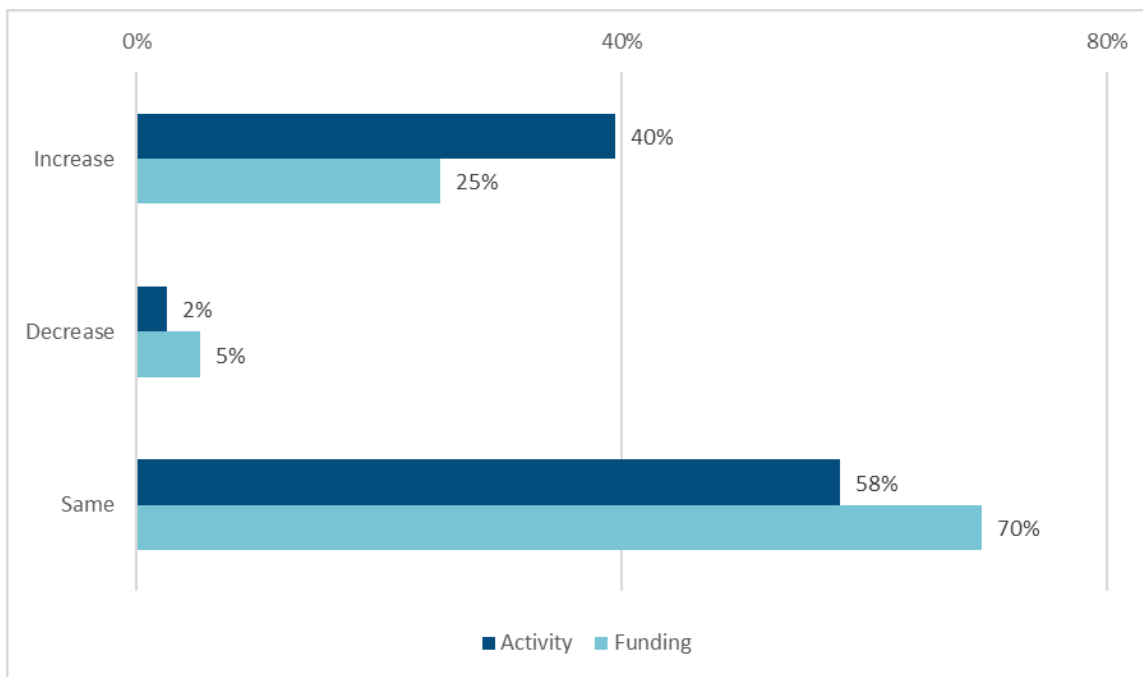


1.14 Risk Activities and Funding

Half of respondents reported that activities related to ERM continued to grow in 2021 (but only 20% of respondents reported experiencing staff growth), with 40% expecting activity growth in 2022. As seen in Figure 11, only 25% of respondents anticipate an increase in 2022 funding. Risk managers continue to

improve efficiency as they complete implementation of projects related to regulatory requirements. In a year 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 strategic.

Figure 11
 Anticipated ERM Levels in 2022
 % of Responses to Given Question



1.15 Strategic Opportunities

Nearly all (90%) of risk managers reported that they have input (a seat at the table) during strategic opportunities and nearly 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 all questions except top current risk, where it is second. It is especially dominant as the top emerging risk.
- *Pandemics/infectious diseases* dominated the top current risk with a higher percentage than the combined total of the next two ranked risks.
- By category, responses are fairly evenly distributed except for instances where a single risk dominates the question. For example, *Climate change* pulls up the top emerging risk for the Environmental category and *Pandemics/infectious diseases* pulls up the top current risk for the Societal category.
- The Geopolitical category maintained its top ranking for top five emerging risks despite having no individual risks ranked in the top five.
- Risk events were widespread but some risks did not increase with them; e.g., tropical storms, severe weather. Others, like *Globalization shift*, seem to be less important as risk managers become accustomed to populism and political extremes.
- Risk managers tend to segregate between those who define strategic impact through financial and disruption lenses. Their responses vary based on this focus. Combining this diversity on a risk team may provide benefits as risks are more likely to be considered and discussed.

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, as retention and recruiting became more difficult.
- Risk teams were involved with implementing business continuity plans when the pandemic scenario became a reality and many are seeing enhanced duties as a result. Asset risk management needs to increase its status as a part of ERM. Liquidity risk may interact with alternative asset classes to be a problem for some firms in the future.
- Leading indicators are being generated for emerging risks and actionable criteria established for some risks at best-practice companies but the practice is not spreading.
- Risk combinations in scenario planning and risk assessment should continue to be built up, with narrative scenarios a natural next step for internal and regulatory risk management purposes.

2.3 Conclusions

The decade of the 2020s is off to a resounding start. We have already seen a global pandemic, political insurrection, a European war, global inflation and all kinds of weather-related events that would have been unlikely without global warming. The *15th Survey of Emerging Risks*, compiled in November 2021, provides a snapshot during this period. Risk teams appear to have done a good job during the work-from-home transition, with some capitalizing on that success to accept greater responsibilities. In some places the survey seems to anticipate breakouts of risk, perhaps in the Economic category, while others seem contrarian (Geopolitical). The threat multipliers that are created from risk combinations, built into a narrative that looks beyond linear changes to include tipping points and higher-order interactions between risks like climate change, financial volatility and regional instability, are likely to be important for many years.

The pandemic, and now the war in Ukraine, 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 and provide it in story form so senior management and other decision makers can decide what risks they are comfortable holding. If assumptions aren't stable for the next 40 years, for either assets or liabilities, then how can an actuary feel comfortable pricing a product over that time span?

Risk managers have a hard job. They are the people who need to tell others when shortcuts were taken, like using non-predictive historical data, to price and manage risk. Many times, management seems to prefer ignorance of a risk rather than to address it proactively. A risk team can be a great source of talent for business and corporate units if members are allowed to develop a broad perspective of risk. The skill set of looking at risk interactions and considering the marginal impact of decisions adds value that is hard to teach.

Emerging risks play a key part in preparing for the future. Unknown knowns, where historical data is not predictive, need experienced practitioners to anticipate non-linear assumption changes. Planning proactively for change was shown effective during the pandemic, even if the change did not match up exactly to the actual outcome. Many risk managers understand their company better than anyone. Let them shine! Opportunities await those who accept the challenge.

Section 3: Background

This research project was sponsored by the Joint Risk Management Section (JRMS) of the CIA, CAS and SOA (thanks to the Financial Reporting and Reinsurance Sections).² 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 CERA Global Association, the International Actuarial Association (IAA) ERM Section and social media such as Twitter and LinkedIn groups related to risk management. A total of 153 responses were received. This represents a material percentage relative to the number distributed (more than 2,500 to the JRMS). This is the 15th survey completed in the research series. Many questions generate sustained trends that suggest conclusions, but the results continue to evolve as the time since the financial crisis lengthens and geopolitical changes occur. In recent years, concerns over cyber issues and climate change increased and, of course, in 2020 the COVID-19 pandemic was a great concern. 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 and November 2020. The current-year survey was conducted in November 2021, coinciding with the COP26 climate conference in Glasgow and closing just before 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

October 2011—Fifth survey

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

October 2012—Sixth survey

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

- 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/>

Rather than developing a unique set of emerging risks for consideration when the survey was first developed, the research team chose one originally created by the World Economic Forum (WEF). The WEF reports (annually since 2007) can be found at www.weforum.org. The 23 risks used in this survey are described in detail in Appendix I. They differ slightly from those in previous years. The current survey

questions have also evolved over the years, with the base questions stable and open-ended questions replaced once information received had stabilized.

Some definitions were updated to reflect current common risk definitions. 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 a few 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 Dave Ingram, Steve Hodges, Victor Chen, Sandee Schuster, Brian Fannin, Jan Schuh and David Schraub 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:

Max J. Rudolph, FSA, CFA, CERA, MAAA
Rudolph Financial Consulting, LLC
11981 Ballpark Way, Apt 426
Papillion, NE 68046
402-895-0829
max.rudolph@rudolph-financial.com
www.rudolph-financial.com
Twitter: [@maxrudolph](https://twitter.com/maxrudolph)

Section 4: Results

The *15th Survey of Emerging Risks*, sponsored by the Canadian Institute of Actuaries (CIA), Casualty Actuarial Society (CAS) and Society of Actuaries (SOA, with specific thanks to the Financial Reporting, Reinsurance and Joint Risk Management Sections, consisting of members from each of the three sponsoring organizations) includes sections covering current risks, emerging risks, leading indicators, ERM and current topics. Highlights of each section are presented here, with complete results found in Appendix II. Appendix I shares individual risks and their definitions, derived over the 15 iterations of the survey. Respondents submitted a total of 153 surveys (down from 188 in the prior survey). The survey requests individual rather than formal company responses. It uses an anonymous electronic format that encourages the expression of individual opinions rather than company positions. 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 of the comments, compiled in Appendix II, and compare their 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.

4.1 What Changes in Responses Mean

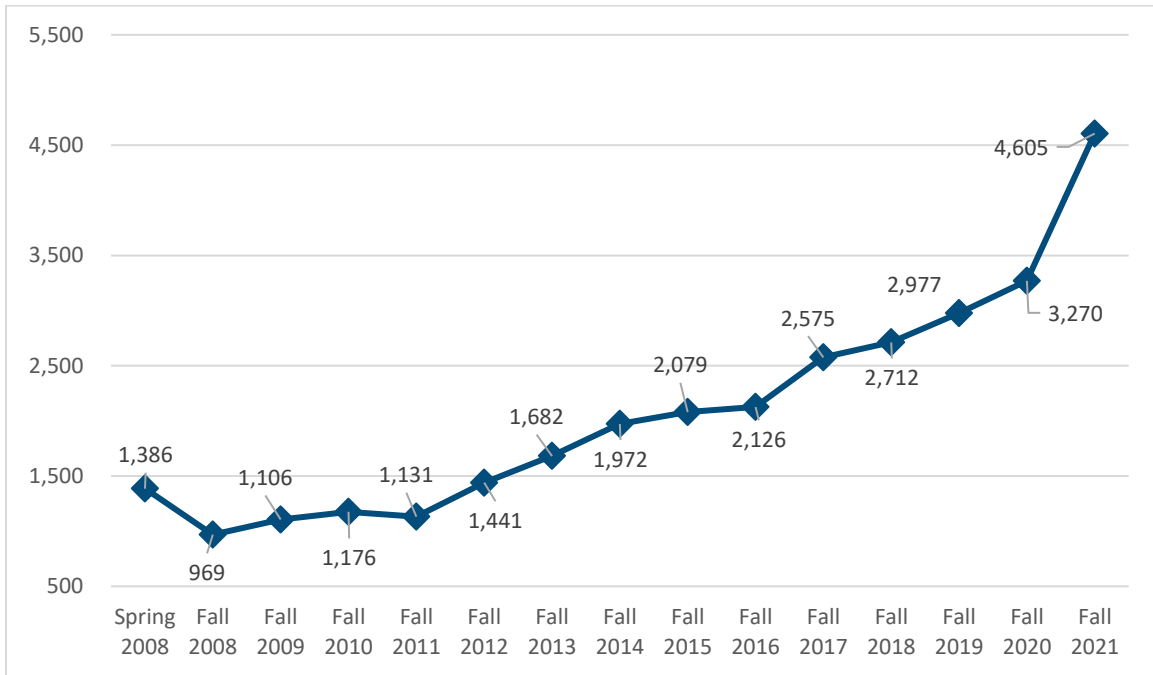
Note that each survey is taken at a different point in history, so the same risk managers do not necessarily respond. This year, 63% of respondents reported that they also participated in the past and 51% have been a risk manager for at least 10 years. Repeat respondents, especially those with great familiarity of the topic, might be more likely to change their responses based on new or recent experiences. While the actual results (to the near one percent) are provided, the survey should be interpreted based on directional and relative changes between iterations. Increases and decreases in response rates, and relative to the average, 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.

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. 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.

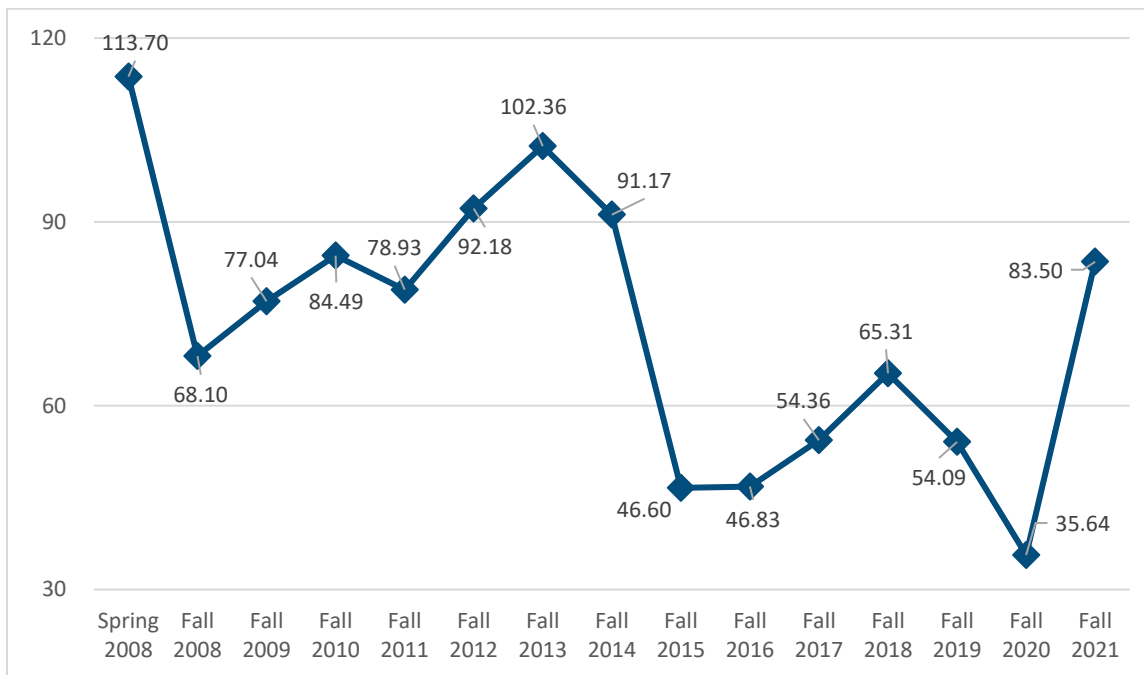
Figure 12
S&P 500, 2008–2021



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, 2021.

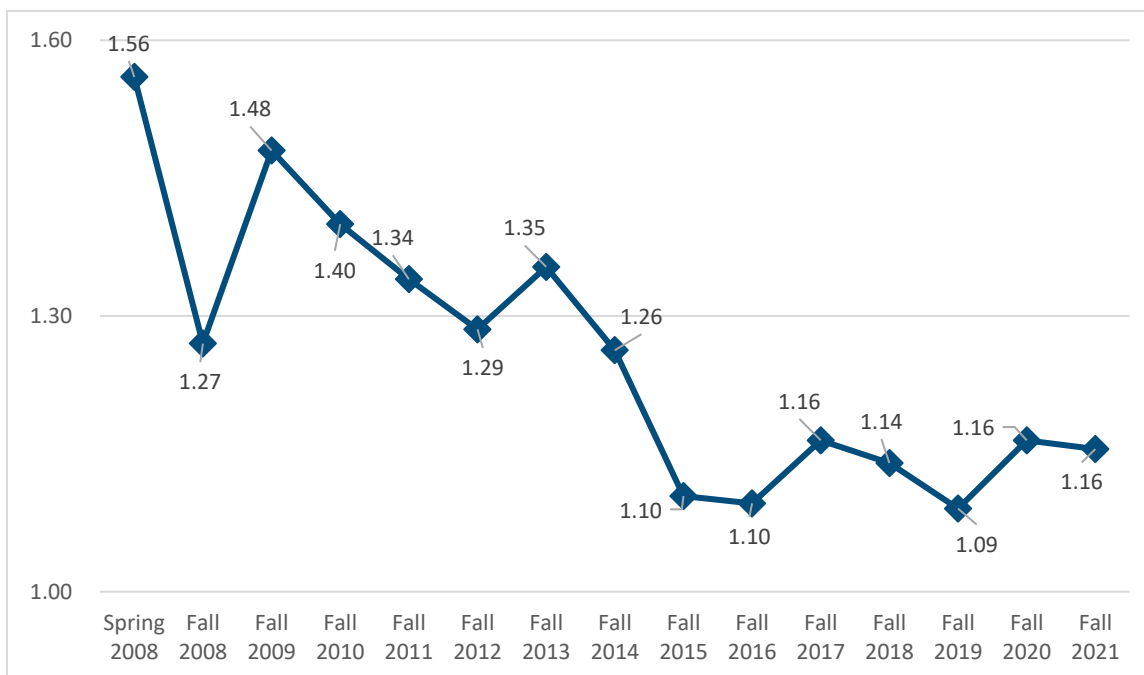
Figure 13
Price of Oil, 2008–2021

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=RWT&f=D

Figure 14
Exchange Rate, U.S. Dollars per Euro, 2008–2021



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 2021 arrived with a vaccine against COVID-19 but with many of the same issues tied to climate change and geopolitical intrigue. Since the survey closed, Russia invaded Ukraine, influencing oil, inflation and food security, the dollar has strengthened, and severe weather and wildfire events are occurring regularly at unusual times and places.

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%)
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 previous, 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 as 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%)

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.

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)

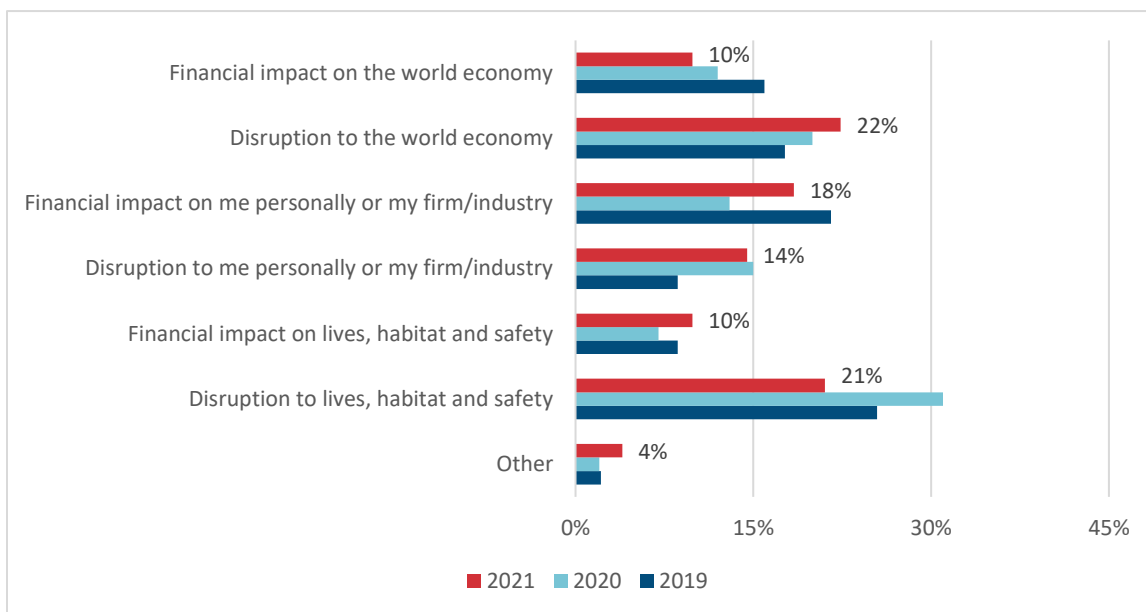
1. *Climate change* (58%)
2. *Cyber/networks* (52%)
3. *Pandemics/infectious diseases* (38%)
4. *Disruptive technology* (32%)
5. *Financial volatility* (30%)

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.

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). In the current survey, disruption responses increased and financial responses decreased in every case. Among the response options for defining strategic impact, five were selected by at least 14% of respondents, with a large increase in the response *Financial impact on me personally or my firm/industry* (up 5%). The largest drop was previously the top response, *Disruption to lives, habitat and safety* (down 10%). As shown in Figure 15, the most commonly selected definition was *Disruption to the world economy*.

Figure 15
Greatest Strategic Impact
% of Responses



Respondents also were asked to consider 23 risks and identify the risk with the greatest strategic impact. Complete definitions of the risks are provided in Appendix I, but the risk names are also listed here for the reader’s convenience. Risk 3 was updated from *Chinese destabilization* in recent surveys.

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*

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.

Changes to risk names and definitions since the original WEF-defined risks are documented in Appendix I. The 23 emerging risks used in this iteration of the survey were reviewed. Names were unchanged for all risks except one, and four risks had their definitions updated. The definitional changes, described in more detail in Appendix I, added digital currencies (*Currency shock*), a reference to TCFD (Task Force on Climate-related Financial Disclosures) (*Climate change*), substance abuse (*Chronic diseases/medical delivery*) and skills shortages (*Demographic shift*). Each reflects updated thinking about the risk. Some were recommended in the previous survey.

The distribution of results by category follows, along with prior-year results. The 2020 and 2021 results were heavily influenced by the arrival of the COVID-19 pandemic, especially in the current risk results. *Pandemics/infectious diseases* spiked in 2020, appropriately, resulting in other risks being down.⁴

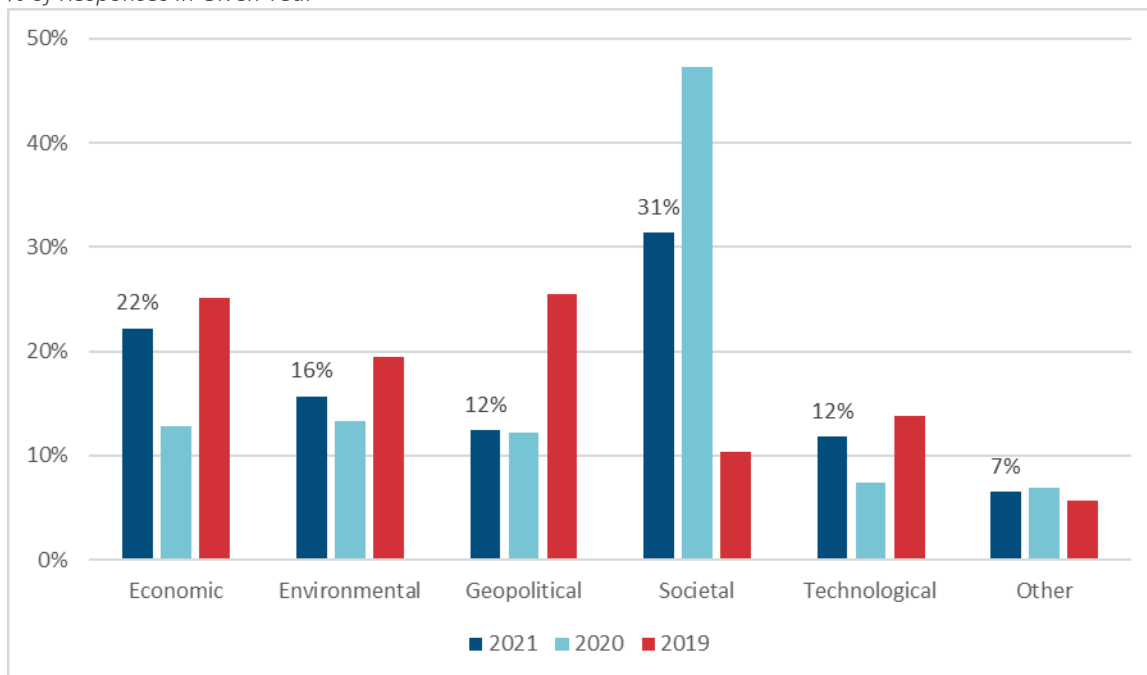
	2021	2020	2019
Economic	22%	13%	25%
Environmental	16%	13%	19%
Geopolitical	12%	12%	26%
Societal	31%	47%	10%
Technological	12%	7%	14%
Other	7%	7%	6%

As shown in Figure 16, the Societal category, led by *Pandemics/infectious diseases*, dominated the responses by collecting nearly half (47%). Each of the other categories lost ground. The largest decrease, at 14%, was the Geopolitical category.⁵ Some of these extremes rebalanced in 2021 in a form of mean reversion.

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



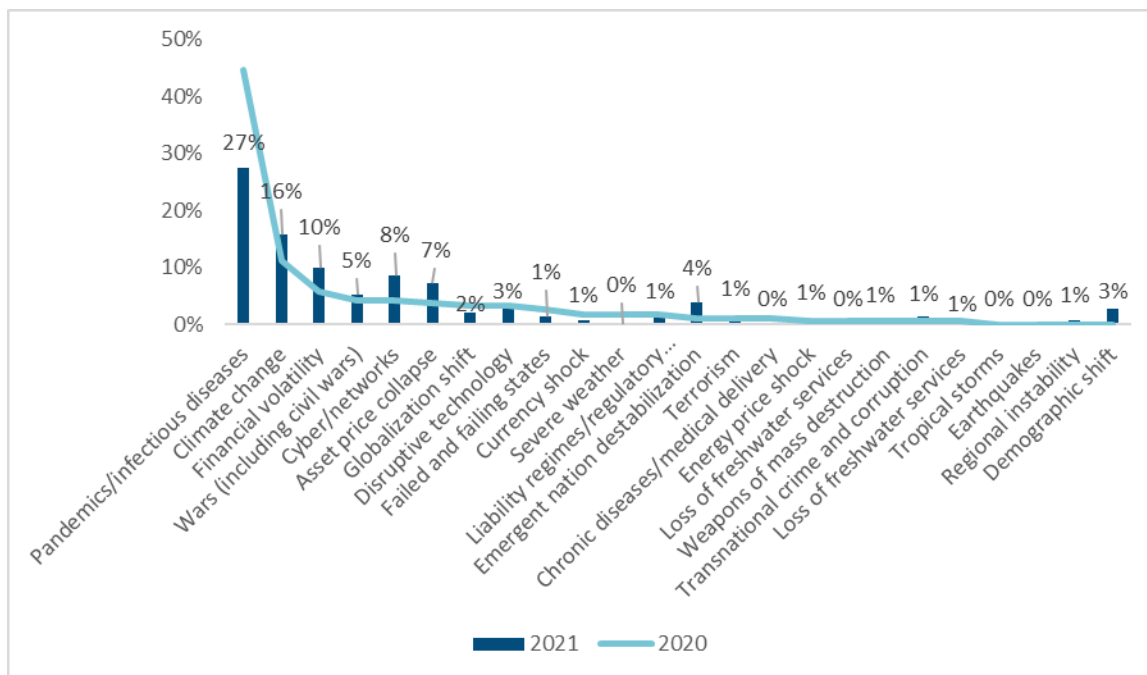
From an individual risk perspective, *Climate change* rebounded from 11% to 16% (same level as 2019) between surveys to remain in the second spot behind *Pandemics/infectious diseases*, which decreased from its peak of 45% in the previous survey to 27% of respondents selecting it as having the greatest current impact. These two risks finished ahead of *Financial volatility*, *Cyber/networks* (up 4%) and *Asset price collapse*. *Failed and failing states* dropped from 3% to 1%, the only other risk that fell by at least half.

All but five risks were chosen as the top current risk by at least one respondent. *Loss of freshwater services*, *Natural catastrophe: tropical storms*, *Natural catastrophe: earthquakes*, *Natural catastrophe: severe weather* and *Chronic diseases/medical delivery* were not chosen.

There were several themes in the Other category. Respondents identified current risks tied to flawed democracies and misinformation. *Globalization shift* is likely the closest existing risk.

Figure 17 shows how current risks can change between surveys. Data labels reflect 2021 results. Results for top current risk often reflect recency bias, but previously popular risks that have reduced results may be a contrarian indicator.

Figure 17
 Top Current Risk, Year Over Year
 % of Responses in Given Year

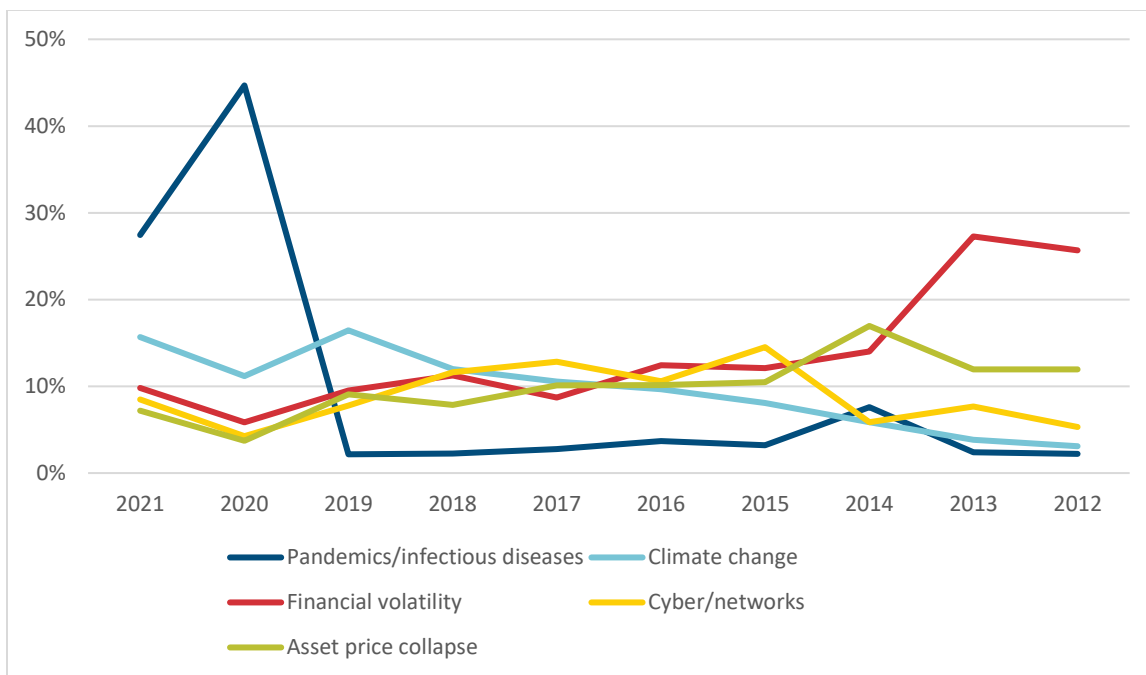


The top two choices differentiated themselves from the other options. These were the top five current risks chosen, with the top four repeating from the prior survey:

1	<i>Pandemics/infectious diseases</i>	27%
2	<i>Climate change</i>	16%
3	<i>Financial volatility</i>	10%
4	<i>Cyber/networks</i>	8%
5	<i>Asset price collapse</i>	7%

When looking at trends it is interesting to see how the top five current risks have performed over the last 10 years. *Climate change* has steadily increased, *Pandemics/infectious diseases* spiked in 2020 as COVID-19 erupted and *Financial volatility* fell (along with other economic risks) as time increased since the great financial crisis.

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 a separate question.

4.5.1 Top Five: 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.” The WEF suggests a reasonable time horizon of 10 years, but that is not required here. The data is compared across surveys and considers recent events as part of the analysis.

Each survey comes at a unique time in history. The pandemic, geopolitical concerns and climate change clearly had an outsized impact on this iteration of the survey. Prior to viewing the results, the researcher has a view of what to expect based on recency bias. The pullbacks for *Pandemics/infectious diseases* and increases for *Energy price shock* were not surprising, but other risks that were in the news did not see the expected gains. These included *Natural catastrophes: tropical storms*, *Failed and failing states* and *Disruptive technology*. *Climate change* rebounded and set a new high.

While 81% of respondents chose the full complement of five emerging risks, the average number selected was 4.72. Percentages reported for this survey are based on the number of respondents who answered the specific survey question so sum greater than 100% (for comparison to other results this question is later recalculated to a total of 100%). This allows consistent comparison with previous and subsequent survey iterations.

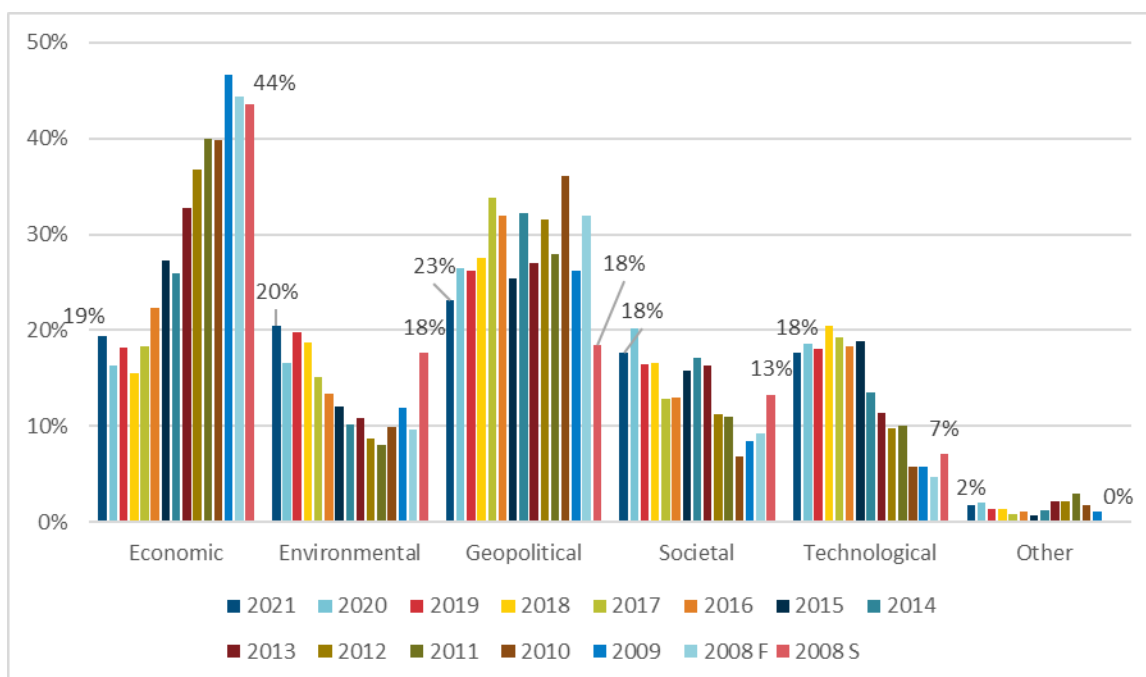
In a tight race with each category between 18% and 23%, Geopolitical maintained its lead (23% of the total selections came from this category), despite once again placing no individual risks in the top five (top responses were *Wars (including civil wars)* and *Globalization shift*), with the increasing Environmental

category (20%, up from 17%) in second place, followed by a resurging Economic category (19%, up from 16%). Societal and Technological tied for fourth. The results distributed by category (using percentages of total responses) are as follows:

		2021	2020	2019
1	Geopolitical	23%	26%	26%
2	Environmental	20%	17%	20%
3	Economic	19%	16%	18%
4T	Societal	18%	20%	16%
4T	Technological	18%	19%	18%

As Figure 19 shows, each category has its own story across the history of the survey. A recovery by Economic risks may prove prophetic as 2022 seems to reflect a heightened concern for each of the five risks.

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 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).

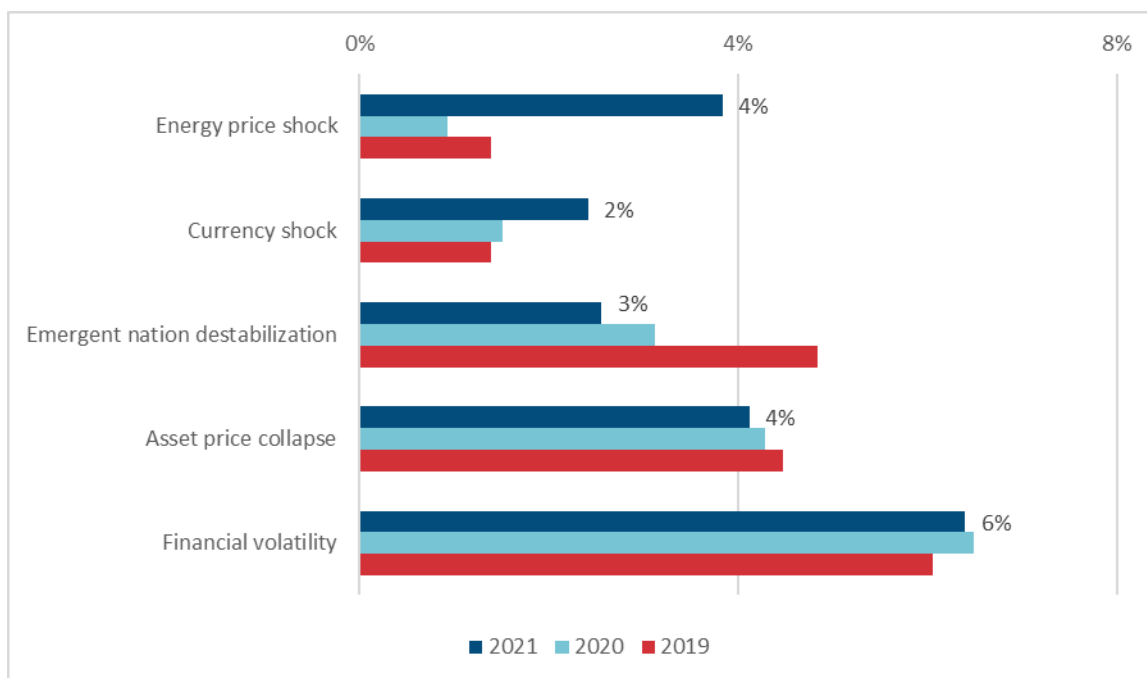
In 2021, there were material increases in a few individual risks. Risks up at least 5% included *Energy price shock* (18%, up from 4%), *Climate change* (58%, up from 50%), *Loss of freshwater services* (15%, up from 8%) and *Cyber/networks* (52%, up from 47%). Risks down 5% included *Failed and failing states* (13%, down from 18%), *Pandemics/infectious diseases* (38%, down from 45%) and *Disruptive technology* (32%, down from 40%). New highs were posted for *Energy price shock*, *Climate change* and *Loss of freshwater services*. New lows were achieved by *Emergent nation destabilization*, *Terrorism*, *Failed and failing states* and *Regional instability*.

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 15 survey cycles. Environmental (20% vs 14% average), Societal (18% vs 14% average) and Technological (18% vs 13% average) each satisfied this criterion, while Economic (19% vs 30% average) and Geopolitical (23% vs 28% average) were lower. Among individual risks, 7 of the 23 had above-average results. The greatest positive differential was 5% for *Climate change*. Several other risks were above average by more than 1%, with *Pandemics/infectious diseases* and *Disruptive technology* higher by 3% and *Wars (including civil wars)* and *Cyber/networks* higher by 2%. Eleven trended below average, once again including all of the Economic risks despite some recent gains in the category. *Currency shock*, *Emergent nation destabilization*, *Financial volatility* and *Terrorism* fell 3% below average and *Asset price collapse*, *Failed and failing states* and *Regional instability* at 2% below average were the only other risks that fell more than 1%.

Figures 18 through 22 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 the top current and emerging risk categories.

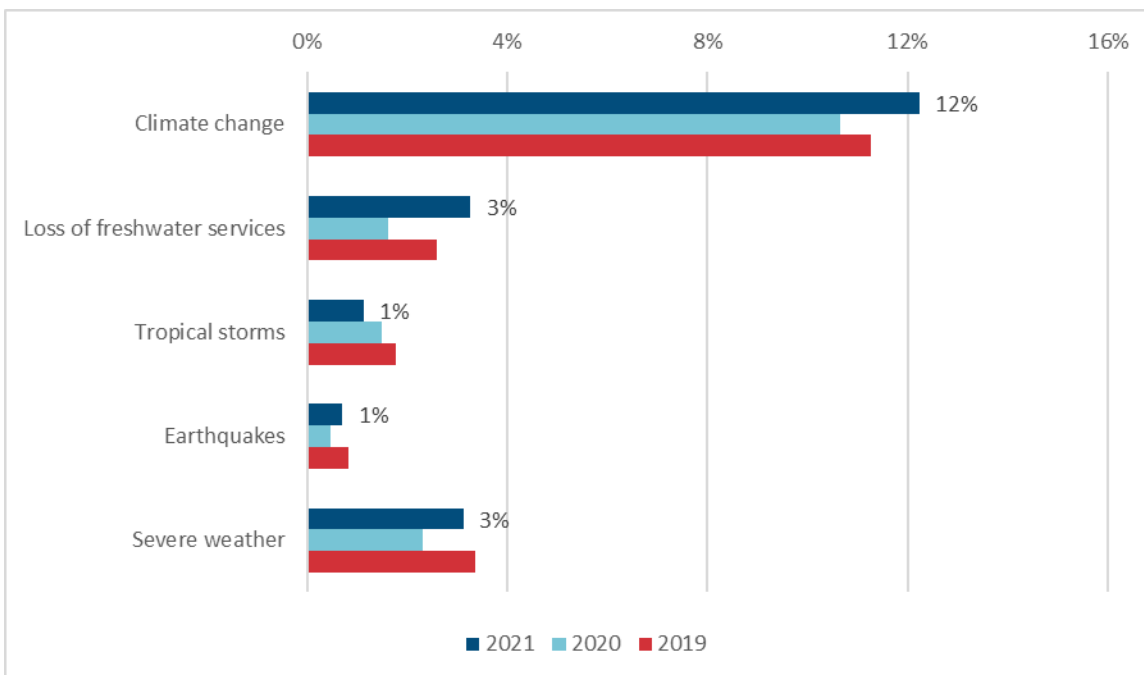
Economic risks were selected more often in total than in the previous survey, led by *Energy price shock*, as shown in Figure 21.

Figure 21
Emerging Risk Trends: Economic Risks
% of Total Responses



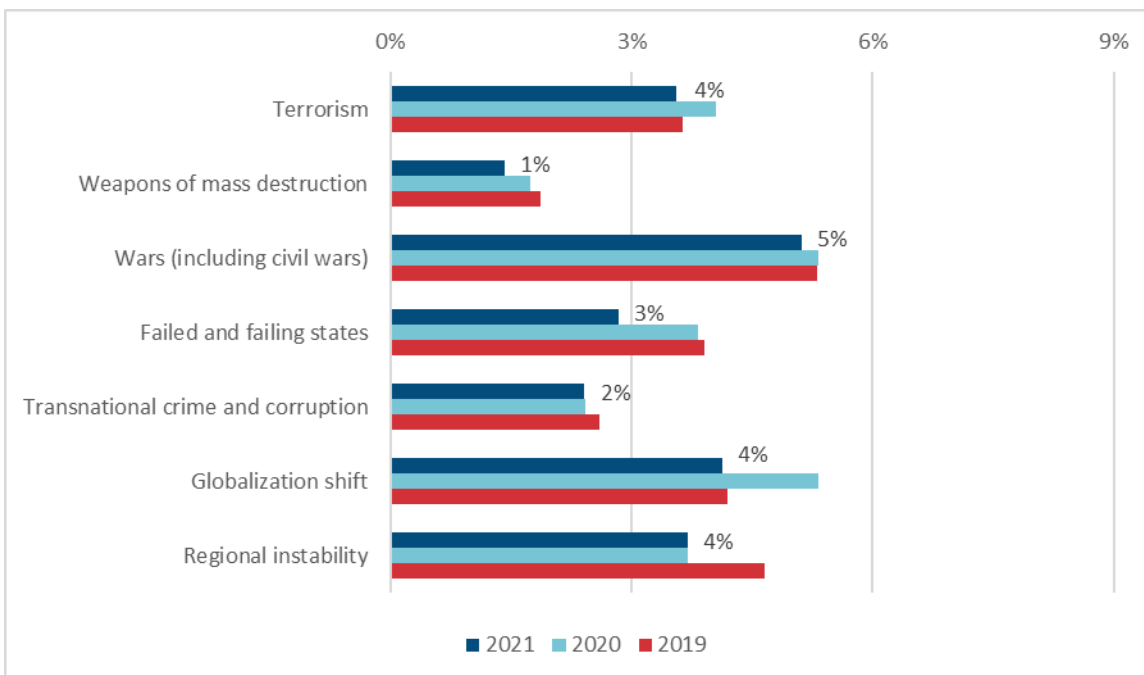
As shown in Figure 22, four of the five Environmental risks were selected more often in the current survey. The increase in responses for *Loss of freshwater services* is especially interesting as it is an underlying risk without splashy media coverage.

Figure 22
Emerging Risk Trends: Environmental Risks
% of Total Responses



In the Geopolitical category, none of the seven risks increased in the current survey, as shown in Figure 23. The conflict in Ukraine will be reflected in future risk surveys.

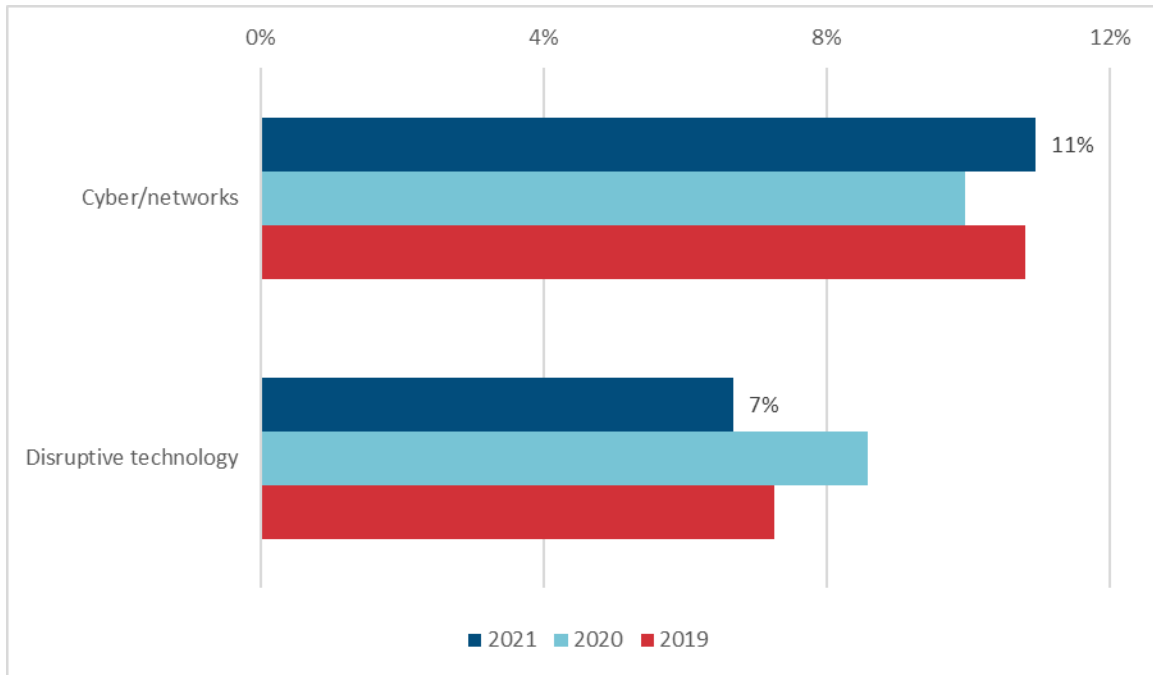
Figure 23
Emerging Risk Trends: Geopolitical Risks
% of Total Responses



None of the Societal risks chosen increased in 2021. This can be seen in Figure 24.

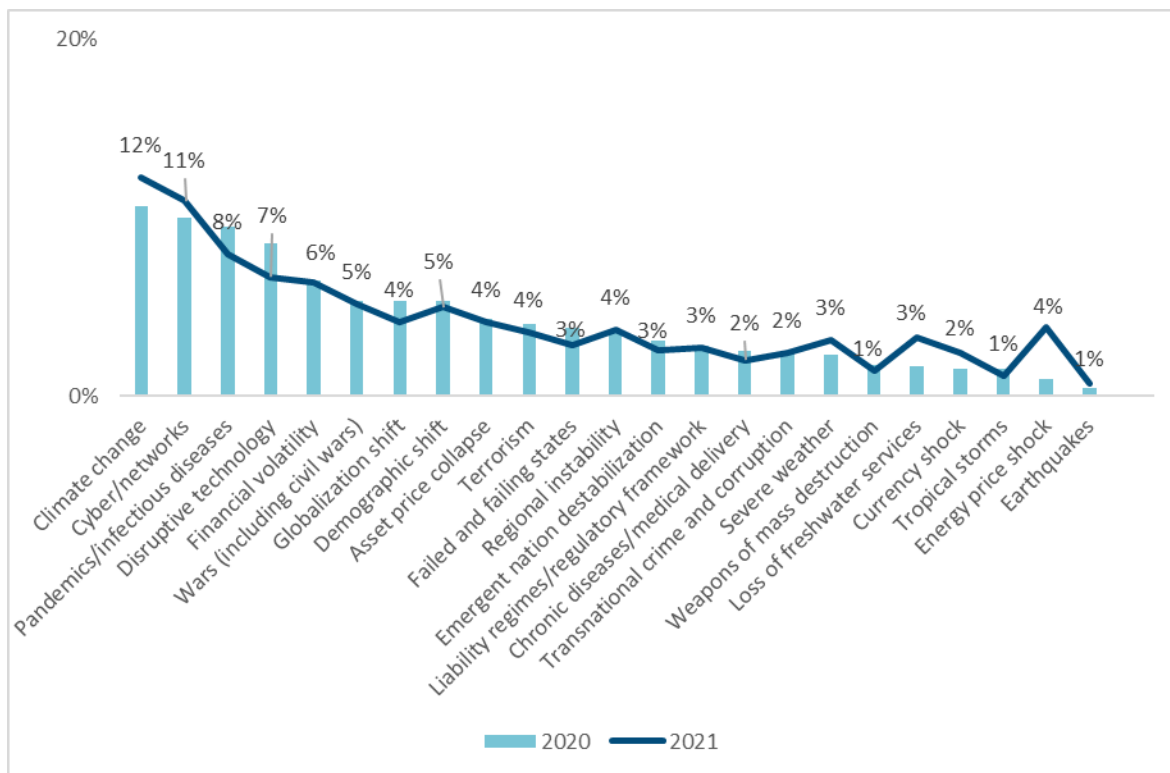
Figure 24
Emerging Risk Trends: Societal Risks

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 2021, with risks sorted based on 2020 results. While pandemics and some types of technology fell off risk managers’ radars, the current survey reflects increases in several risks that were ranked quite low in the previous survey.

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*

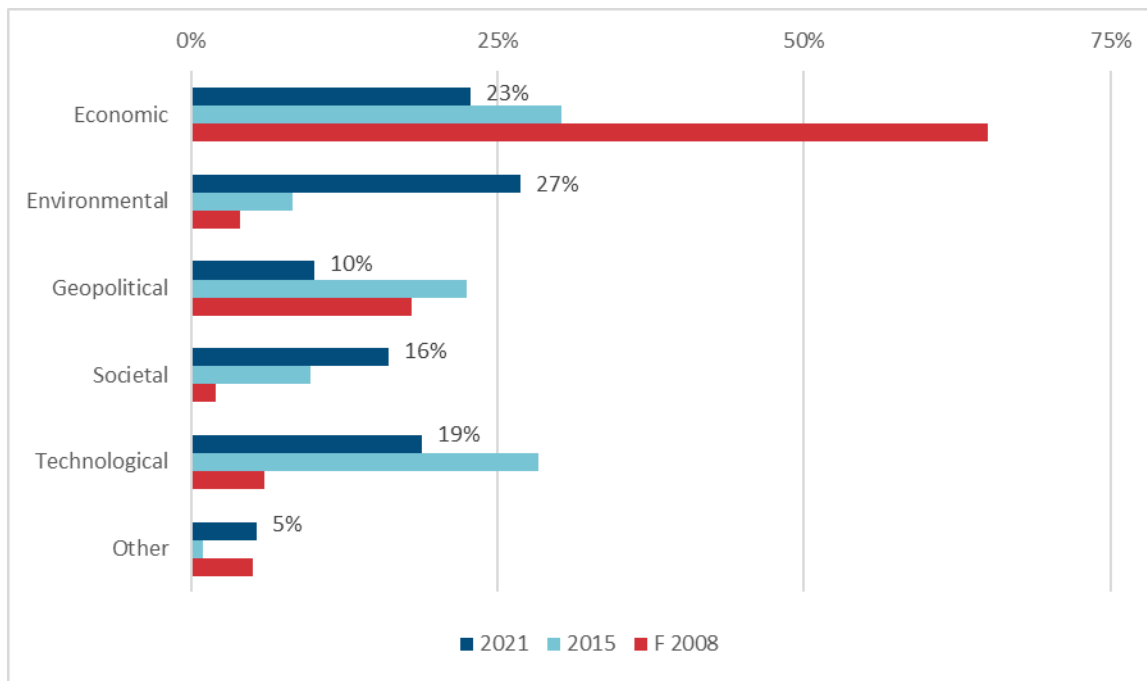
Respondents were asked to state the single emerging risk, from the group they selected in the previous question, they expected to have the greatest impact. The responses to this question can be volatile between years based on recent events. The Environmental category maintained the top ranking, with the Economic category surging to second. The Societal category, reached a new survey high behind a 3% increase from *Demographic shift*, and the Geopolitical category saw a new low as six of the seven risks were below the previous survey. *Climate change*, at 26%, would be the leading category by itself and is well ahead of second place *Cyber/networks*. The largest drop was *Disruptive technology*, from 15% to 6%. The largest increase was *Cyber/networks*, increasing from 3% to 13%. These two Technological category risks flipped positions from the prior survey for largest moves.

		2021	2020	2019
1	Environmental	27%	29%	32%
2	Economic	23%	15%	18%
3	Technological	19%	18%	21%
4	Societal	16%	16%	9%
5	Geopolitical	10%	19%	18%

Figure 27 compares the top emerging risks at the category level for the fall 2008, 2015 and 2021 surveys. 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 had been stable until its recent decline.

Figure 27
Emerging Risk with Greatest Impact, by Category
% of Responses in Given Year



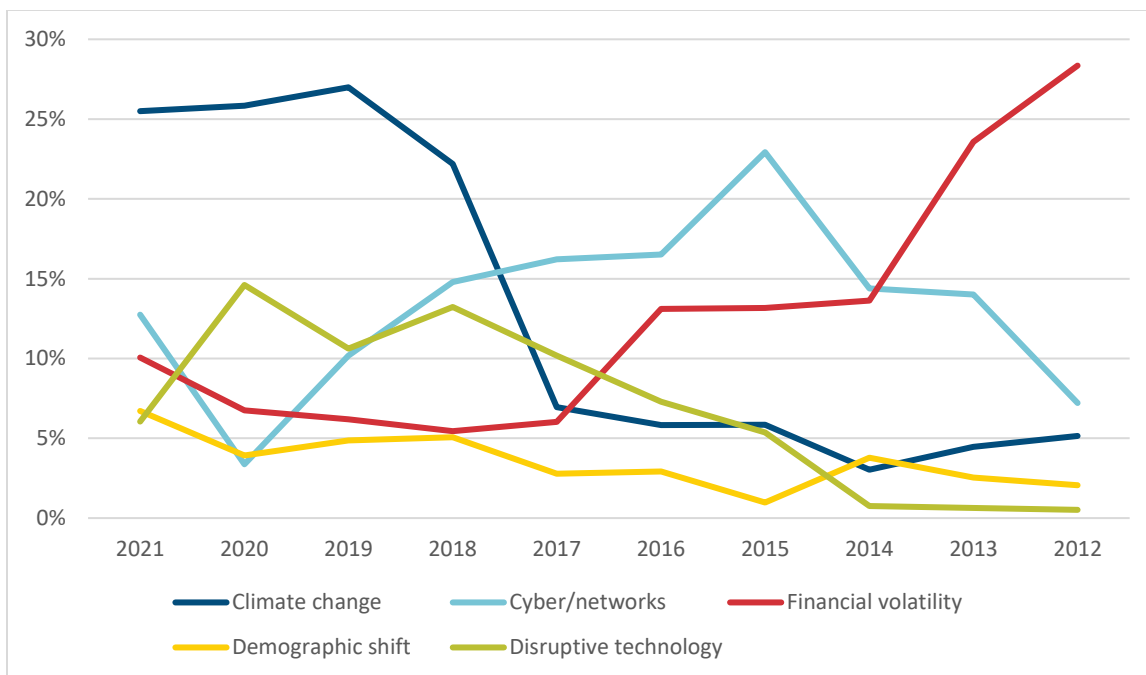
The top emerging risk in this iteration of the survey remained *Climate change*, which dominates each of the survey questions asking about emerging risks. *Cyber/networks* is second. *Pandemics/ infectious diseases* dropped out of the top five. Here are the leading responses, with results indicated for 2021–2019:

1.

		2021	2020	2019
1	<i>Climate change</i>	26%	26%	27%
2	<i>Cyber/networks</i>	13%	3%	10%
3	<i>Financial volatility</i>	10%	7%	6%
4	<i>Demographic shift</i>	7%	4%	5%
5	<i>Disruptive technology</i>	6%	15%	11%

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* has rebounded after dropping from earlier high levels. *Cyber/networks* increased and then fell back, and the last two years have seen it offset with *Disruptive technology*, with each moving in opposite directions by similar amounts. *Demographic shift* has bounced around but reached a new high in the current survey.

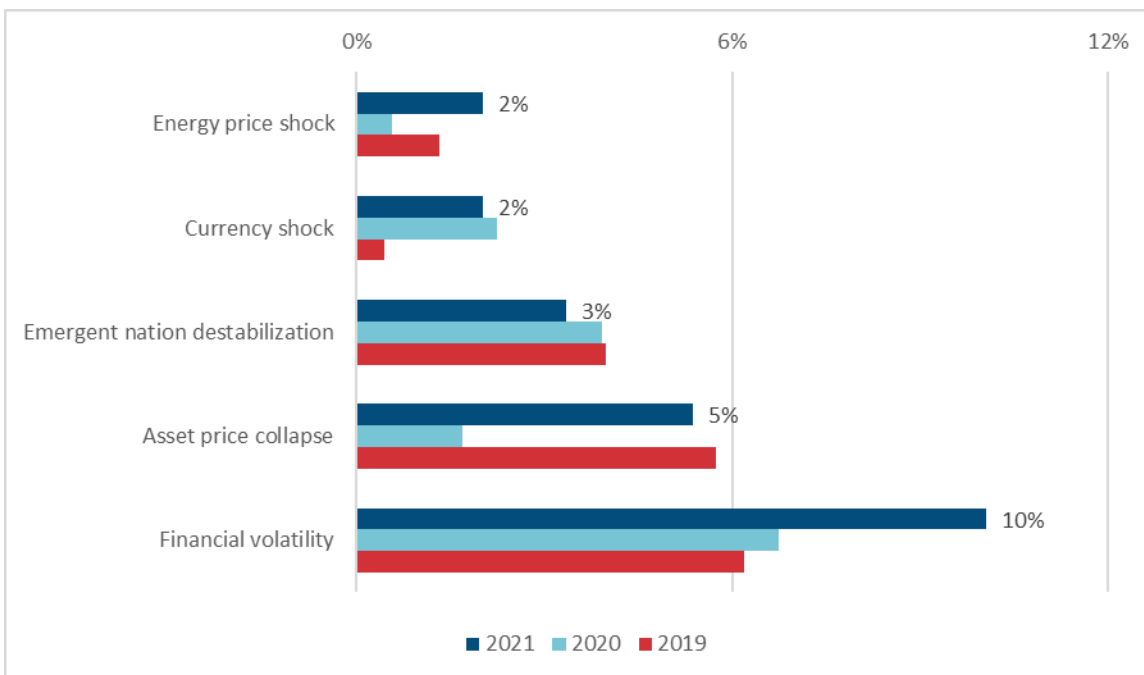
Figure 28
 Top Emerging Risk, 10-Year Trend for Top Five Responses
 % of Responses in Given Year



For each risk category, Figures 29 through 33 shows 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 between 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.

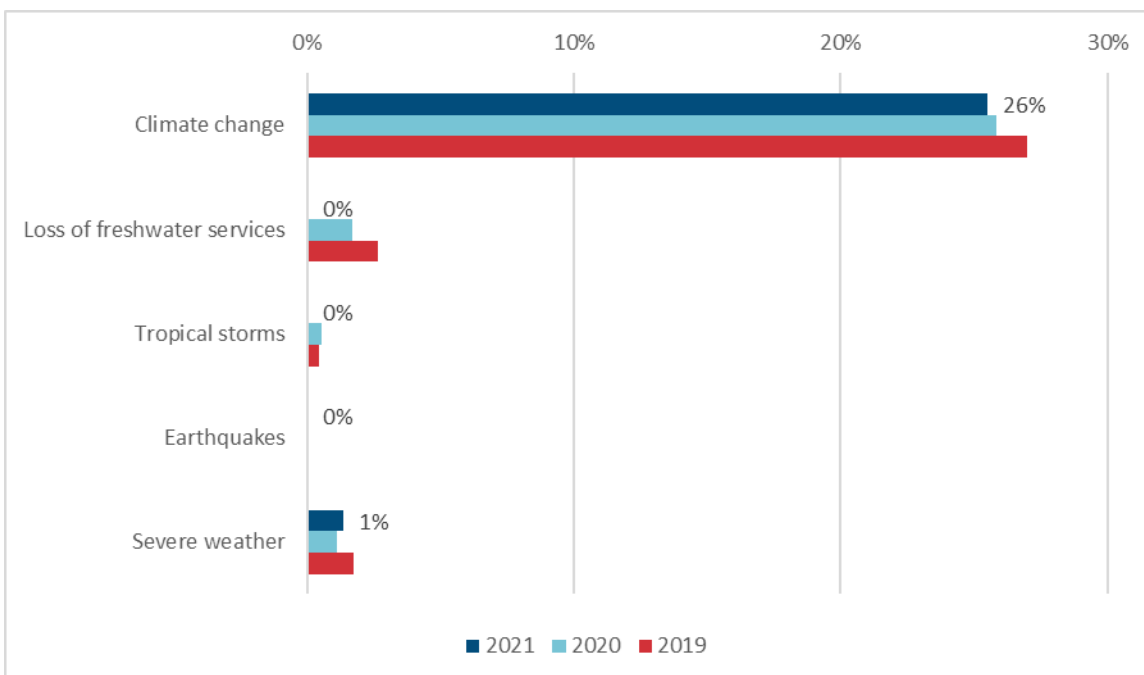
As shown in Figure 29, the Economic category showed the highest result in the *Energy shock* risk since 2015 and the highest result in the *Financial volatility* risk since 2016. Respondents seem to be aware of a growing concern around economic risks.

Figure 29
 Top Emerging Risks—Economic
 % of Total Responses



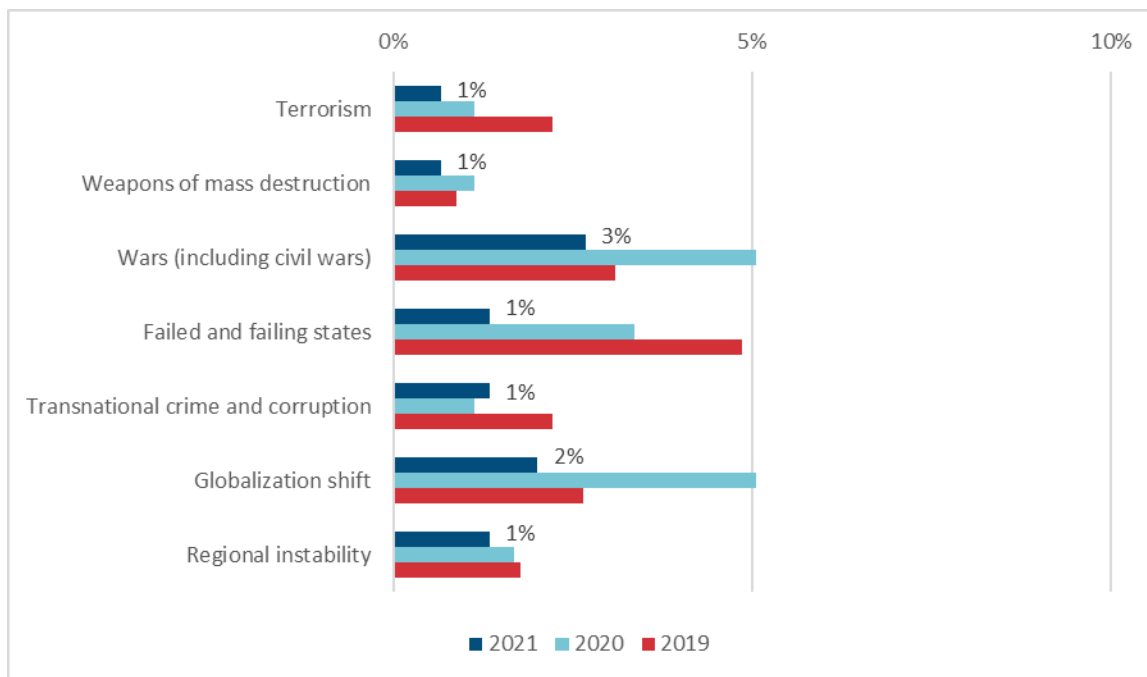
Environmental category risks, shown in Figure 30, remain small, except for *Climate change*, which remains the top overall risk for the fourth consecutive year.

Figure 30
 Top Emerging Risks—Environmental
 % of Total Responses



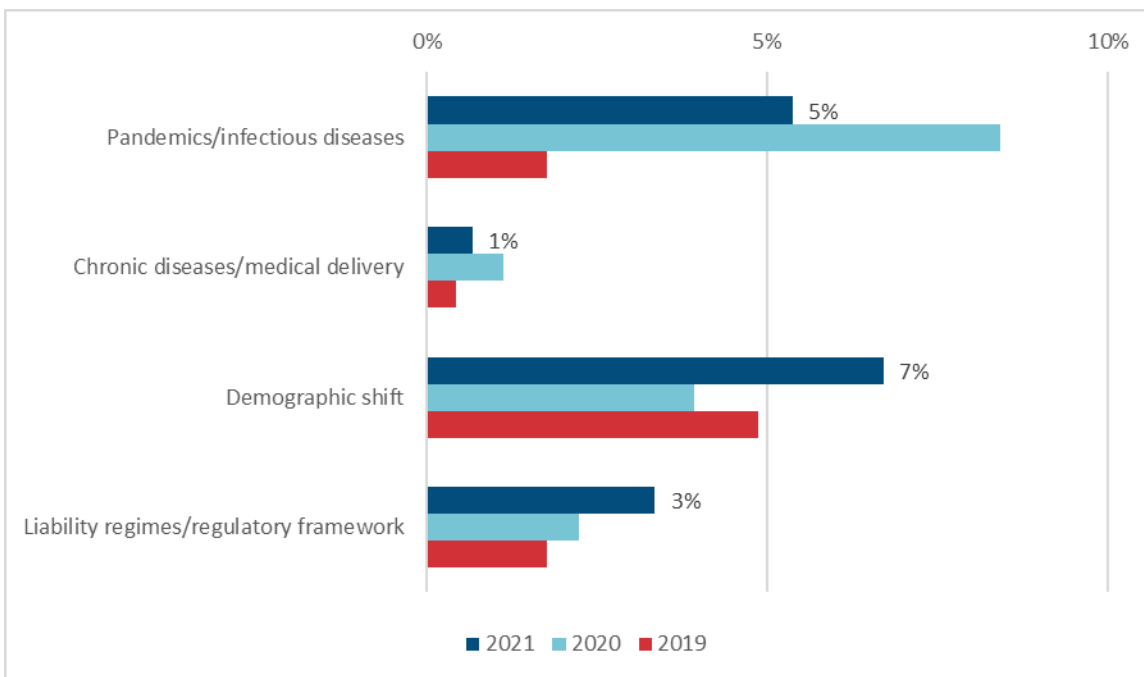
Geopolitical risks tend to be the most volatile in the survey, so it is not surprising to see in Figure 31 that many of these risks whipsaw, with 2021 a down year. *Terrorism* and *Failed and failing states* each recorded the lowest results in the survey’s history and *Globalization shift* had its lowest result since 2015.

Figure 31
 Top Emerging Risks—Geopolitical
 % of Total Responses



As shown in Figure 32, the Societal category saw a spike in the *Demographic shift* risk to its highest level, offsetting a drop of 3% in the *Pandemics/infectious diseases* risk from its high in 2020.

Figure 32
 Top Emerging Risks—Societal
 % of Total Responses



In the Technological category, shown in Figure 33, Cyber/networks rebounded from its lowest level (3% to 13%) and *Disruptive technology* fell to its lowest level since 2015.

Figure 33
 Top Emerging Risks—Technological
 % of Total Responses

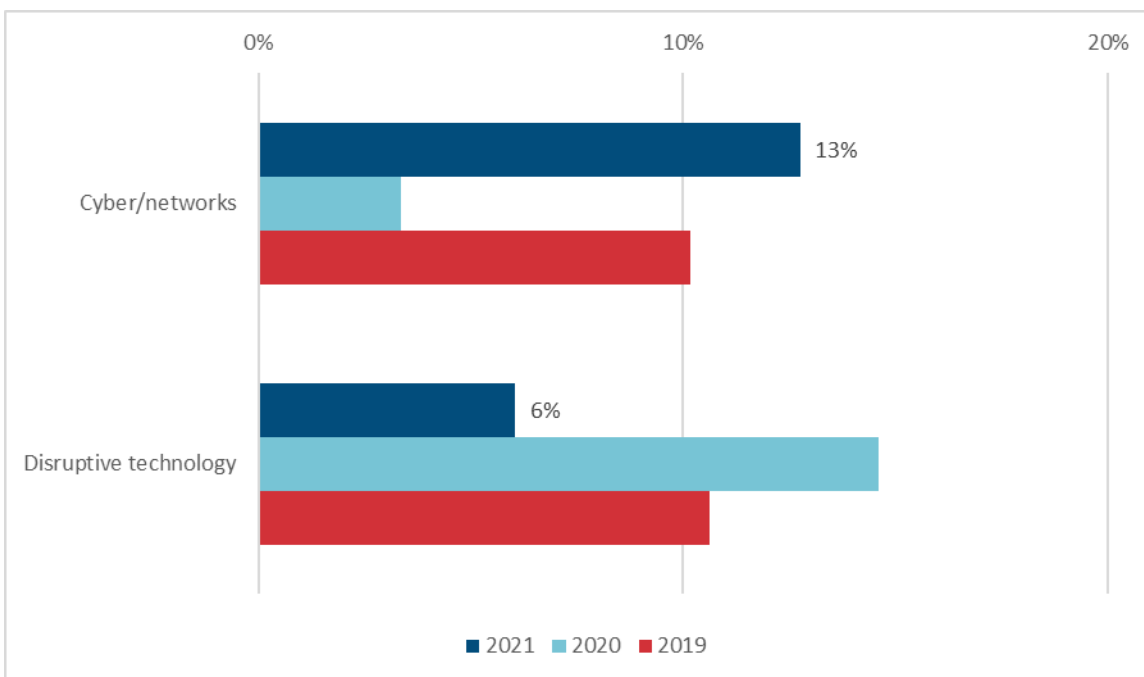
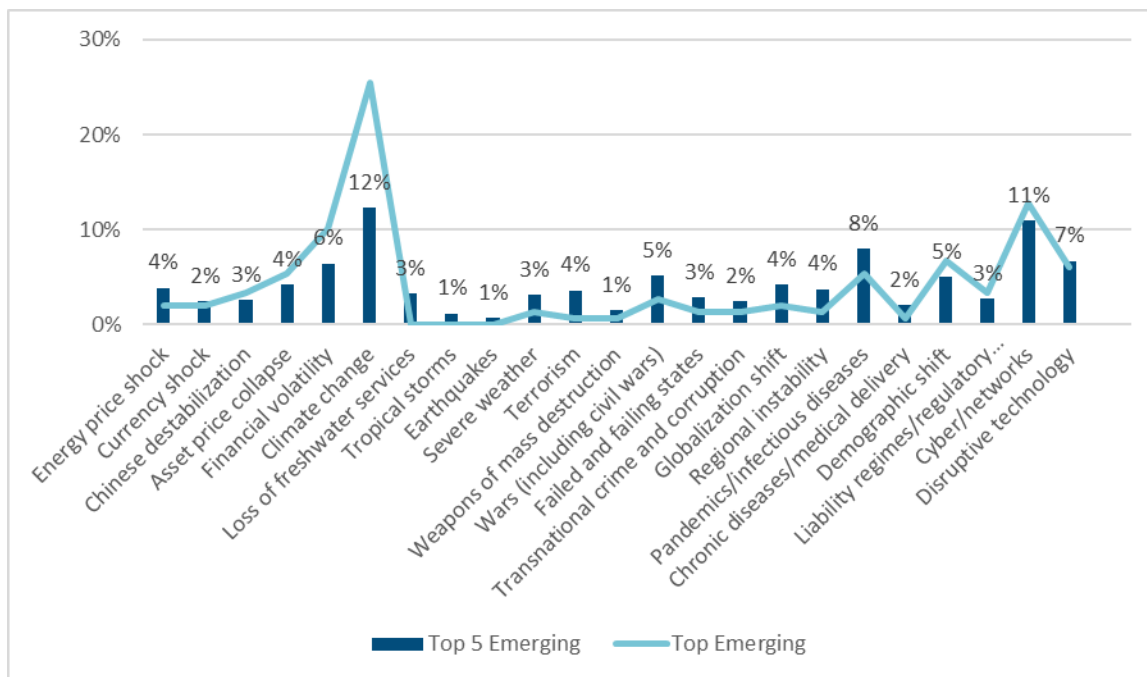


Figure 34 compares the percentages selecting each risk as the top risk with the percentages selecting each risk as one of the five top risks. For several risks, these two measures of perceived importance vary. If we use the highest absolute positive differential to mark the importance of being the top overall risk relative to inclusion in the top five list, that risk was again *Climate change*, at 13%. The greatest negative differential is *Loss of freshwater services* at -3%.

Figure 34
Emerging Risks Selected for Top Five and Top Risk
% of Responses to Given Question



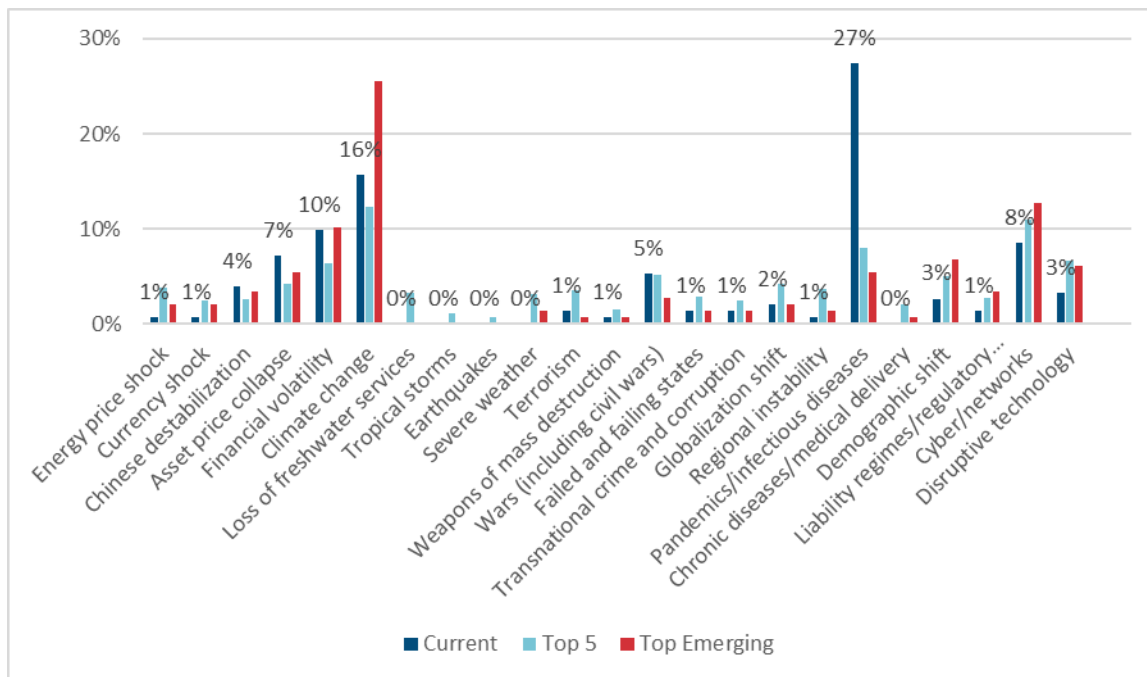
A comparison of the top current risk and top emerging risk suggests which risks are expected to be relatively more important in the future. The largest absolute negative differential (current less than top emerging risk) is *Climate change*, at 10%, followed by *Cyber/networks* and *Demographic shift*. The largest absolute positive differentials, suggesting an expectation of lower risk in the future, are *Pandemics/infectious diseases* at 22%, *Wars (including civil wars)* at 3% and *Asset price collapse* at 2%.

While the top five emerging risk choices might be thought to come from a different distribution, we can compare those selections with top emerging risk scores as a gauge of concentration risk. Risks that have higher concentration risk have a top five score materially lower than their top emerging risk scores. In this year’s survey, risks with the highest differential are *Climate change* and *Financial volatility*. *Loss of freshwater services* has the greatest positive differential, at 3%.

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 14 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 *Pandemics/infectious diseases*, *Asset price collapse*, *Wars (including civil wars)* and *Emergent nation destabilization*. The risks where the top emerging risk is the top score include five risks: *Financial volatility*, *Climate change*, *Demographic shift*, *Liability regimes/regulatory framework* and *Cyber/networks*.

Figure 35
Risk Perception, by Risk and Question

% of Responses to Given Question



4.5.3 Risk Combinations

Risks interact with each other. Sometimes it matters, with higher-order interactions resulting in tipping points that generate a regime shift to a new distribution. The risk combination question allows the practitioner to see what their peers think is important going forward. Nearly as interesting is to look at the risk combinations that no one chooses and seek out contrarian views, where the reader identifies a group of risks they think are more likely to be important than their peers. These can then be qualitatively monitored over time.

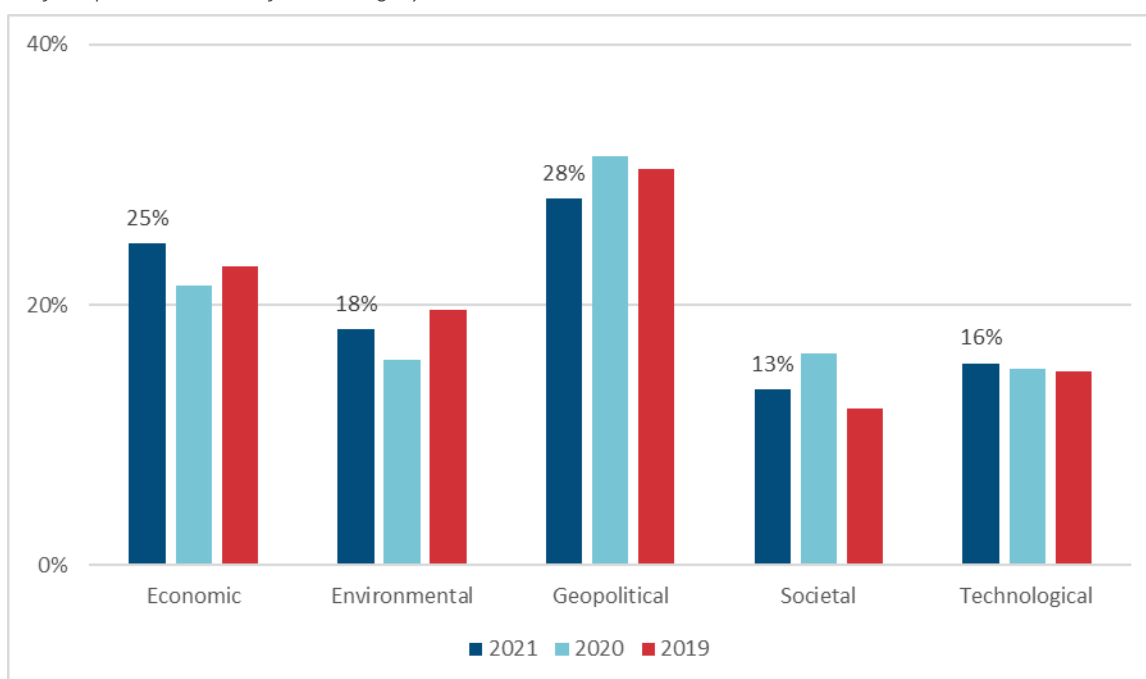
Clustering of events looks at either a combination of multiple risks or the same risk occurring more frequently than it would if the frequency was spread out based on likelihood (e.g., a 4% likelihood risk is expected to occur on average every 25 years but occurs both this year and again next year). For many entities this can be a solvency driver. Risk management efforts manage most regular risks, but 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 out 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 Geopolitical and Economic categories are the most frequent response categories, with an increase in the Societal category offsetting a decrease in Environmental. Figure 36 provides a graphical representation of the results that follow.

		2021	2020	2019
1	Geopolitical	28%	31%	30%
2	Economic	25%	21%	23%
3	Societal	13%	16%	12%
4	Environmental	18%	16%	20%
5	Technological	16%	15%	15%

Figure 36
 Most Impactful Risk Combinations, by Risk Category
 % of Responses Selected from Category in Given Year



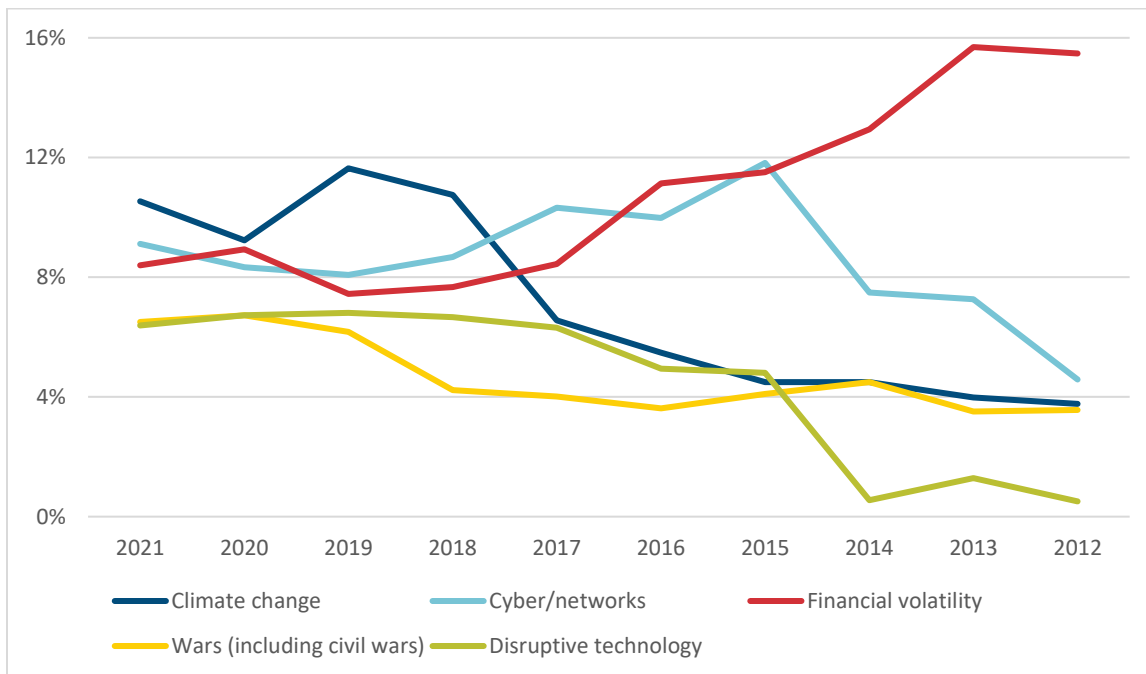
The individual risks most often selected for combinations were *Climate change*, *Cyber/networks* and *Financial volatility*.

		2021	2020	2019
1	<i>Climate change</i>	11%	9%	12%
2	<i>Cyber/networks</i>	9%	8%	8%
3	<i>Financial volatility</i>	8%	9%	7%
4	<i>Wars (including civil wars)</i>	7%	7%	6%
5	<i>Disruptive technology</i>	6%	7%	7%

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* is rising, *Financial volatility* falling and *Cyber/networks* peaked in 2015. *Disruptive technology* seems to have peaked, at least temporarily, while *Wars (including civil wars)* was stable until it began rising in the

last three surveys. The survey is not always a leading indicator but does seem to have anticipated a higher likelihood of conflict.

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:

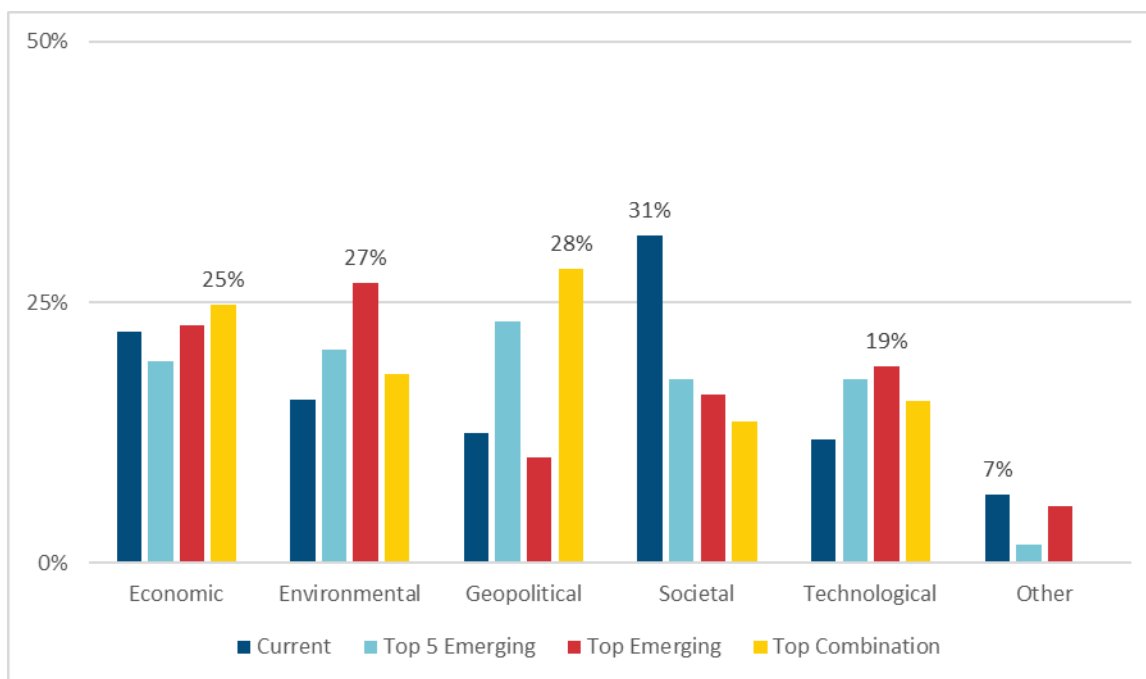
- | | |
|---|--|
| 33 responses 8%, no. 1 in previous survey | 13 responses 3% |
| <i>Cyber/networks</i> | <i>Climate change</i> |
| <i>Disruptive technology</i> | <i>Loss of freshwater services</i> |
| 19 responses 5% | 12 responses 3% |
| <i>Asset price collapse</i> | <i>Climate change</i> |
| <i>Financial volatility</i> | <i>Natural catastrophe: severe weather</i> |
| 14 responses 3% | 12 responses 3% |
| <i>Pandemics/infectious diseases</i> | <i>Terrorism</i> |
| <i>Chronic diseases/medical delivery</i> | <i>Cyber/networks</i> |

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

		2021	2020	2019
Geopolitical	Geopolitical	15%	14%	16%
Economic	Economic	11%	8%	11%
Economic	Geopolitical	11%	11%	12%
Environmental	Environmental	9%	8%	11%
Geopolitical	Technological	8%	9%	7%
Technological	Technological	8%	6%	7%
Economic	Societal	6%	9%	4%
Environmental	Societal	6%	5%	6%
Economic	Environmental	5%	3%	5%
Environmental	Geopolitical	5%	6%	6%
Societal	Societal	5%	4%	4%
Economic	Technological	4%	4%	5%
Geopolitical	Societal	3%	7%	4%
Societal	Technological	3%	4%	3%
Environmental	Technological	1%	1%	2%

By category, responses don't generally vary by a large amount when viewed across the four major questions. As shown in Figure 38, exceptions occur for the Societal category (the frequency of including these risks as the top current risk is high due to *Pandemics/infectious diseases*), Geopolitical (frequency of selection as top combination risk is high), Technological (selection as top current risk is low), Geopolitical (selection as top five emerging risks is high), and Environmental (selection of top emerging risk is high due to *Climate change*).

Figure 38
 Selection of Risks in Category, by Question
 % of Responses Selected from Category for Given Question

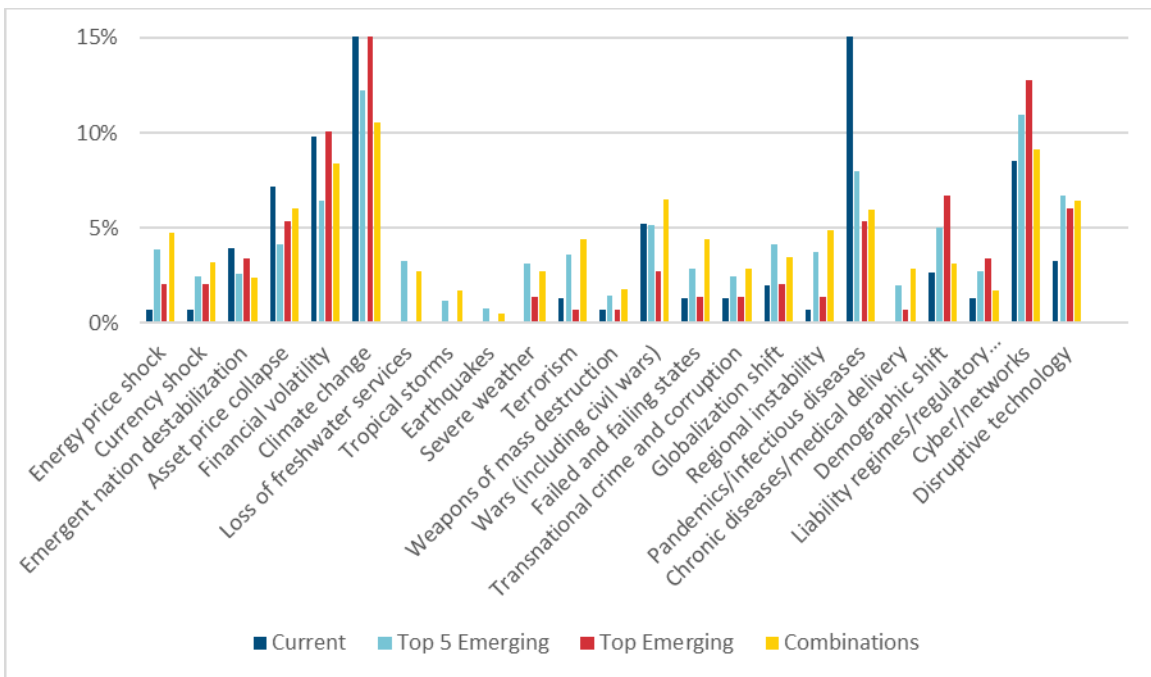
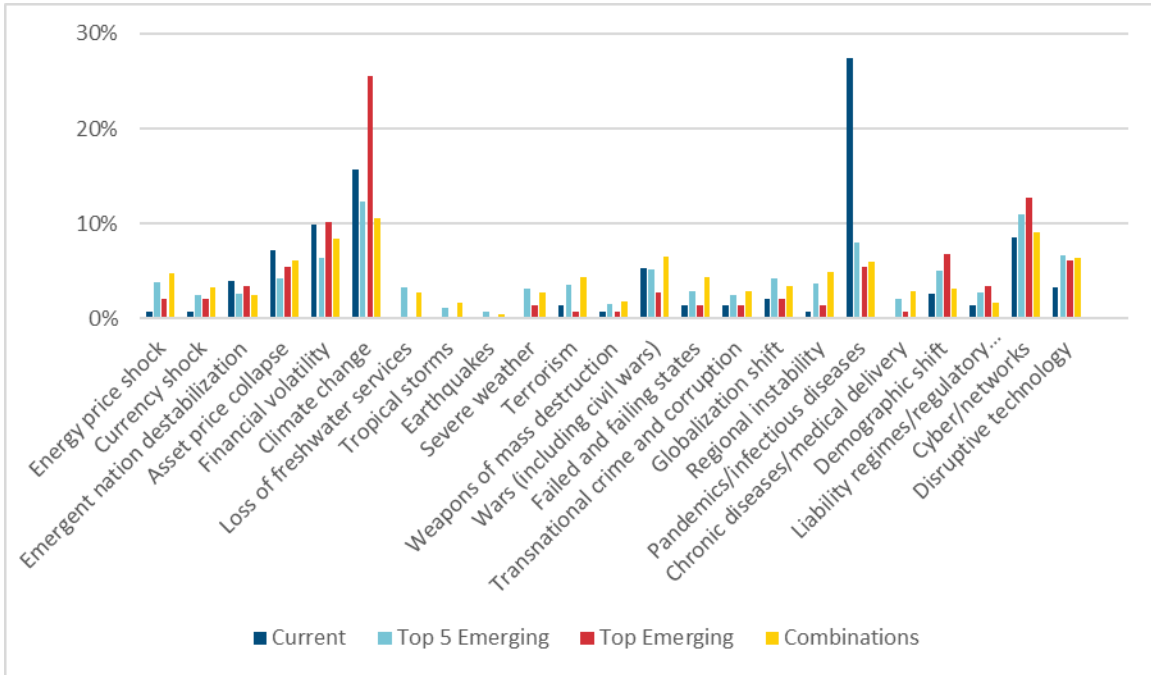


Risk by risk, there is much more variation, as shown in Figure 39.

Figure 39

Selection of Risk, by Question

% of Responses to Given Question (note that two versions of the chart are provided, one with results uncapped and the other with results capped at 15% to allow better review of the majority of the risks)



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

- *Emergent nation destabilization*
- *Asset price collapse*
- *Pandemics/infectious diseases*

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

- *Loss of freshwater services*
- *Natural catastrophe: earthquakes*
- *Natural catastrophe: severe weather*
- *Globalization shift*
- *Disruptive technology*

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

- *Financial volatility*
- *Climate change*
- *Demographic shift*
- *Liability regimes/regulatory framework*
- *Cyber/networks*

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

- *Energy price shock*
- *Currency shock*
- *Natural catastrophe: tropical storms*
- *Terrorism*
- *Weapons of mass destruction*
- *Wars (including civil wars)*
- *Failed and failing states*
- *Transnational crime and corruption*
- *Regional instability*
- *Chronic diseases/medical delivery*

There are 253 possible risk combinations. Since the financial crisis in 2008–2009, results have trended toward reduced concentration. This has shifted in the current iterations of the survey, as shown in Figure 40.

Figure 40
Cumulative Distribution of Risk Combinations Selected

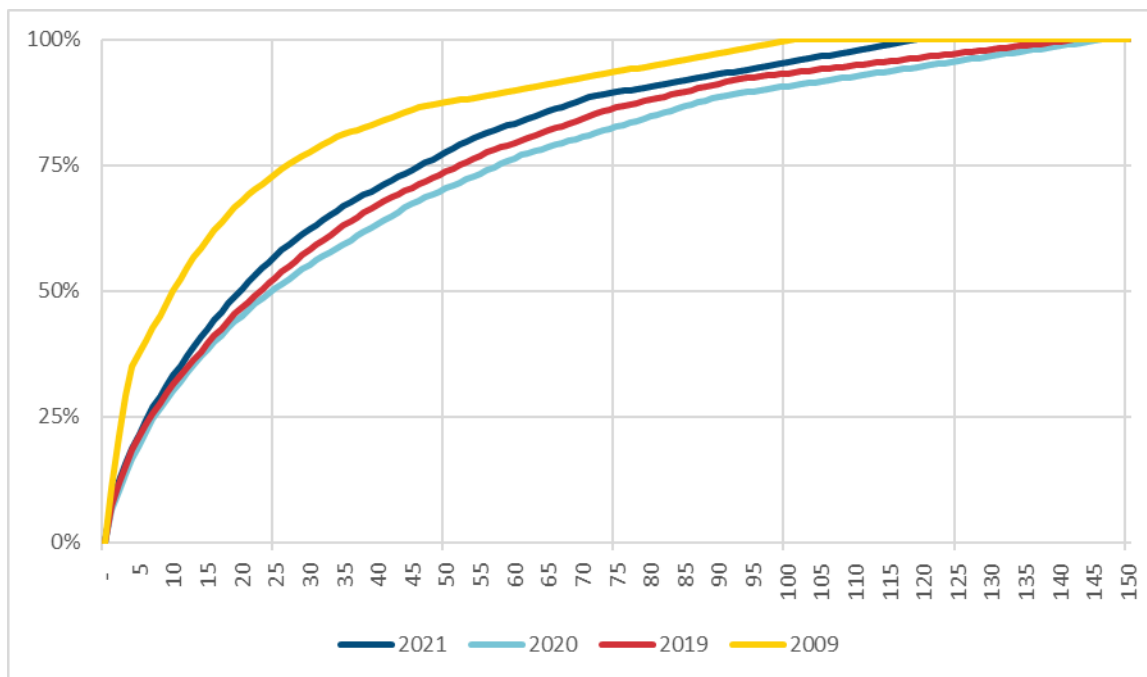
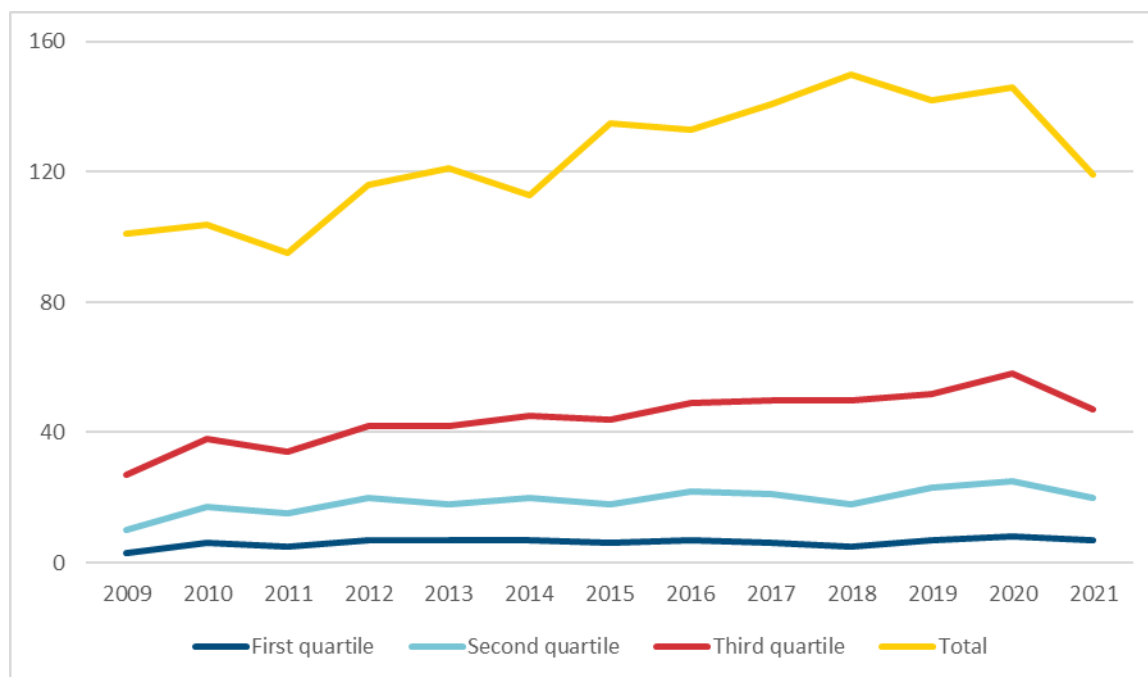


Figure 41 shows the number of combinations selected each year, with data listed cumulatively and the first quartile representing the most frequent responses. The current survey suggests a shift toward concentrated risks. Fewer than half of the possible two-risk combinations were selected. With so many 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

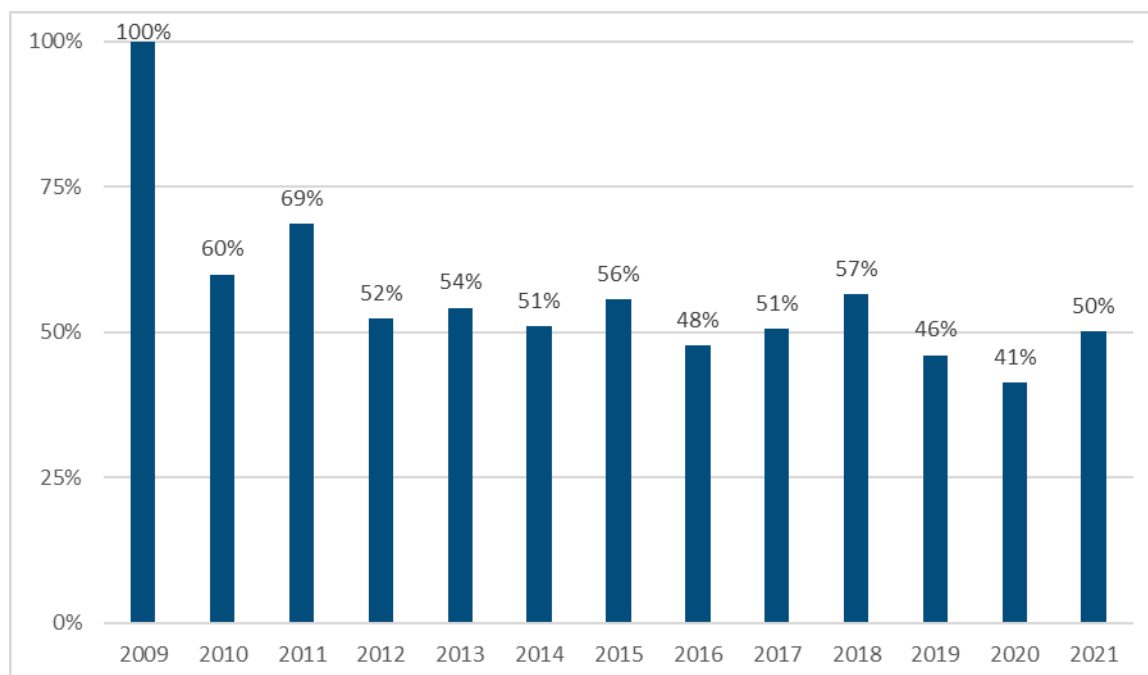


The level of concentration can be considered an indicator of the current risk environment, with each quartile being considered against the extreme example of 2009 and then averaged across the three quartile results.⁶ Shown in Figure 42, this year's risk concentration ratio of 50% returns the metric to a more typical rate 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 is a survey, not a double-blind study, making it useful without overpromising the output ramifications. Responses are lower than generally would be statistically analyzed; early questions have over 150 responses and it reduces in later sections, so splitting a question further makes 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 makes sense 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 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 40% who chose financial impact versus the 60% 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 44 shows, for top current risk, the differentials by risk category. Not surprisingly, 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 geopolitical risks.

Figure 44
 Top Current Risk Segregated by Greatest Strategic Impact
 % of Responses

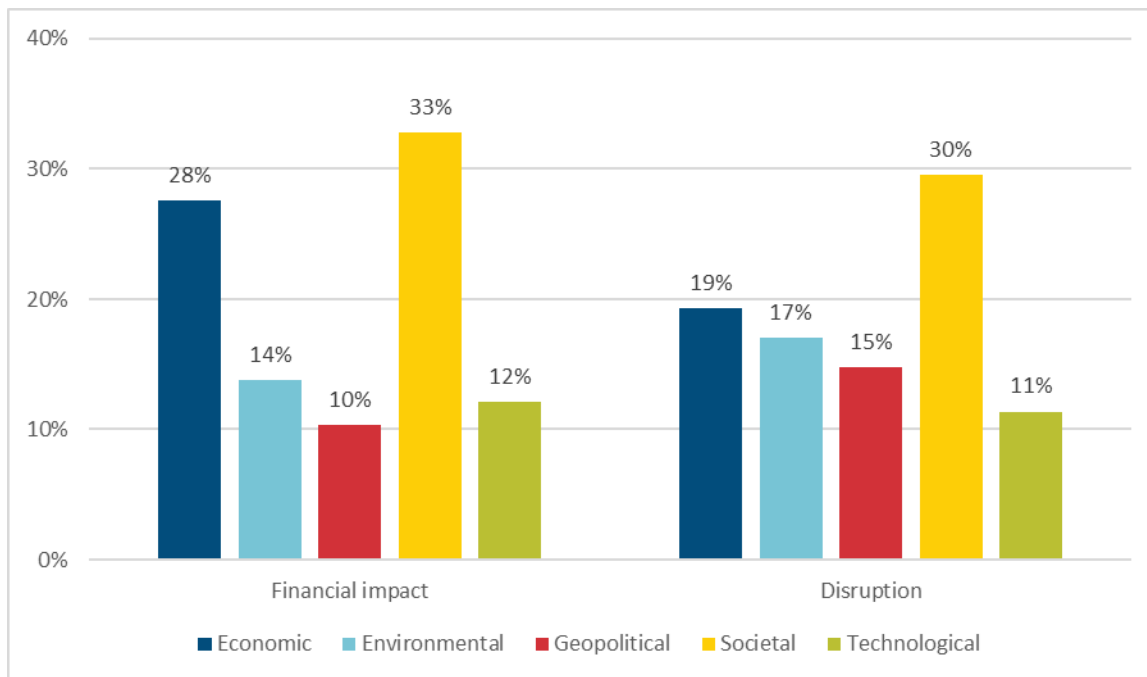


Figure 45 shows, for the top five emerging risks, the differentials by risk category. Similar to the top current risk, those who focus on the financial impact of strategic risks also choose economic risks and those who focus on disruption are more likely to choose geopolitical risks as their top five emerging risks.

Figure 45
 Top Five Emerging Risks Segregated by Greatest Strategic Impact
 % of Responses

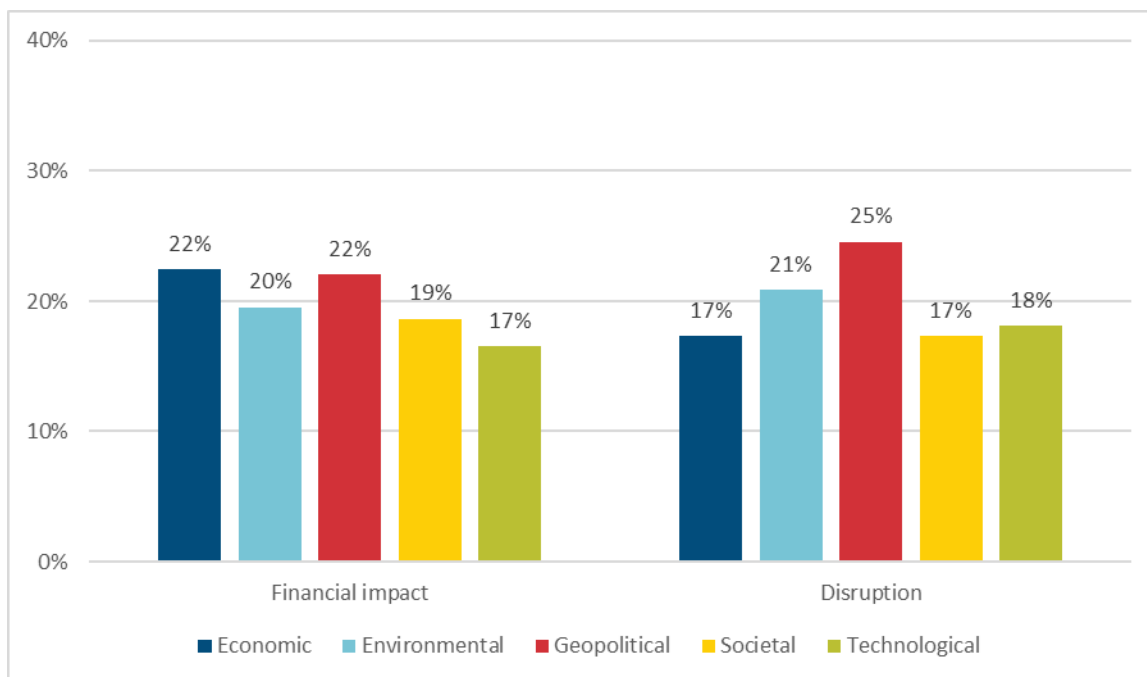
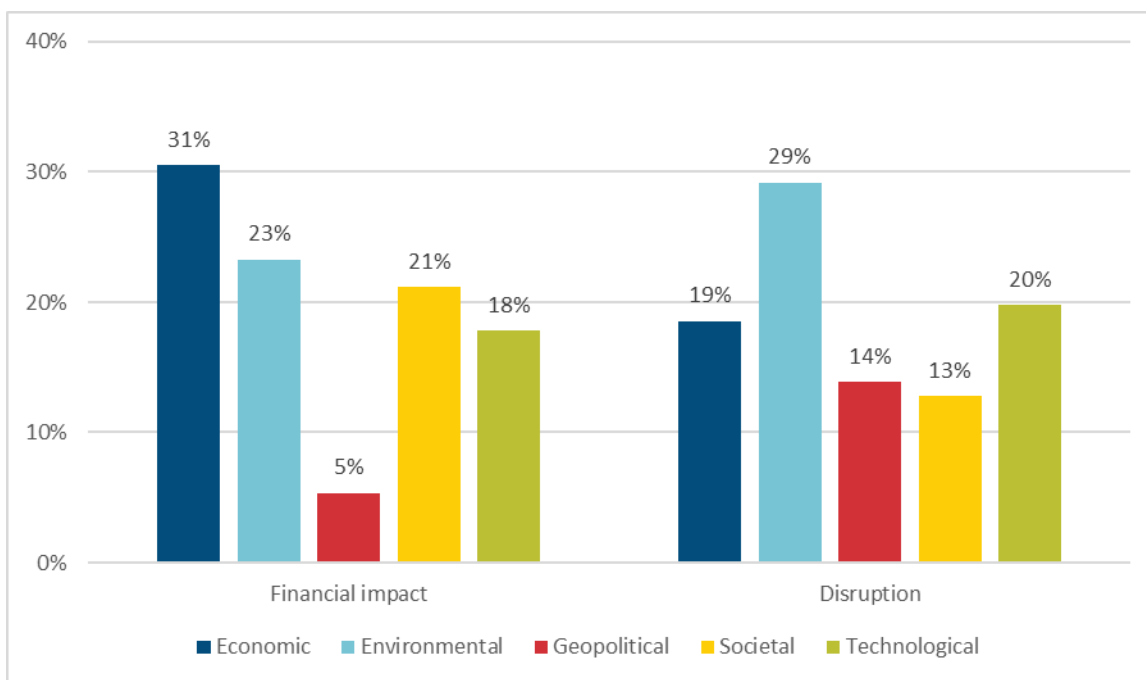


Figure 46 shows, for the top emerging risk, the differentials by risk category are more distinct. Those who focus on the financial impact of strategic risks are more likely to also choose economic risks (+12%) and societal risks (+8%). Those who focus on disruption are more likely to choose geopolitical risks (+9%) or environmental risks (+6%) as their top emerging risk.

Figure 46
 Top Emerging Risk Segregated by Greatest Strategic Impact
 % of Responses



Finally, Figure 47 shows, for the top risk combinations, less difference between the way respondents answer the question about defining greatest strategic impact.

Figure 47
 Top Risk Combinations Segregated by Greatest Strategic Impact
 % of Responses

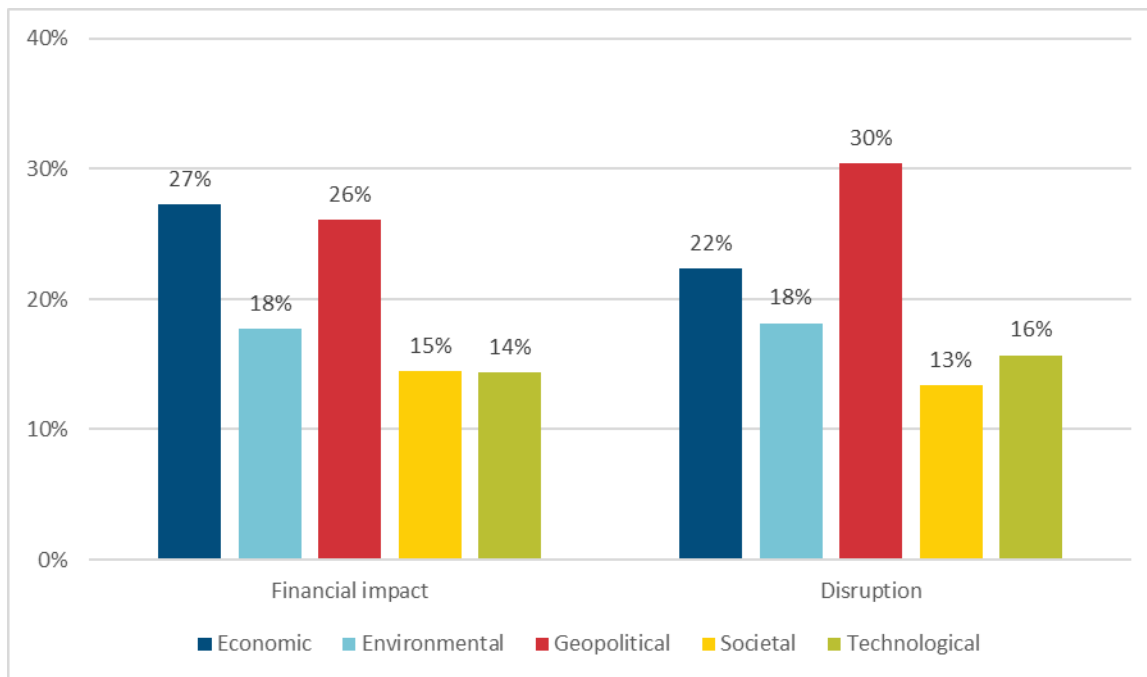
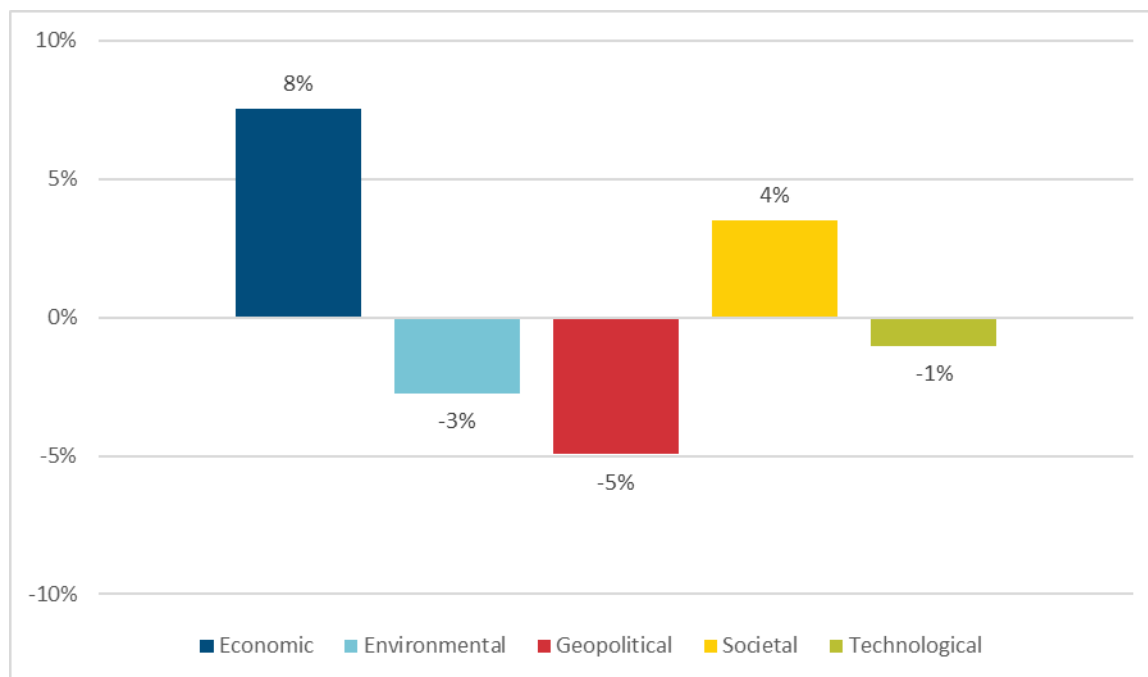


Figure 48 shows the net result across all four questions. Again, you see higher results for the Economic and Societal categories if financial impact is used to define greatest strategic impact and Geopolitical and Environmental risks if disruption was preferred.

Figure 48
 Greatest Strategic Impact Segregated Results: Average Net
 % of Responses



4.5.5 Additional Risks

A final question for 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. These responses are typically used to modify the risk definitions in future survey iterations to incorporate risk nuances. Here are some typical suggestions:⁸

- *Financial inequality*
- *Sexual immorality*
- *Clash of ideological differences and perceived threat from rising power to existing power*
- *Insurance coverage becoming less desirable and undervalued by consumers*
- *Social network societal influence*
- *Humans move further from loving their neighbor as themselves. Behavior drives increasing chaos.*
- *Decreasing empathy*
- *Emergence of the metaverse*
- *Privacy regulations*
- *Crumbling infrastructure*
- *Air and water pollution*
- *Automation, including that of actuarial roles*

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 medical concerns and pollution. Many of these are

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

already included in the current risk definitions but can be considered for greater visibility in future iterations of the survey.

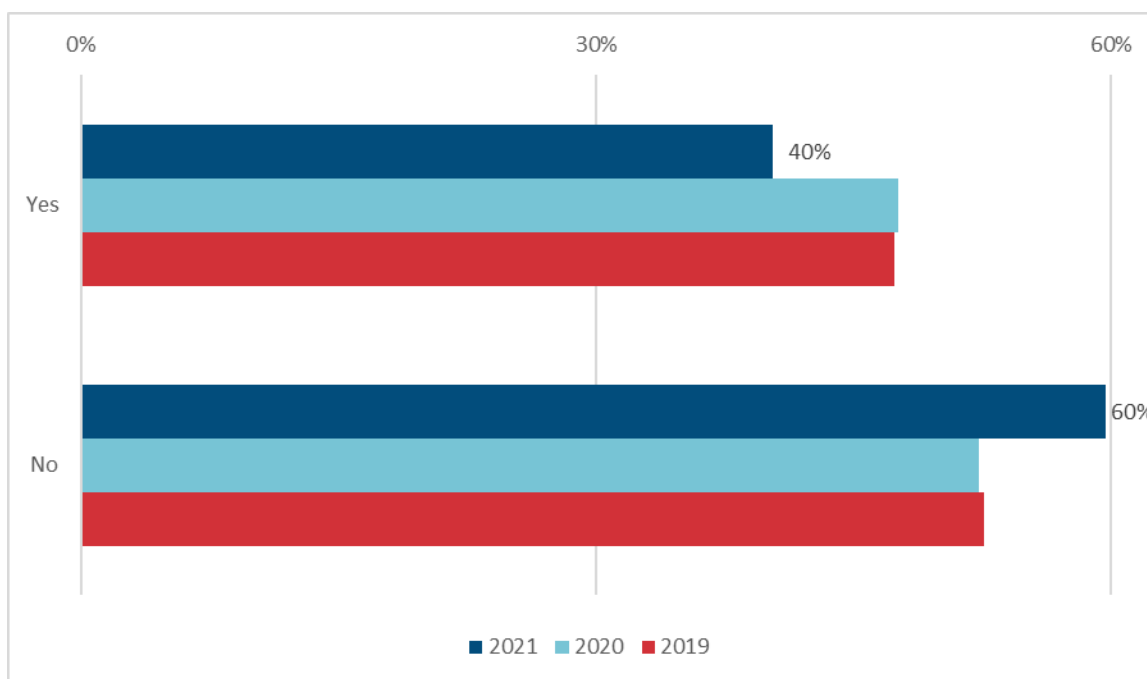
4.6 SECTION B: Leading Indicators

Key risk indicators (KRIs) provide information about a specific risk. They do not replace previously used metrics (lagging indicators, such as an income statement or number of employees hired) but attempt to identify drivers of future performance. Leading indicators of emerging risks are metrics, or events (e.g., initial cluster of respiratory cases in a hospital), indicating that an emerging risk is more likely to materialize. This allows quicker responsive action.

Indicators that trend over time, like GDP or the consumer price index (CPI), can provide macroeconomic KRIs, as can revenue and expense metrics. These measure historical results. Leading indicators provide information earlier in the process. For example, for a government entity, a lower labor force participation rate would drive expectations of lower collected taxes. A leading indicator could also be an event that becomes a Boolean operator, acting as an on/off indicator. An example might be enactment of a single-payer health-care system in the U.S., with new equilibriums achieved over time for labor and tax rates. Identifying a likelihood of such an event makes little sense for analysis. It either is or it isn't, which aligns well with deterministic scenario planning.

The survey asked about the use of leading indicators that provide a firm with actionable information. As shown in Figure 49, 40% of respondents said they formally identify emerging risks, down from recent surveys.

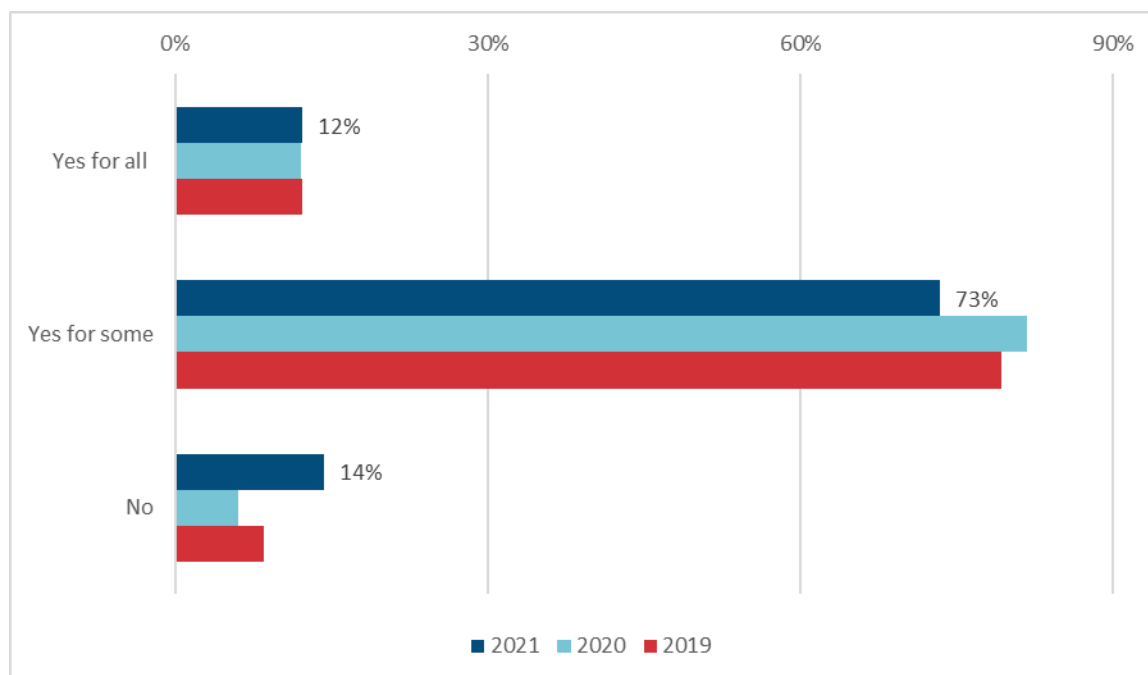
Figure 49
 Whether Respondents Formally Identify Emerging Risks
 % of Responses in Given Year



For respondents who reported having a formal process (those without one moved directly to Section C), the survey asked about measuring, monitoring and mitigating an emerging risk once it has been identified. Figure 50 shows that nearly all respondents said they do this for some or all of their identified emerging risks. However, 14% reported having no process in place (up from 6%).

Figure 50

Whether Respondents Have a Process to Measure, Monitor and/or Mitigate Emerging Risks
% of Responses in Given Year



It can be a challenge to take action based on leading indicators. If a firm reprices its products to reflect higher risk before others in the industry, sales will dry up. It is a balancing act we have seen recently challenge risk managers for risks due to climate change and pandemics.

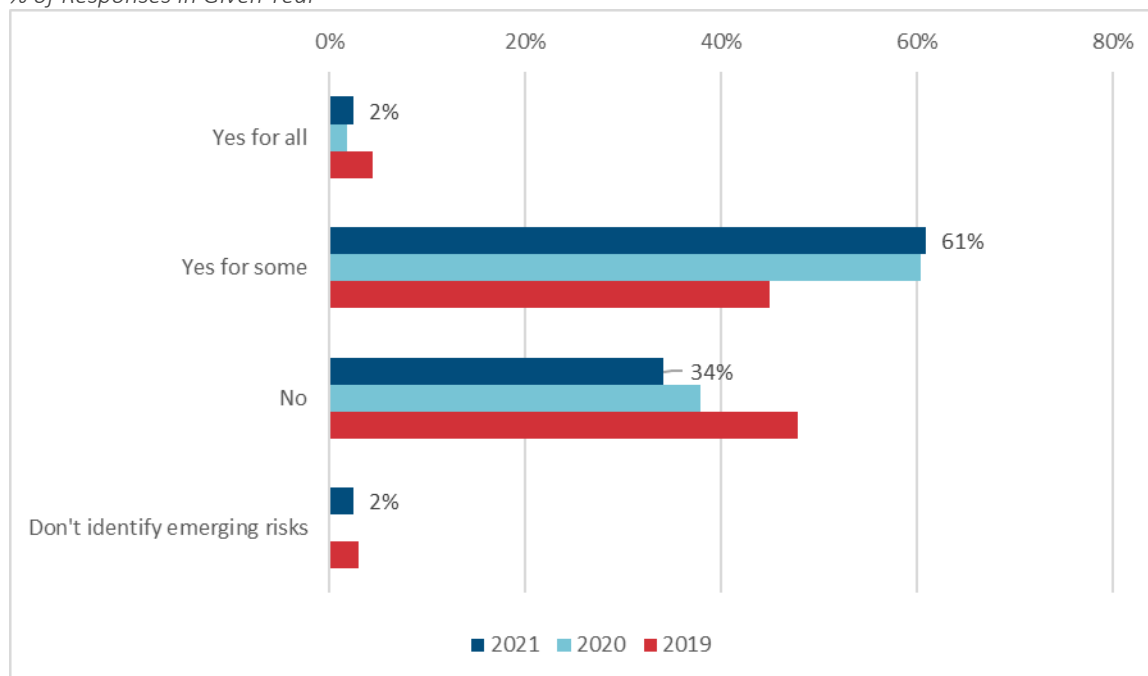
Most of the comments discussed respondents' activities to measure, monitor and mitigate the risk. This shows that progress is being made, as more leading indicators are listed and proactive steps taken as a result. Here are examples of processes in place:

- *Review reinsurance programs; monitor exposure by industry and reduce sales if one industry is getting disproportionate in exposure.*
- *Watch elections and those seizing power to have a sense of where regulatory framework might be heading.*
- *The US becoming a failed state is such a risk. Monitoring attempts to subvert elections through monitoring election laws, ballot initiatives and far-right violence.*
- *Rate of change in magnitude of tariffs as a percent of each country's GDP, the KRI is tracked and updated on either an annual or quarterly basis. Further discussion with the corporate CRO, ERM committee and business unit CROs is had around whether the concern warrants any action or, at a minimum, elevation of information for awareness to the board.*
- *Identification of chemicals that have the potential to lead to insurance claims. We track the stages of "emergence" of each one of those, identifying the ones that can be set aside and the ones that need to be further looked into.*
- *War for talent was identified and steps were taken to attract/retain talent.*

A follow-up question asked, "Once an emerging risk is identified, do you select leading indicators to measure changing likelihoods?" As shown in Figure 51, 63% of respondents noted that they had leading indicators for some or all identified emerging risks. These results show that most risk managers are aware

of the need for leading indicators and the examples provided show that some have a good understanding of what is required, although many examples still reflect lagging indicators.

Figure 51
Whether Respondents Have Leading Indicators for Emerging Risks
% of Responses in Given Year

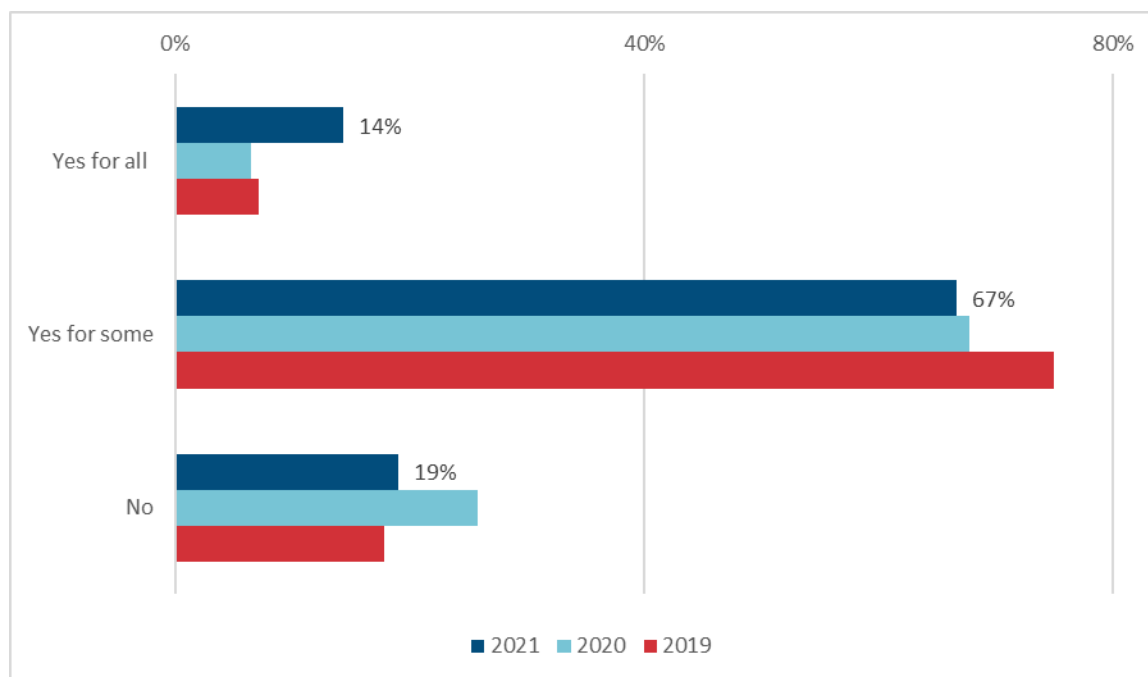


The specific examples shared about leading indicators being collected and monitored are interesting. The leading indicators, like identifying the exposure to frontline workers in a pandemic scenario, tie directly to results. Here are a few of the responses:

- *Emerging risk of life exposure to frontline workers—we measure exposure by industry; aggregating where necessary to understand our exposure to a potential pandemic.*
- *One ex is a new competitor in a market. We continually monitor who is active in which markets and track that within our business plans.*
- *Not sure of exact number, but it's > 20, including some risks with multiple indicators. One example is emerging cybersecurity risk, measured using external ratings, speed to disable credentials for terminated employees, % of employees caught in simulated attacks by the cybersecurity team, etc.*
- *Identified about 10–12 emerging risks (within the 3–5 year horizon) which can impact the org. These risks are placed on a living heatmap which indicates likelihood and potential impact of the risk for the current fiscal year.*

The survey asked whether these leading indicators include criteria that would lead to action to mitigate or accept the risk. Most (81%) stated that criteria exist for some or all of their emerging risks, as shown in Figure 52, with a large increase in those saying yes for all (from 6% to 14%). This is an evolving practice, but the high percentage is encouraging.

Figure 52
 Whether Leading Indicators Include Criteria for Action
 % of Responses in Given Year



When respondents were asked for examples, they shared specific actions and triggers. Some good examples are as follows:

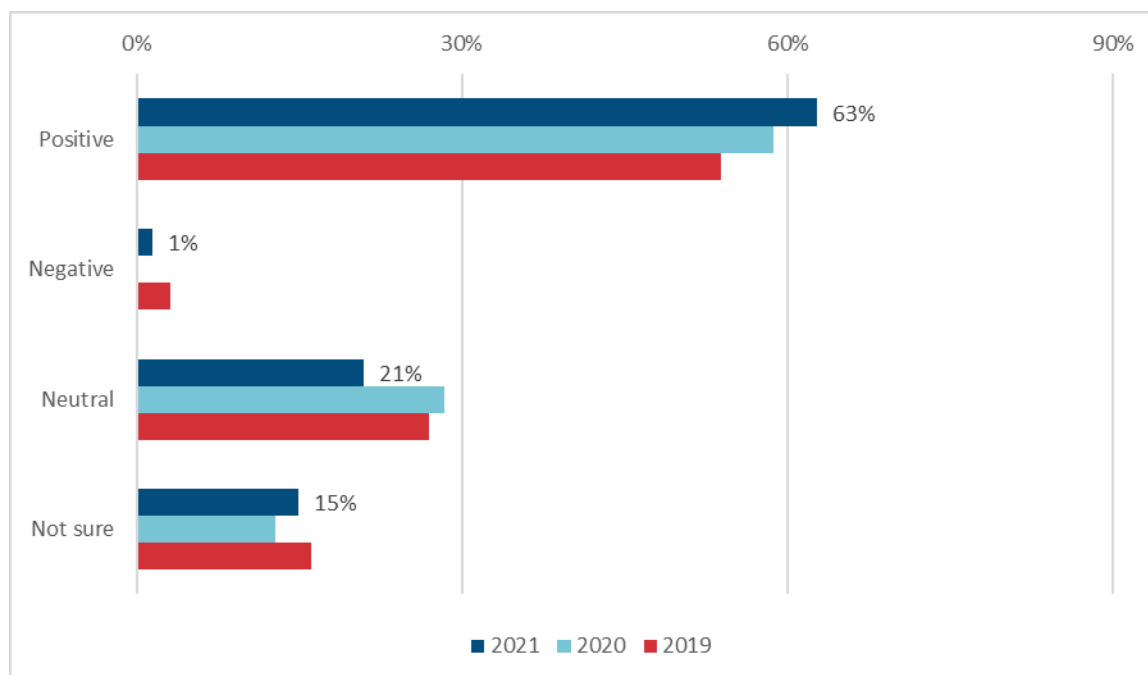
- *Limit life inforce exposure to frontline workers to x% of total exposure.*
- *We have defined a level of asset leverage above which executive leadership must determine whether to continue writing certain types of high-leverage new business.*
- *When risk status of KRI is elevated to Yellow, exceeding our established checkpoints, we initiate mitigation activity.*

4.7 SECTION C: Enterprise Risk Management (ERM)

This section solicits input from practitioners on the overall health of ERM. 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 questions 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 53 shows, a majority (63%, up from 59%) responded that the effect has been positive and the trend is improving. The high number of *Neutral* or *Not sure* responses (36%) is also telling, as ERM continues to evolve toward company-specific levels consistent with unique governance goals and company risk culture. The pandemic has allowed some risk teams to take center stage, and those teams have been recognized for their good work.

Figure 53
 Effect of ERM in Respondent's Company/Industry
 % of responses in Given Year

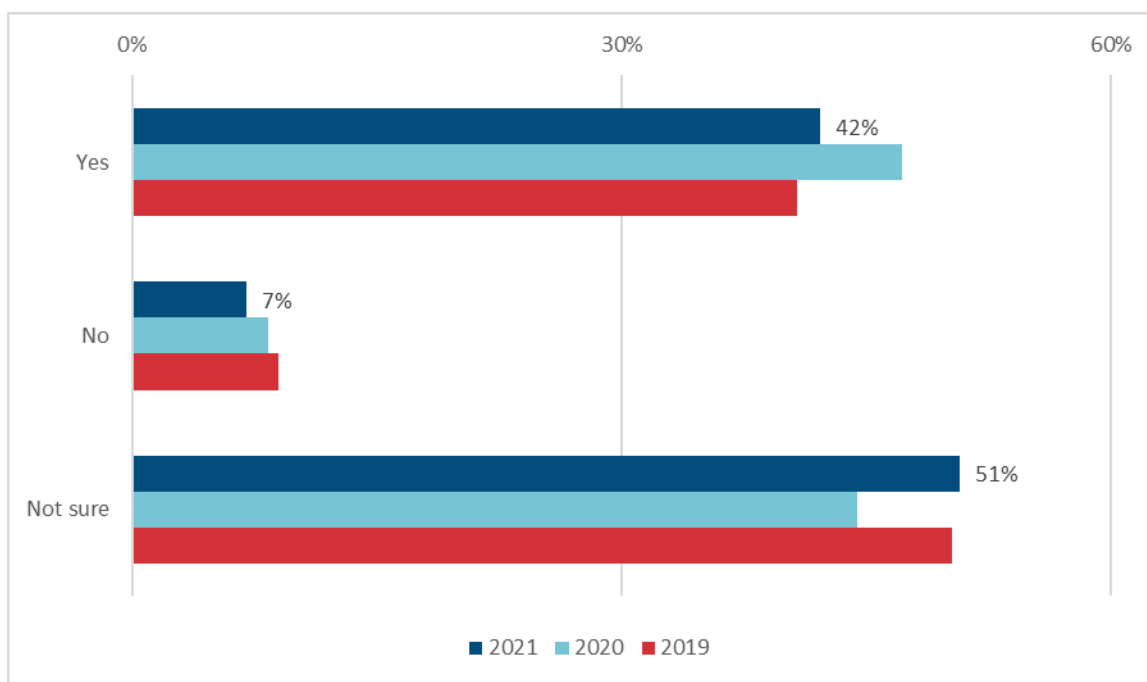


An open-ended question asked respondents to share an example from the past year where another company used ERM in a positive way. Most of the comments reflected ERM responses to COVID-19, including both continuity planning and proactive coverage of testing to mitigate more serious outcomes. The comments included the following:

- *Business continuity planning/management has led to insurers improving their ability to have staff work remote. This positioned many insurers quite well when the pandemic shut downs occurred—they were able to quickly move to remote work with little operational disruption.*
- *ERM to assess cyber risk.*
- *Auto industry—electric vehicle disruption.*
- *ERM was essential in dealing with the consequences of the COVID-19 pandemic. The most common example was health insurance companies covering all COVID testing and preventative measure costs in order to limit risk of hospitalization costs from the disease.*
- *The pandemic concerns provided additional opportunity to discuss ERM tracking and demonstrate to a broader audience the value of the mitigation efforts and various risk management schema in place. This was particularly valuable for life reinsurance companies that needed to demonstrate their value to clients at a time when many clients were increasing retention and the life reinsurance market was retrenching to adjust for a more limited scope of opportunities and lower expected IRRs.*
- *The Argentine government's resolutions due to the pandemic to have a seven-month quarantine and the obligation to pay double severance pay, motivated white-collar companies to invest in improving their networks and in tools for their employees to be able to work from home. Corollary: many companies improved their productivity, in many cases by more than 30%.*
- *Private equity firms recognized that BBB assets falling to below investment-grade levels would cause great harm to them so they used their contacts to ensure that the market was stabilized through stimulus.*

It is important for decision makers to strive toward achieving the desired balance between risk and return. The survey asked, “Does implementing ERM improve company returns relative to the amount of risk?” Results as shown in Figure 54 show a split between *Yes* (42%) and *Not sure* (51%). Splitting the comments out by how the question was answered provides additional clarification. A company’s unique risk culture often drives the role of ERM. This question has many well-thought-out responses. Readers are encouraged to read all of them in Appendix II.

Figure 54
Whether ERM Improves Returns Relative to Risk
% of Responses in Given Year



Among those stating that ERM does improve returns relative to risk, comments included transparency and awareness:

- *I'm answering over time... In the short run, ERM probably reduces returns until an event happens. At a minimum, it brings a greater awareness of risk to provide for better returns when the risk emerges. That discipline of ERM has tentacle benefits in terms of better BCP, quicker recovery, etc.*
- *The ratings for companies that have a strong ERM framework are always better.*
- *It does not take much ERM expenditures to make the company savings way more.*
- *Any discussion/process that produces (even small) incremental risk awareness and evaluation improves company returns.*
- *Identifying risks in a vacuum removes diversification benefits as well as pile on impacts.*
- *Honestly, it depends on how ERM is applied. I have seen more than a few "check-box" ERM exercises which add little to no value and simply increase company costs.*
- *If a company wants to get value from ERM, the senior leadership has to be honest with themselves that it is not a panacea and make measured judgments and where and how the greatest benefit can be achieved. That can be challenging if the corporate culture is set to allow the loudest person in the room to rule the argument.*
- *ERM creates a discipline to acknowledge risk taking, management, monitoring, etc., of the activities.*
- *ERM process brings transparency to risk.*

- *Helps to mitigate risk earlier in the process, hopefully to avoid future loss events or decrease the severity of loss.*
- *Better control of worse outcomes.*
- *Allows for better understanding of risk, interactions, and effective capital uses.*
- *If I can improve my decision making then my returns increase and/or my risk decreases—if not then I'm not adding value.*

Respondents who said ERM does not improve returns relative to risk were extremely direct about their misgivings, with quite a few comments made despite accounting for only 7% of the responses. The solution to shortcomings is often obvious, with politics and lack of understanding of the benefits holding back decision making. Comments included the following:

- *Managing for risk when competitors and the marketplace is not puts the firm at a disadvantage until the crisis moment arrives. Management, shareholders and policyholders generally do not have the fortitude to address the long-term.*
- *It's too abstract.*
- *It's a fad. Just another boondoggle for the Management Consulting industry.*

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

- *Costs of ERM are a given and occur in the present. Returns/Risk need to be evaluated over time.*
- *Depends if a company becomes overconfident or hubris when thinking their ERM practices will shield them from all risks.*
- *I think the answer is Yes for companies that do it well and No for companies that do not.*
- *ERM may or may not improve ROE. In my view the main objective is to reduce the impact and probability of material losses. ERM can also highlight opportunities, which may be accretive to ROE.*
- *It depends on whether ERM is simply a data gathering exercise or an actionable plan.*
- *It may reduce risk, but it always reduces returns. It is important to understand the value of embedded options, and this is where market valuations are important.*
- *Not always. If the relationship between ERM and the business is one of teamwork and working together—including having ERM sit at the table during strategic discussions—then yes.*
- *Most companies in the region where I work implement ERM simply for regulatory compliance purposes.*
- *Some may become too conservative due to ERM and miss out on potential earnings due to risk avoidance.*
- *Improve? It might reduce returns in exchange for avoidance of a potential loss. Is that improvement? Depending on your perspective, maybe yes or maybe no.*
- *They are harder to quantify, so harder to measure impact until they are realized, if ever actually realized in a sense of measuring against company ROI.*

One new, open-ended question was asked this year. With the survey in its 15th iteration, respondents were asked to provide details if the results had helped them to manage risk. Some have used the survey much like an external consultant, to get outside feedback, while others used it to kick start their own risk and solvency assessment (ORSA) process and cyber efforts. The following shares a few examples:

- *I shared the results of the 14th survey with our executive team, when developing our own ERM program.*
- *The survey gave me what risks are communicated out there.*
- *We use the concept in our ORSA analysis.*

- *Highlighting cyber risk has led to more attention to that risk across financial institutions*
- *I used this survey in the past to convince management to put more resources towards Climate change.*
- *The comments from respondents over the past couple of years suggesting how to start up an ERM process was very helpful.*

For the second consecutive survey, respondents were asked how risk evaluation and risk mitigation, both implemented and planned, changed under COVID-19. There was more discussion of business continuity previously, while more comments here reflect changes to the risk process. The following are examples of their responses:

- *Focused more on employee retention of key employees given increased remote nature of jobs.*
- *It has shifted the time frame of several analyses, bringing risk events forward several years; it has also placed more emphasis on the operational/practical elements of risk mitigation.*
- *It has become more political.*
- *Our list of risks and potential implications has expanded.*
- *The biggest change is that a perceived nearly impossible event became possible. This, however, has not seemingly altered risk management appetites.*
- *The assigned probability of a risk event has become less important for me, since before COVID most would have assigned a low probability to a pandemic.*
- *People have an even more distorted perception of risk now that the media and politicians have used fear-mongering of the virus to take more control over people's daily lives. And measures that promote virus safety at all costs ignore the risk/benefit trade-off inherent in any of these policies.*
- *Pandemic provided a realistic scenario to base public health measures against operational impacts.*
- *We go even deeper in trying to think about ways that contract wording can be challenged in court.*
- *COVID caused us to focus on risks to our supply chain (well before the current national supply chain problems).*

4.8 SECTION D: Current Topics

More than a decade after the event, the 15th survey in this series continues to reflect on the period since the global financial crisis, but now has had another global event to deal with in the pandemic. The Current Topics section reflects this, showing changing expectations.

Asked their expectations about the global economy in 2022, respondents were more positive than respondents the previous year, with 51% having a moderate and 29% a good outlook, as shown in Figure 55. Strong expectations were slightly higher, with poor dropping from 25% to 15%. As can be seen in Figure 56, the net result, adding good and strong, and subtracting poor, remained stable.

Figure 55
 Net Expectations for the Global Economy (Good + Strong – Poor)
 % of Responses in Given Year

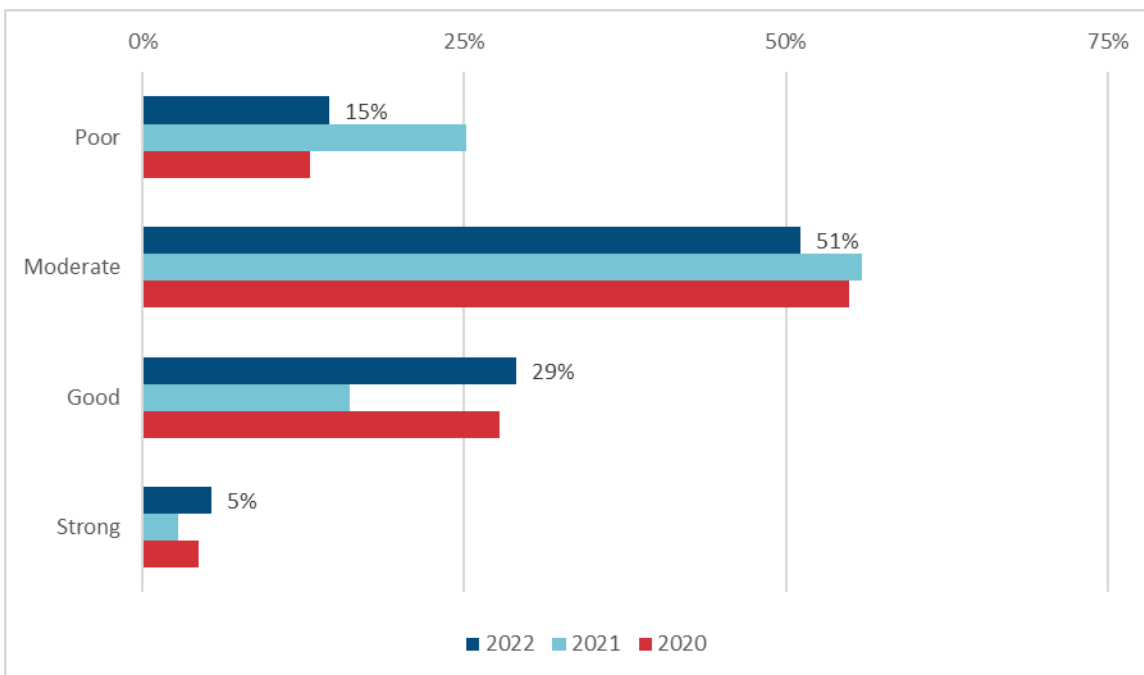
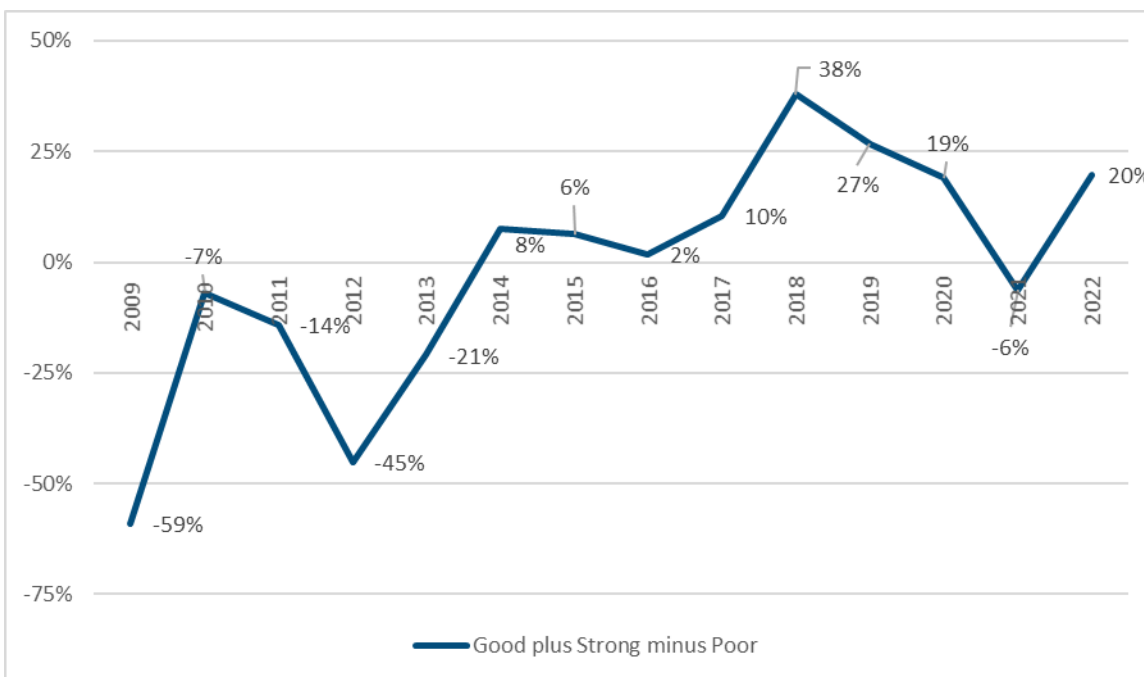
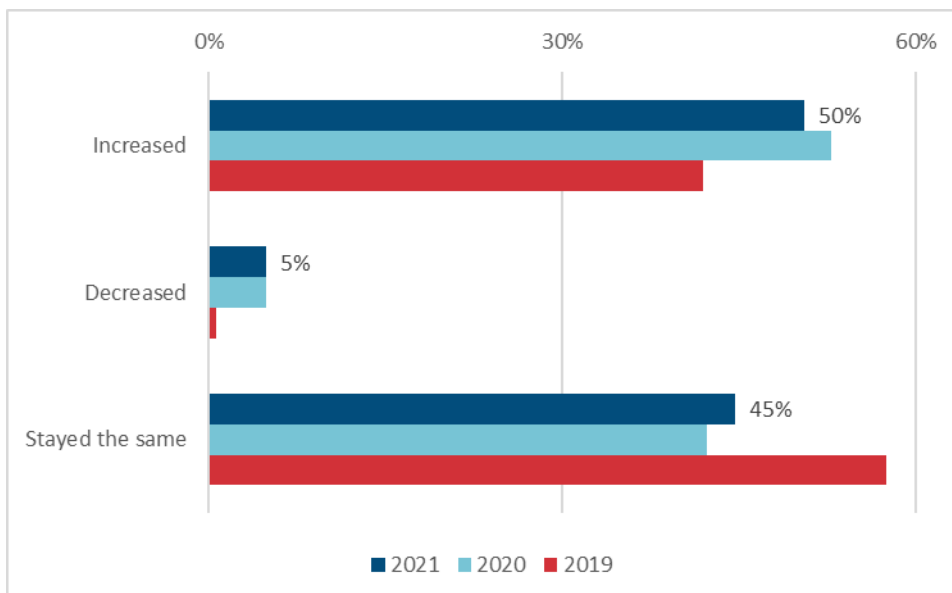


Figure 56
 Net Economic Expectations, 2009–2021
 % of Responses in Given Year



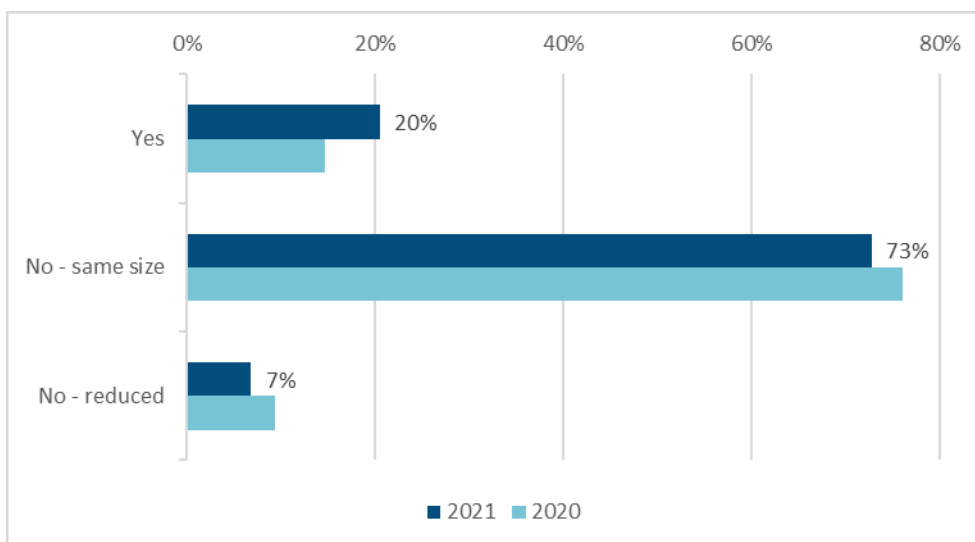
Half of the risk managers (50%) reported increased ERM activity in 2021, as shown in Figure 57.

Figure 57
Perceived Level of ERM Activity
% of Responses in Given Year



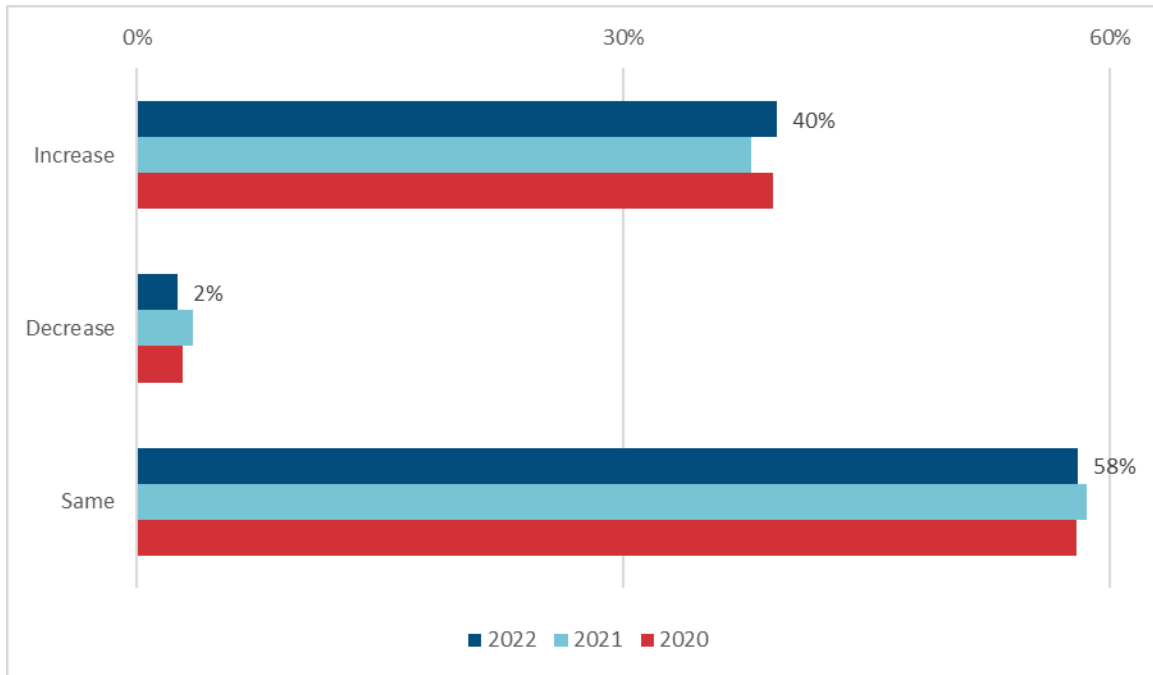
Higher ERM activity led to internal staff growth for 20% (up from 15%) of the respondents in 2021, as shown in Figure 58. (Note that this question was modified somewhat in 2020 to be consistent with the wording of nearby questions, so comparisons to earlier surveys are inappropriate and have been left out of the chart.)

Figure 58
ERM Internal Staff Growth
% of Responses in Given Year



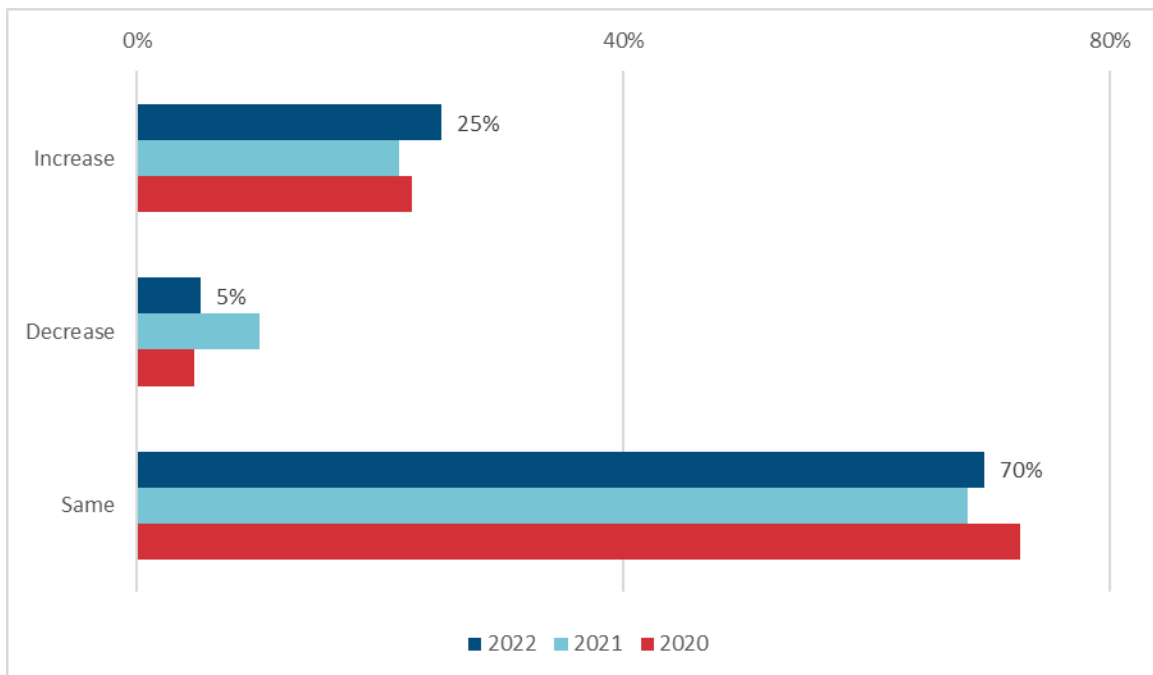
ERM activity is expected to increase for 40% of the respondents in 2022, as shown in Figure 59, with only 2% expecting ERM activity to decrease.

Figure 59
ERM Activity Growth
% of Responses in Given Year



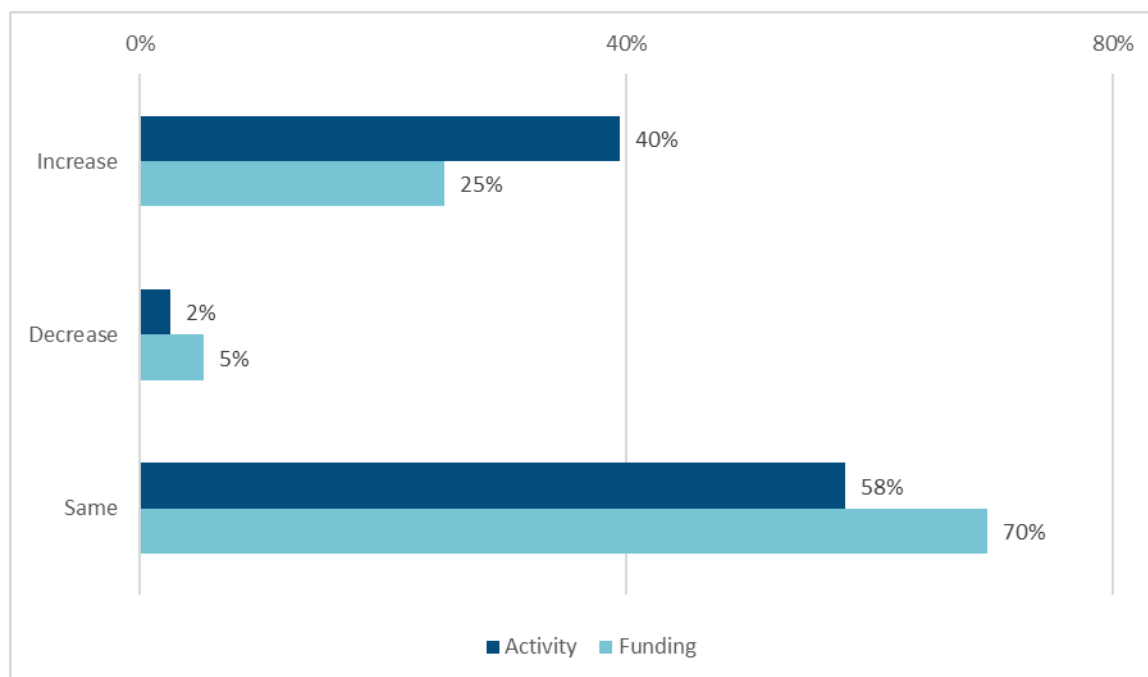
Respondents indicated that levels of funding for ERM are expected to slightly increase in 2022. Figure 60 shows that 5%, down from 10%, expect funding to decrease for the upcoming year.

Figure 60
Anticipated Levels of ERM Funding
% of Responses to Given Question



In Figure 61, respondents show that activity levels are expected to increase in 2022 more than funding. This is consistent with prior surveys.

Figure 61
Anticipated Levels of ERM Activity and Funding in 2022
% of Responses to Given Question

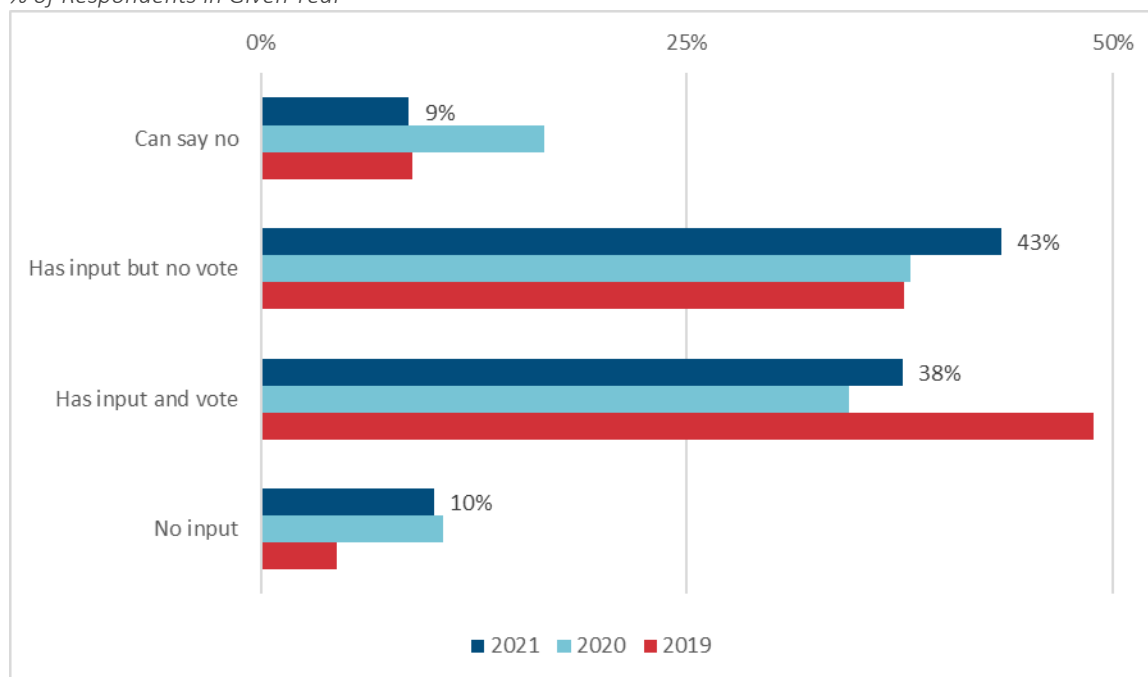


Technological risks have grown in importance in this survey over the years. Earlier in the survey *Disruptive technology* had a lower response rate for some questions. The survey asked about specific scenarios used to analyze this risk. They include:

- *Telemedicine*
- *Increasing ease of selling life insurance directly to consumer/online/on an app*
- *Change in consumer behavior*
- *Disruptive medical procedures and devices*
- *Firewall breakthrough causing data leakage*
- *Automated underwriting*
- *Cyberattacks*
- *Blockchain, cryptocurrencies, AI*

The survey asked how the ERM team is used when a strategic opportunity is presented to a firm. As illustrated in Figure 62, while 91% of respondents said they can either say no to a strategic opportunity and/or have input. Within the group that has input, fewer have the ability to unilaterally say no to an opportunity.

Figure 62
 Use of ERM Team for a Strategic Opportunity
 % of Respondents in Given Year



Respondents were asked to share examples of the ERM department being recognized following a risk event, in either a positive or negative way. Many of the examples spoke of scenario planning that was developed by the ERM unit. A few examples were specific and provide guidance to risk teams of where successes and failures might be recognized:

- *Performed shock analysis of COVID-19 event including impacts to operating financials and RBC; helped understand the potential impact across the organization—well received.*
- *Much of our COVID-19 response (both financial and operational) was based upon previous pandemic planning done by the ERM department and described to management and the board in our ORSA.*
- *Company implemented a Crisis Management Team (subset of ERM committee) when monitoring the pandemic impacts. This was perceived well by staff with the continued communication.*
- *ERM helped to refine contract wording following COVID.*
- *Complimented for ensuring our business continuity plans were kept up to date and we had no down time.*
- *Our outside ERM practice was recognized for identifying before COVID-19 that insurance would not apply to losses, especially business interruption.*
- *Prior to a risk event, I was deemed excess baggage for pushing management toward proactive planning around pandemics and low interest rates.*

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?

- *Our analysis focuses on demographics which may be overlooked and overpriced.*
- *We're in involuntary unemployment insurance. Opportunity for sales as people are more aware of the potential value.*

- *The use of alternative assets since U.S. insurers are abusing these asset classes to unwisely get marginal increased return with little knowledge of downside correlation risks.*
- *Climate change and impact on certain asset classes.*
- *A lot on the asset side, looking for undervalued stocks. My filters look for low leverage balance sheets.*

Respondents were asked if they had identified bubbles. Debt of various kinds, real estate and assets that are securitized and leveraged were suggested:

- *Sharp division of the political ideologies both within and beyond the borders.*
- *Cash/Monetary policy...leading to asset pricing bubbles. Hyperinflation may be on the horizon, for which no action is taking place.*
- *No.*
- *Too much money being spent on "build-it-and-they-will-come" web portals for insurance.*
- *The use of CLOs and other alternative assets, private equity buying up housing and crowding out the middle class from home ownership.*
- *Cryptocurrency, housing, US money supply.*
- *Commodities.*
- *Not sure it is your definition of a bubble, but staffing shortages.*
- *Anything with high leverage.*

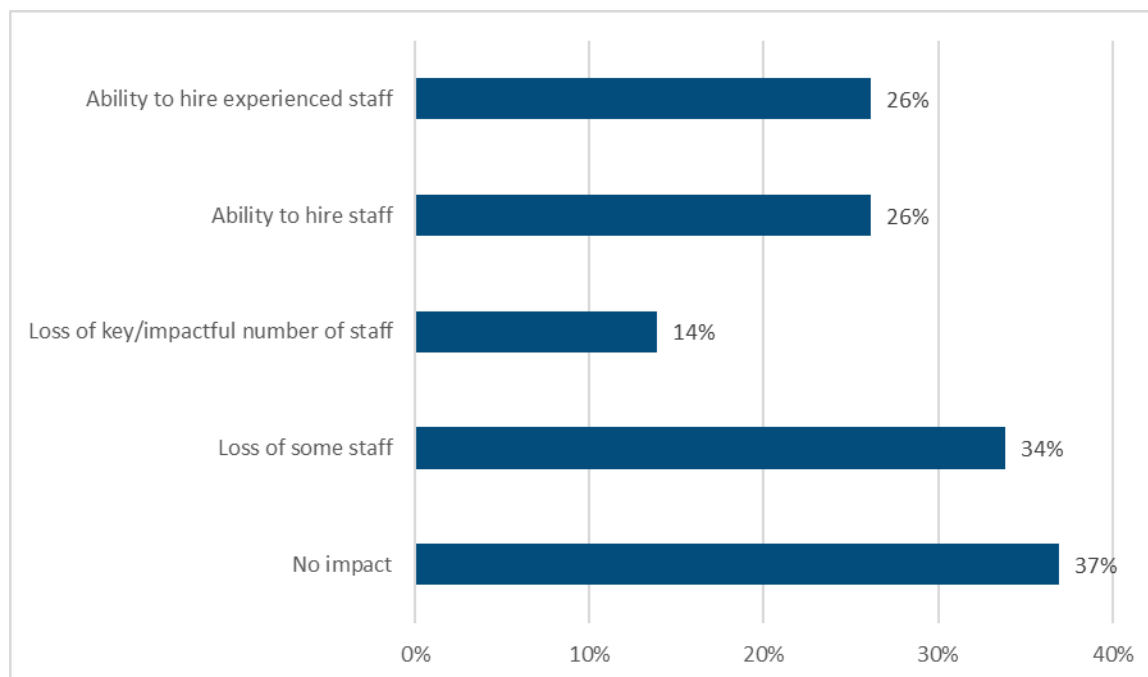
Respondents were also asked to share an unknown known, where there is historical data but it is not predictive, along with how it is managed. Several referred to low interest rates, pandemics and illiquid assets:

- *Long-term COVID claims on disability—working with industry contacts to learn together.*
- *Mortality trends appear to be diverging from historical data, particularly with respect to stratification by income. We are trying to balance a quantitative historical approach with periodic qualitative thought exercises regarding what could happen and what that might mean, both in terms of a best estimate assumption and in the tail.*
- *Cyber incidents. Be vigilant. Spend on management consistent with expected cost-benefit.*
- *Weather impact on dental claims. We use a longer historical period to evaluate. This is always changing, however.*
- *Impact of genetic testing or lack thereof (where certain countries won't allow its use in underwriting).*
- *Mortality in current environment (pandemic). Looking at past events to try and estimate possible impact, but current pandemic doesn't mirror past.*
- *Climate change and the impact to business continuity/resiliency. We build mitigation steps which are designed to work in various scenarios due to any of a number of unspecified causes.*
- *Severe weather and property loss. We adjust by making sure we have adequate insurance and properly valued assets.*
- *Low interest rate environments monitored through extreme sensitivity testing.*

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. The survey asked employees at insurance companies how it has impacted the ERM function in their situation. The survey found that 63% of respondents have been impacted by the issue in some way, and nearly 10% had been impacted by all four choices.

With no previous base 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 this is a temporary high point, consistently stable level, or something else. Over 50% of those reporting an impact had lost staff, as shown in Figure 63, while for over 40% the ability to hire staff and hire experienced staff was impacted (multiple responses allowed). More than one in five had lost a key member or an impactful number of staff.

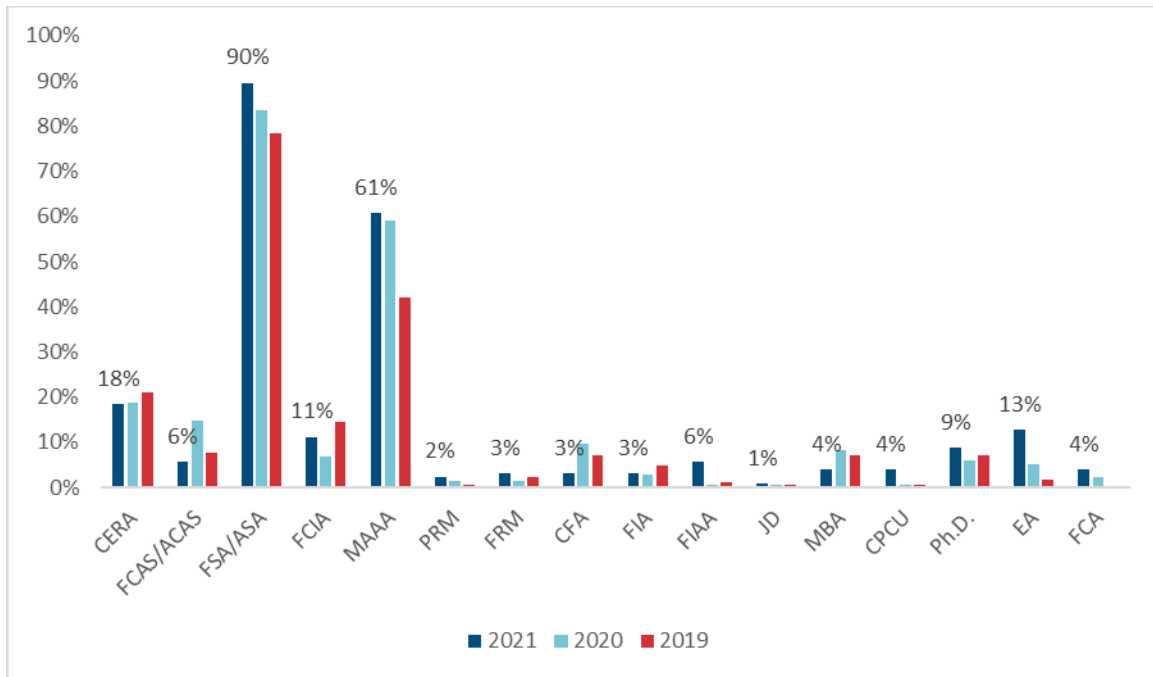
Figure 63
Impact of the Great Resignation to ERM Function
% of Respondents



4.9 SECTION E: Demographics

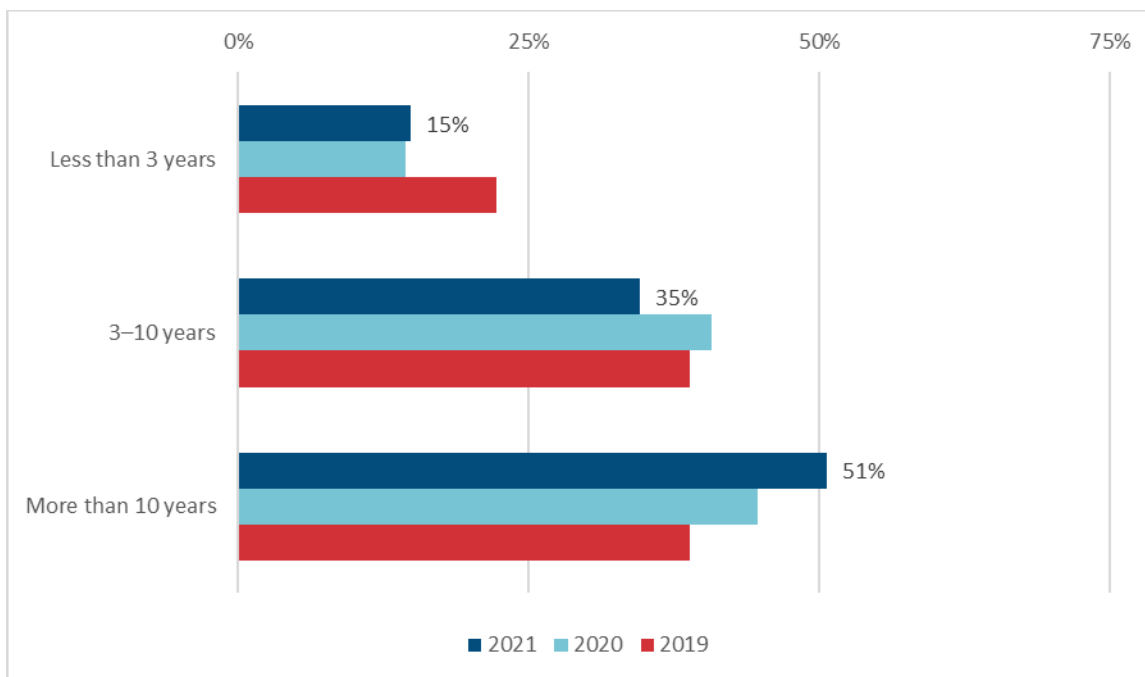
Each year, the *Survey of Emerging Risks* is distributed using targeted emails and social media. For this survey, a record 63% reported filling out the survey in the past. Those holding the CERA credential from an actuarial organization represented 18% of the total. One of the sponsors, the JRMS, was well represented in the survey, with 90% of respondents holding a credential from the SOA, 6% from the CAS and 11% from the CIA (see Figure 64). Other groups strongly represented were Enrolled Actuaries (13%), those holding the FIAA credential from the Institute of Actuaries of Australia (6%) and those with a Ph.D. (9%). Many respondents held multiple credentials.

Figure 64
Credentials Held by Respondents
% of Responses in Given Year



This year’s survey was completed by more experienced practitioners, with 51% having more than ten years of experience as risk managers (see Figure 65). The researcher is again indebted to respondents who share their experiences. Most respondents work at an insurer/reinsurer (62%) or consulting firm (24%).

Figure 65
 Respondents' Risk Management Experience
 % of Responses in Given Year

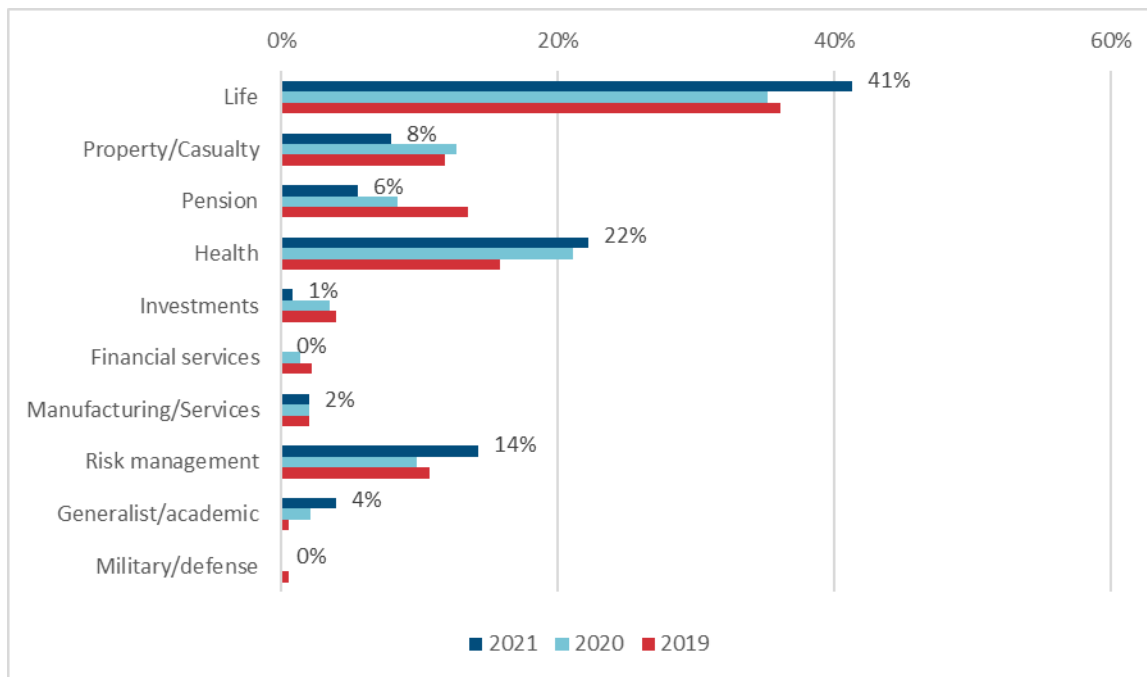


The survey was sent directly to all JRMS, INARM and IAA AFIR-ERM members, some targeted social media groups on LinkedIn and Twitter, and to the members of many SOA sections.

The survey continued to be dominated by North Americans (91%), with a significant minority coming from Europe (3%) and Asia (2%). This year, surveys were also completed by risk managers in the Middle Eastern, South American, Caribbean/Bermuda, Australia/Pacific and African regions.

As illustrated in Figure 66, the primary areas of practice were led by life insurance, health, risk management, property/casualty and pensions.

Figure 66
 Respondents' Practice Areas
 % of Responses in Given Year



A final survey question asked for sources respondents use to scan for emerging risks. The ideas may be the most valuable part of this report for some. Many respondents shared news services, the *Wall Street Journal*, magazines and newsletters (e.g., *The Economist*, *Coverager*, *Washington Post*, *Rand*), reinsurer and consultant publications, rating-agency reports, seminars, the NAIC, professional actuarial organizations (e.g., the IAA, IFOA, CAS, SOA and CIA), the CDC and WHO, books (both non-fiction and fiction), websites (e.g., Virtual Capitalist, Our World in Data) 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:

- *Comment on the "woke" culture that wants to "cancel" their political opponents.*
- *I suggest that you either create a separate survey for product development/pricing actuaries, or better tailor for this group. A lot of risks originate with this group, so that their attitudes matter. Judging from conversations with my peers inside and outside the company, risk management at insurance and financial services is more decentralized than is realized. Even when there is a unit specifically dedicated towards risk management.*
- *Keep it up—good work here.*
- *This is an important survey.*
- *Note in email that anyone can fill out the first section and if you aren't comfortable with the other parts just forward to the demographics section and submit.*

Researcher's Notes for Future Surveys

- Add questions probing:
 - What actions do you take between crises to remain influential?
 - How prepared is your firm for a major risk event that has never happened before (resilience)?
 - Currency shock—include risk of Bretton Woods—type overhaul
 - What types of narrative scenarios do you consider?
- Include pollution in climate change risk definition

Appendix I: Glossary of Risks

The 23 core risks originally defined by the World Economic Forum (WEF) in 2007 has led to an updated version for the current survey, with a description of each.

Economic Risks

- Energy price shock—Energy prices change abruptly.
- 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, ecosystem biodiversity (e.g., insects, shell fish) and human lives. (Drivers include, but are not limited to, space weather and human influence.) Alternative divisions are physical risks and transition risks.
- Loss of freshwater services—Water shortages impact agriculture, businesses and human lives (Drivers include, but are not limited to, climate change and human influence).
- 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 lead 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 are held by unstable groups, leading 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 continues to be endemic, and non-state entities successfully penetrate the global economy.
- Globalization shift—Preference changes to imports and immigration. Populism, political uncertainty. Countries retrench and become more nationalistic and protectionist, or open up their economies to outsiders. Inequality and food insecurity challenge the concept of fairness and egalitarianism.
- Regional instability—Certain unstable areas may 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. Material change to medical delivery or financing.
- Demographic shift—Evolving populations (e.g., age, size, race, migration trends, skills shortages) drive changes in economic growth and levels of government intervention.
- Liability regimes/regulatory framework—Costs increase faster than GDP, with increases in the spread and size of litigiousness (e.g., social inflation) and speed of regulatory revisions.

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 major infrastructure: power distribution, water supply, transportation, telecommunication, emergency services and finance.
- Disruptive technology—Unintended consequences of technology leads to abrupt change (e.g., drones, self-driving cars, additive manufacturing, the 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 *US current account deficit/fall in US 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 Nonproliferation 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 government 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.

Appendix II: 15th Survey Results (Compiled Fall 2021)

This appendix includes the survey as well as the responses. There were 153 respondents. Not all of 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 15 years.

The following text introduced the survey to recipients via email.

Take Part in the 15th Survey of Emerging Risks

The Joint Risk Management Section of the Canadian Institute of Actuaries, the Casualty Actuarial Society, and the Society of Actuaries will oversee an online survey to help understand individual risk managers' perspectives on 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. 22nd. It should take about 15 minutes to complete. We hope you will share your thoughts and experiences in comment boxes. **Responses from more than one risk manager within the same company are encouraged.** All responses are anonymous. Thanks to the SOA Reinsurance and Financial Reporting Sections for supporting this research.

If you have questions about the survey, please contact Jan Schuh at the SOA Research Institute, jschuh@soa.org.

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/>, <https://www.cia-ica.ca/> and www.soa.org.

Responses are anonymous and multiple responses from an organization are encouraged.

As you complete the five 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. 22, 2021**.

A glossary of terms is available for reference: Glossary of risks 2021. [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.

Macroeconomic Trends

Date	Survey Date	S&P 500	Oil Price	Survey Date
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

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 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 tripling of the S&P 500, much lower prices for oil and a stronger U.S. dollar.

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?

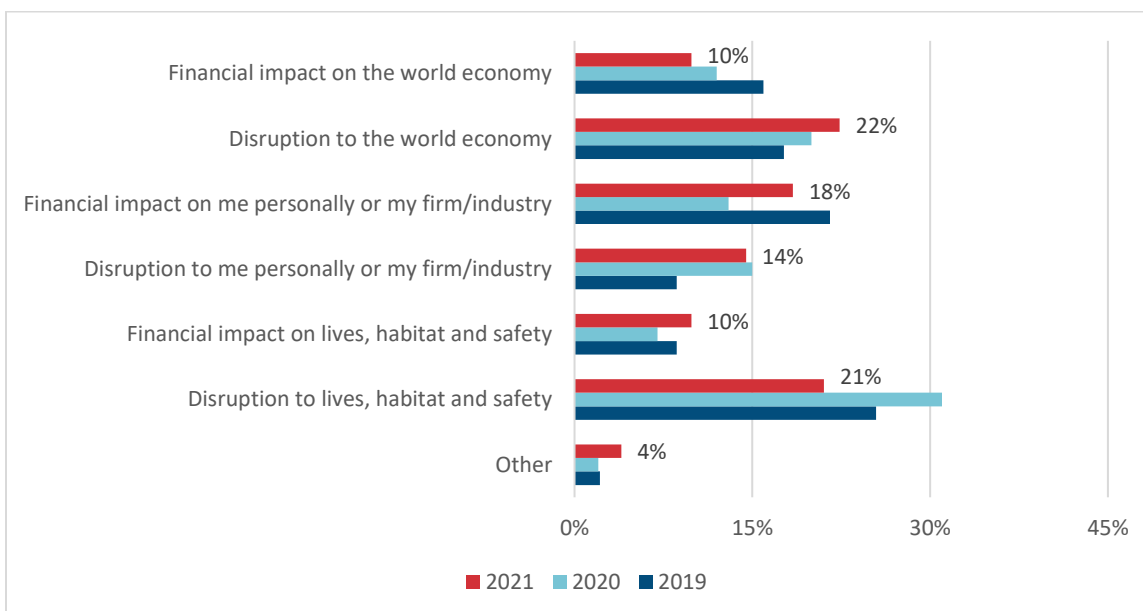
152 total responses

	Responses	2021	2020	2019
Financial impact on the world economy	15	10%	12%	16%
Disruption to the world economy	34	22%	20%	18%
Financial impact on me personally or my firm/industry	28	18%	13%	22%
Disruption to me personally or my firm/industry	22	14%	15%	9%
Financial impact on lives, habitat and safety	15	10%	7%	9%
Disruption to lives, habitat and safety	32	21%	31%	25%
Other	6	4%	2%	2%

Other

- *The above descriptors refer to different levels of scope. Although people often equate strategic issues with broader scope, strategy really refers to the patchwork of mutually reinforcing initiatives that delivers an outcome greater than the sum of the parts. A strategic impact related to risk is when a risk pulls at the thread of one of those strategic initiatives (in my view).*
- *It depends on whose strategy we are talking about.*
- *All of the above.*
- *Both financial impact and disruption.*
- *Disruption to my clients.*
- *I live in Argentina and I answer for what happens in my country. In this case financial impact to me personally, my industry, my life, habitat and security.*

Greatest Impact

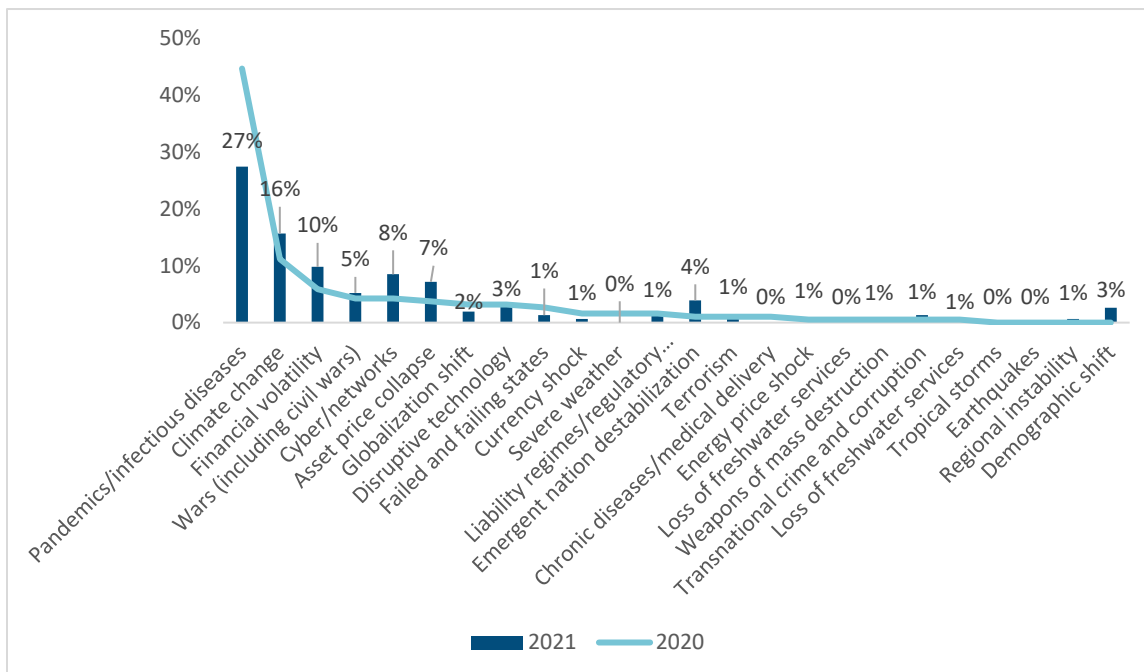


Later in this analysis some of the survey results will be segregated between how respondents answered this question:

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, when previous results for individual risks were above 2%, **yellow highlight** is used to indicate a five-percentage-point increase or doubling, and **green highlight** indicate a five-percentage-point decrease or halving.

153 total responses

The rankings for the top current risks are

1. Pandemics/infectious diseases 27%
2. Climate change 16%
3. Financial volatility 10%
4. Cyber/networks 8%
5. Asset price collapse 7%

	2021	2020	2019	2018	2017
Economic	22%	13%	25%	24%	22%
Energy price shock	1%	1%	0%	0%	1%
Currency shock	1%	2%	1%	2%	0%
Emergent nation destabilization	4%	1%	5%	3%	1%
Asset price collapse	7%	4%	9%	8%	10%
Financial volatility	10%	6%	10%	11%	9%

	2021	2020	2019	2018	2017
Environmental	16%	13%	19%	17%	16%
Climate change	16%	11%	16%	12%	11%
Loss of freshwater services	0%	1%	0%	1%	1%
Natural catastrophe: tropical storms	0%	0%	1%	3%	2%
Natural catastrophe: earthquakes	0%	0%	1%	0%	1%
Natural catastrophe: severe weather (except tropical storms)	0%	2%	1%	2%	0%

	2021	2020	2019	2018	2017
Geopolitical	12%	12%	26%	24%	33%
Terrorism	1%	1%	2%	4%	6%
Weapons of mass destruction	1%	1%	2%	3%	6%
Wars (including civil wars)	5%	4%	5%	3%	6%
Failed and failing states	1%	3%	4%	5%	4%
Transnational crime and corruption	1%	1%	3%	2%	2%
Globalization shift	2%	3%	5%	5%	4%
Regional instability	1%	0%	3%	3%	5%

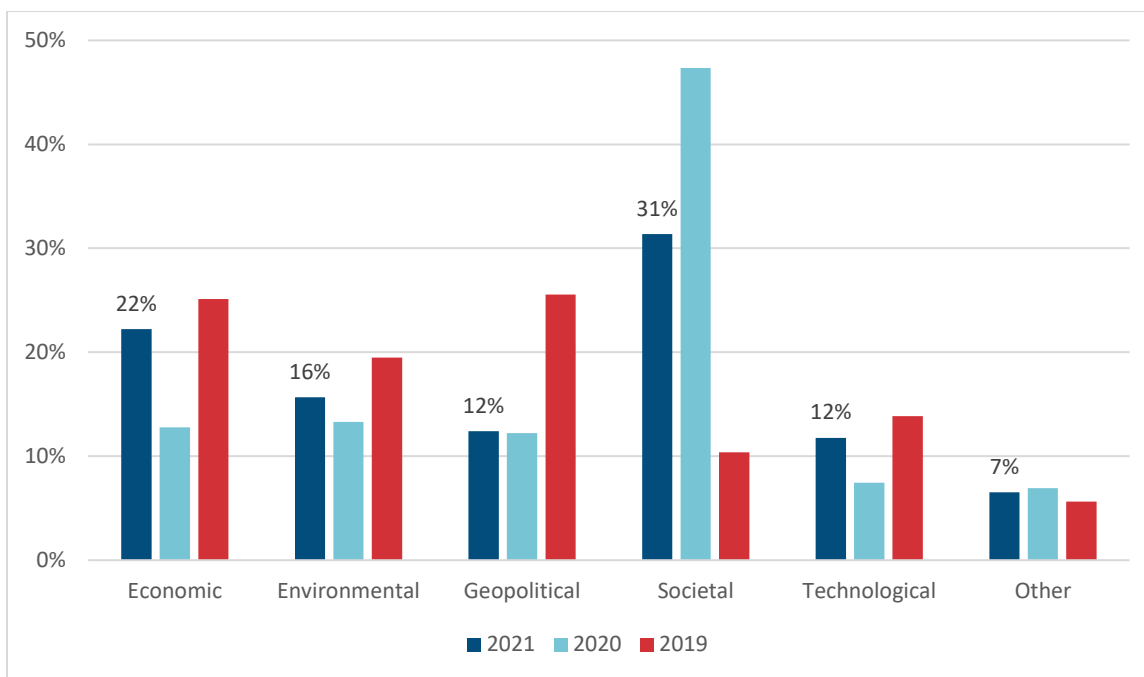
	2021	2020	2019	2018	2017
Societal	31%	47%	10%	11%	10%
Pandemics/infectious diseases	27%	45%	2%	2%	3%
Chronic diseases/medical delivery	0%	1%	3%	2%	1%
Demographic shift	3%	0%	3%	4%	2%
Liability regimes/regulatory framework	1%	2%	2%	3%	4%

	2021	2020	2019	2018	2017
Technological	12%	7%	14%	19%	18%
Cyber/networks	8%	4%	8%	12%	13%
Disruptive technology	3%	3%	6%	7%	6%

Other (7%/7%/6%/5%/1%)

- Liberal education
- US domestic politics and relations with China
- Democracy ending in the United States
- Government overreach to attempt to compensate for the listed risks
- Government elimination of individual freedom
- No one knows what the truth is any more, so how can you solve any of these problems
- Ongoing economic impact as a result of COVID, with mass exodus from workforce
- Flawed democracies
- Misinformation campaigns
- Communism

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.

703 total responses from 149 surveys

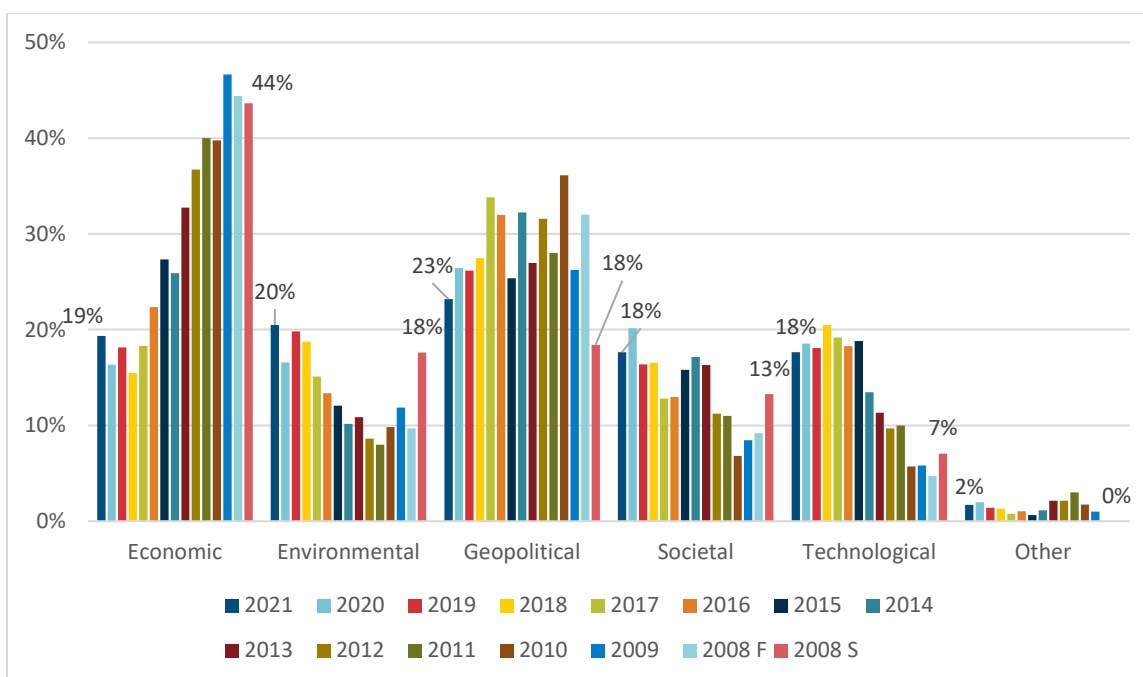
Average of 4.72 risks selected per survey (same as prior survey)

Divisor in percentages for major categories is 703; for individual risks it is 149. Note that due to multiple responses, the sum of all percentages is materially greater than 100%.

Number of responses selected (maximum of 5):

- 1: 1 survey (1%)
- 2: 2 surveys (1%)
- 3: 7 surveys (5%)
- 4: 18 surveys (12%)
- 5: 121 surveys (81%)

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



The rankings for the top five emerging risks are

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

	2021	2020	2019	2018	2017
Economic	19%	16%	18%	15%	18%
Energy price shock	18%	4%	7%	6%	5%
Currency shock	11%	7%	7%	7%	7%
Emergent nation destabilization	12%	15%	23%	15%	16%
Asset price collapse	19%	20%	21%	19%	30%
Financial volatility	30%	31%	29%	27%	29%

	2021	2020	2019	2018	2017
Environmental	20%	17%	20%	19%	15%
Climate change	58%	50%	54%	49%	29%
Loss of freshwater services	15%	8%	12%	13%	11%
Natural catastrophe: tropical storms	5%	7%	8%	8%	16%
Natural catastrophe: earthquakes	3%	2%	4%	6%	6%
Natural catastrophe: severe weather (except tropical storms)	15%	11%	16%	12%	10%

	2021	2020	2019	2018	2017
Geopolitical	23%	26%	26%	27%	34%
Terrorism	17%	19%	17%	23%	41%
Weapons of mass destruction	7%	8%	9%	13%	21%
Wars (including civil wars)	24%	25%	25%	18%	19%
Failed and failing states	13%	18%	19%	25%	14%
Transnational crime and corruption	11%	11%	12%	12%	14%
Globalization shift	19%	20%	20%	20%	30%
Regional instability	17%	17%	22%	18%	31%

	2021	2020	2019	2018	2017
Societal	18%	20%	16%	17%	13%
Pandemics/infectious diseases	38%	45%	22%	25%	14%
Chronic diseases/medical delivery	9%	12%	12%	8%	8%
Demographic shift	23%	25%	33%	32%	23%
Liability regimes/regulatory framework	13%	13%	11%	12%	16%

	2021	2020	2019	2018	2017
Technological	18%	19%	18%	20%	19%
Cyber/networks	52%	47%	51%	56%	53%
Disruptive technology	32%	40%	35%	40%	38%

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

- *Nationalism and the problems it creates—social problems and inflation*
- *Civil unrest encouraged by godless leaders*
- *Global governmental regime shifts*
- ***Climate change will lead to most of the other threats, directly or indirectly***
- *Dysfunctional politicians*
- *Government and central bank experimentation*
- *Government elimination of individual freedom*
- *Ability to know the truth*
- ***Bias in information or outright disinformation***
- *Deterioration of trust in social institutions*
- *Communism*
- *Geopolitical relations*

Another way to review this data is as a percentage of the total responses. For example, *Climate change* had 86 responses in this survey. In the previous analysis just shared, $86/149 = 58\%$. In the following tables, we will look at $86/703 = 12\%$ 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

Results are presented with the average across all 15 surveys first, then listing each result starting with the most recent survey.

	Avg	2021	2020	2019	2018	2017
Economic	30%	19%	16%	18%	15%	18%
Energy price shock	5%	4%	1%	1%	1%	1%
Currency shock	5%	2%	2%	1%	1%	1%
Emergent nation destabilization	5%	3%	3%	5%	3%	3%
Asset price collapse	6%	4%	4%	4%	4%	6%
Financial volatility	9%	6%	6%	6%	6%	6%

	Avg	2021	2020	2019	2018	2017
Environmental	14%	20%	17%	20%	19%	15%
Climate change	7%	12%	11%	11%	11%	6%
Loss of freshwater services	2%	3%	2%	3%	3%	2%
Natural catastrophe: tropical storms	2%	1%	2%	2%	2%	3%
Natural catastrophe: earthquakes	1%	1%	0%	1%	1%	1%
Natural catastrophe: severe weather (except tropical storms)	2%	3%	2%	3%	3%	2%

	Avg	2021	2020	2019	2018	2017
Geopolitical	28%	23%	26%	26%	27%	34%
Terrorism	6%	4%	4%	4%	5%	9%
Weapons of mass destruction	2%	1%	2%	2%	3%	4%
Wars (including civil wars)	3%	5%	5%	5%	4%	4%
Failed and failing states	5%	3%	4%	4%	5%	3%
Transnational crime and corruption	2%	2%	2%	3%	2%	3%
Globalization shift	4%	4%	5%	4%	4%	4%
Regional instability	6%	4%	4%	5%	4%	7%

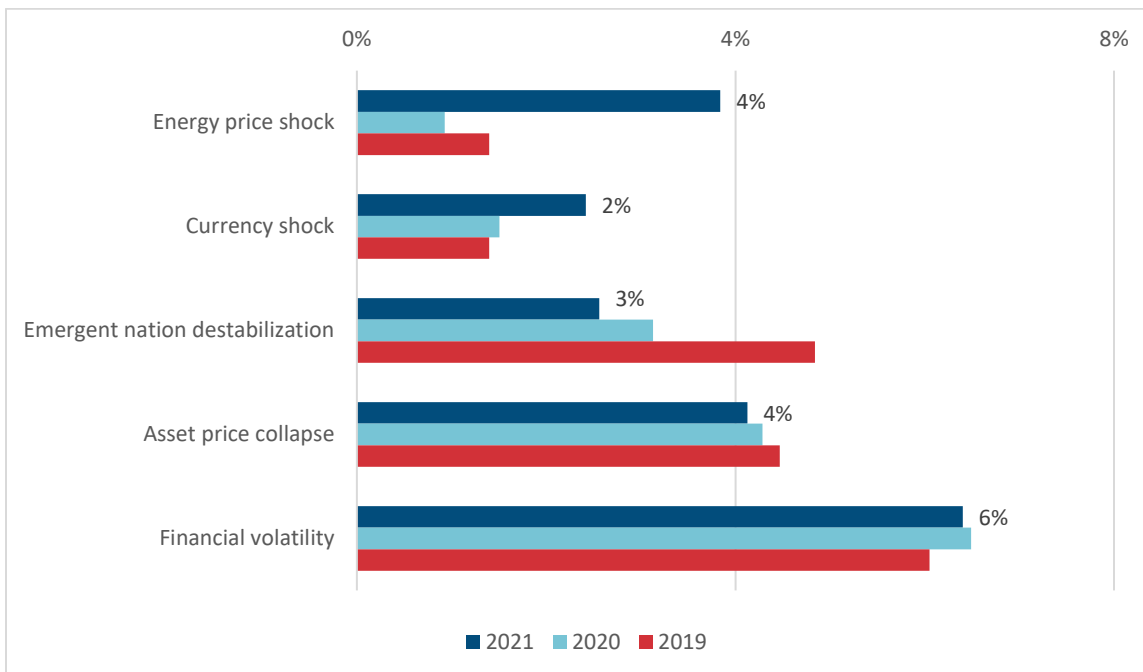
	Avg	2021	2020	2019	2018	2017
Societal	14%	18%	20%	16%	17%	13%
Pandemics/infectious diseases	5%	8%	10%	5%	5%	3%
Chronic diseases/medical delivery	2%	2%	3%	3%	2%	2%
Demographic shift	6%	5%	5%	7%	7%	5%
Liability regimes/regulatory framework	3%	3%	3%	2%	3%	3%

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%.

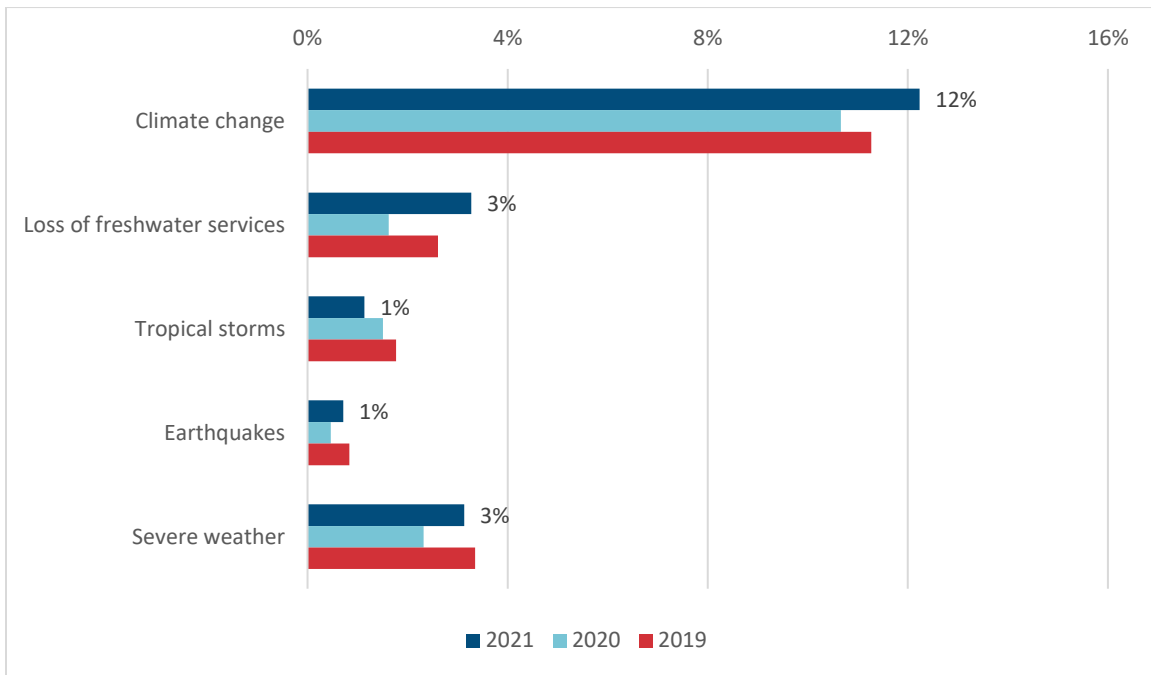
	Avg	2021	2020	2019	2018	2017
Technological	13%	18%	19%	18%	20%	19%
Cyber/networks	9%	11%	10%	11%	12%	11%
Disruptive technology	4%	7%	9%	7%	9%	8%

Other—Avg 2% (2%/2%/1%/1%/1%)

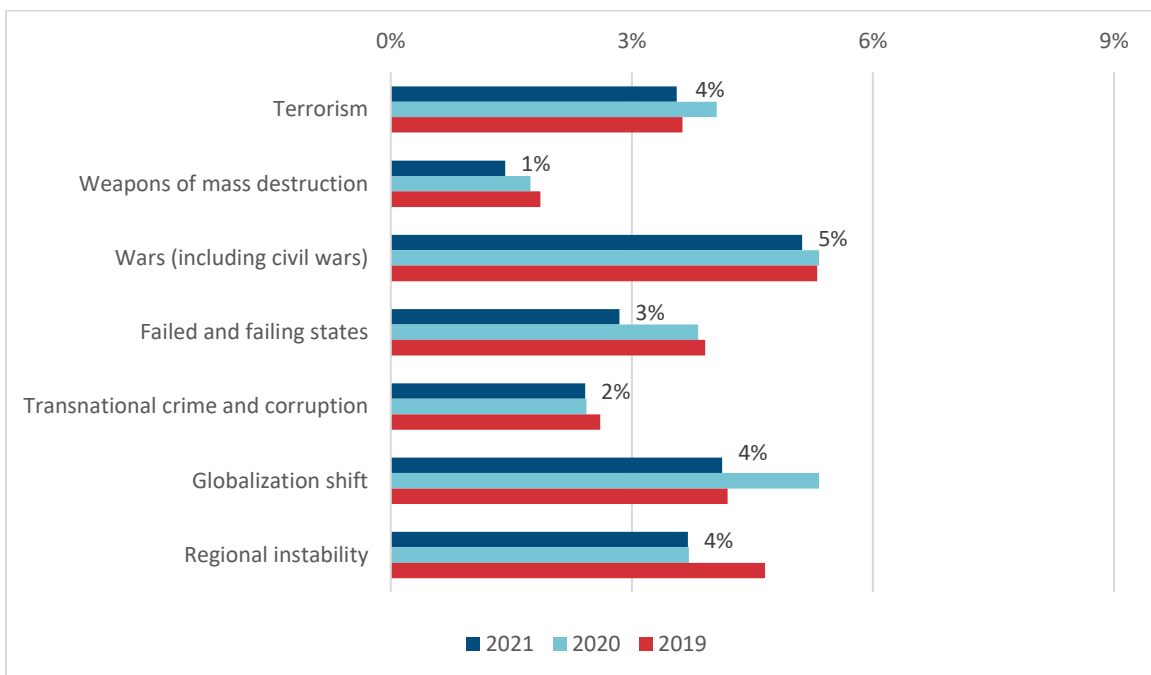
Emerging Risk Trends—Economic (% of Total)



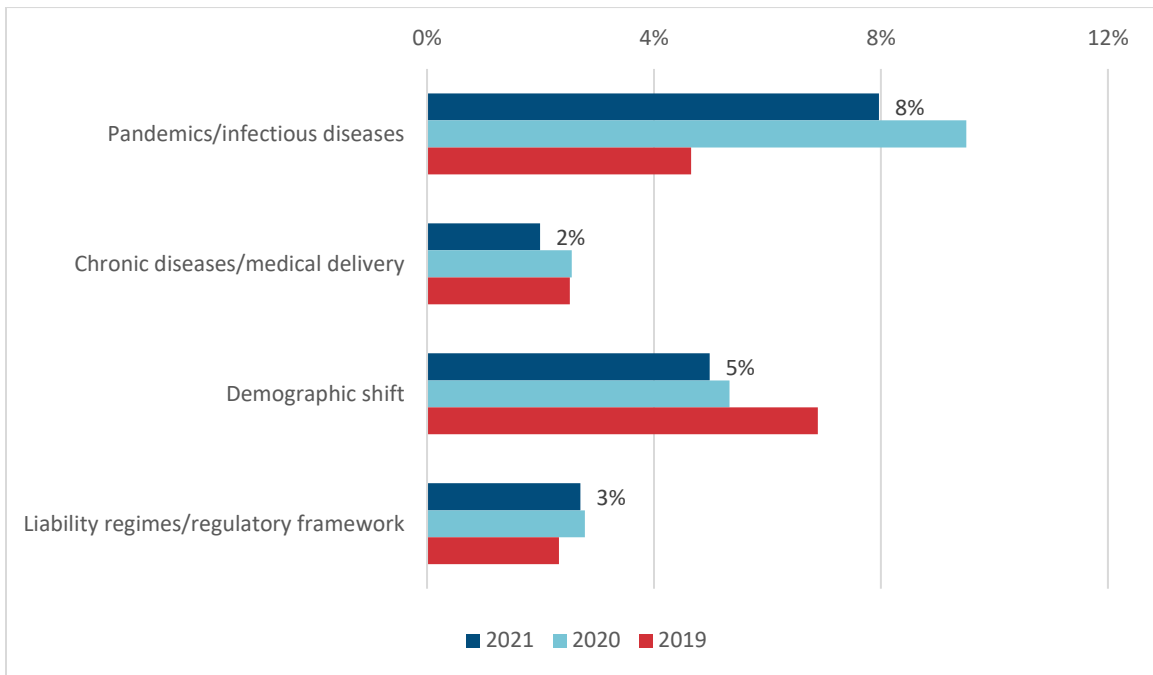
Emerging Risk Trends—Environmental (% of Total)



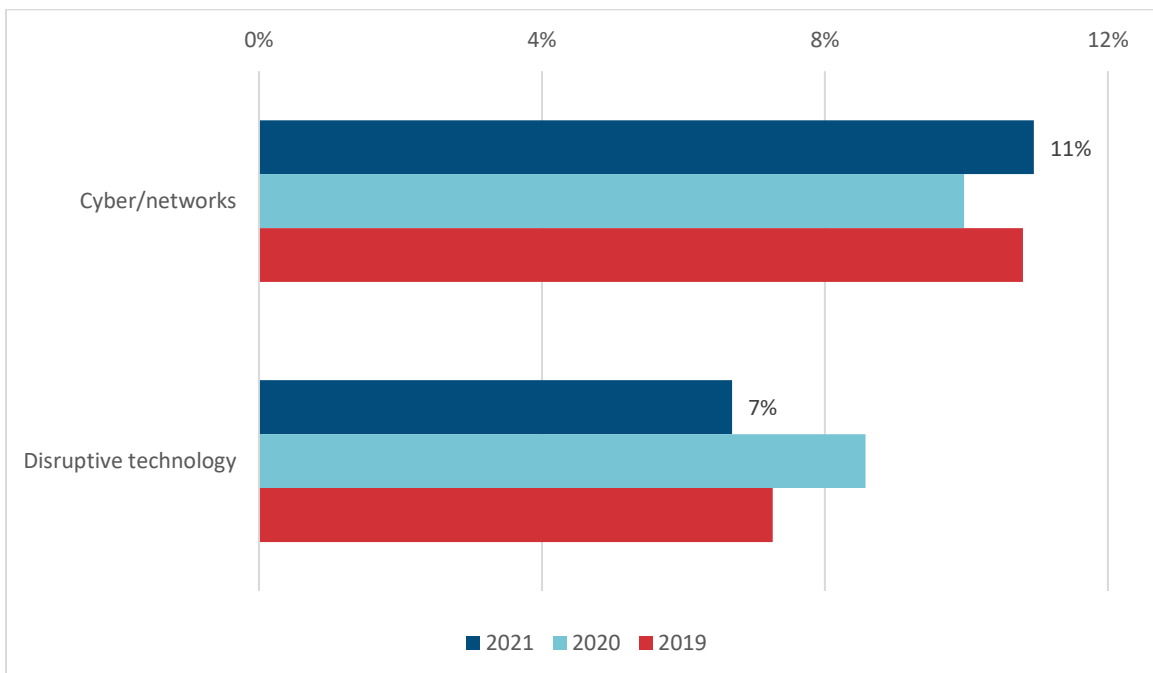
Emerging Risk Trends—Geopolitical (% of Total)



Emerging Risk Trends—Societal (% of Total)



Emerging Risk Trends—Technological (% of Total)

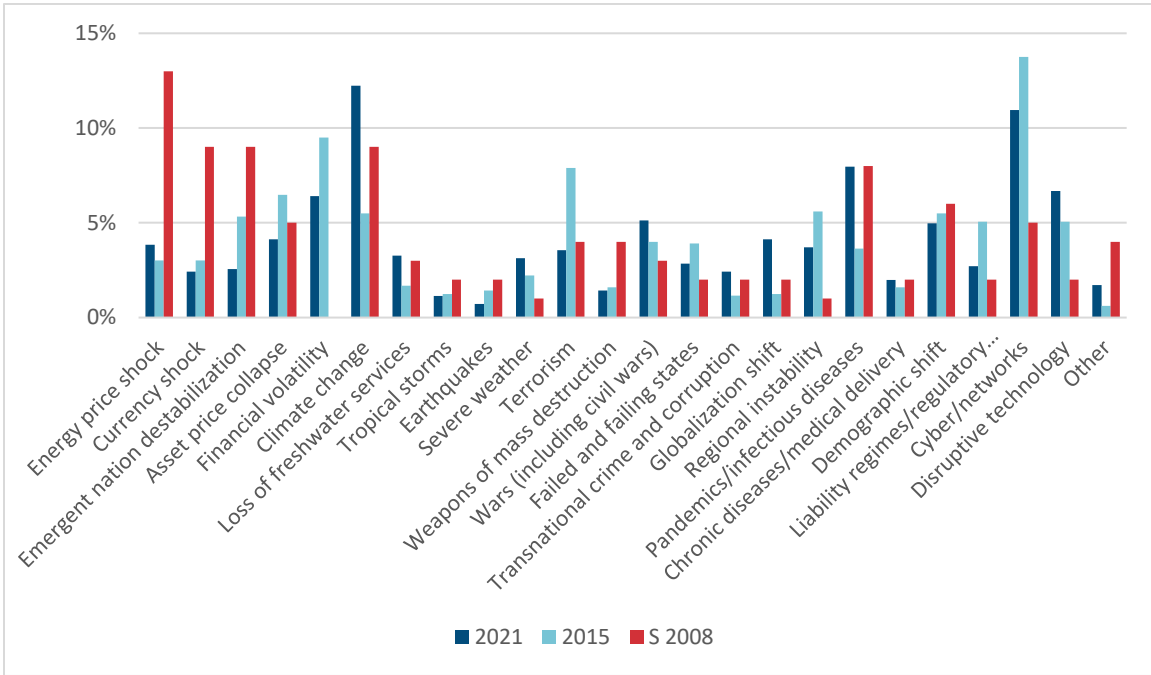


Top Five Emerging Risks as Percentage of Total

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

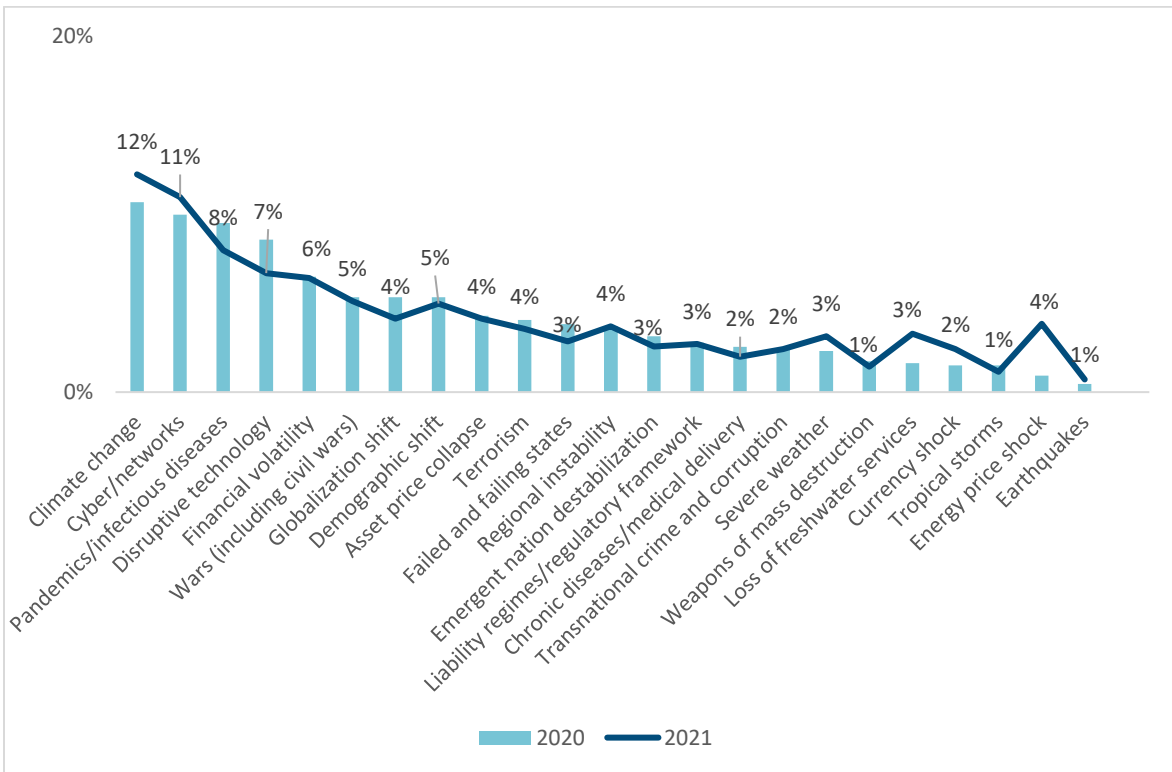
	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	F 2008	S 2008	Average
Energy price shock	4%	1%	1%	1%	1%	2%	3%	3%	2%	6%	7%	9%	10%	8%	13%	5%
Currency shock	2%	2%	1%	1%	1%	2%	3%	1%	6%	5%	6%	10%	14%	10%	9%	5%
Emergent nation destabilization	3%	3%	5%	3%	3%	4%	5%	6%	6%	7%	7%	9%	7%	6%	9%	6%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

Top Emerging Risks (Choose Up to Five)

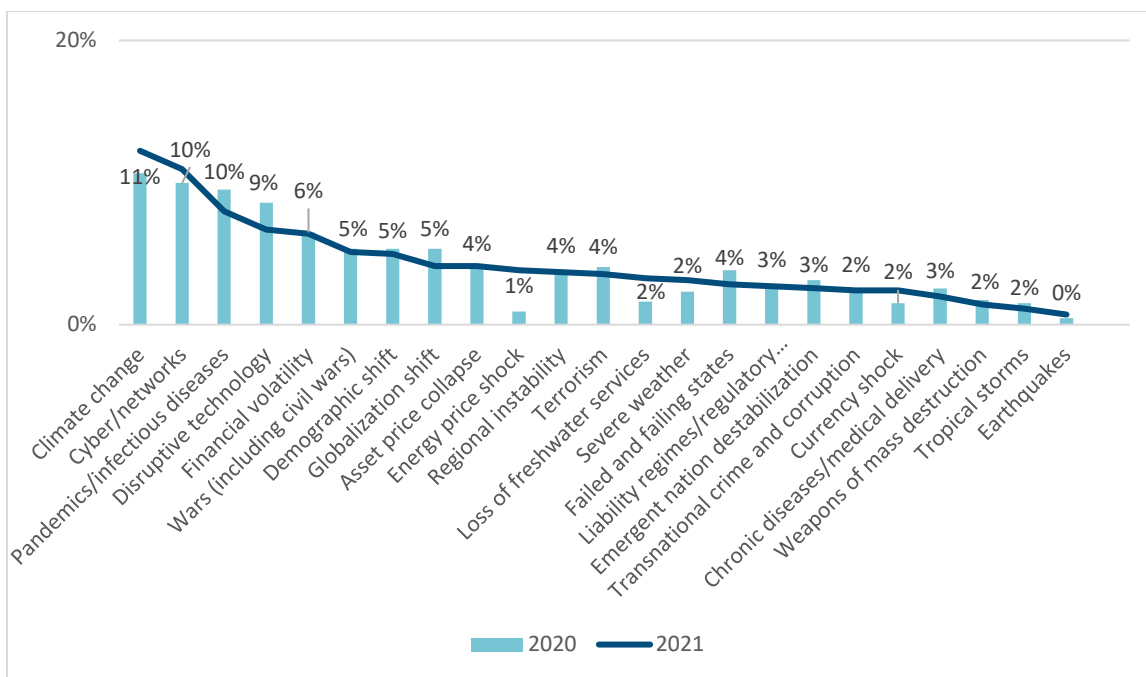


What follows are two versions of the same chart, with the first one sorted based on the prior survey's results. The data labels in the first chart reflect 2021 results.

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 26%
2. Cyber/networks 13%
3. Financial volatility 10%
4. Demographic shift 7%
5. Disruptive technology 6%

	2021	2020	2019	2018	2017
Economic	23%	15%	18%	13%	20%
Energy price shock	2%	1%	1%	0%	0%
Currency shock	2%	2%	0%	1%	0%
Emergent nation destabilization	3%	4%	4%	2%	2%
Asset price collapse	5%	2%	6%	5%	12%
Financial volatility	10%	7%	6%	5%	6%

	2021	2020	2019	2018	2017
Environmental	27%	29%	32%	26%	9%
Climate change	26%	26%	27%	22%	7%
Loss of freshwater services	0%	2%	3%	2%	0%
Natural catastrophe:	0%	1%	0%	1%	0%

tropical storms					
Natural catastrophe: earthquakes	0%	0%	0%	0%	0%
Natural catastrophe: severe weather (except tropical storms)	1%	1%	2%	1%	0%

	2021	2020	2019	2018	2017
Geopolitical	10%	19%	18%	18%	32%
Terrorism	1%	1%	2%	2%	9%
Weapons of mass destruction	1%	1%	1%	1%	2%
Wars (including civil wars)	3%	5%	3%	3%	4%
Failed and failing states	1%	3%	5%	3%	4%
Transnational crime and corruption	1%	1%	2%	2%	1%
Globalization shift	2%	5%	3%	4%	4%
Regional instability	1%	2%	2%	3%	7%

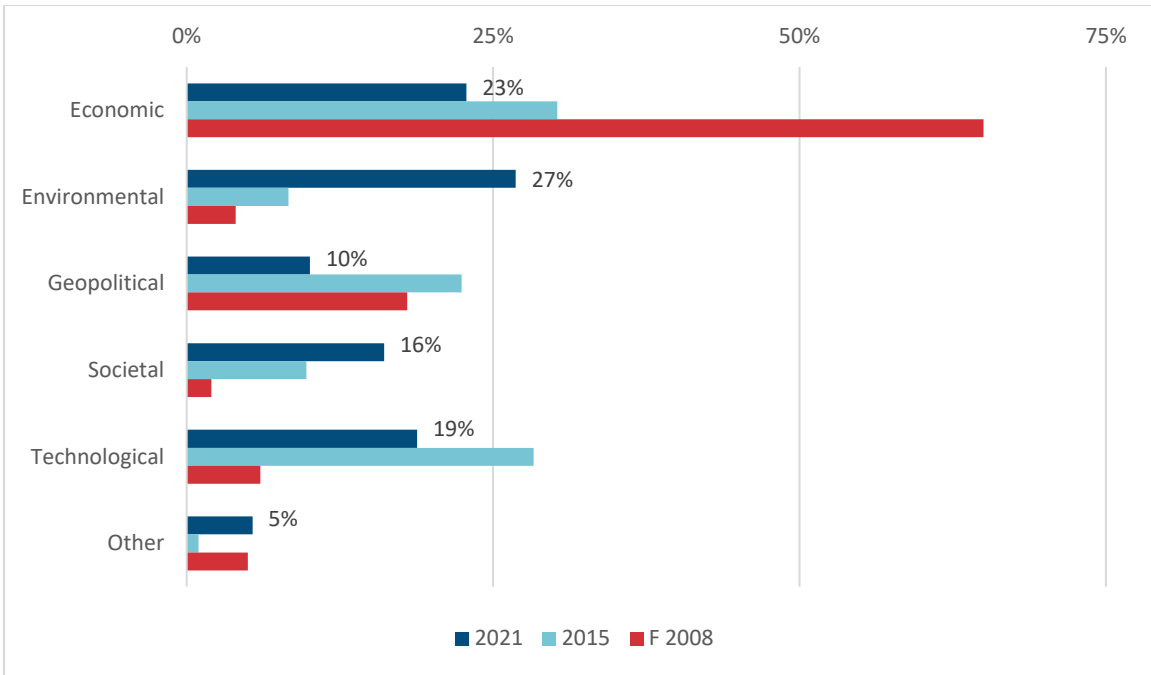
	2021	2020	2019	2018	2017
Societal	16%	16%	9%	12%	11%
Pandemics/infectious diseases	5%	8%	2%	4%	0%
Chronic diseases/medical delivery	1%	1%	0%	2%	1%
Demographic shift	7%	4%	5%	5%	3%
Liability regimes/regulatory framework	3%	2%	2%	2%	6%

	2021	2020	2019	2018	2017
Technological	19%	18%	21%	28%	26%
Cyber/networks	13%	3%	10%	15%	16%
Disruptive technology	6%	15%	11%	13%	10%

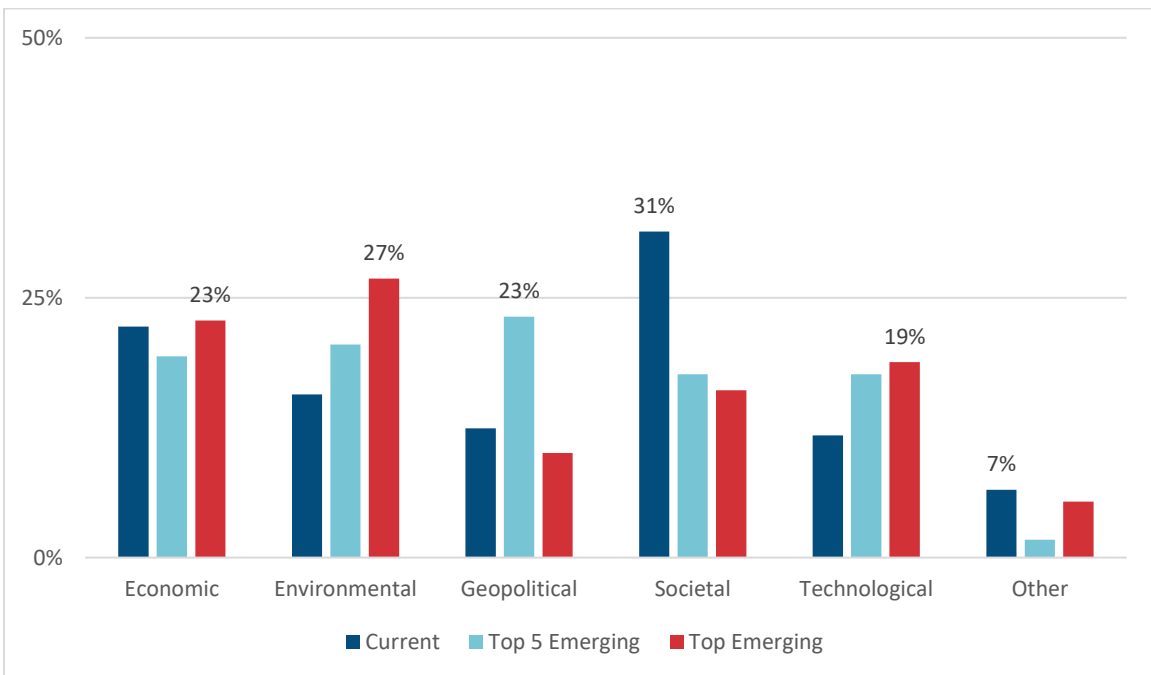
Other (5%/3%/3%/3%/2%)

- *Civil unrest encouraged by godless leaders*
- *Global governmental regime shifts*
- *Climate change will lead to most of the other threats, directly or indirectly.*
- *Government and central bank experimentation*
- *Government elimination of individual freedom*
- *Ability to know the truth*
- *Deterioration of trust in social institutions*
- *Communism*

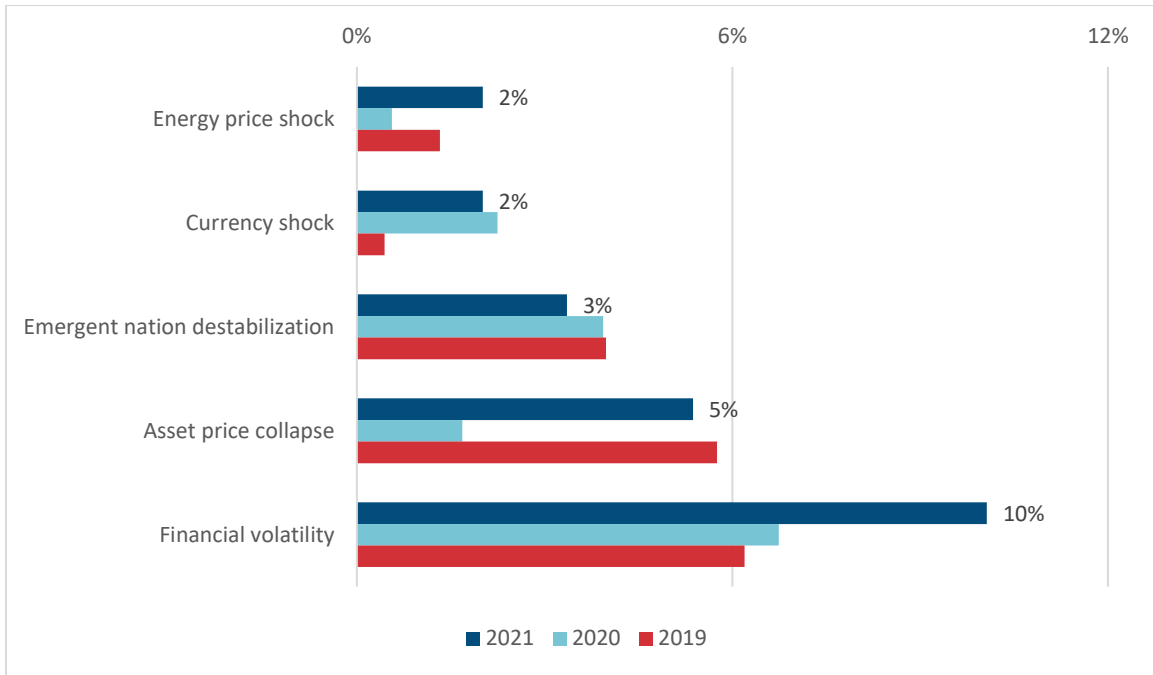
Top Emerging Risks by Category—Single Greatest Impact



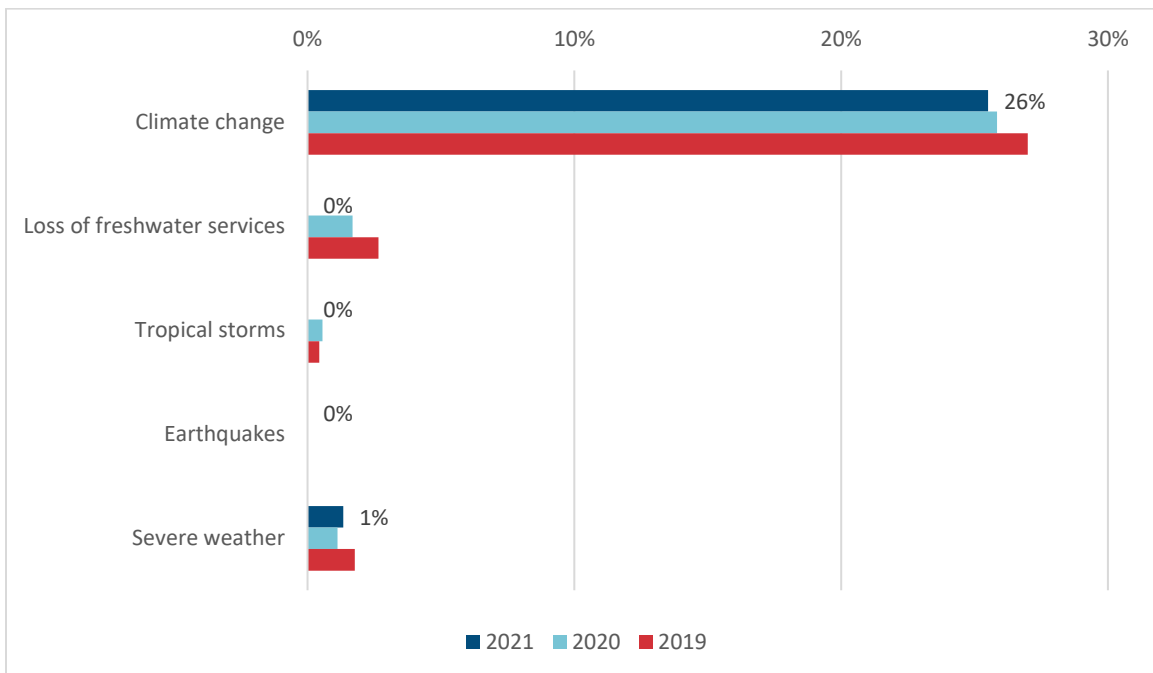
Category Comparison Across Three Questions



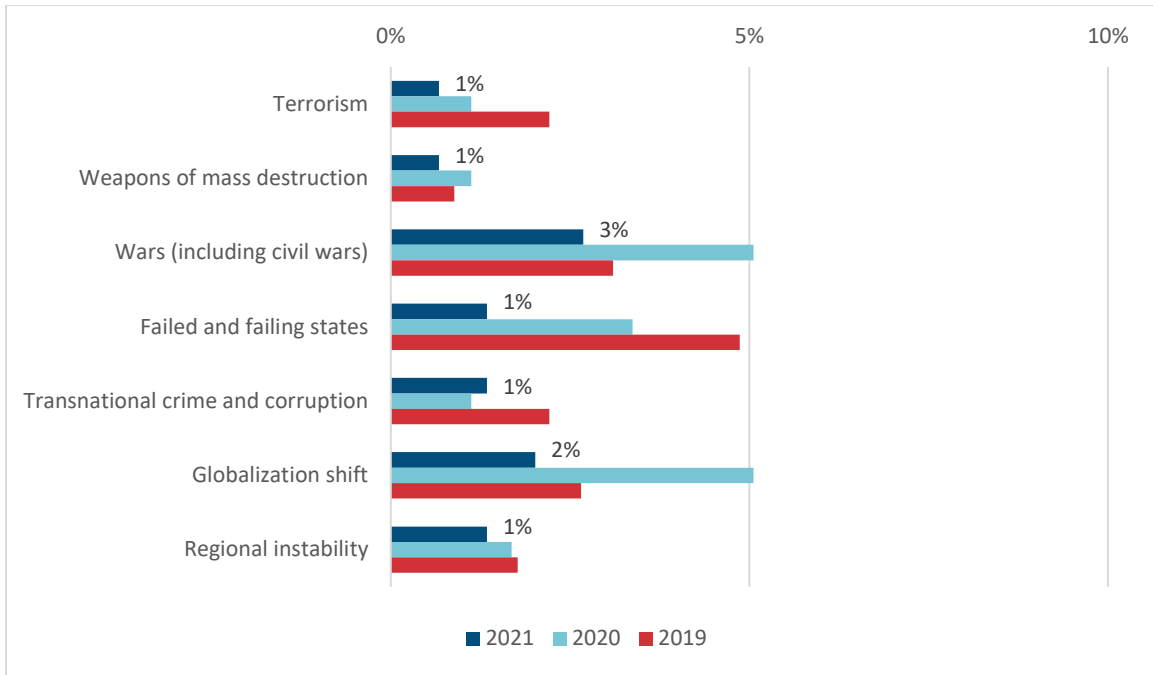
Top Emerging Risks—Economic (% of Total)



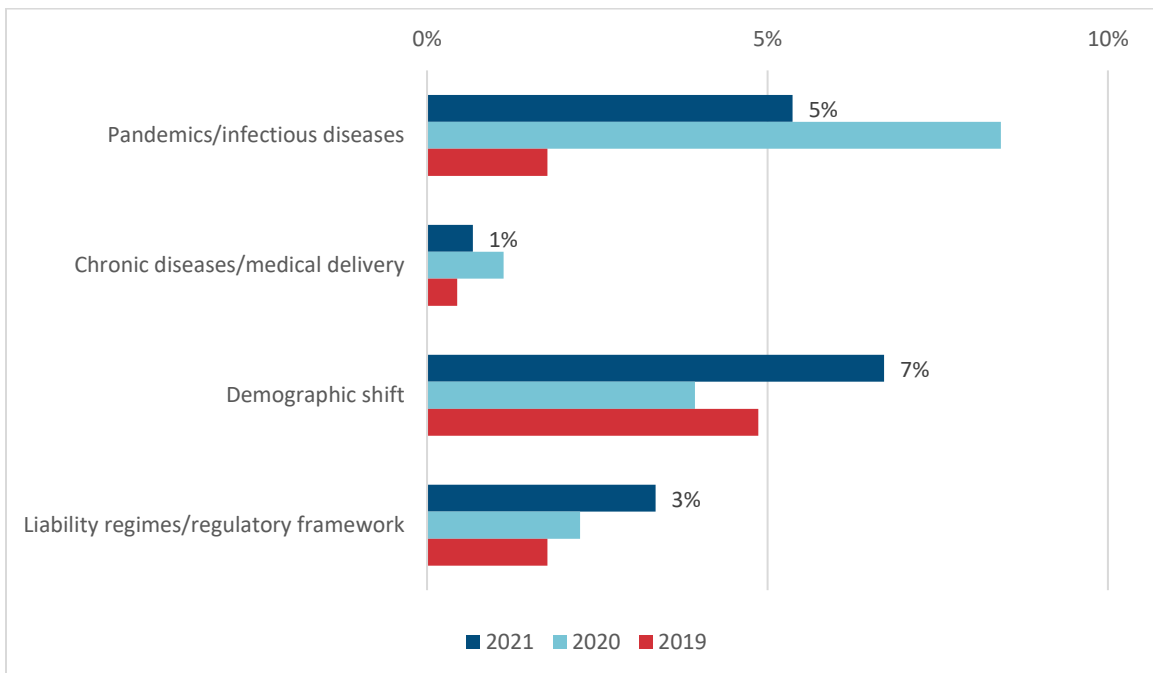
Top Emerging Risks—Environmental (% of Total)



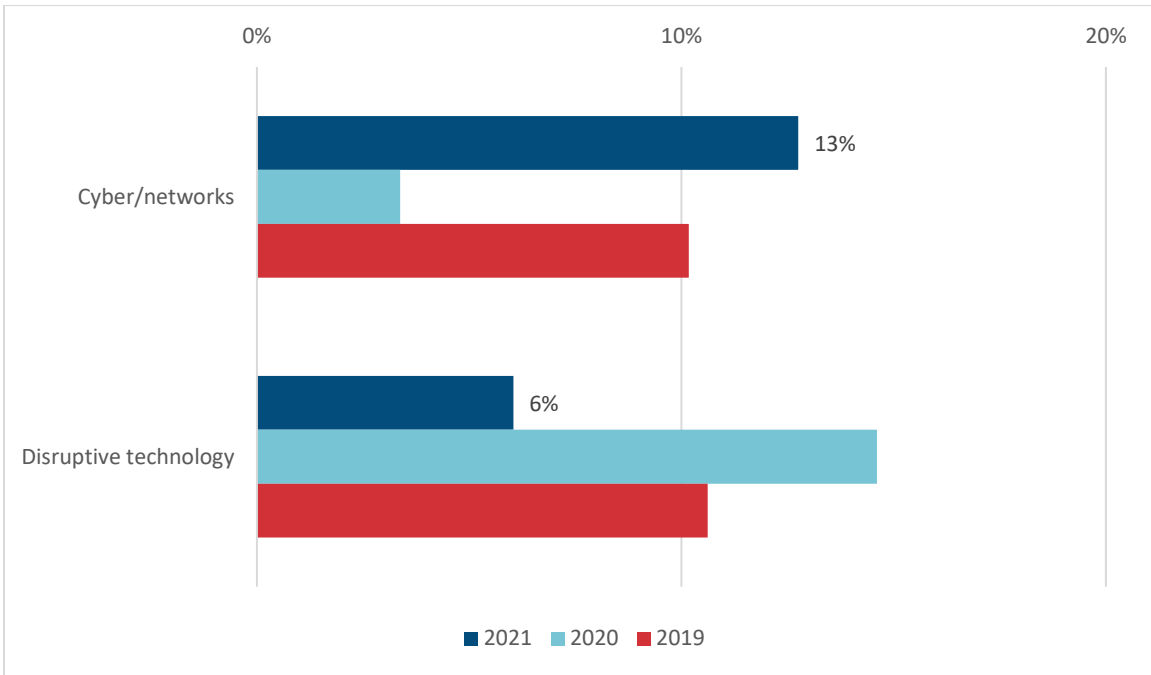
Top Emerging Risks—Geopolitical (% of Total)



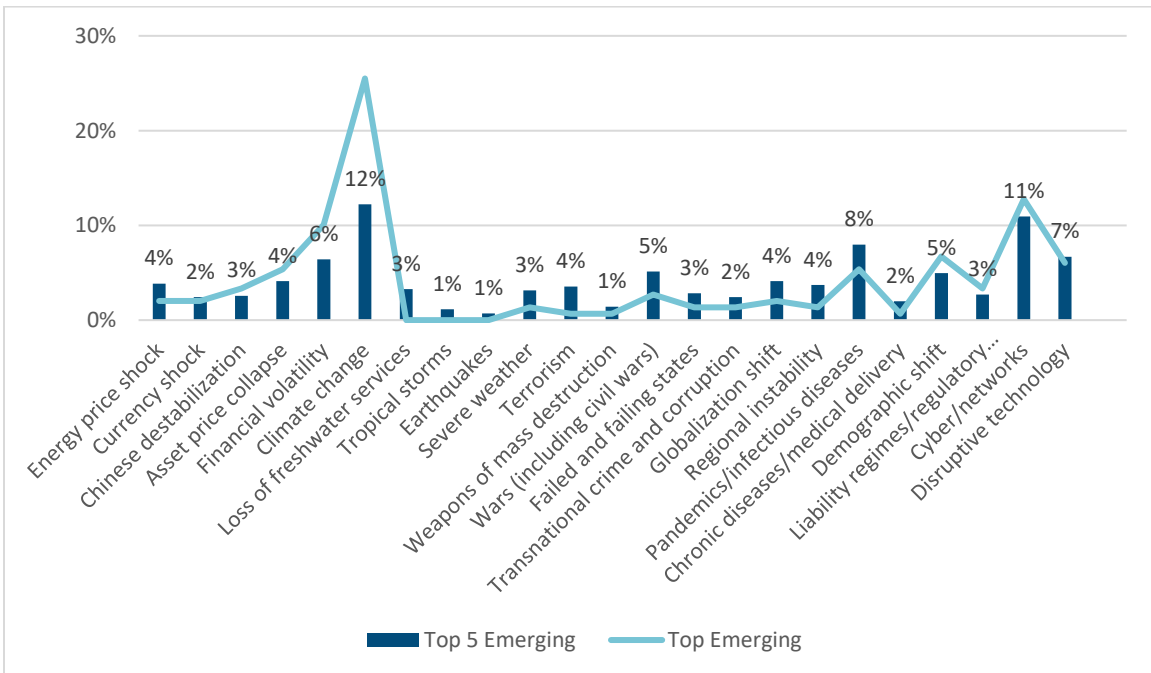
Top Emerging Risks—Societal (% of Total)



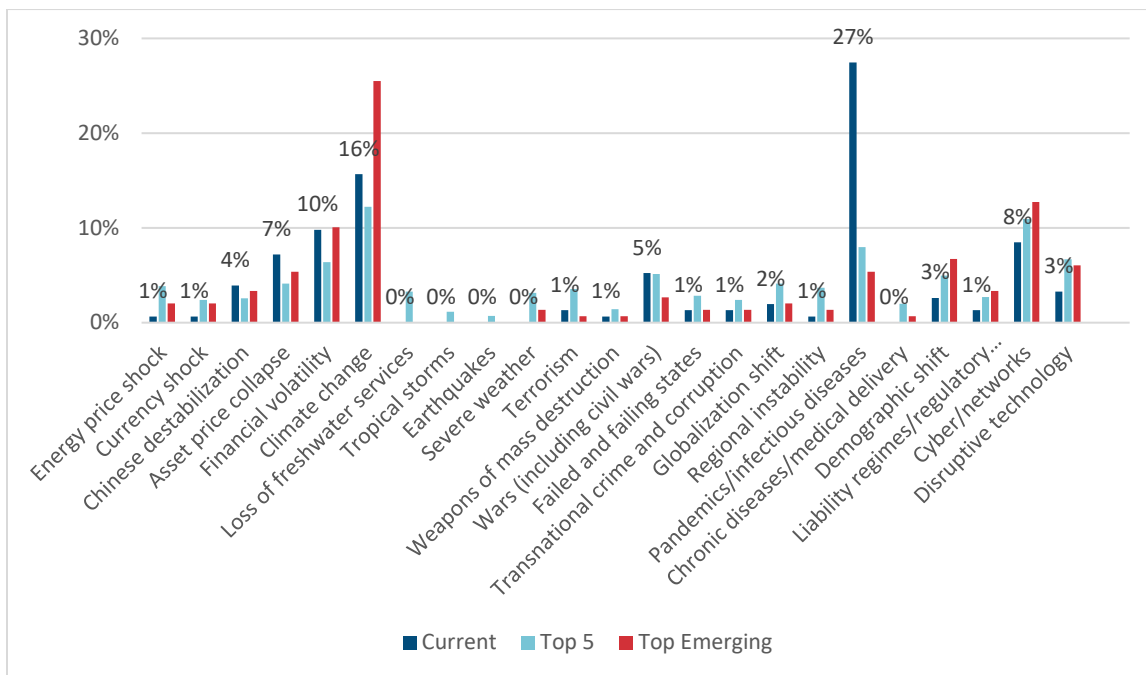
Top Emerging Risks—Technological (% of Total)



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—**421 total responses (mean across all surveys is listed first)**

The rankings for combination risks are

1. Climate change 11%
2. Cyber/networks 9%
3. Financial volatility 8%
4. Wars (including civil wars) 7%
5. Disruptive technology 6%

	Avg	2021	2020	2019	2018
Economic	35%	25%	21%	23%	22%
Energy price shock	5%	5%	2%	2%	2%
Currency shock	5%	3%	1%	2%	2%
Emergent nation destabilization	5%	2%	3%	5%	3%
Asset price collapse	7%	6%	6%	6%	7%
Financial volatility	12%	8%	9%	7%	8%

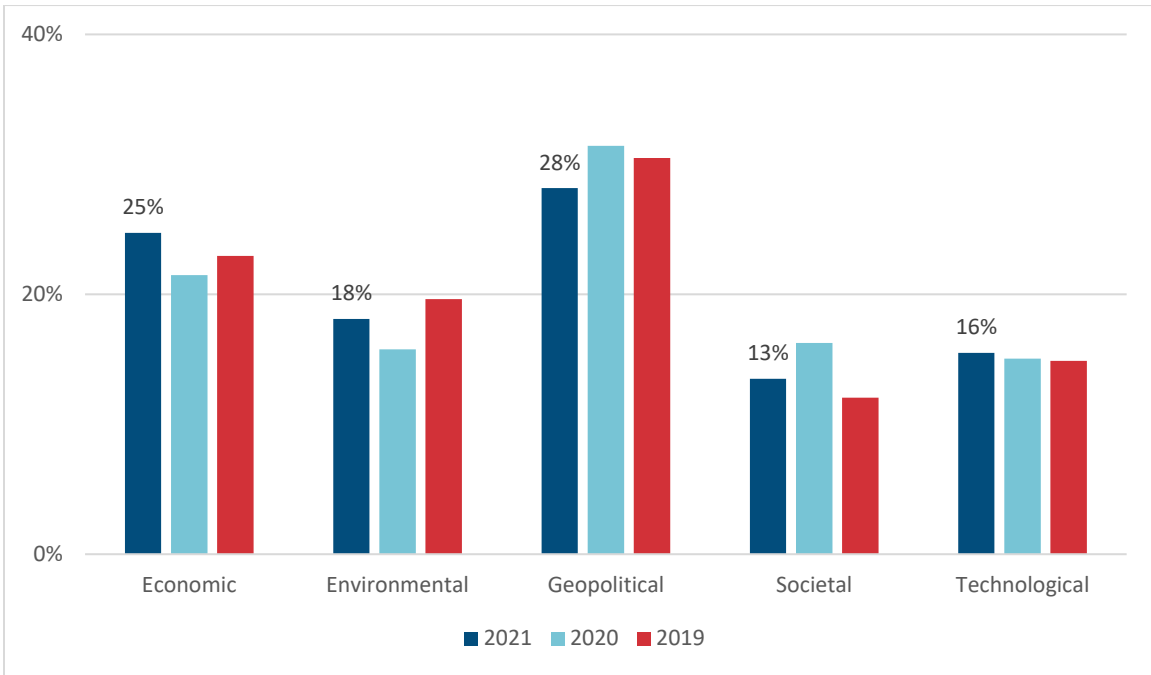
	Avg	2021	2020	2019	2018
Environmental	14%	18%	16%	20%	21%
Climate change	6%	11%	9%	12%	11%
Loss of freshwater services	2%	3%	2%	3%	3%
Natural catastrophe: tropical storms	2%	2%	2%	2%	3%
Natural catastrophe: earthquakes	1%	0%	0%	0%	1%
Natural catastrophe: severe weather (except tropical storms)	2%	3%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

	Avg	2021	2020	2019	2018
Geopolitical	32%	28%	31%	30%	30%
Terrorism	7%	4%	4%	5%	5%
Weapons of mass destruction	3%	2%	2%	2%	3%
Wars (including civil wars)	4%	7%	7%	6%	4%
Failed and failing states	6%	4%	6%	5%	6%
Transnational crime and corruption	2%	3%	3%	2%	3%
Globalization shift	4%	3%	5%	4%	4%
Regional instability	6%	5%	4%	6%	5%

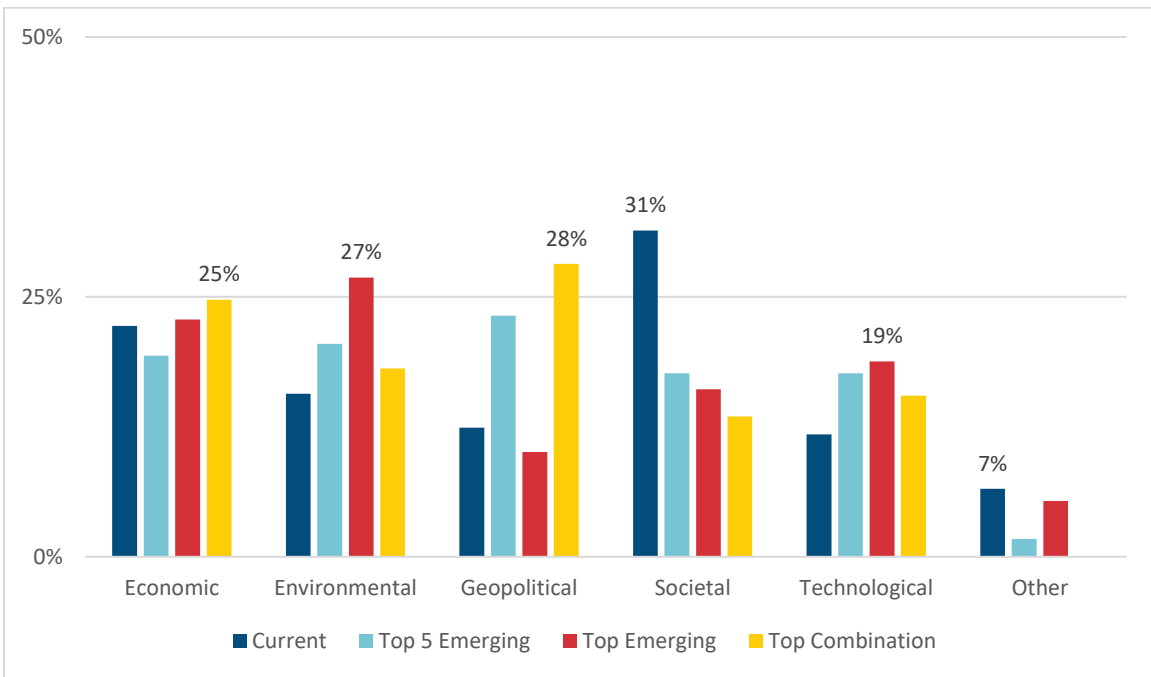
	Avg	2021	2020	2019	2018
Societal	11%	13%	16%	12%	12%
Pandemics/infectious diseases	4%	6%	7%	3%	4%
Chronic diseases/medical delivery	1%	3%	3%	2%	2%
Demographic shift	4%	3%	4%	5%	4%
Liability regimes/regulatory framework	2%	2%	2%	2%	1%

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

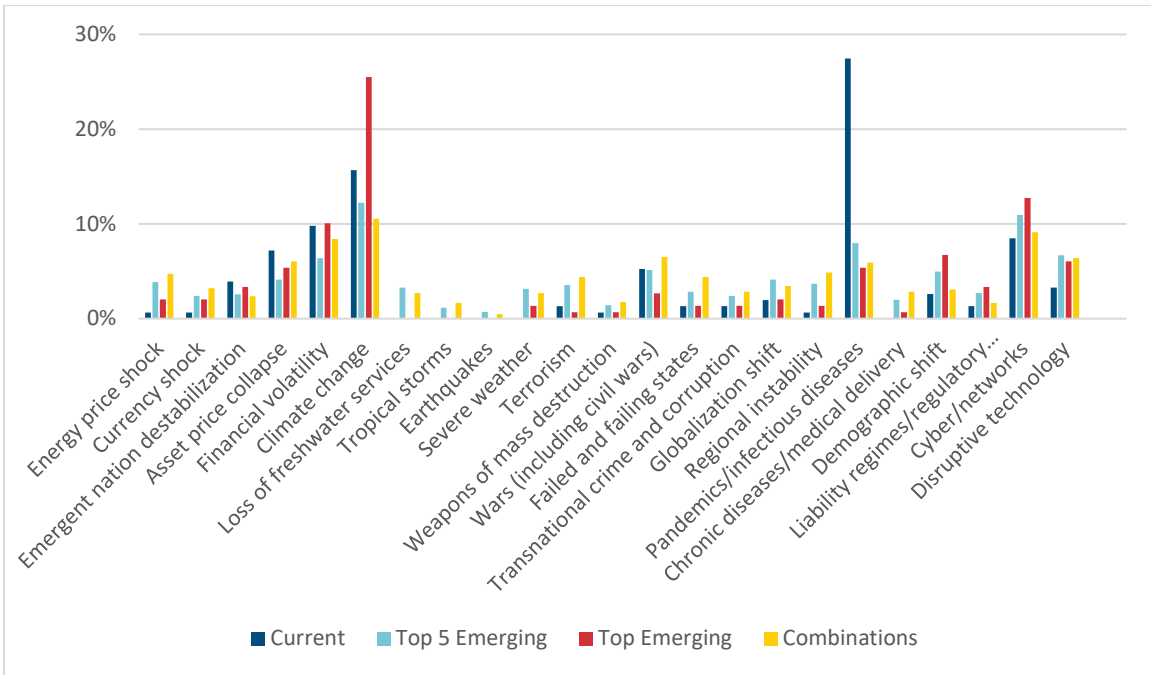
Risk Combinations



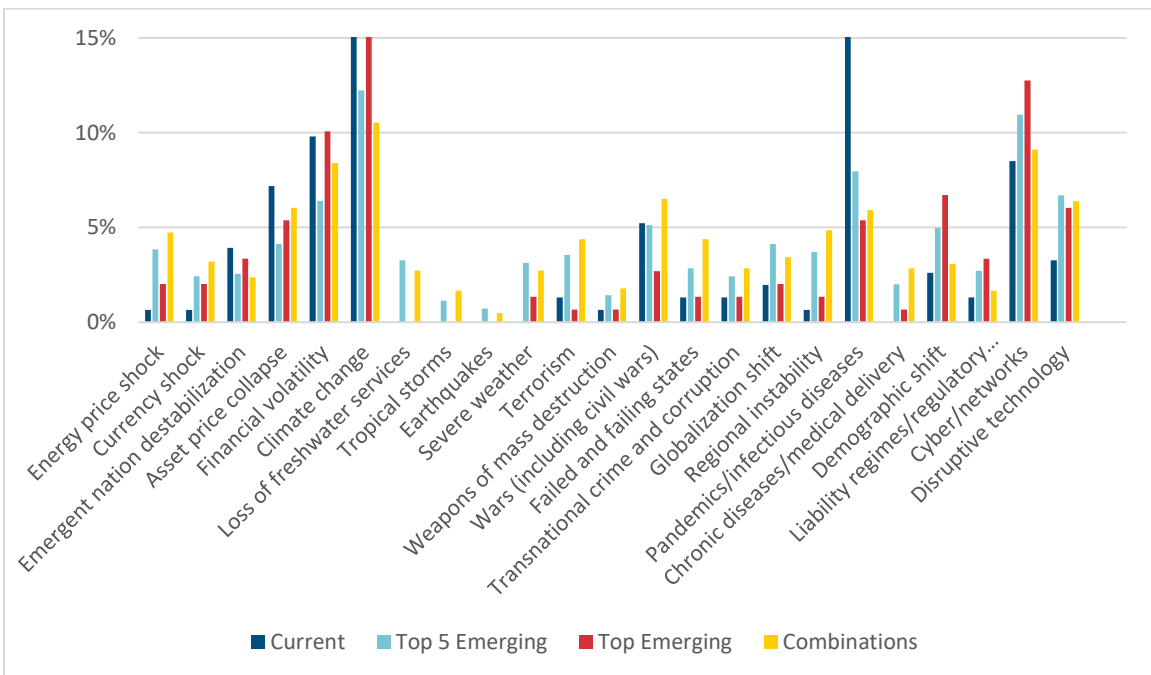
Category Comparison Across Four Questions



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 2021	Top 5 2021	Top 2021	Combos 2021
Energy price shock	0.7%	3.8%	2.0%	4.7%
Currency shock	0.7%	2.4%	2.0%	3.2%
Emergent nation destabilization	3.9%	2.6%	3.4%	2.4%
Asset price collapse	7.2%	4.1%	5.4%	6.0%
Financial volatility	9.8%	6.4%	10.1%	8.4%
Climate change	15.7%	12.2%	25.5%	10.5%
Loss of freshwater services	0.0%	3.3%	0.0%	2.7%
Tropical storms	0.0%	1.1%	0.0%	1.7%
Earthquakes	0.0%	0.7%	0.0%	0.5%
Severe weather	0.0%	3.1%	1.3%	2.7%
Terrorism	1.3%	3.6%	0.7%	4.4%
Weapons of mass destruction	0.7%	1.4%	0.7%	1.8%
Wars (including civil wars)	5.2%	5.1%	2.7%	6.5%
Failed and failing states	1.3%	2.8%	1.3%	4.4%
Transnational crime and corruption	1.3%	2.4%	1.3%	2.8%
Globalization shift	2.0%	4.1%	2.0%	3.4%
Regional instability	0.7%	3.7%	1.3%	4.9%
Pandemics/infectious diseases	27.5%	8.0%	5.4%	5.9%
Chronic diseases/medical delivery	0.0%	2.0%	0.7%	2.8%
Demographic shift	2.6%	5.0%	6.7%	3.1%
Liability regimes/regulatory framework	1.3%	2.7%	3.4%	1.7%
Cyber/networks	8.5%	11.0%	12.8%	9.1%
Disruptive technology	3.3%	6.7%	6.0%	6.4%
Other	6.5%	1.7%	5.4%	

Comparison Across Four Questions where differentiation between questions is present

Comparison Across Four Questions	Current	Top 5	Top	Combos	C-top5	C-top	C-combo	top5-top	top 5-combos	top-combos
	2021	2021	2021	2021						
Energy price shock	0.7%	3.8%	2.0%	4.7%	-3.2%	-1.4%	-4.1%	1.8%	-0.9%	-2.7%
Currency shock	0.7%	2.4%	2.0%	3.2%	-1.8%	-1.4%	-2.5%	0.4%	-0.8%	-1.2%
Emergent nation destabilization	3.9%	2.6%	3.4%	2.4%	1.4%	0.6%	1.6%	-0.8%	0.2%	1.0%
Asset price collapse	7.2%	4.1%	5.4%	6.0%	3.1%	1.8%	1.2%	-1.2%	-1.9%	-0.7%
Financial volatility	9.8%	6.4%	10.1%	8.4%	3.4%	-0.3%	1.4%	-3.7%	-2.0%	1.7%
Climate change	15.7%	12.2%	25.5%	10.5%	3.5%	-9.8%	5.2%	-13.3%	1.7%	15.0%
Loss of freshwater services	0.0%	3.3%	0.0%	2.7%	-3.3%	0.0%	-2.7%	3.3%	0.5%	-2.7%
Tropical storms	0.0%	1.1%	0.0%	1.7%	-1.1%	0.0%	-1.7%	1.1%	-0.5%	-1.7%
Earthquakes	0.0%	0.7%	0.0%	0.5%	-0.7%	0.0%	-0.5%	0.7%	0.2%	-0.5%
Severe weather	0.0%	3.1%	1.3%	2.7%	-3.1%	-1.3%	-2.7%	1.8%	0.4%	-1.4%
Terrorism	1.3%	3.6%	0.7%	4.4%	-2.2%	0.6%	-3.1%	2.9%	-0.8%	-3.7%
Weapons of mass destruction	0.7%	1.4%	0.7%	1.8%	-0.8%	0.0%	-1.1%	0.8%	-0.4%	-1.1%
Wars (including civil wars)	5.2%	5.1%	2.7%	6.5%	0.1%	2.5%	-1.3%	2.4%	-1.4%	-3.8%
Failed and failing states	1.3%	2.8%	1.3%	4.4%	-1.5%	0.0%	-3.1%	1.5%	-1.5%	-3.0%
Transnational crime and corruption	1.3%	2.4%	1.3%	2.8%	-1.1%	0.0%	-1.5%	1.1%	-0.4%	-1.5%
Globalization shift	2.0%	4.1%	2.0%	3.4%	-2.2%	-0.1%	-1.5%	2.1%	0.7%	-1.4%
Regional instability	0.7%	3.7%	1.3%	4.9%	-3.0%	-0.7%	-4.2%	2.4%	-1.2%	-3.5%
Pandemics/infectious diseases	27.5%	8.0%	5.4%	5.9%	19.5%	22.1%	21.5%	2.6%	2.0%	-0.5%
Chronic diseases/medical delivery	0.0%	2.0%	0.7%	2.8%	-2.0%	-0.7%	-2.8%	1.3%	-0.8%	-2.2%
Demographic shift	2.6%	5.0%	6.7%	3.1%	-2.4%	-4.1%	-0.5%	-1.7%	1.9%	3.6%
Liability regimes/regulatory framework	1.3%	2.7%	3.4%	1.7%	-1.4%	-2.0%	-0.3%	-0.7%	1.0%	1.7%
Cyber/networks	8.5%	11.0%	12.8%	9.1%	-2.5%	-4.3%	-0.6%	-1.8%	1.8%	3.6%
Disruptive technology	3.3%	6.7%	6.0%	6.4%	-3.4%	-2.8%	-3.1%	0.6%	0.3%	-0.4%
Other	6.5%	1.7%	5.4%		4.8%	1.2%		-3.7%		

Combinations

2021 chart (top 10 are highlighted)

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>	<u>21</u>	<u>22</u>	<u>23</u>
1		8	0	7	4	9	1	0	0	1	0	0	5	1	0	0	1	1	0	1	0	0	0
2			0	4	6	0	0	0	0	0	0	0	2	1	0	1	0	0	0	2	0	3	0
3				0	0	2	0	1	0	0	2	1	6	5	0	0	2	0	0	0	0	1	0
4					19	3	0	0	0	0	1	0	0	2	1	1	2	3	0	1	1	3	3
5						6	0	0	0	0	0	0	1	2	1	4	3	10	1	1	6	3	3
6							13	9	0	12	0	0	3	1	0	3	7	8	3	5	3	1	1
7								0	0	2	0	0	2	0	0	1	3	0	1	0	0	0	0
8									2	1	0	0	1	0	0	0	0	0	0	0	0	0	0
9										0	0	0	0	0	0	0	1	1	0	0	0	0	0
10											0	0	0	0	0	0	1	3	0	0	0	1	1
11												4	7	4	4	1	0	0	0	0	0	12	2
12													8	0	0	0	1	0	0	0	0	0	1
13														9	1	0	6	1	0	0	0	3	0
14															5	0	4	1	0	1	0	1	0
15																1	0	0	0	1	0	8	2
16																	7	2	0	3	0	3	2
17																		1	0	1	1	0	0
18																			14	3	0	2	0
19																				3	0	1	1
20																					0	0	4
21																						2	1
22																							33
23																							

Leading combinations were as follows (percentages shown for consecutive years in the top 10):

33 responses 8%, no. 1 in previous survey

Cyber/networks

Disruptive technology

19 responses 5%, no. 2

Asset price collapse

Financial volatility

14 responses 3%, no.3

Pandemics/infectious diseases

Chronic diseases/medical delivery

13 responses 3%, no. 4

Climate change

Loss of freshwater services

12 responses 3%, no. 5

Climate change

Natural catastrophe: severe weather

12 responses 3%, no. 5

Terrorism

Cyber/networks

10 responses 2%, no. 7

Financial volatility

Pandemics/infectious diseases

9 responses 2%, no. 8

Energy price shock

Climate change

9 responses 2%, no. 8

Climate change

Natural catastrophe: tropic storms

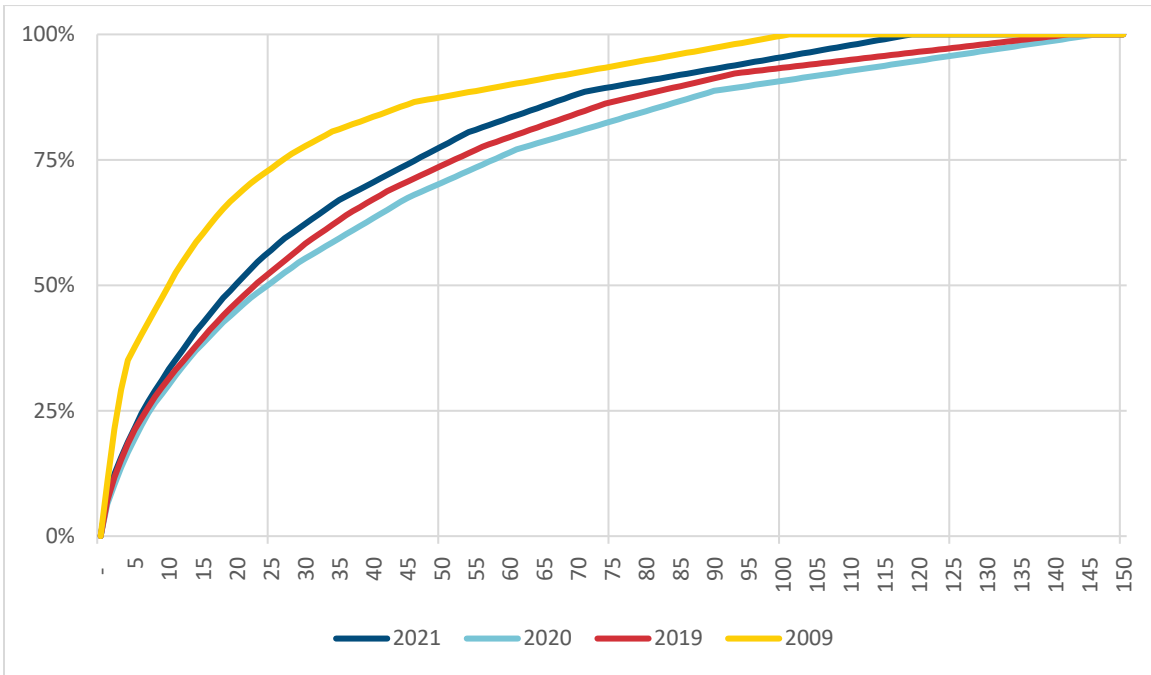
9 responses 2%, no. 8

Wars (including civil wars)

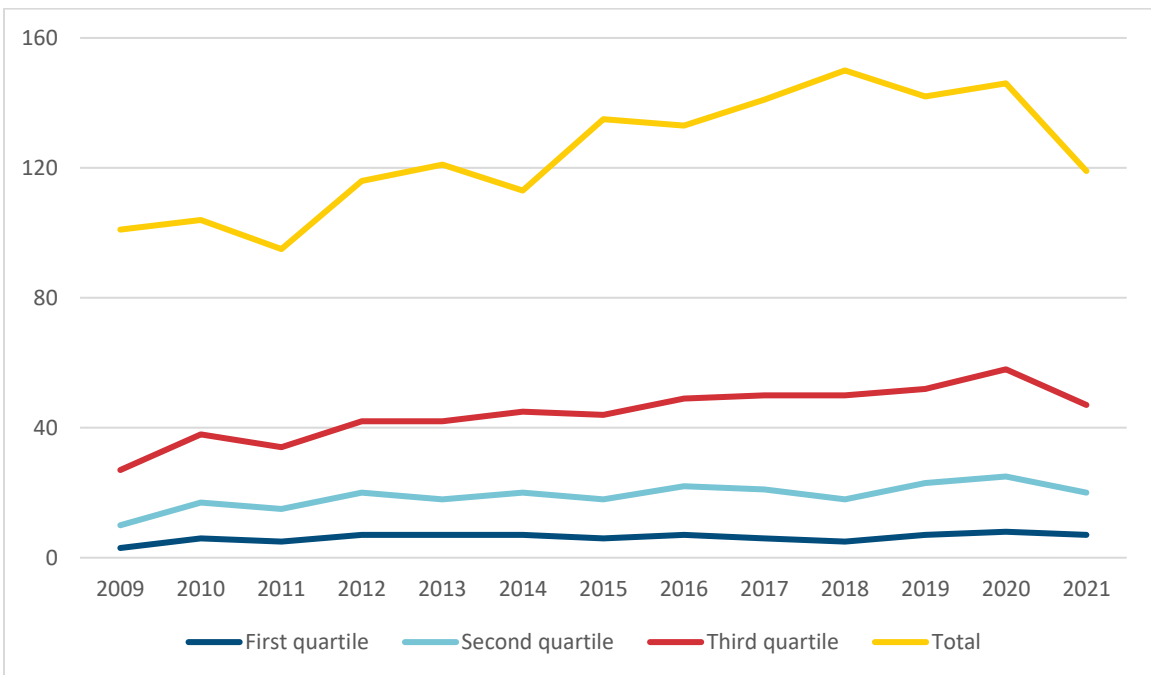
Failed and failing states

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

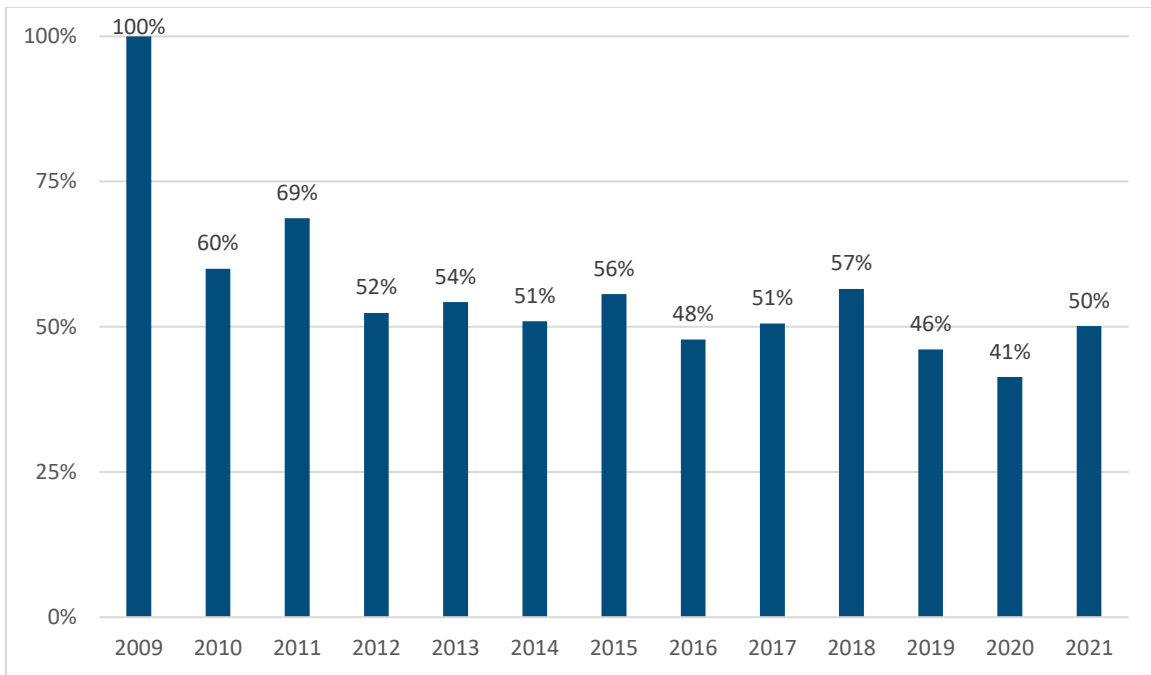
Cumulative Distribution of Combinations (253 total possible)



Risk Combinations



Risk Concentration Ratio (Base 2009 = 100%)

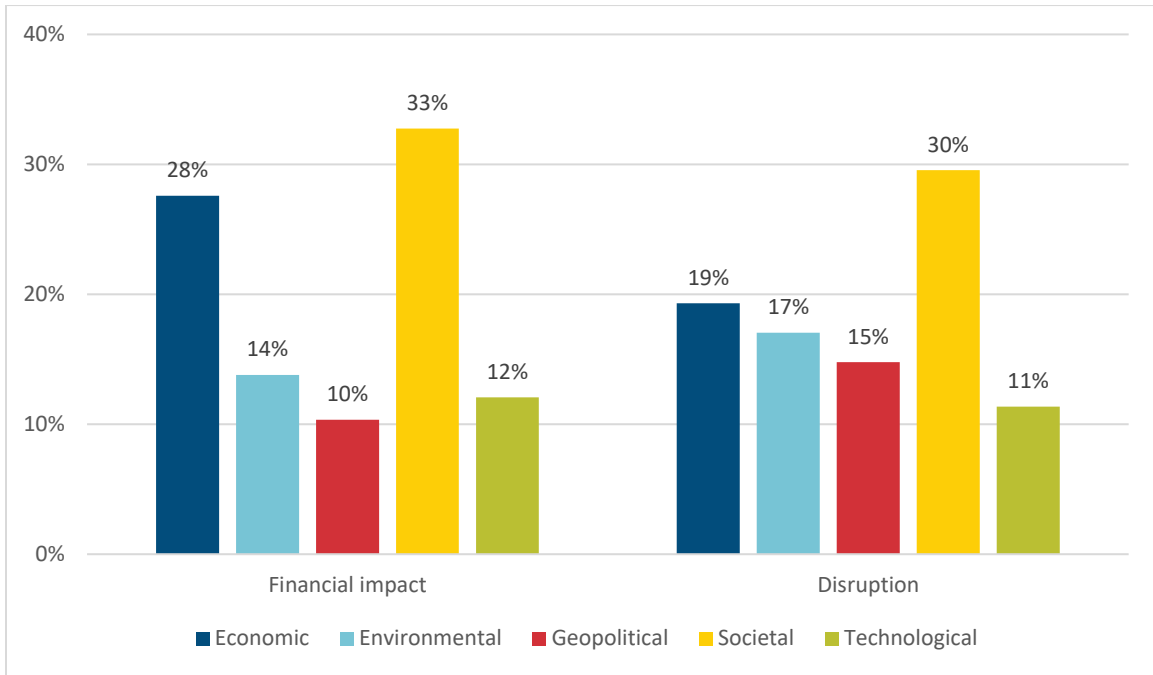


It was suggested that questions be segregated by their response to *Greatest strategic impact related to risk can have various meanings. How do you define it?* Six responses combined two options split between financial impact and disruption with three options split as follows:

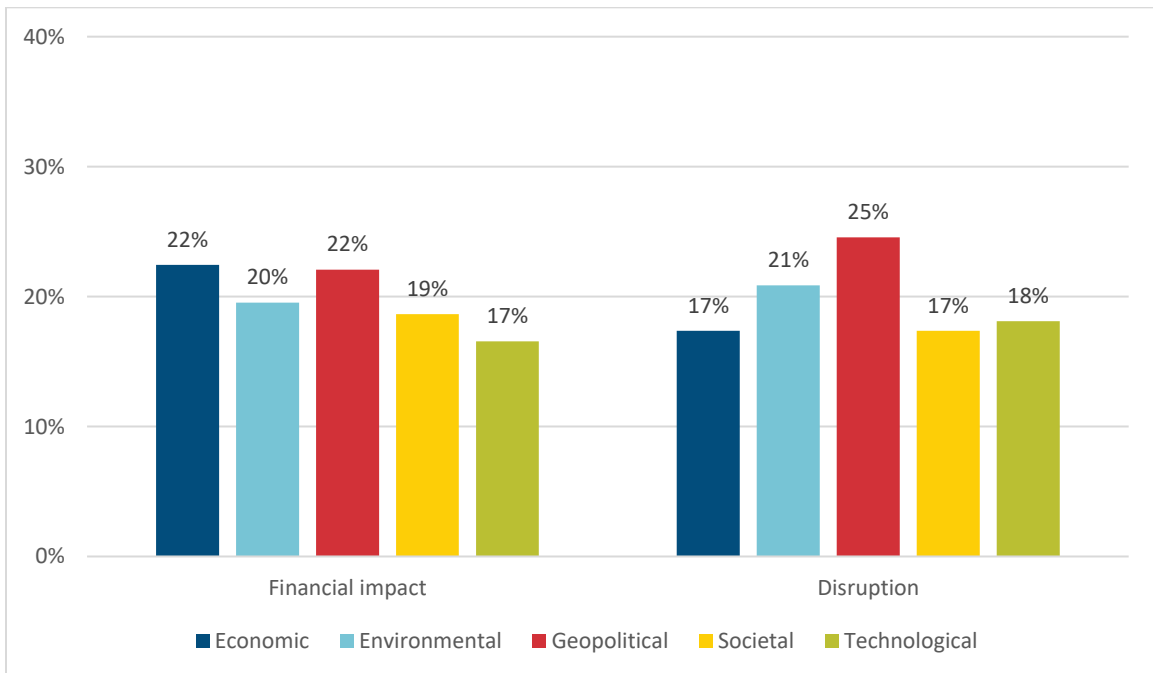
- World economy
- Me personally or my firm/industry
- Lives, habitat and safety

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

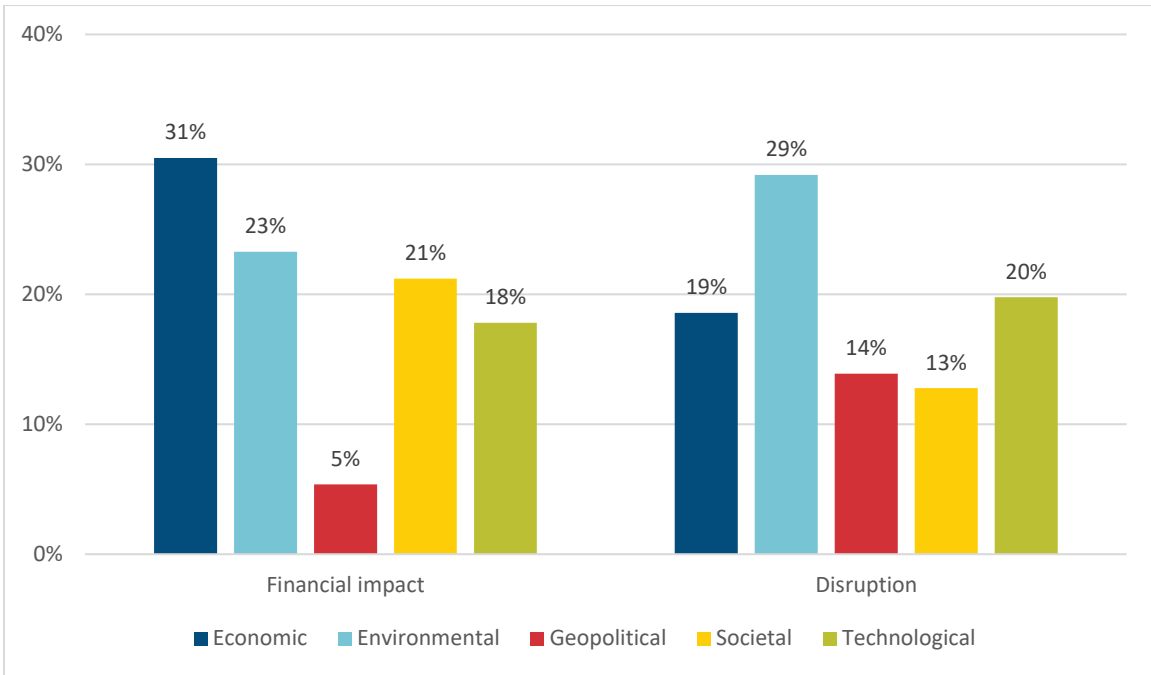
Top Current Risk Aggregated by Greatest Strategic Impact



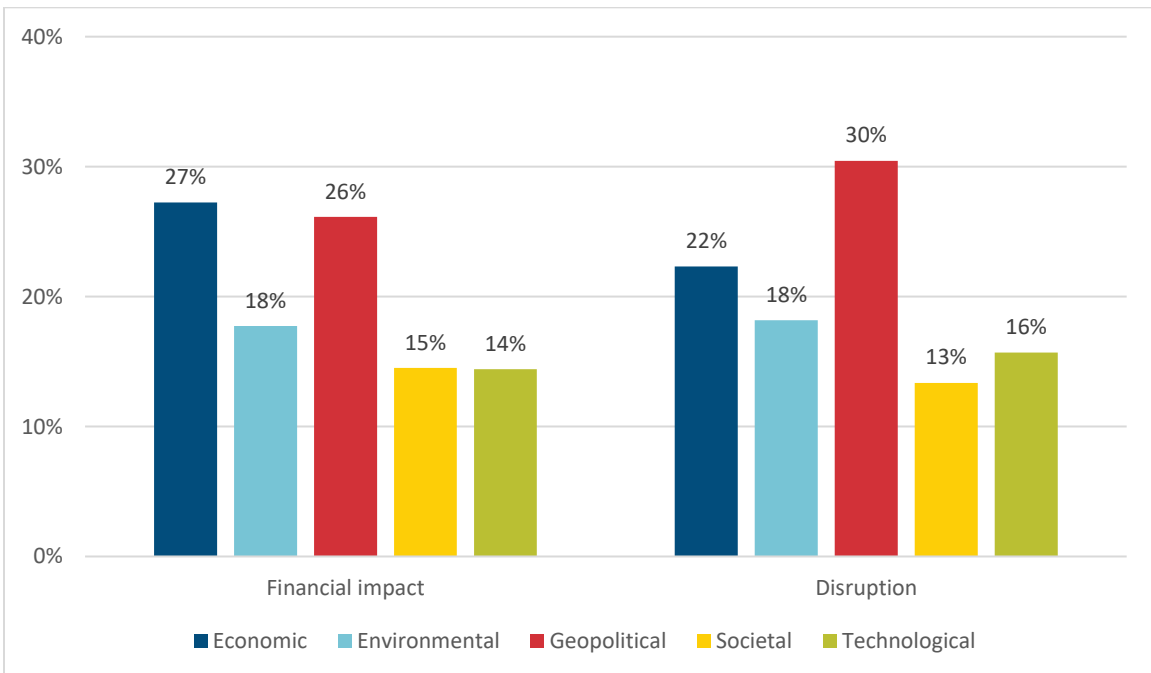
Top Five Emerging Risks Aggregated by Greatest Strategic Impact



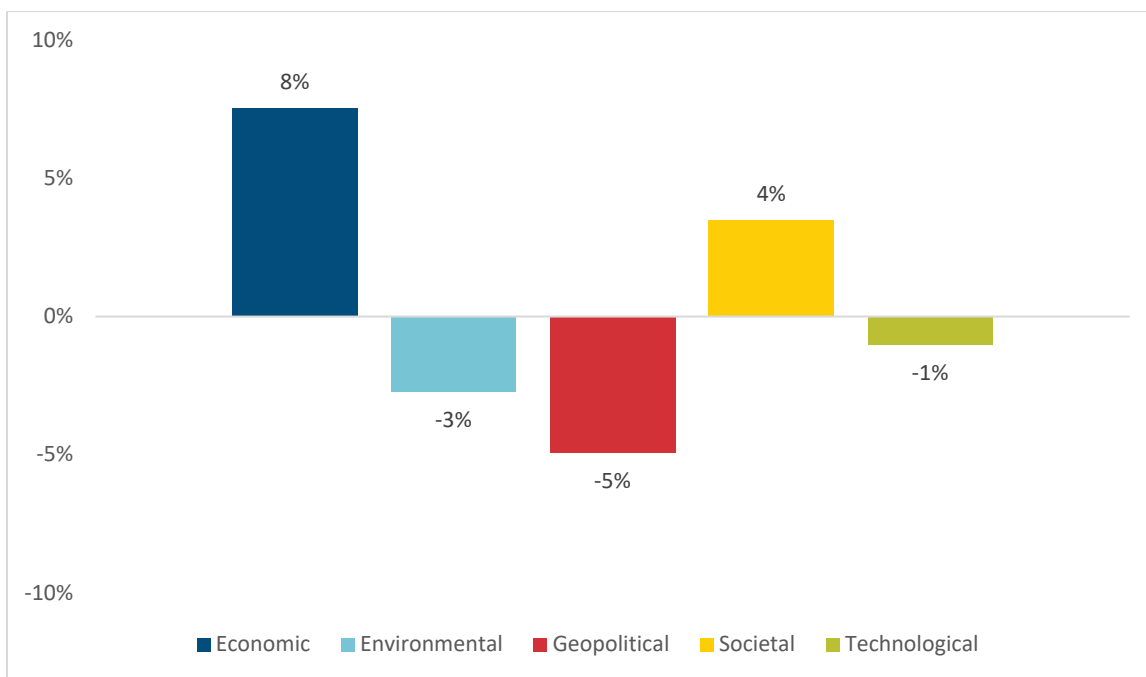
Top Emerging Risk Aggregated by Greatest Strategic Impact



Top Risk Combinations 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. If you do not work in the insurance industry, please skip to question 7. As the market exists today, which risks do not impact the insurance industry? (Please select all that apply.)

Seventy-five respondents chose at least one risk, for a total of 255 responses (average of 3.40 risks selected per survey that selected at least one).

The top rankings for risks that don't impact the insurance industry are

1. Failed and failing states 49%
2. Emergent nation destabilization 39%
3. Weapons of mass destruction 32%
4. Loss of freshwater services 25%
4. Globalization shift 25%

The bottom rankings for risks that don't impact the insurance industry (so risks that DO impact the insurance industry) are

19. Asset price collapse 4%
19. Natural disasters: tropical storms 4%
19. Natural disasters: earthquakes 4%
22. Chronic diseases/medical delivery 3%
22. Liability regimes/regulatory framework 3%

Category

Economic	69%
Environmental	49%
Geopolitical	185%
Societal	20%
Technological	16%

Risk

Economic	
Energy price shock	13%
Currency shock	5%
Emergent nation destabilization	39%
Asset price collapse	4%
Financial volatility	8%

Environmental	
Climate change	9%
Loss of freshwater services	25%
Natural catastrophe: tropical storms	4%
Natural catastrophe: earthquakes	4%
Natural catastrophe: severe weather (except tropical storms)	7%

Geopolitical	
Terrorism	11%
Weapons of mass destruction	32%
Wars (including civil wars)	23%
Failed and failing states	49%
Transnational crime and corruption	20%
Globalization shift	25%
Regional instability	25%

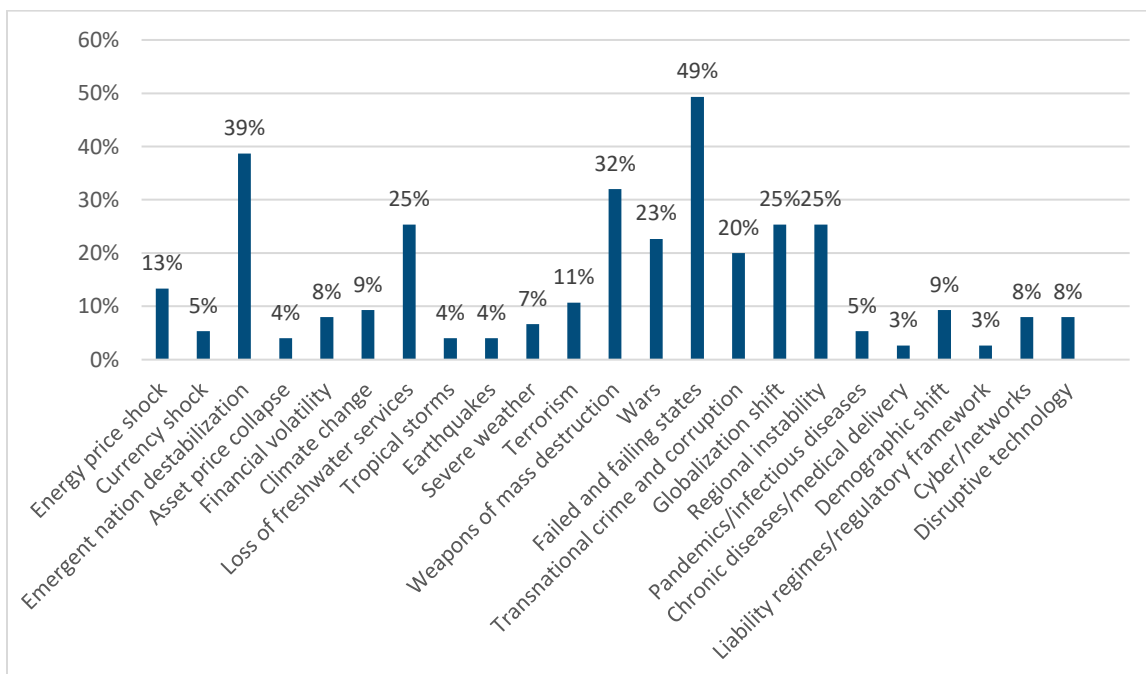
Societal	
Pandemics/infectious diseases	5%
Chronic diseases/medical delivery	3%
Demographic shift	9%
Liability regimes/regulatory framework	3%

Technological	
Cyber/networks	8%
Disruptive technology	8%

Other

- None of the above.
- **Everything listed impacts the insurance industry, in some place or in some way.**
- All of these can, in some way, impact the insurance industry.
- They all do.
- None. All of these have potential to impact the industry.
- **Weapons of mass destruction would probably be more than insurance could address.**
- They all impact insurance in one way or another.
- Except for derivatives of energy-related (commodity) products, in the Life Insurance and Health insurance industries, I don't see a lot of connection between energy prices and Life insurance.
- They all do.
- They all impact the industry one way or another.
- International treatment of debt by country; Trade and tariffs exploitation.
- All do.
- They all impact the insurance industry.
- They all impact insurance to some extent.
- All listed can have some impact.
- All the above is impacting the insurance industry.
- **All of these risks have immediate or second order impact on multinational insurers.**
- All those listed could impact the insurance industry in some way.
- All of the above risks can affect the insurance industry, though some may affect it only through secondary impacts.
- Increase in crime rate.
- **Everything that happens in the world affects the insurance industry, either directly or indirectly (butterfly effect).**
- Each has at least an indirect impact, but many of these risks have direct implications to various types of insurers—all on the asset side, and often on the liability side of the balance sheet too.

Risks that Do Not Impact the Insurance Industry



Question 7. 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 2021.

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

- *Financial inequality*
- *Sexual immorality*
- *Failure of democracy*
- *Clash of ideological differences and perceived threat from rising power to existing power*
- *US domestic politics*
- *Political instability/inaction*
- *Central bank actions/overreach*
- *Disruptive legislation—insurance/annuity products lose their tax favored status*
- *Insurance coverage becoming less desirable and under-valued by consumers*
- *Social network societal influence*
- *Mass immigration/migration as areas of the planet become less livable*
- *Dysfunctional politicians*
- *Government surveillance and mandates*
- *Government control/regulatory*
- *Growing wealth disparity within in developed nations—I used globalization risk to account for this*
- *Declining birthrate*
- *Medical breakthrough: A significant medical breakthrough (cure cancer, Alzheimer’s disease, etc.), which would materially disrupt life insurance, annuities, pension, LTC, medical insurance, etc.*
- *Decentralization*
- *Humans move further from loving their neighbor as themselves. Behavior drives increasing chaos*
- *Fraud*
- *Model failure*
- *Inflation/supply chain disruption due to pandemic*
- *The US becoming a fascist state in 2024 through an overthrow of the election by Republicans*
- *Nationalism*
- *Decreasing empathy in society (this was named as a top emerging global risk in the WEF survey)*
- *Government elimination of individual freedom*
- *The end of money*
- *Early-career debt load*
- *Separated economic/political spheres (e.g., U.S. vs China)*
- *Impact of social media/targeted advertising/biased media*
- *Increase in autocratic political regimes*
- ***Emergence of the metaverse***
- *Ability to discern the truth*
- *Lack of workers*
- *Tariff abuse*
- *Cultural norm changes*
- *Inability to distinguish fact from fiction*
- *Political*
- *Extreme political divisiveness*
- *Some societies being left behind due to low education and literacy rates*

- *Distrust of political process*
- *Bad political leadership*
- *ESG*
- *Superpower growth—whether new superpower emergence or decline of existing superpowers*
- *Disinformation*
- *Mass emigrations*
- *Shift to totalitarianism*
- *Privacy regulations*
- *Factual distortion—"fake news"*
- *Crumbling Infrastructure*
- *Lack of talent/resources*
- *Solar flares*
- *Crime rate*
- *Loss of trust in institutions*
- *Societal—labor shortage*
- *Communism*
- *Failure of democratic countries*
- *Social unrest—loss of confidence in institutions*
- *A significant solar event*
- *Breakdown of society infrastructure*

Suggestion 2

- *Free speech*
- *Rise of nationalism in Europe*
- *Geopolitics*
- *Population shifts/immigration/emigration*
- *Interest rate risk*
- ***Air and water pollution—this is more than just climate change***
- *Regulatory overreach*
- *Legislation change: If one or more major countries enacts a law that would materially disrupt the insurance industry*
- *Politicization of actuarial societies*
- *Political polarization occurring globally*
- *Automation including that of actuarial roles*
- *Government elimination of individual freedom*
- *Virtual societal warfare*
- *Global and localized inequality/inequity*
- *Increased extreme political regimes (both left and right)*
- *Development of the cryptocurrency markets*
- *Oligarchy*
- *Media lack of accountability*
- *Cultural degradation*
- *Lack of national self-sufficiency via globalization; e.g., simple example is early lack of supply of PPE in a pandemic*
- *Trade wars/tariffs/import restrictions*
- *Increasing inequalities*
- *Outsourcing relationships*
- *IT risk*
- *Demographic growth*

Section B: Leading Indicators of Emerging Risks

Some questions require an industry perspective. Please choose an industry where you are a risk expert and answer questions consistently throughout.

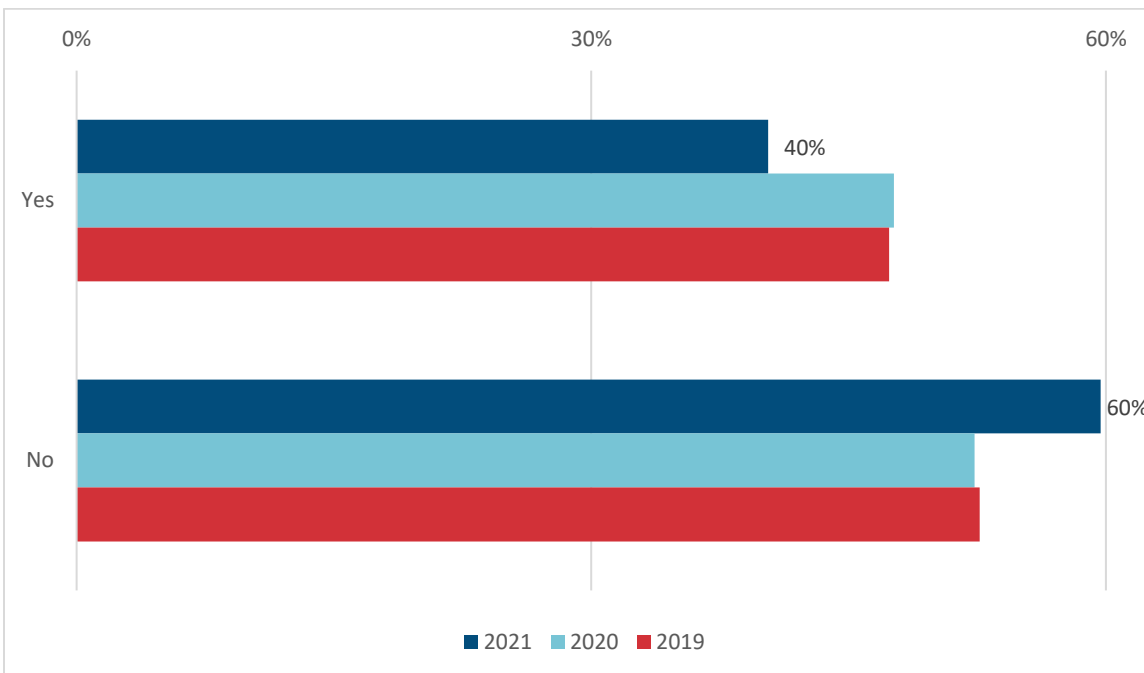
In this section, once a respondent answers a question *No* or *Not applicable*, the survey moves that respondent immediately to Section C.

Question 1. Do you formally identify emerging risks?

Percentages back out responses stating that the question is not applicable to the respondent.

	2021	2020	2019
Yes	40%	48%	47%
No	60%	52%	53%

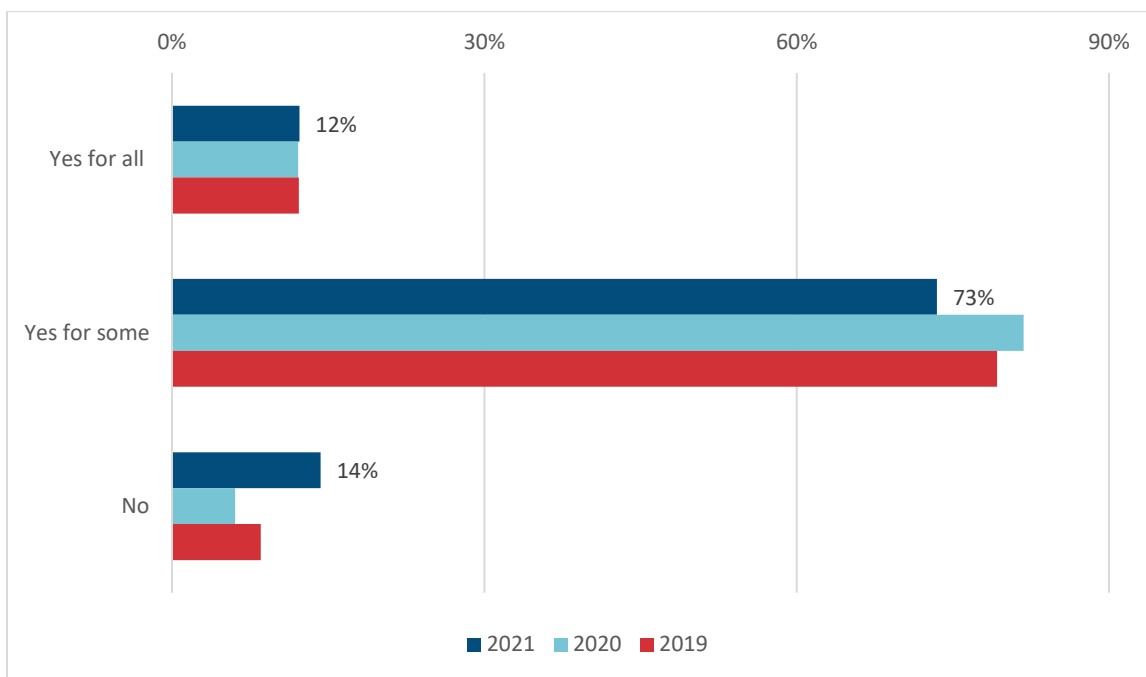
Formally Identify Emerging Risks



Question 2. Once an emerging risk is identified, do you have a process to measure, monitor and/or mitigate the risk?

	2021	2020	2019
Yes for all	12%	12%	12%
Yes for some	73%	82%	79%
No	14%	6%	9%

Process to Measure/Monitor/Mitigate



Question 3. If yes, please provide an example.

From those who responded *Yes for all*:

- *If a new risk is identified (such as the pandemic which began in 2020), we stood up a task force to contemplate decisions pertaining to all aspects of the risk (staff, customers, etc.) and met frequently to ensure we were considering all emerging data*
- *We have a Risk Committee where we stochastically model the impact of the risk, and discuss mitigation tactics*
- ***Emerging risk—pension funds taking excessive investment risk through leverage***
Solution—prevent them from doing so
- *Track a quarterly log of emerging risk issues, assign to an owner, track potential impact to company and planned mitigation, if applicable*
- *COVID-19 effects on the health-care industry*
- *Risk mitigation plans were identified, developed and implemented to address emerging risks associated with a changing demographic in our primary target markets*

From those who responded *Yes for some*:

- *Monitor individual risks exposure and review reinsurance programs; **monitor exposure by industry and reduce sales if one industry is getting disproportionate in exposure***
- *Track qualitatively latest developments or quantitatively if indexes exist*
- *Pandemic is monitored both quantitatively (epidemiologically) and qualitatively. Medical, operational, and strategic teams meet regularly to consider necessary action*
- *Climate risk—we acknowledge it but do not have a relevant measure/metric*
- *Monitor regulatory activity, market trends for all emerging risks. For other emerging risks, may monitor relevant company KPIs*
- *Risk committee monitors for emerging risks. Once identified and prioritized, it would be added to the risk universe matrix*

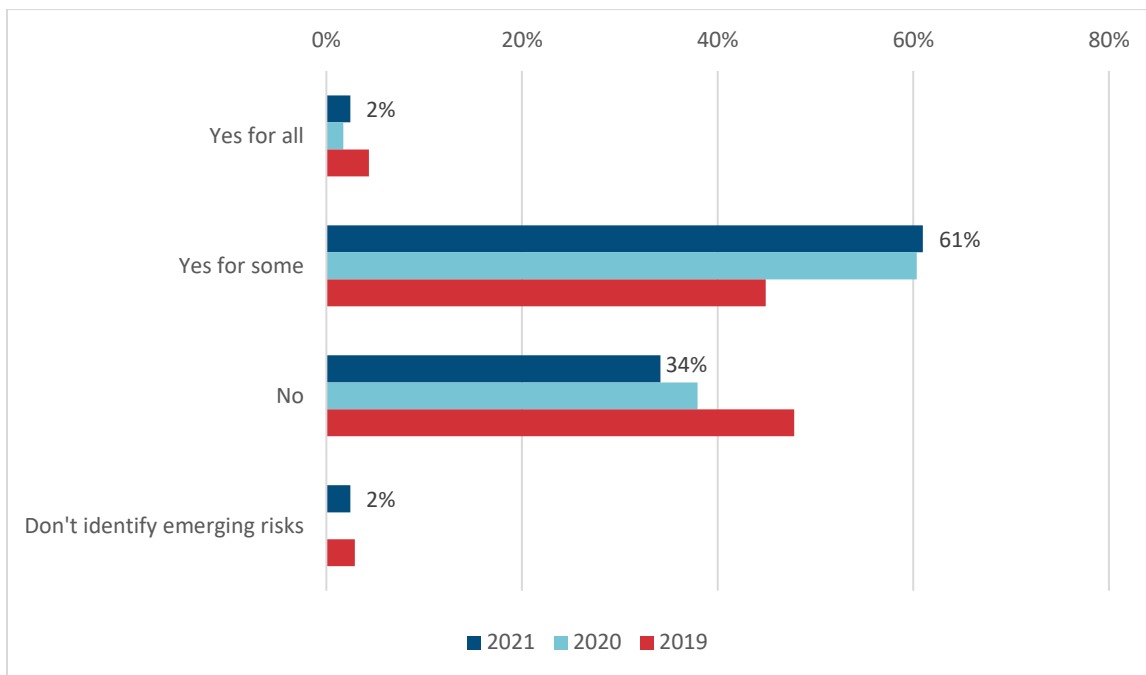
- Watch elections and those seizing power to have a sense of where regulatory framework might be heading
- Cyber
- The US becoming a failed state is such a risk. Monitoring attempts by the Republican Party to subvert elections through monitoring election laws, ballot initiatives, and far-right violence
- Opioid liability
- Impact of pandemics on the insurance industry
- Future regulations; buying habits
- I am a health actuary and I monitor and measure the risk associated with new health technology
- **For emerging risks where a reasonable proxy or leading indicator is available, such as rate of change in magnitude of tariffs as a percent of each country's GDP, the KRI is tracked and updated on either an annual or quarterly basis. Further discussion with the corporate CRO, enterprise risk management committee, and business unit CROs is had around whether the concern warrants any action or, at a minimum, elevation of information for awareness to the board**
- Changes in hospital pricing
- **Identification of chemicals that have the potential to lead to insurance claims. We track the stages of "emergence" of each one of those, identifying the ones that can be set aside and the ones that need to be further looked into**
- Hybrid working model—we are developing our own plans, but early days, so will include monitoring to determine success, changes, etc. We are taking things slowly
- We make assumptions of the risk and what implication can have on the P&L
- We would have company SMEs help identify proper metrics to measure if the risk exposure changes. The metric would then be included in a quarterly dashboard sent to our risk oversight group
- Regulatory change is monitored for potential impact to company and report to senior leaders
- War for talent was identified and steps were taken to attract/retain talent
- I help clients identify emerging risks, then we develop controls or process to ID, address and educate stakeholders
- Survey relevant sphere of financial institutions
- Cyber threat on a derivative exchange
- LDTI (regulatory)

Question 4. Once an emerging risk is identified, do you select leading indicators to measure changing likelihoods? (Example: In 2009, the threat of missiles fired by North Korea received much publicity. One company monitored investment flows to/from North or South Korea as an advance indication of the threat’s credibility.)

Percentages back out respondents stating that the question is not applicable to them or they are not sure of the correct response.

	2021	2020	2019
Yes for all emerging risks identified	2%	2%	4%
Yes for some	61%	60%	45%
No	34%	38%	48%
We do not formally identify emerging risks	2%	0%	3%

Emerging Risk Leading Indicators



Question 5. If yes, please note how many you have identified and provide an example of these methods, including the specific emerging risk and metrics used.

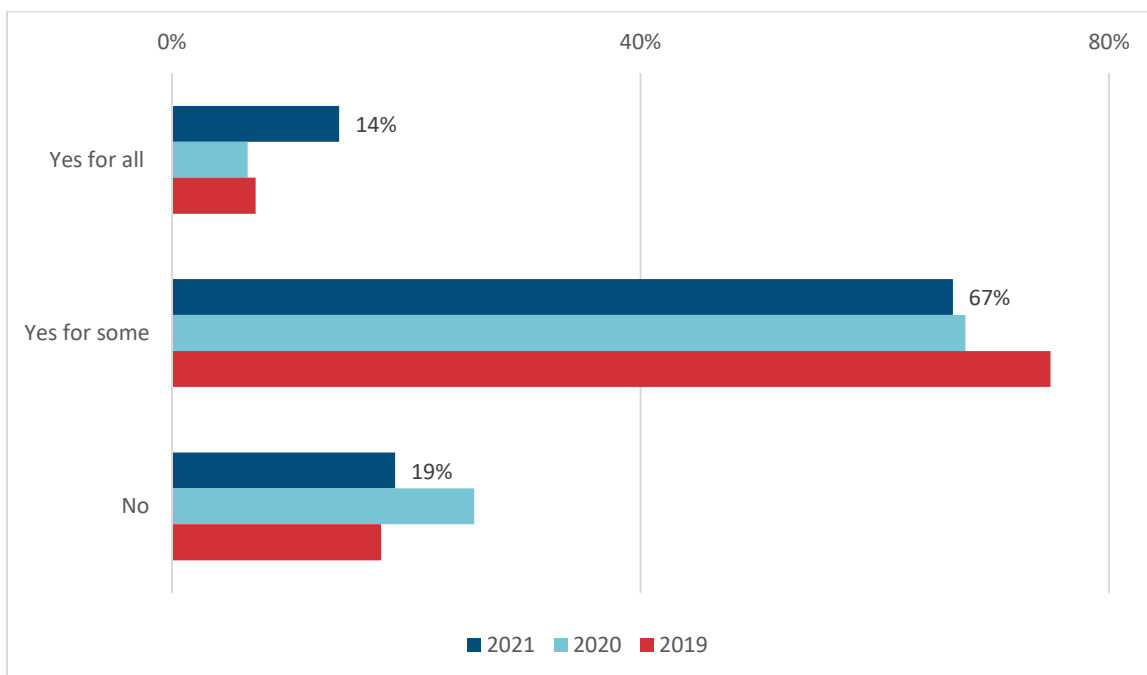
- *Emerging risk of **life exposure to frontline workers**—we measure exposure by industry; aggregating where necessary to understand our exposure to a potential pandemic*
- *One example is **a new competitor in a market**. We continually monitor who is active in which markets and track that within our business plans*
- *Not sure of exact number, but it's > 20, including some risks with multiple indicators. One example is **emerging cybersecurity risk is measured using external ratings, speed to disable credentials for terminated employees, % of employees caught in simulated attacks by the cybersecurity team, etc.***
- *We are working on these right now, so none to report*
- *It's just the top 10 risks. As an example, for emerging regulatory risks, we monitor proposed legislation at the state level*
- *I've already listed the US as a failed state above*
- *Don't know*
- *I mostly monitor utilization patterns on an informal basis*
- *# of emerging risks identified is confidential per corporate policy. An example of one such risk is given below.*
 - *Emerging risk: tariff abuse*
 - ***Concern: impact of tariffs on trade between countries (i.e., impact on the velocity of trade) and the more specific knock-on impact on financial service transaction velocity***
 - *Indicators: rate of **tariffs** as a % of GDP for each major country in which the company does business, with rate of change for the tariff rate tracked as well*
- *Hospital prices, studies of prices in different markets*
- *Indicators for each emerging risk include: recent news, new lawsuits, scientific research*
- *Changes in privacy regulations: number of states adopting*
- *Confidential*

- Identified about 10–12 emerging risks (within the 3–5 year horizon) which can impact the org. These risks are placed on a **living Heatmap** which indicates likelihood and potential impact of the risk for the current fiscal year
- When we first identified cyber risks, we used as an indicator the insurance market availability for those parts of cyber risk that were incurable. This was closer to a decade ago now
- No

Question 6. If you identify leading indicators of emerging risks, do you have criteria for when to take action to mitigate (or accept) the risk?

	2021	2020	2019
Yes for all emerging risks identified	14%	6%	7%
Yes for some	67%	68%	75%
No	19%	26%	18%

Criteria for Action Based on Leading Indicators



Question 7. If yes, please provide an example.

- Limit life inforce exposure to frontline workers to x% of total exposure
- We have defined a level of **asset leverage** above which executive leadership must determine whether to continue writing certain types of high-leverage new business
- At this point, I write about emerging risks for the benefit of others
- Not disclosable
- Various
- When recent news/lawsuits/research starts grabbing the attention of the insurance industry, either through a claim or appeals being considered, that is when we keep a closer eye on the risk and treat it differently
- Changes to regulation: monitor state of domicile and will make plans to adopt

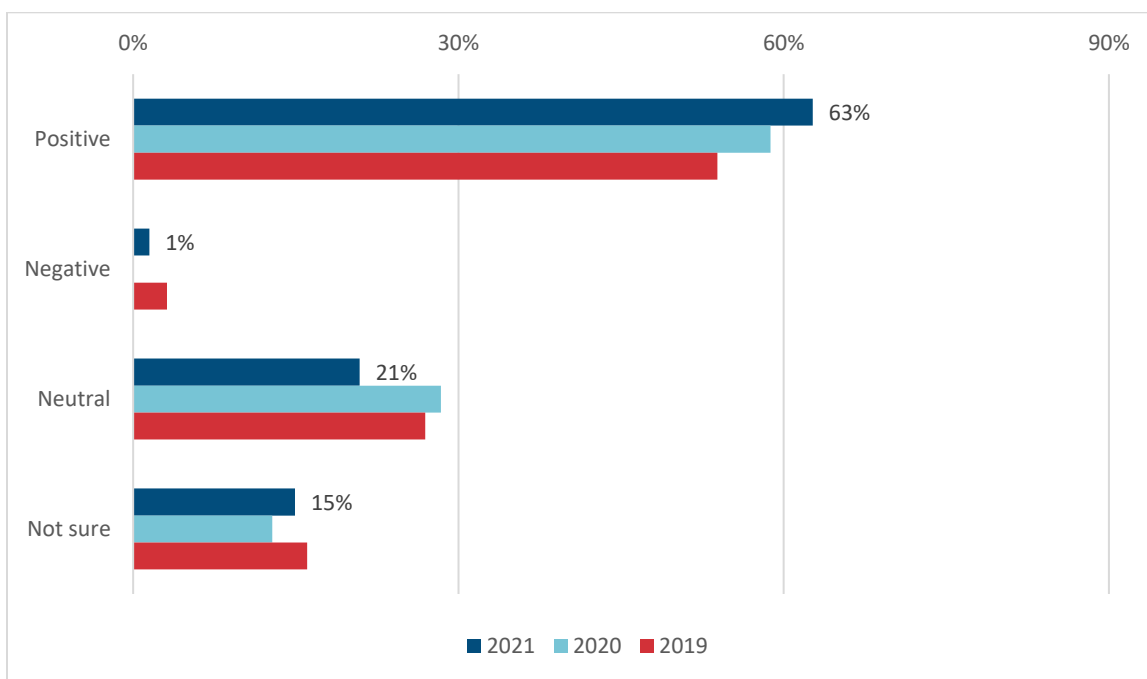
- When risk status of KRI is elevated to yellow, exceeding our established checkpoints, we initiate mitigation activity
- **If a risk was identified, and quantified to the degree possible, we made efforts to address when key stakeholders agreed in a one-to-three-year time horizon**
- Reporting to senior management
- Not all risk can be mitigated. If risk is realistic, one must think about mitigation if possible

Section C: Enterprise Risk Management

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

	2021	2020	2019
Positive	63%	59%	54%
Negative	1%	0%	3%
Neutral	21%	28%	27%
Not sure	15%	13%	16%

ERM Effect



Question 2. Please share an example from the past year, if applicable, where another company (in any industry) used ERM in a positive way.

- Understood our increasing exposure in some products and demographics and adjusted reinsurance accordingly
- ERM is still being used to measure and monitor the impacts associated with the pandemic
- **Those companies that were prepared to transition all employees to work from home**
- I don't have one

- *Business continuity planning/management has led to insurers improving their ability to have staff work remotely. This positioned many insurers quite well when the pandemic shutdowns occurred—they were able to quickly move to remote work with little operational disruption*
- *We use an ERM model to evaluate medical outcomes*
- *Business continuation plan*
- *ERM requirements forced companies to think about the relationships between multiple risks and their impact on their company*
- *My former employer (I am retired) is now using Environmental, Social and Governance as an organizing theme (<https://www.pwc.com/us/en/about-us/tomorrow-takes-trust.html>)*
- *ERM to assess cyber risk*
- *Identify modeling controls needed*
- *Auto industry—**electric vehicle disruption** (e.g., Tesla disrupting the auto industry). General Motors to eliminate gasoline and diesel light-duty cars and SUVs by 2035*
- *The company's ERM framework had led the company to produce catastrophe plans for workers in case the home office could not be utilized (due to flooding, tornado, etc.). The plan was utilized in March 2020 as the **company transitioned to predominantly remote work** due to the COVID-19 pandemic. The existing ERM plans improved continuity of services*
- *Covid-19 impact on risk appetite*
- *I don't have one*
- *ERM was essential in dealing with the consequences of the COVID-19 pandemic. The most common example was health insurance companies covering all COVID testing and preventative measure costs in order to limit risk of hospitalization costs from the disease*
- *Insurance industry and pandemics*
- *All the financial sector across the globe that has been able to implement a work from home rapidly in March 2020. If no ERM process had been in place, there would have been an important disruption in services, which has not occurred*
- *The pandemic concerns provided additional **opportunity to discuss ERM tracking and demonstrate to a broader audience the value of the mitigation efforts** and various risk management schema in place. This was particularly valuable for life reinsurance companies that needed to demonstrate their value to clients at a time when many clients were increasing retention and the life reinsurance market was retrenching to adjust for a more limited scope of opportunities and lower expected IRRs*
- *Introduction of new health-care interventions, start-up companies, assessment of value studies*
- ***Carbon credits** to offset environmental impact*
- *Encourages the process of identifying new risks*
- *ERM had a positive impact in handling the continuity of business under COVID*
- *Business continuity plans well established by ERM function allowed us to be up and running when work from home become the norm under covid*
- *Every company that had a plan to work from home*
- *No specific examples but since insurance companies are required to perform ERM, they are more aware of potential risks and take actions to mitigate them*
- *Linking ERM to COVID and business continuity has increased the perception of ERM*
- ***Developing an annual strategic risk review prior to completion of annual planning process***
- *This is a very presumptuous Q unless the responder (me) has worked at that other company*
- *Risk mitigation around the pandemic*
- *ERM identified cyber risk as an issue, and that if we developed risk controls our ability to get insurance would be better. When the market hardened, we were able to get the best terms in the range of our industry for clients such as higher education*
- *ERM framework development*
- *The Argentine government's resolutions due to the pandemic to have a seven-month quarantine, and the **obligation to pay double severance pay**, motivated white-collar companies to invest in*

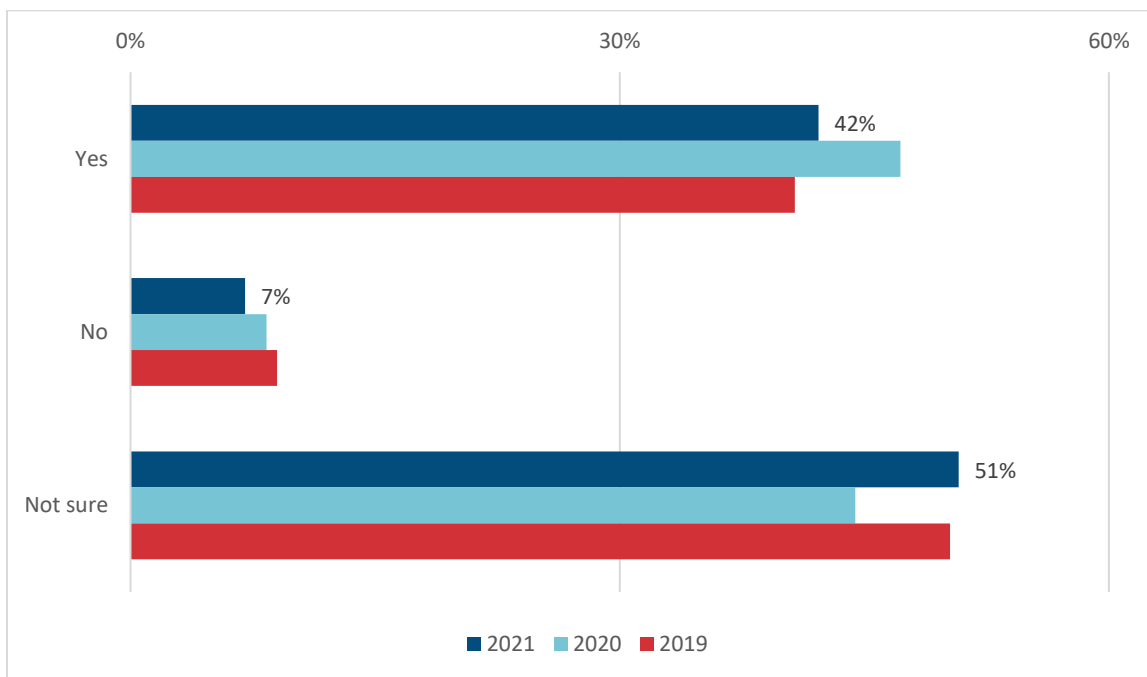
improving their networks and in tools for their employees to be able to work from home. Corollary: many companies improved their productivity in many cases by more than 30%

- Helping to prevent cyber attacks
- Great management of human resources in the COVID 19 pandemic
- Model validation, economic value of assets and liabilities
- COVID-19 sensitivity testing
- Business continuity plan
- Applied business contingency plans in practice
- **Private equity firms recognized that BBB assets falling to below investment grade levels would cause great harm to them so they used their contacts to ensure that the market was stabilized through stimulus**

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

	2021	2020	2019
Yes	42%	47%	41%
No	7%	8%	9%
Not sure	51%	44%	50%

Does ERM Improve Returns Relative to Risk?



Question 4. Why or why not?

For those who answered Yes:

- It should improve returns because management is able to make **more informed decisions** due to the ERM process
- **I'm answering over time... In the short run, ERM probably reduces returns until an event happens. At a minimum, it brings a greater awareness of risk to provide for better returns when the risk emerges. That discipline of ERM has tentacle benefits in terms of better BCP, quicker recovery, etc.**

- Prevents company from taking excess risk to achieve higher returns. **Striving for the best risk adjusted returns adds the most value to the company**
- **By being prepared for risk events that without ERM may not have been considered**
- It influences contracts and pricing
- Better ALM in optimizing risk adjusted return
- The ratings for companies that have a strong ERM framework are always better
- It does not take much ERM expenditures to make the company savings way more
- Stabilizes financial results
- **Some don't/didn't think in terms of risk and return. Any discussion/process that produces (even small) incremental risk awareness and evaluation improves company returns**
- Forces management to undergo the exercise and have discussions around risk, rather than just assuming risks are absorbed, mitigated, etc.
- Identifying risks in a vacuum removes **diversification benefits as well as pile-on impacts**
- Because this process helps at determining risks and thinking about solutions in the event the risk materializes. It does not mean that all risks are determined but a sound process of looking at what happens worldwide adds new items to take into consideration
- Honestly, it depends on how ERM is applied. I have seen more than a few **"check-box" ERM exercises which add little to no value and simply increase company costs**. If a company wants to get value from ERM, the **senior leadership has to be honest** with themselves that it is not a panacea and make measured judgments and where and how the greatest benefit can be achieved. That can be challenging if the corporate culture is set to allow the loudest person in the room to rule the argument
- More successful ventures
- **ERM creates a discipline** to acknowledge risk taking, management, monitoring, etc., of the activities
- Yes, as it leads to taking measured risks based on risk appetite and therefore improving the quality of company earnings by lowering volatility and consistent earnings over time
- Mitigating the risk should have a positive result in the company
- I believe that the ERM process brings transparency to risk companywide and, further, gives the opportunity to understand the control environment and whether it is functioning appropriately (with the help from internal audit)
- Reflect better true cost of risk
- Helps to mitigate risk earlier in process, hopefully to avoid future loss events or decrease the severity of loss
- ERM systems provide value to the organization and stakeholders in excess of any quantified values derived
- Prevent problems before they emerge
- **Better control of worse outcomes**
- Yes, allows for better understanding of risk, interactions, and effective capital uses
- Decision makers more acutely aware of the risk/reward trade-off
- **If I can improve my decision making** then my returns increase and/or my risk decreases—if not, then I'm not adding value

For those who answered No:

- Generally, ERM recommendations are not implemented to the fullest extent. If they were, restrictions on the business would generally lead to lower growth and pricing/product decisions for "through the cycle," which could generally lead to underperformance in asset bubbles, excess monetary availability, and so forth. In other words, **managing for risk when competitors and marketplace is not puts the firm at disadvantage until the crisis moment arrives**. Management, shareholders, policyholders generally do not have the fortitude to address the long term

- **It's too abstract**
- *Asset risk has increased with multiple bubbles and ERM doesn't capture converging correlations of these emerging risks*
- **It's a fad. It is and ineffectively implemented. Just another boondoggle for the Management Consulting industry**
- *Risk mgt has a cost. In long term, risk return trade-offs may improve returns*

For those who answered Not sure:

- *Difficult to measure accurately*
- *Depends on how you consider the question, and the level of expenses involved. ERM is not likely to generate income, but should improve stability and reduce downside (particularly catastrophic downside) risk*
- *Costs of ERM are a given and occur in the present. Returns/Risk need to be evaluated over time*
- *It is difficult to project company returns on an inherent risk (e.g., no risk mitigations/controls) vs net risk basis. Most risk mitigations are embedded in the management of a company*
- *I'm not sure*
- *See my comment above*
- **Depends if a company becomes overconfident or hubris when thinking their ERM practices will shield them from all risks**
- **I think the answer is Yes for companies that do it well and No for companies that do not. Both are possible**
- *ERM may or may not improve ROE. In my view, the main objective is to reduce the impact and probability of material losses. ERM can also highlight opportunities, which may be accretive to ROE*
- *ERM will reduce volatility rather than increase returns. With decreased volatility, return for risk MAY increase*
- *ERM can limit volatility of returns by addressing risks, but I am not sure that it can actually increase returns without additional risk being taken on*
- **Can enhance risk awareness, but new approaches to mitigation their impact does not always work, are costly, or are beyond the ability of a single company to "fix"**
- **It depends on whether ERM is simply a data gathering exercise or an actionable plan**
- *It may reduce risk, but it **always reduces returns**. The life industry is a buy/hold industry but applying an economic framework overstates risk. It is important to understand the value of embedded options, and this is where market valuations are important*
- *Not always. If the relationship between ERM and the business is just one of control or check-and-balance, ERM tends to not add much to the conversation. **If it is one of teamwork and working together—including having ERM sit at the table during strategic discussions—then yes***
- *Hard to assess the overall impact, since I only see the one scenario*
- *ERM implementation is a cost drag. It protects against tail events, but ex post, we measure profit in dollars. **Few people care about the value of the protection, they only care how much you made.** Once we have full industry-wide understanding of a return on (risk-adjusted) capital, we should find that ERM improves returns*
- **Most companies in the region where I work implement ERM simply for regulatory compliance purposes**
- *It should as companies are more aware of their risks but some may become too conservative due to ERM and miss out on potential earning due to risk avoidance*
- *Recently retired. But I've found that risk management tends to be driven mostly by software capabilities and regulatory requirements. So C-3 tends to be overanalyzed, C-1 seems to be okay, but the others don't seem to get the attention they deserve, unless something is a known risk*
- **Improve? It might reduce returns in exchange for avoidance of a potential loss. Is that improvement? Depending on your perspective, maybe yes or maybe no**

- They are harder to quantify, so harder to measure impact until they are realized, if ever actually realized in a sense of measuring against company ROI
- In the case of Argentina, most of the time ERM is implemented in order for the company to survive a state interventionist market policy

Question 5. This survey is in its 15th iteration. If any previous versions helped you manage risk, please share any details that you can.

- ***I shared the results of the 14th survey with our executive team, when developing our own ERM program***
- *The survey gave me what risks are communicated out there*
- *We use the concept in our ORSA analysis*
- *None*
- *Provide possibilities for additional emerging risks to consider*
- ***I read these reports just to make sure I am staying current. Most are not specific to my interests***
- *I share the results within my company*
- *This survey does not help manage risk. Surveys don't manage anything*
- *Highlighting cyber risk has led to more attention to that risk across financial institutions*
- *None*
- *No*
- ***I used this survey in the past to convince management to put more resources towards Climate change***
- ***The comments from respondents over the past couple of years suggesting how to start up an ERM process was very helpful***

Question 6. How have risk evaluation and risk mitigation, both implemented and planned, changed under COVID-19?

- **Focused more on employee retention** of key employees given increased remote nature of jobs
- It has shifted the time frame of several analyses, bringing risk events forward several years; it has also placed more emphasis on the operational/practical elements of risk mitigation
- Risks of working from home are more in the limelight
- It has become **more political**
- Our list of risks and potential implications has expanded
- Risk evaluation was elevated
- The biggest change is that a perceived nearly impossible event became possible. This, however, has not seemingly altered risk management appetites
- Yes. Working from home and disaster recovery planning/BCP
- We have **rethought some of our risk limits** in light of our COVID-19 experience. COVID-19 has also provided a new data point with respect to pandemic risk
- **The assigned probability of a risk event has become less important for me, since before COVID most would have assigned a low probability to a pandemic**
- Risk categories/subcategories updated to reflect impact of remote work
- Pandemics were anticipated, but not really taken seriously until 2020
- Better understood how different risks can be interacted
- There is less time and fewer resources to devote to non-COVID risks
- Pandemic risk is now front and center for future mitigation measures
- People have an even more distorted perception of risk now that the media and politicians have used fear-mongering of the virus to take more control over people's daily lives. And **measures that promote virus safety at all costs ignore the risk/benefit trade-off inherent in any of these policies.**
- Unforeseen risks from unprecedented events

- I believe **companies set up more rapid response mitigation teams** to respond
- More attention to product diversification. For example, carriers with LTC and Life blocks have seen more modest impacts than carriers with only Life exposure
- For our companies, not too much. Did make real just how fast a risk can become a reality
- Re-assessment of risks. Developed/enhanced new/existing controls to mitigate the risks
- Leftist political worldview has guided risk mitigation strategies, not data
- No changes
- More real-time assessments
- Risk evaluation has broken down since there is a disconnect between public attitudes and actual risk
- More frequent monitoring of statistics across several geographies
- Pandemic provided a realistic scenario to base public health measures against operational impacts
- Greater emphasis on its importance and more focus on its benefits to companies
- included pandemics where they weren't on the horizon before
- Based on the relative lack of financial impact of Covid 19, pandemic appears less significant considering technology
- COVID-19 was definitely an added factor, but the modeling and timing of utilization changes in both general medical services and COVID-19 specific services has proved to be a challenge
- More aware of one-off events
- Pandemics, although part of insurance contracts prior to the Covid-19 went from a theoretical to a practical side. Lots of changes will be observed in the insurance industry over the next years once all impacts of this pandemics will be known and priced
- They haven't in my experience, other than providing a more recent example for the updating of the RBC mortality factors
- Risk evaluation has become fraught with even more uncertainty
- COVID has added an additional layer of risk and uncertainty
- We go even deeper in trying to think about **ways that contract wording can be challenged in court.** There is a push for 100% clarity of coverage now
- The thinking has gone beyond continuity in the context of an emergency site to locate for business continuity
- We were dismissive of pandemic risk before Covid. No longer the case
- I don't think changed but it did provide a real use case to highlight how risk management (being prepared, proactive, etc.) can help when unexpected things happen
- Discussions are taking place using words like **"when this happens again" instead of "if."** With respect to covid
- Seems things are much more unknown
- Brought in more virtual workstation and cyber risks
- Don't know. Although my own company did extensive planning after the first coronavirus near-pandemic, so the transition appeared to be pretty orderly. I heard anecdotally that it wasn't so smooth at other companies
- It is more clear for management of risk that can affect the economy
- COVID brought a different lens around overall accumulation risk
- Yes
- New risks, risk impacts, More unknown, unknown risks becoming known
- COVID caused us to **focus on risks to our supply chain** (well before the current national supply chain problems)
- They have heightened awareness about thinking about things that have not happened yet, especially those that are uninsurable
- Even unlikely risks are still real risks
- Unknown
- Greater appreciation of risks related to human resources availability

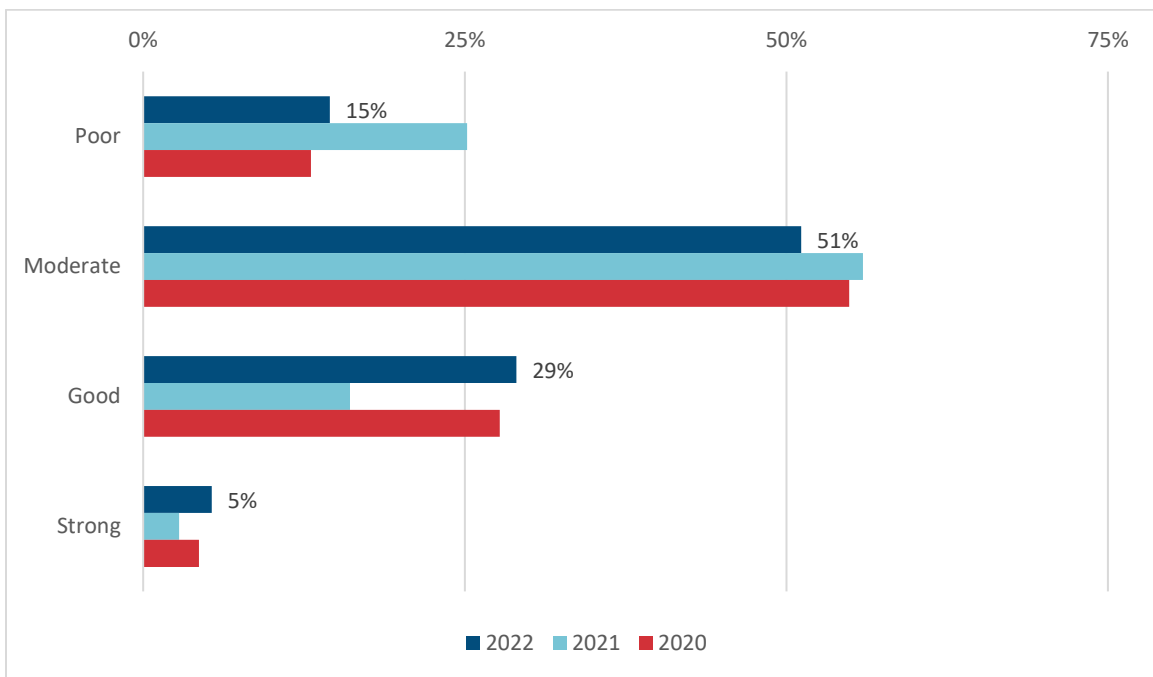
- Yes
- Reinforced current frameworks
- Perception the stress and scenario testing add value has increased
- The pandemic has been a string of related decisions about risk. The industry did a good job of reacting, but a poor job of being proactive
- I think the risk of a global pandemic was considered very small, while we have seen the need to better understand this risk and its widespread impacts

Section D: Current Topics

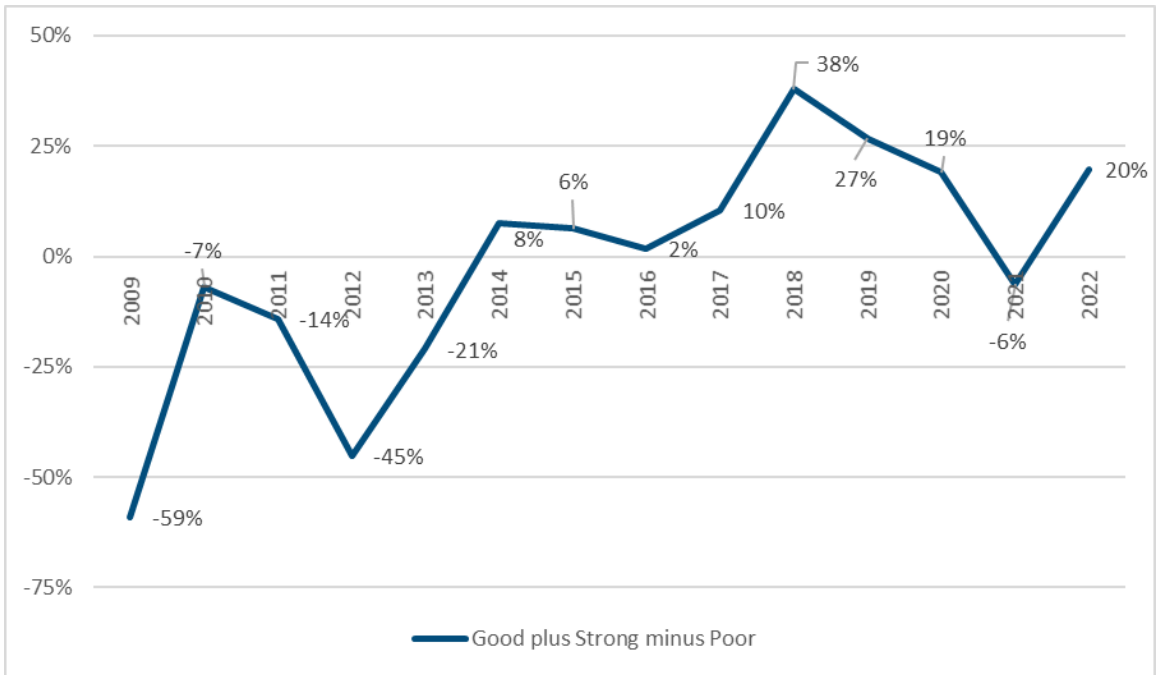
Question 1. Your expectation for the 2022 global economy is:

	2022	2021	2020
Poor	15%	25%	13%
Moderate	51%	56%	55%
Good	29%	16%	28%
Strong	5%	3%	4%

Global Economic Expectations



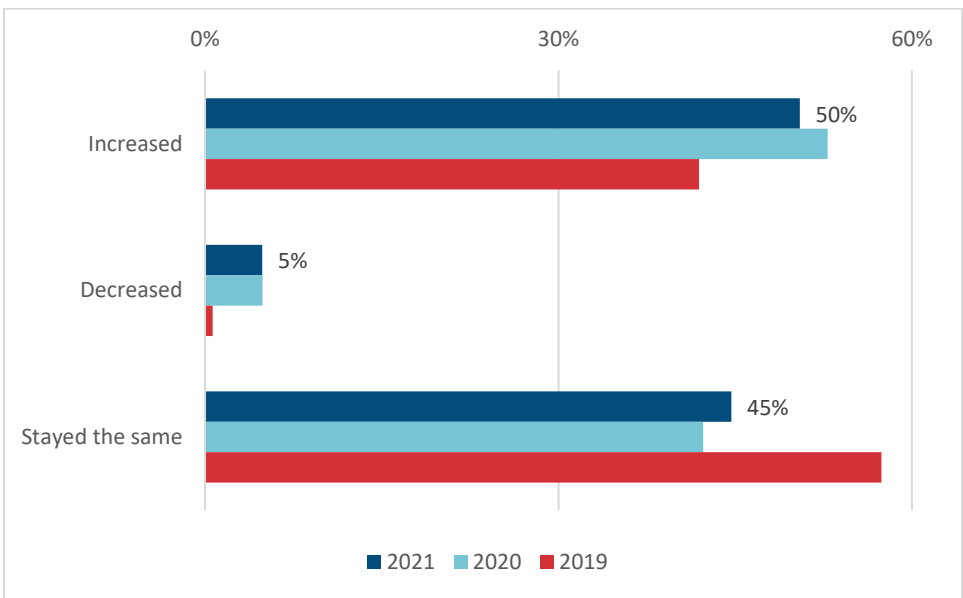
Combined Net (Good + Strong – Poor) Economic Expectations



Question 2. Did you experience a change in the level of ERM-focused activities for your organization or clients in 2020?

	2021	2020	2019
Increased	50%	53%	42%
Decreased	5%	5%	1%
Stayed the same	45%	42%	57%

ERM Activity

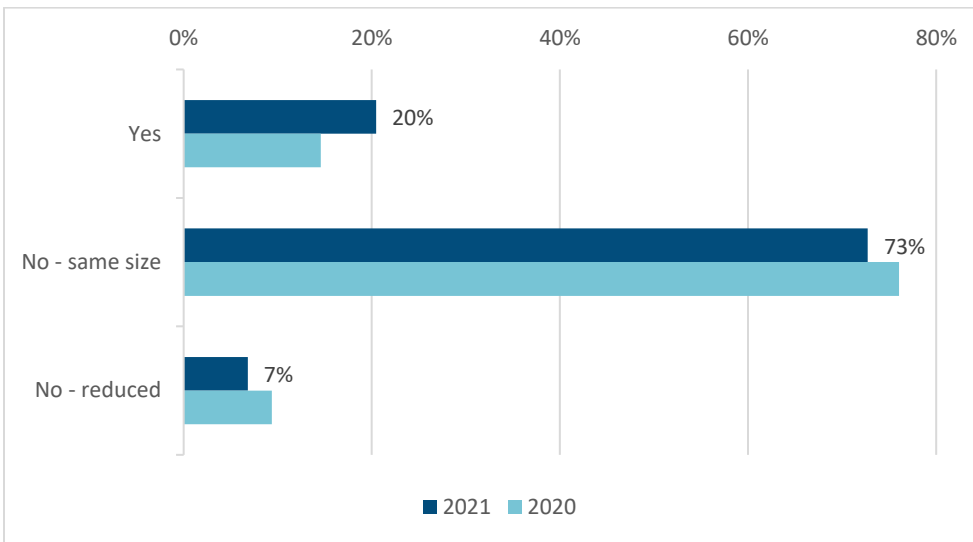


Question 3. Did your internal ERM staff increase in 2021?

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

	2021	2020
Yes	20%	15%
No—same size	73%	76%
No—reduced	7%	9%

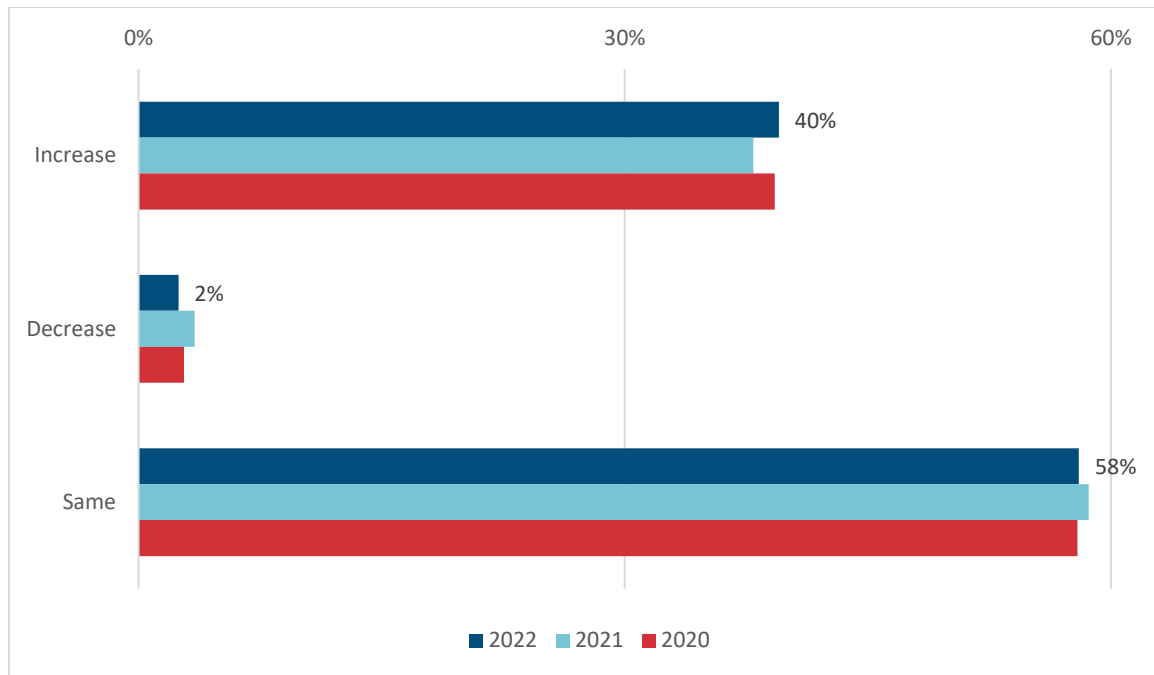
ERM Internal Staff Growth



Question 4. Do you anticipate a change in the level of ERM-focused activities for your organization or clients in 2022 relative to 2021?

	2022	2021	2020
Increase	40%	38%	39%
Decrease	2%	3%	3%
Stay the same	58%	59%	58%

Future Expectations—Activity



Question 5. What types of Disruptive technology scenarios do you analyze?

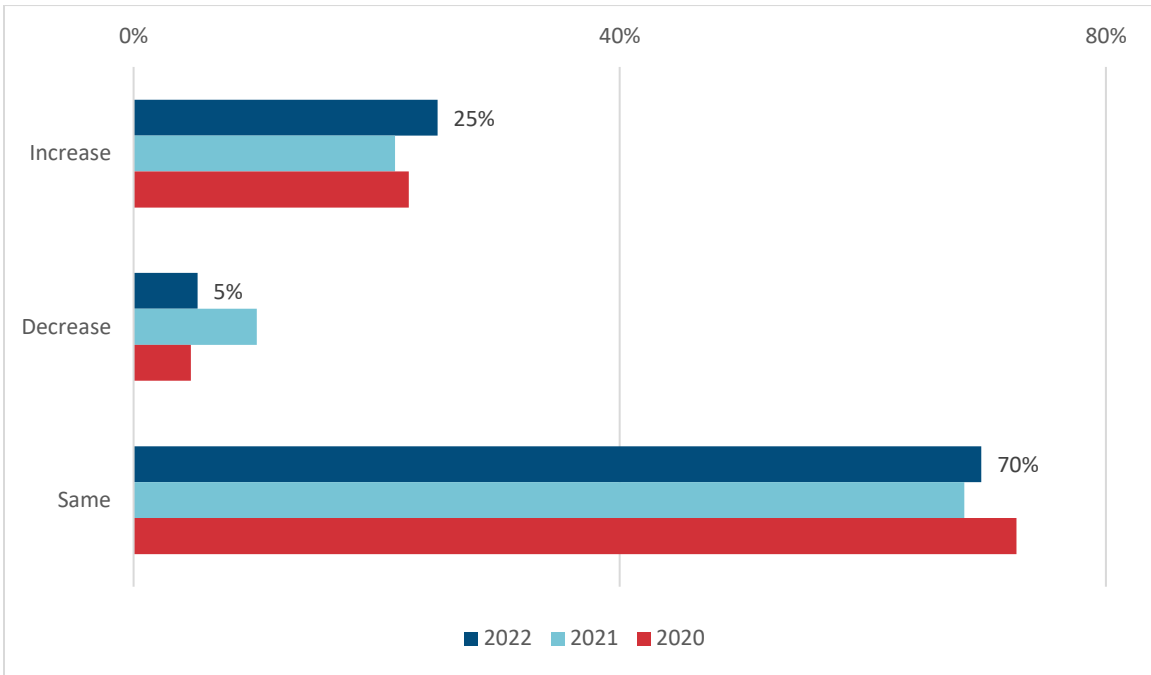
- *Look at disruptive consumer facing application intake—circumventing our current methods; understanding **telemedicine and impacts to health insurance model***
- *Increasing ease of **selling life insurance direct to consumer/online/on an app***
- *Movement to digital tools, cyber attacks*
- *Not my area of expertise*
- *Digitization of the entire world*
- *New market entrants; medical advancements; economic disruptions (job losses/changes due to automation, etc.)*
- *Cyber security at my company (not me)*
- *Cyber/data loss*
- *Change in consumer behavior*
- *Competition*
- *None*
- *No specific scenarios. Impact of disruption technology is embedded in the evaluation of process error, data security and business continuity risks. Strategically, impact is embedded in business plan projections (e.g., technology roadmap, expected sales, net income)*
- *Disruptive medical procedures and devices*
- *Firewall break through causing data leakage*
- *Moving to a paperless society, moving away from fiat currency (e.g., cryptocurrency adoption)*
- *Competitors/start-ups*
- *Technology*
- *None. As we see it, limited impact to our business*
- *None*
- *None*

- *Fintech disruption of banking industry*
- *Inability to deliver necessary products and services*
- *Not much—get involved in cyber security issues*
- ***Automated underwriting, direct to consumer sales***
- *I'm currently interested in how smart contract technology will impact the EMR/EHR space*
- *Cyberattacks*
- *System failures not necessarily caused by cyberattacks*
- *Not disclosable*
- *Technology developed in managing specific health care conditions or issues*
- *Cryptocurrencies, impact of social networks*
- *Blockchain, cryptocurrencies, AI*
- ***New entrants in the market more effectively implement new technologies and are more effective in engaging younger customers than the existing companies***
- *We are following quantum computing, distributed ledgers, crypto currency*
- *AI*
- *Digital delivery of new business and services post-issue*
- *Mostly insurtech disruption. However, we are also looking at changing in customer purchasing preferences that could influence our distribution model*
- *Potential impact to our ability to adapt business plan*
- *Potential impacts to not looking at new technology*
- *Potential impacts of legacy systems*
- *Changes in consumer preferences as well as vulnerabilities in various points in the value chain*
- *Apps, bots*
- *Those that are possible competitors to existing clients, or those companies trying to disrupt others by helping them see the weaknesses in other business models or processes/efficiencies that others can capitalize on with industry knowledge*
- *All*
- *InsurTech*

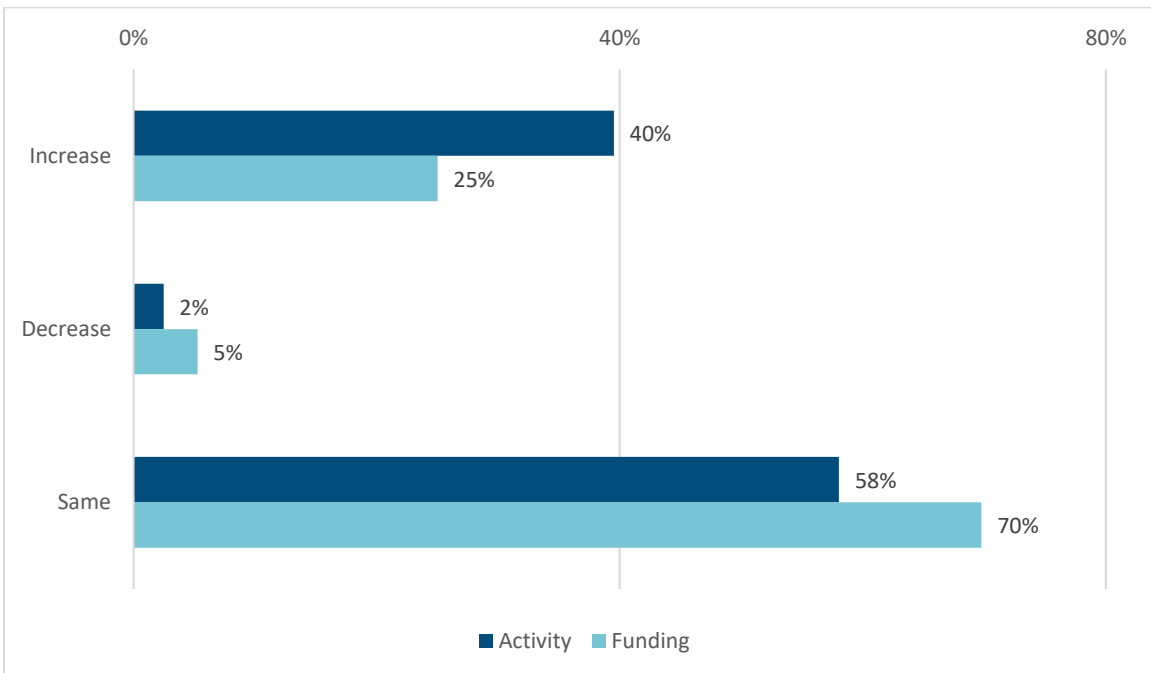
Question 6. Do you anticipate a change in the level of funding dedicated to ERM-focused activities for your organization or clients in 2022 relative to 2021?

	2022	2021	2020
Increase	25%	22%	23%
Decrease	5%	10%	5%
Stay the same	70%	68%	73%

Future Expectations—Funding



2022 Anticipated ERM Levels



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.)

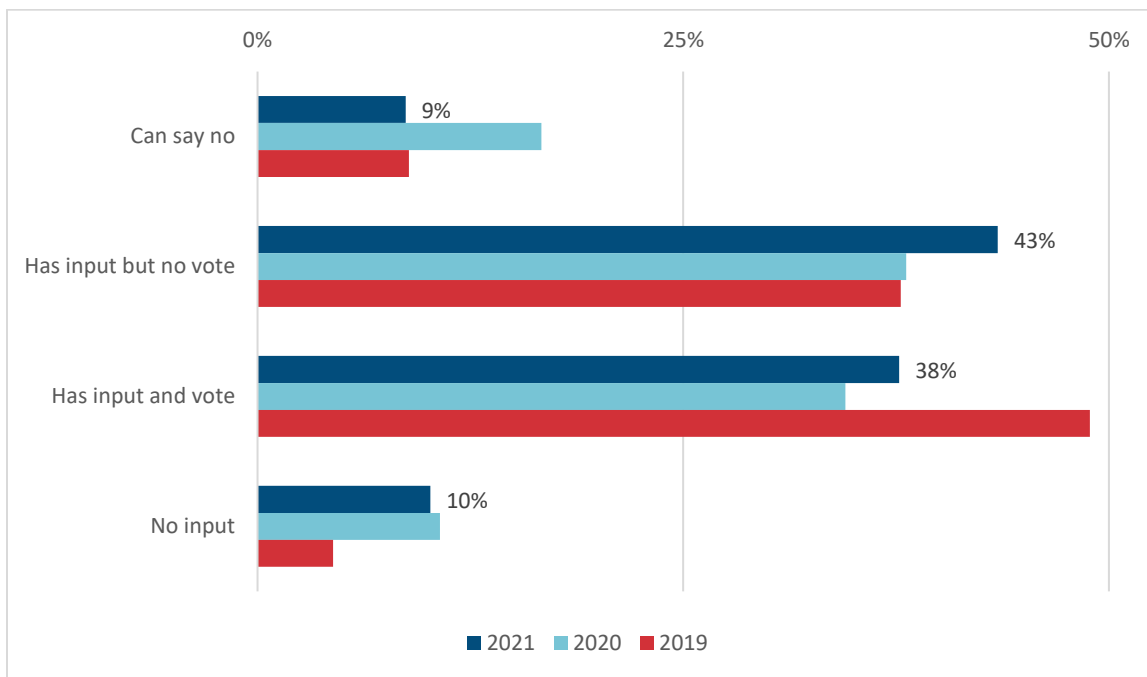
Percentages back out respondents stating that the question is not applicable to them.

	2021	2020	2019
Our ERM function can say no to a strategic opportunity	9%	17%	9%
Our ERM function has input but not a vote when a strategic opportunity is being considered	43%	38%	38%
Our ERM function has input and a vote when a strategic opportunity is being considered	38%	35%	49%
Our ERM function has no input when a strategic opportunity is being considered	10%	11%	4%

Comments/Examples

- *ERM area is new—have not been given the opportunity although we are arguing for it*
- *We are working towards getting a vote for all opportunities*

Strategic Opportunity



Question 8. Please share an example (if you have one) where the ERM department/function was recognized, either positively (e.g., proactive mitigation) or negatively, following a risk event.

- **Performed shock analysis of covid-19 event**, including impacts to operating financials and RBC; helped understand the potential impact across the organization—**well received**
- *Our company was able to immediately flip to a remote working environment once the COVID-19 pandemic closed our office buildings*
- *Much of our COVID-19 response (both financial and operational) was based upon previous pandemic planning done by the ERM department and described to management and the board in our ORSA*
- *We consult on ERM, don't use it directly*
- *ERM has a say during the planning and implementation phases*

- *Researching mortality bonds, modelling of risks*
- *Not applicable*
- *Company implemented a **Crisis Management Team** (subset of ERM committee) when monitoring the pandemic impacts. This was perceived well by staff with the continued communication*
- *Not disclosable*
- *COVID modeling*
- *ERM helped refining contract wording following Covid*
- *Covid response for the company was directed by our ERM team*
- *Complimented for ensuring our business continuity plans were kept up to date and we had no down time*
- *COVID, Data events, etc.*
- *Have been recognized throughout the pandemic for being proactive in changes that are made*
- *I don't have one*
- *Our outside ERM practice was recognized for identifying before COVID-19 that insurance would not apply to losses, especially business interruption*
- *Sensitivity testing leverage during COVID-19*
- ***Prior to a risk event, I was deemed excess baggage for pushing management toward proactive planning around pandemics and low interest rates***

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?

- *Our analysis focuses on **demographics** which may be overlooked and overpriced*
- *Product innovations*
- *Cost of IT*
- *Business mix, regulatory/tax/accounting changes or differences between jurisdictions, opportunistic acquisitions*
- *Speeding up **on-line selling opportunity***
- *We're in involuntary unemployment insurance. Opportunity for sales as people are more aware of the potential value*
- *None*
- ***The use of **alternative assets since US insurers are abusing these asset classes to unwisely get marginal increased return with little knowledge of downside correlation risks*****
- *N/A*
- *That is handled by another team so I cannot comment in a meaningful fashion*
- *All risks provide opportunities, even the ones that might look more risky than others*
- *We do monitor potential opportunities for our investments especially during times of market disruption and volatility*
- *When looking at emerging risks, we consider whether any or all of them also create opportunities*
- *Climate change and impact on certain asset classes*
- *Review product/product pricing on a regular basis*
- *Regulatory/tax opportunities are always monitored*
- *Outsourcing activities, primarily by how the contractual nature of them reduce liability or how they change s those relationships are now being re-negotiated*
- *Understanding insurance and investment product diversification benefits*
- *A lot on the asset side, looking for undervalued stocks. My filters look for low leverage balance sheets. Many of these are written about in the business press so initial scans are not that hard to find*

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

- *Housing*
- *Disparity of the wall street and main street*
- *Sharp division of the **political ideologies** both within and beyond the borders*
- *Cash/monetary policy...leading to asset pricing bubbles. **Hyperinflation may be on the horizon**, for which no action is taking place*
- *No*
- *Too much money being spent on "**build-it-and-they-will-come**" web portals for insurance*
- *No*
- *Real estate prices*
- *No*
- *The use of **CLOs and other alternative assets**, 2) **private equity buying up housing** and crowding out the middle class from home ownership*
- *No*
- *Asset prices. P/E ratios so high relative to output*
- *Yes*
- *No, the tendency is rather to have underpriced segments of the market*
- *Believe equity and real estate are in bubbles*
- ***Cryptocurrency**, housing, US money supply*
- *Commodities*
- *No, although concern around real estate prices in certain markets*
- *Yes*
- *Not sure it is your definition of a bubble, but **staffing shortages**.*
- *Stock prices*
- *N/A*
- *CLO, regional property, **anything with high leverage**, coastal property*

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

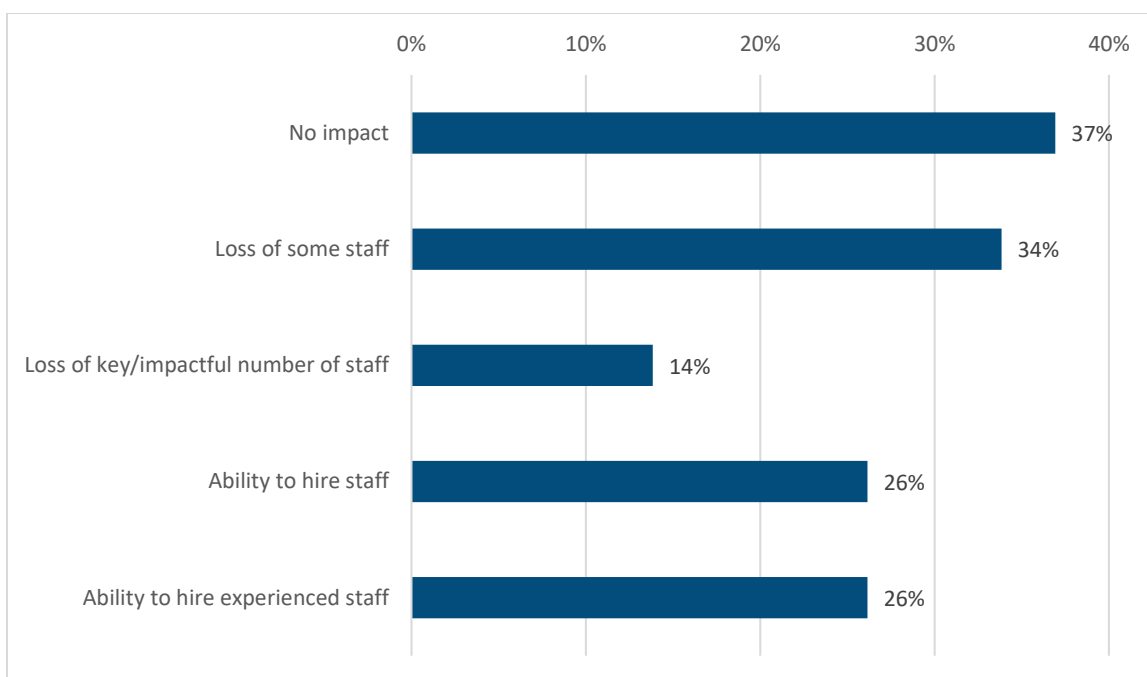
- ***Long-term covid claims** on disability—working with industry contacts to learn together*
- *Experience data on a new product*
- ***Mortality trends appear to be diverging from historical data, particularly with respect to stratification by income.** We are trying to balance a quantitative historical approach with periodic qualitative thought exercises regarding what could happen and what that might mean, both in terms of a best estimate assumption and in the tail*
- *Severity of **global warming***
- ***Cyber incidents.** Be vigilant. Spend on management consistent with expected cost-benefit*
- *Not applicable*
- *Loss of business due to economic environment. We take point estimates and include caveats when communicating forecasting assumptions*
- ***Weather impact on dental claims.** We use a longer historical period to evaluate. This is always changing, however*
- *Cyber risk*
- *Cyber, because of the constantly changing nature of the risk*
- *Can't, because it is unknown*
- *Impact of **genetic testing or lack thereof** (where certain countries won't allow its use in underwriting)*
- *Mortality in current environment (pandemic). Looking at past events to try and estimate possible impact, but current pandemic doesn't mirror past*
- *Climate change and the impact to business continuity/resiliency. We build mitigation steps which are designed to work in various scenarios due to any of a number of unspecified causes*

- Severe weather and property loss. We adjust by making sure we have adequate insurance and properly valued assets
- Low interest rate environments monitored through extreme sensitivity testing
- Anything **climate related**—avoid on the asset side

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

No impact	37%
Loss of some staff	34%
Loss of key/impactful number of staff	14%
Ability to hire staff	26%
Ability to hire experienced staff	26%

Great Resignation



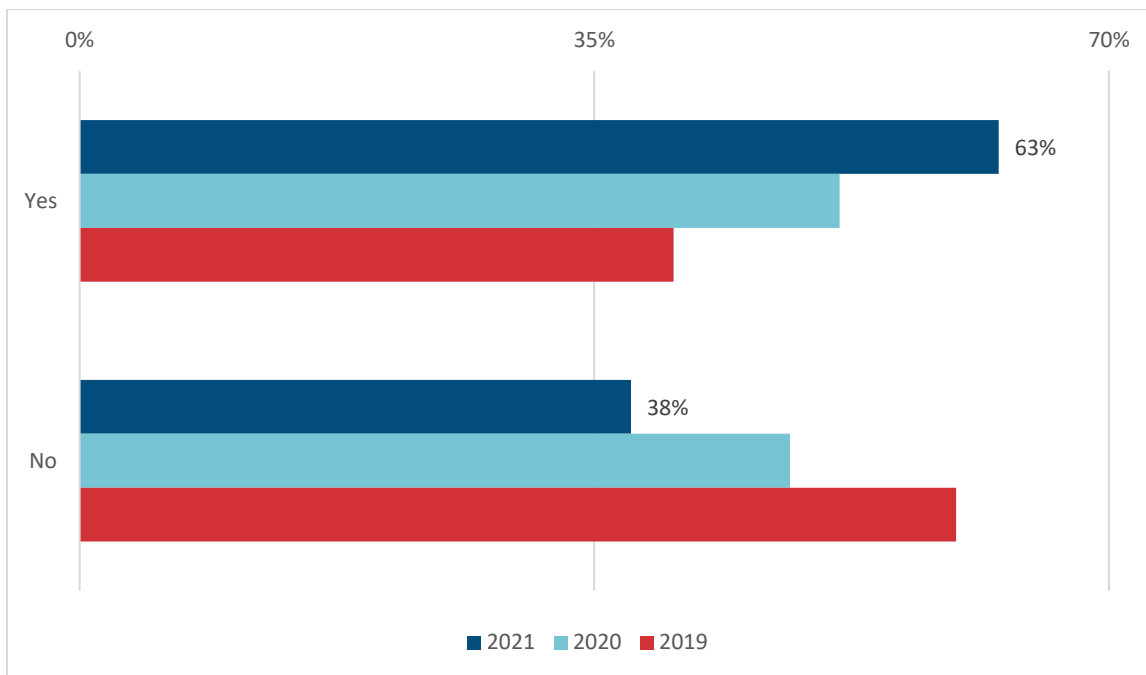
Section E: Demographics

If you are retired, respond based on your most recent career path.

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

	2021	2020	2019
Yes	63%	52%	40%
No	38%	48%	60%

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.

	2021	2020	2019
CERA	18%	19%	21%
FCAS/ACAS	6%	15%	8%
FSA/ASA	90%	84%	78%
FCIA	11%	7%	14%
MAAA	61%	59%	42%
PRM	2%	1%	1%
FRM	3%	1%	2%
CFA	3%	10%	7%
FIA	3%	3%	5%
FIAA	6%	1%	1%
JD	1%	1%	1%
MBA	4%	8%	7%
CPCU	4%	1%	1%
Ph.D.	9%	6%	7%
EA	13%	5%	2%
FCA	4%	2%	0%

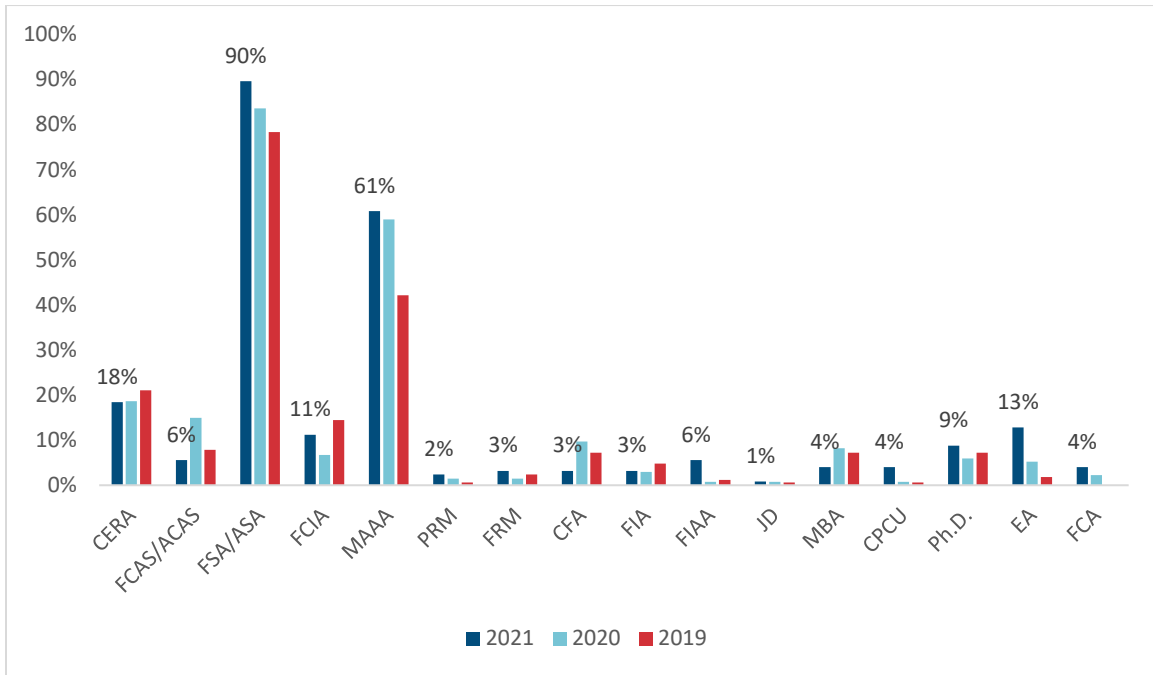
Other actuarial credentials

- *FFA*
- *FIA*
- *FASSA*
- *ERMCP*
- *Actuary from Facultad de Ciencias Económicas de la Universidad de Buenos Aires*

Other non-actuarial credentials

- *FLMI*
- *CLU, ChFC*
- *FLMI*
- *M.S., FLMI, ARA, ACS,*
- *FLMI*
- *FLMI CLU ChFC*
- *FLMI*
- *FLMI*
- *FLMI/M*
- *CPA*
- *ALMI, CFSA*
- *CFP*
- *CRM*
- *CIA. CRMA*
- *FLMI RHU*

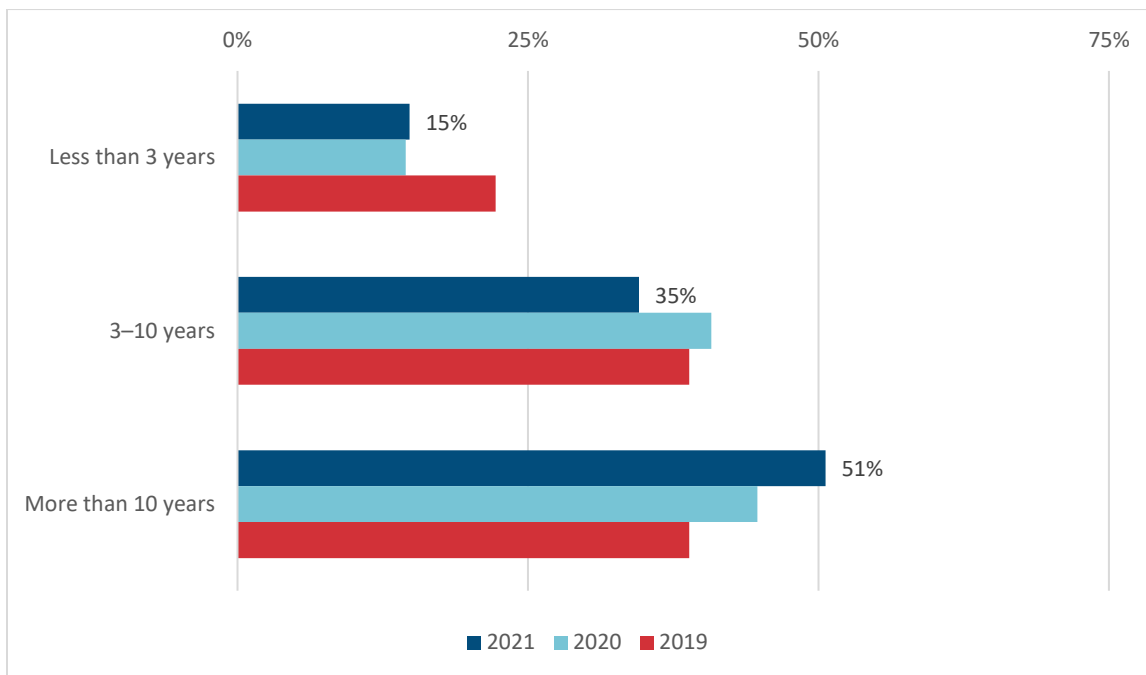
Credentials



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

	2021	2020	2019
Less than 3 years	15%	14%	22%
3–10 years	35%	41%	39%
More than 10 years	51%	45%	39%

Experience



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

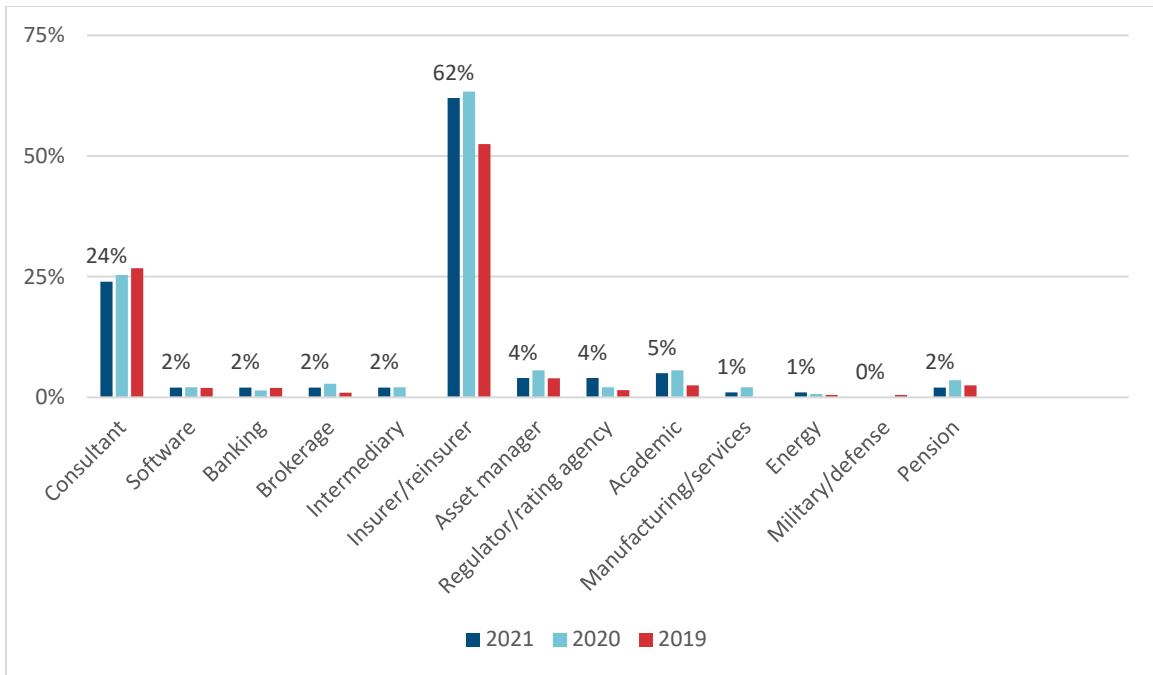
	2021	2020	2019
Consultant	24%	25%	27%
Software	2%	2%	2%
Banking	2%	1%	2%
Brokerage	2%	3%	1%
Intermediary	2%	2%	0%
Insurer/reinsurer	62%	63%	52%
Asset manager	4%	4%	4%
Regulatory/rating agency	4%	4%	1%
Academic	5%	5%	2%
Manufacturing/Services	1%	1%	0%
Energy	1%	1%	0%
Military/Defense	0%	0%	0%
CRO (or acting CRO) at CRO Council firm	2%	2%	0%
CRO (or acting CRO) at CRO Forum firm	0%	0%	0%
Pension fund	2%	2%	2%

Other

- Retired
- Actuary

- Health Organization
- Member of a board of directors, volunteer position
- Government

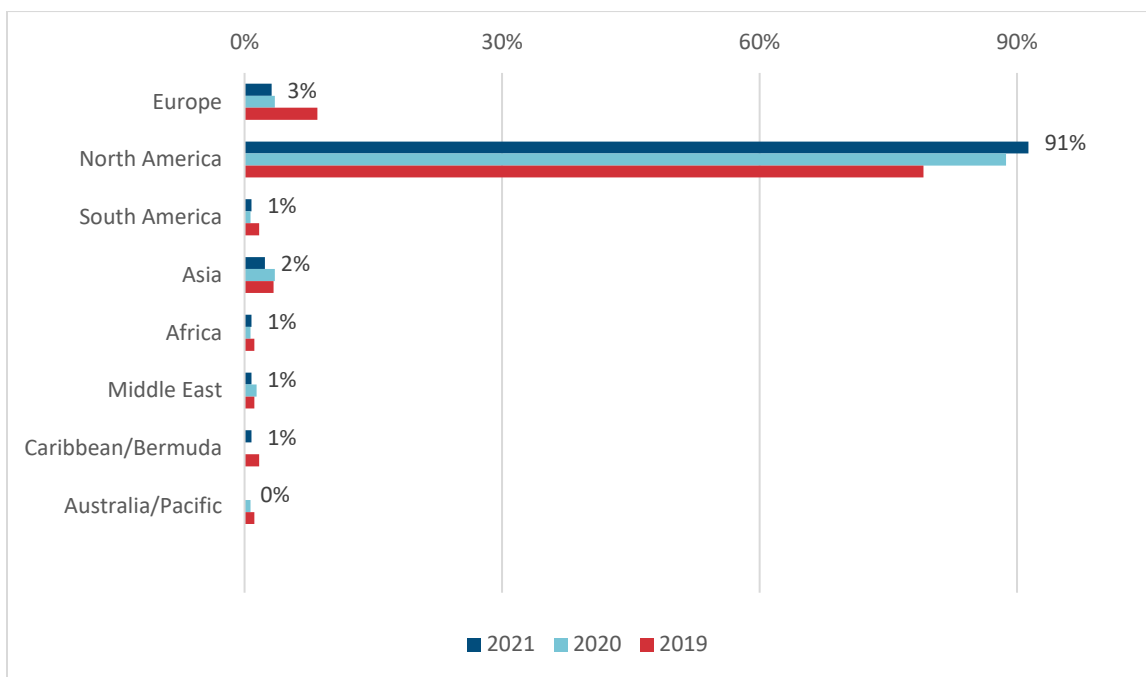
Employer Type



Question 5. Primary region (please select one).

	<u>2021</u>	<u>2020</u>	<u>2019</u>
Europe	3%	4%	8%
North America	91%	89%	79%
South America	1%	1%	2%
Asia	2%	4%	3%
Africa	1%	1%	1%
Middle East	1%	1%	1%
Caribbean/Bermuda	1%	0%	2%
Australia/Pacific	0%	1%	1%

Region



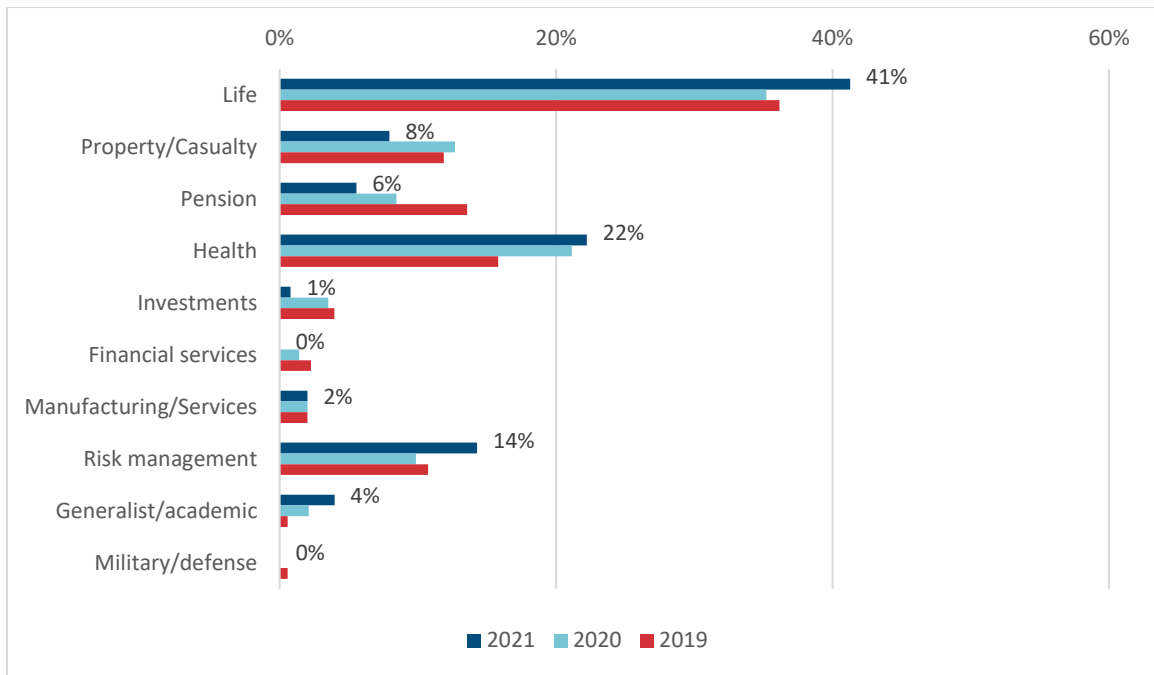
Question 6. Primary area of practice (please select one).

	2021	2020	2019
Life	41%	35%	36%
Property/casualty (general insurance, nonlife)	8%	13%	12%
Pension	6%	8%	14%
Health	22%	21%	16%
Investments	1%	4%	4%
Financial services (noninsurance)	0%	1%	2%
Manufacturing/services	2%	2%	2%
Risk management	14%	10%	11%
Generalist/academic	4%	2%	1%
Military/defense	0%	0%	1%

Other

- *Social insurance*
- *Annuities and investment products*
- *Social security*

Practice Area



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

- *Just searches on internet—do not have regular go to sources; prefer to have multiple avenues to research and gather info*
- *Actuarial publications*
- *Trusted news networks*
- *Industry articles*
- *PwC banana skins*
- *Coverager*
- *McKinsey*
- *Wall Street Journal+*
- *Industry news, international news*
- *CDC, WHO, state websites, media*
- *Academic research. Industry publications. Global financial and geopolitical news*
- *SOA publications, company ERM department, industry publications*
- *News organizations*
- *SOA*
- *Various emerging risk reports, large company MD&A discussions, industry meetings*
- *SOA joint risk committee*
- *The internet*
- *NAIC materials and SOA education*
- *Industry forums/conferences*
- *Google search*
- *Actuarial resources*
- *Industry publications, webinars/conferences, newspaper*
- *Many online newsletters*
- *The Economist*
- **GARP**
- **CRO Forum**

- OECD
- International Finance Corporation
- Rand Corporation
- *Quality journalism, books written by journalists about past issues (All the Devils are Here [McLean], Who Killed Confederation Life? [McQueen])*
- The Economist/Washington Post
- Kaiser Family Foundation
- Health Affairs
- SOA
- Consultants
- Reinsurers
- Intelligence firm analyses (FBI, Pinkerton, etc.)
- National Academies Press
- **Bestseller lists**
- The Economist
- Industry news, regular news, speaking with people of all industries
- General news
- Trade journals
- Peers
- None
- **This survey, as well as Gartner**
- Reputable newspapers and magazines
- Specialist industrial group newsletters
- Discussions with my CRO
- Industry publications
- Current events
- Conversations with peers inside and outside actuarial profession, academic publications, trade publications
- IASA, McKinsey newsletters, Aon newsletters
- IIA
- Protiviti
- Twitter, mass media
- Industry surveys
- More generic risk surveys
- Internal risk assessments/interviews
- Proprietary sources
- Lists gathered over time from industry resources, colleagues, and those in the industry I network with
- SOA
- IIA
- Credit rating agencies, newspapers, Internet, magazines and specialized financial publications
- GARP
- The Economist
- Trending fiction topics
- **Economist, Virtual Capitalist, Our World in Data**

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

- Comment on the "woke" culture that wants to "cancel" their political opponents
- No

- No
- None
- No
- No
- No
- No, it's thorough as is
- *I suggest that you either create a separate survey for product development/pricing actuaries, or better tailor for this group. A lot of risks originate with this group, so that their attitudes matter. Judging from conversations with my peers inside and outside the company, **risk management at insurance and financial services is more decentralized than is realized**. Even when there is a unit specifically dedicated towards risk management*
- *Keep it up—good work here*
- No
- No
- ***This is an important survey***

Thanks for your participation!

Researcher's Notes for Future Surveys

- Add questions probing:
 - What actions do you take between crises to add value?
 - How prepared is your firm for a major risk event that has never happened before (resilience)?
 - Currency shock—include risk of Bretton Woods—type overhaul
 - Look at which risks have appeared in the top five across all surveys and questions

Appendix III: Survey Results 2020 and Earlier

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



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The Canadian Institute of Actuaries (CIA) is the qualifying and governing body of the actuarial profession in Canada. We develop and uphold rigorous standards, share our risk management expertise, and advance actuarial science to improve lives in Canada and around the world. Our more than 6,000 members apply their knowledge of math, statistics, data analytics, and business in providing services and advice of the highest quality to help Canadian people and organizations face the future with confidence.

The CIA Board has 15 actuaries, six councils focused on the core needs of the profession, and over 40 committees and numerous task forces working on issues linked to the CIA's strategic plan.

The CIA

- Promotes the advancement of actuarial science through research
- Provides for the education and qualification of members and prospective members
- Ensures that actuarial services its members provide meet extremely high professional standards
- Is self-regulating and enforces rules of professional conduct
- Is an advocate for the profession with governments and the public in the development of public policy

The CIA and its members are active in the international actuarial community. The CIA is a founding member of the International Actuarial Association and was involved in the 1998 restructuring of the body.

Canadian Institute of Actuaries

360 Albert Street, Suite 1740
Ottawa, Ontario K1R 7X7

<https://www.cia-ica.ca/>

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

4350 N. Fairfax Drive, Suite 250
Arlington, VA 22203

<https://www.casact.org/>

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.

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Society of Actuaries Research Institute

475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173

www.SOA.org