CASUALTY ACTUARIAL SOCIETY

Canadian Institute of Actuaries | Institut canadien des actuaires

SOCIETY OF ACTUARIES®

14th Survey of Emerging Risks

August 2021

14th Survey of Emerging Risks

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

SPONSORS Canadian Institute of Actuaries
Casualty Actuarial Society
Society of Actuaries

Caveat and Disclaimer

The opinions expressed and conclusions reached by the author are his own and do not represent any official position or opinion of the Canadian Institute of Actuaries, the Casualty Actuarial Society or the Society of Actuaries or their members. The Canadian Institute of Actuaries, the Casualty Actuarial Society and the Society of Actuaries make no representation or warranty to the accuracy of the information.

CONTENTS

14th Survey of Emerging Risks

It is impossible to comprehend the results of this survey without some context. The survey was open during November 2020. While the world's primary risk was COVID-19, and it continues to surprise us today with new symptoms and variants, the year set records for wildfires and hurricanes as well. Into 2021 we have seen Lenin's observation play out.

There are decades where nothing happens; and there are weeks where decades happen.

While the Atlantic hurricane season set records, impacting Central America, the Caribbean and the United States, typhoons hit Asia and especially the Philippines and cyclones in May impacted India and Bangladesh. Climate change continues to impact the strength and frequency of these storms. Heat and drought interacted with wildfires, especially in Australia and the western United States, leading to deaths and property damage. Increasing levels of carbon dioxide were only briefly slowed during early lockdowns as the Keeling Curve (measure of carbon dioxide atmospheric concentration) continues to set records.

Economic growth was volatile following the shutdowns early in the year, with large government stimulus aiding recovery efforts but building debt to levels not seen since World War 2. Trade wars and cyber-attacks introduced new issues to work through. Oil supply and currencies cycled quickly.

The pandemic hit hard worldwide starting in mid-March, and likely was present several months before that. Many ramifications are yet to be understood. For example, moratoriums on evictions of renters and owners are being lifted at a time when housing costs are leading a wave of inflation. Supply chain issues are likely to be noted later in 2021 as shipping container shortages and export manufacturing clarifies.

Whether climate change, pandemics, cyber, war or financial volatility, the risk landscape is moving quickly and historical distributions are no longer stable. Unknown knowns, where historical distributions are no longer predictive, are becoming the norm for many risks. The good news is that experience often is an advantage to recognizing these impacts. Artificial intelligence (AI) tools struggle to predict these changes before the experienced practitioner, and the best analysis seems to come from experienced modelers working with AI tools.

This survey attempts to track the thoughts of risk managers about emerging risks across time. It is the 14th 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 and Reinsurance Sections for their financial support, and the Joint Risk Management Section for logistics and governance.

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 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 they include 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 and other material from previous surveys in the series.

Section 1: Executive Summary

The year 2020 will be remembered for a long time, both for events that caused death and destruction as well as for acts of kindness. The medical profession and other essential workers stepped up in ways that created burdens on them, and concerns about inequality and racial justice became seen in a new light in ways that are stimulating research seeking data so solutions can be developed.

Flooding in Jakarta, Afghanistan, Michigan and the United Kingdom, Cyclone Amphan in India and Bangladesh, the Typhoons Goni and Vamco back-to-back in the Philippines (with the volcano Taal also acting up), a record setting Atlantic hurricane season led by Laura and Eta, heat waves seemingly everywhere, wildfires in Australia and California, and earthquakes in Turkey were all material regional events. Geopolitical tensions and deglobalization continued, and 2020 was reported to be tied with 2016 as the warmest year on record.[1] This evolution of risks is captured in the *14th Survey of Emerging Risks*, completed in November 2020. These events provide examples where recent occurrence of an event leads those who experienced it to overestimate its reoccurrence. This is called *recency bias*[2] and has consistently affected the results of this and other surveys about risk management.

The rotating question in this survey's iteration, where respondents are asked to choose up to three applicable risks, asked which emerging risks interact prominently with COVID-19. Not surprisingly, in addition to *Pandemics/infectious diseases* as runner-up with 18%, *Financial volatility* (20%) and *Chronic diseases/medical delivery* (13%) were also named by more than 10% of respondents.

The responses across all questions, but especially as a current risk, highlight a surge of perceived risk from pandemics. Several open-ended questions solicited respondent's experience with planning for a pandemic, both prior to the current event and looking forward. Climate change and technology concerns remain high priorities. Using this report as a contrarian indicator may help a risk team anticipate future issues that are not currently in the public eye. An example in this iteration of the survey may be earthquakes and energy price shocks, which finished with the lowest responses when five emerging risks were chosen. Surprisingly, given the records set in 2020 around the world, tropical storms are one of the lowest rated risks.

1.1 SURVEY FRAMEWORK

The survey is completed annually (except in 2008, which included the first two iterations in 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.

---

[1] https://www.nasa.gov/press-release/2020-tied-for-warmest-year-on-record-nasa-analysis-shows

[2] Kahneman, Daniel. *Thinking Fast and Slow*. 2013. Farrar, Straus and Giroux. People tend to recall something that has happened recently more easily than something that occurred in the more distant past. This is recency bias, defined by Daniel Kahneman and Amos Tversky. This is among the psychological insights that resulted in Kahneman receiving the Nobel Prize in Economics in 2002.

Economic Risks

1. *Energy price shock*
2. *Currency shock*
3. *Chinese 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*

Respondents are asked to define greatest strategic impact since this is how they will make their choices. 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 this iteration of the survey disruption was chosen more frequently than financial impact.

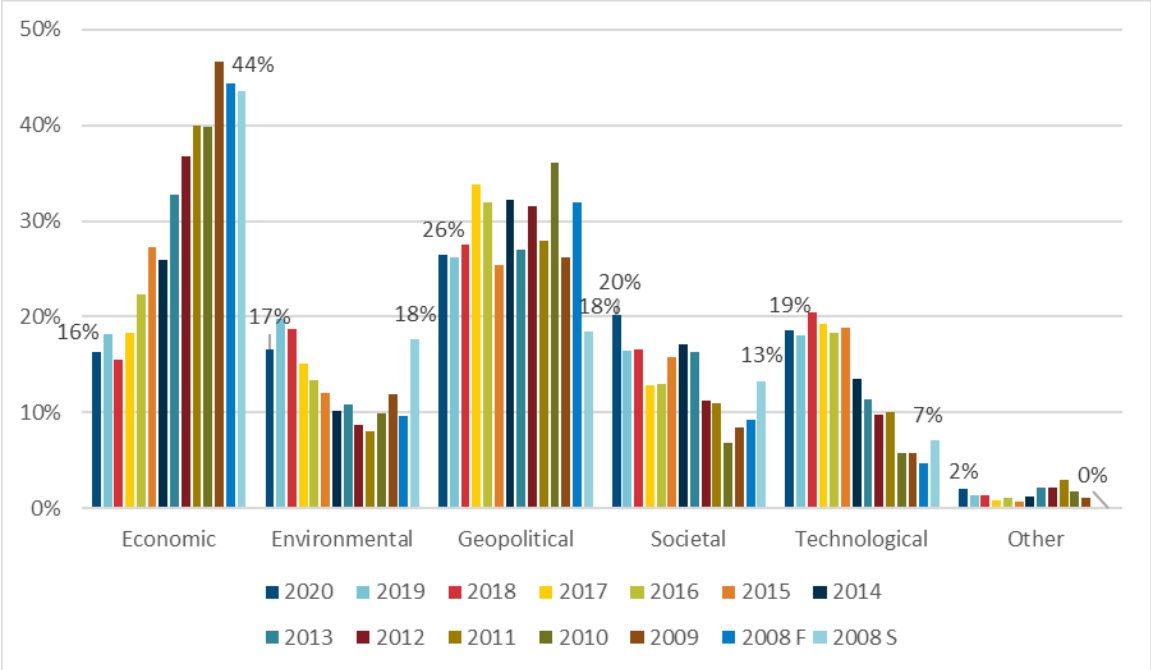
1.2 TOP FIVE EMERGING RISKS

The results continue to show interesting trends, although some were broken in this iteration of the 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 held steady from the prior survey (26% of the total chosen when up to five emerging risks were selected) and maintained the top category response, as Societal moved into second place (20%), just ahead of Technological (19%), Environmental (17%) and Economic (16%). The uppermost choice (although not ranked among the top five risks overall) from the Geopolitical category was *Wars (including civil wars)* (25% of respondents choosing it in their top five, steady with the prior survey). *Globalization shift* (25%, up from 20%) increased and *Regional instability* (17%, down from 22%) fell.

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 *Pandemics/infectious diseases* (45%) and *Disruptive technology* (40%). Electric vehicles, batteries, renewable power and 5G technology all seemed to gain exposure, with new investment vehicles designed to identify companies most likely to disrupt. A new low was recorded by *Regional instability* (17%). From the prior iteration of the survey all five of the Environmental risks were lower.

Climate change remains the top response, followed by *Cyber/networks* and *Pandemics/infectious diseases*.

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 consistent, with only the top two choices switching places). As shown in Table 1, several risks have remained consistently at the top over the past four years.

Table 1

Top Five Emerging Risks, 2017–2020

Year	2017	2018	2019	2020
1	Cyber/networks	Cyber/networks	Climate change	Climate change
2	Terrorism	Climate change	Cyber/networks	Cyber/networks
3	Disruptive technology	Disruptive technology	Disruptive technology	Disruptive technology
4	Regional instability	Demographic shift	Demographic shift	Pandemics/ infectious diseases
5	Asset price collapse	Financial volatility	Financial volatility	Financial volatility

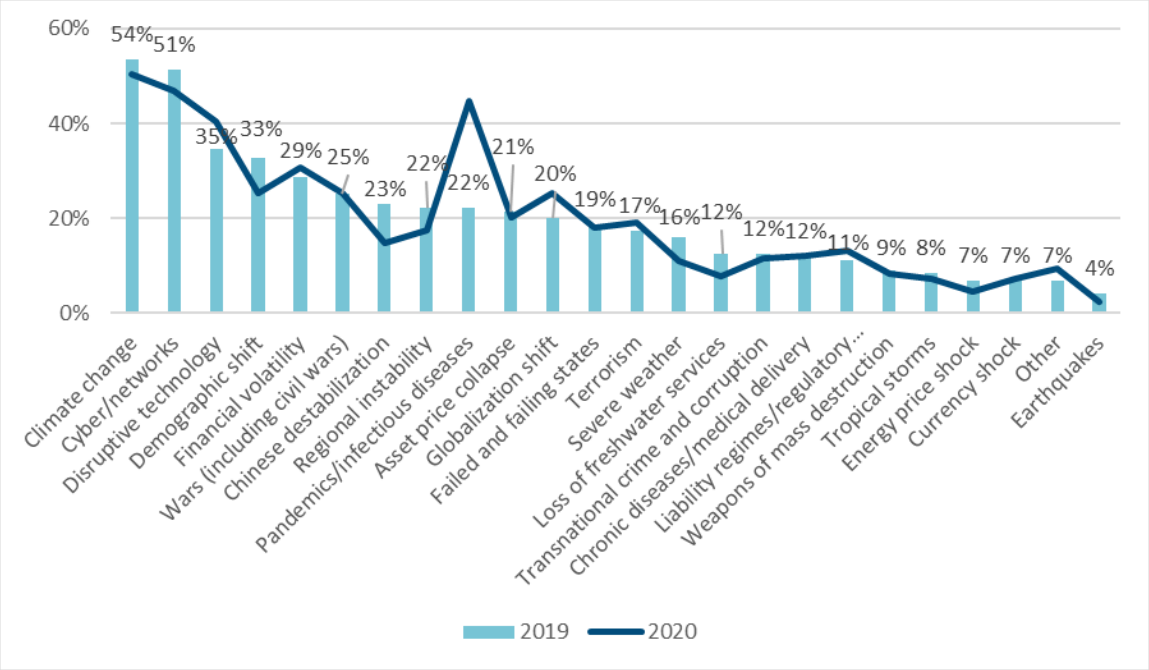
Three risks increased materially from the previous survey when respondents were asked to choose their top five emerging risks. *Pandemics/infectious diseases* more than doubled (22% to 45%), *Globalization shift* (20% to 25%) and *Disruptive technology* (35% to 40%) each showed big jumps. *Chinese destabilization* (23% to 15%) and *Demographic shift* (33% to 25%) both fell despite news about each during the year.

Figure 2 shows the results for the top five emerging risks from the most recent two surveys, listed in order of the rankings from 2019, highlighting the volatility between years for a few risks.

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 *Disruptive technology* moving closer by 5% in 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* (26%, down from 27%)
2. *Disruptive technology* (15%, up from 11%)
3. *Pandemics/infectious diseases* (8%, up from 2% and the largest absolute gain)
4. *Financial volatility* (5%, down from 6%)

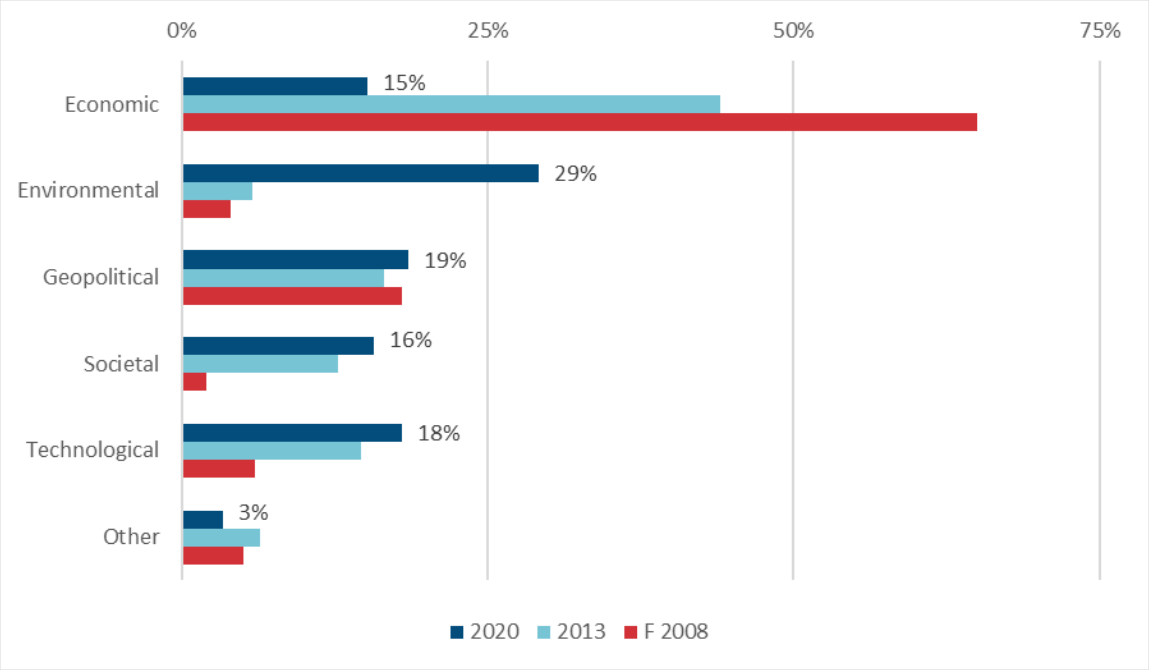
Cyber/networks dropped out of the top five, falling from 10% to 3%, for the largest drop after a peak of 23% in 2015. All of the risks except *Natural catastrophe: earthquakes* were selected by at least one respondent as top emerging risk in this iteration of the survey for the third consecutive year. *Climate change* responses kept the Environmental category in a solid lead (29%, down from the previous year's 32%).

Figure 3 shows how the categories have evolved over the last few iterations 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



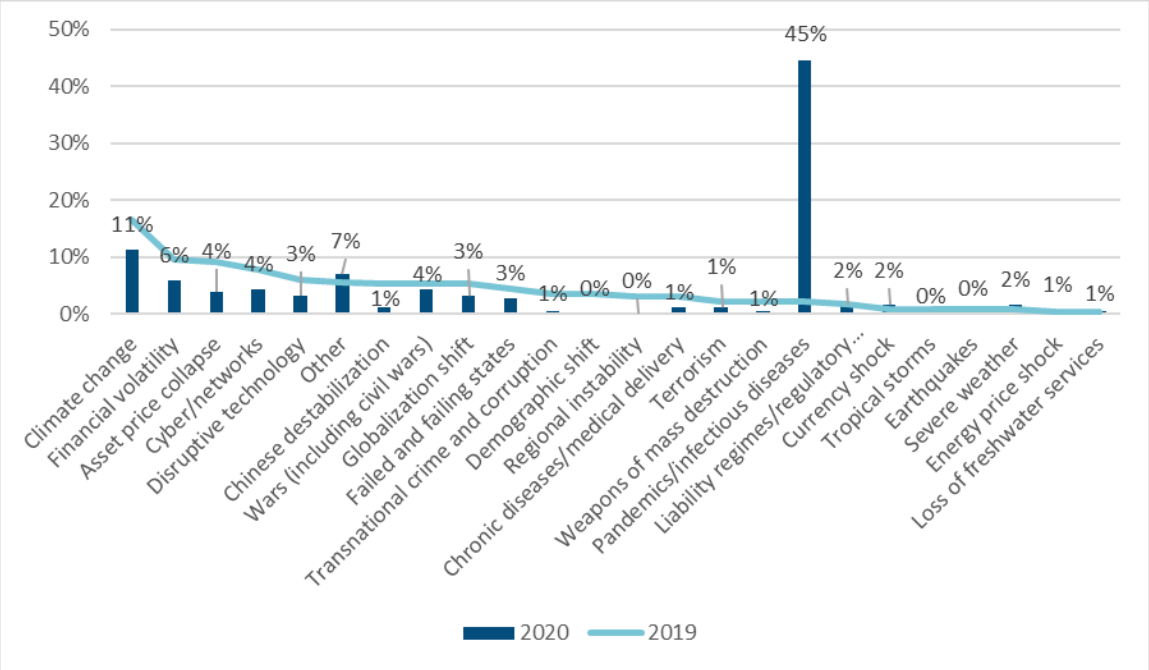
1.4 TOP CURRENT RISK

Not surprisingly, the top current risk in 2020 was *Pandemics/infectious* diseases, with none of the other risks higher by 1% and four risks receiving no support: *Natural catastrophe: tropical storms*, *Natural catastrophes: earthquakes*, *Regional instability* and *Demographic shift*.

Figure 4

Top Current Risk, Year-Over-Year

% of Responses in Given Year



1.5 RISK COMBINATIONS

There are several terms represented by *risk combinations* in this report. *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*, *Financial volatility* and *Cyber/networks*. Interestingly, no combination of these three risks appears in the top five. The top five saw a lot of turnover, with only *Cyber/networks* and *Disruptive technology* maintaining its top five status (at number 1). Overall, the Societal category moved up and the Environmental category moved down from the prior survey. *Climate change*, the top risk chosen, was shut out of the top five combinations after being present in two in the previous survey.

These are the top five combinations that were selected:

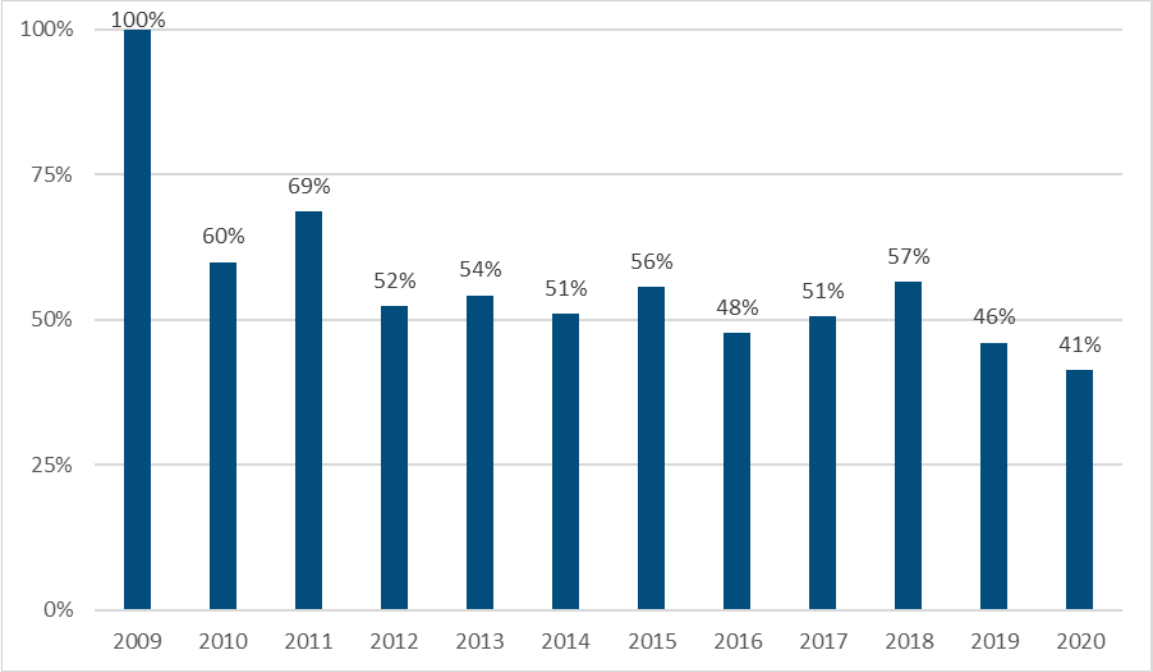
1. *Cyber/networks* and *Disruptive technology*—6%
2. *Asset price collapse* and *Financial volatility*—4%
3. *Wars (including civil wars)* and *Failed and failing states*—3%
4. *Financial volatility* and *Pandemics/infectious diseases*—3%
5. *Terrorism* and *Cyber/networks*—3%

Results this year for the top five combinations were less concentrated, with their total adding up to 20% after last year's comparable total of 21%.

There are 253 possible two-risk combinations of the 23 risks, and the risk concentration ratio is a metric showing how diverse results are. Comparisons are made by ranking the risks and comparing the resulting statistics, looking at the 25th percentile, 50th percentile (median), 75th percentile and total. A higher percentage reflects greater concentration of concerns. A result of 100% would be comparable to the base year of 2009, which has turned out to be an outlier of concentrated risk, when respondents were dealing with the aftermath of the great financial recession. As shown in Figure 5, the distribution of results was less concentrated than in the prior year and at its lowest level since the question was added in 2010.

Figure 5

Risk Concentration Ratio (Base 2009 = 100%)



As a relative measure, the risk concentration ratio represents the current feeling among the risk management community. A lower risk concentration ratio can be interpreted as reduced risk, or it may mean a greater variety of risks are being considered. Alternative interpretations should be considered for a year such as 2020, where a single risk dominated but a wide variety of risk events occurred.

1.6 TRENDING

Figure 6 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*) if they feel a risk is not represented in the list; typical references were about political issues. The survey question with the highest response rate includes a data label for each category. Generally, the top five emerging risks and combination questions generate similar results, while the top current risks drive the top emerging risk categories higher, but these results are an anomaly driven by the presence of a dominant risk.

Figure 6

Category Comparison Across Four Questions

% of Responses to Given Question

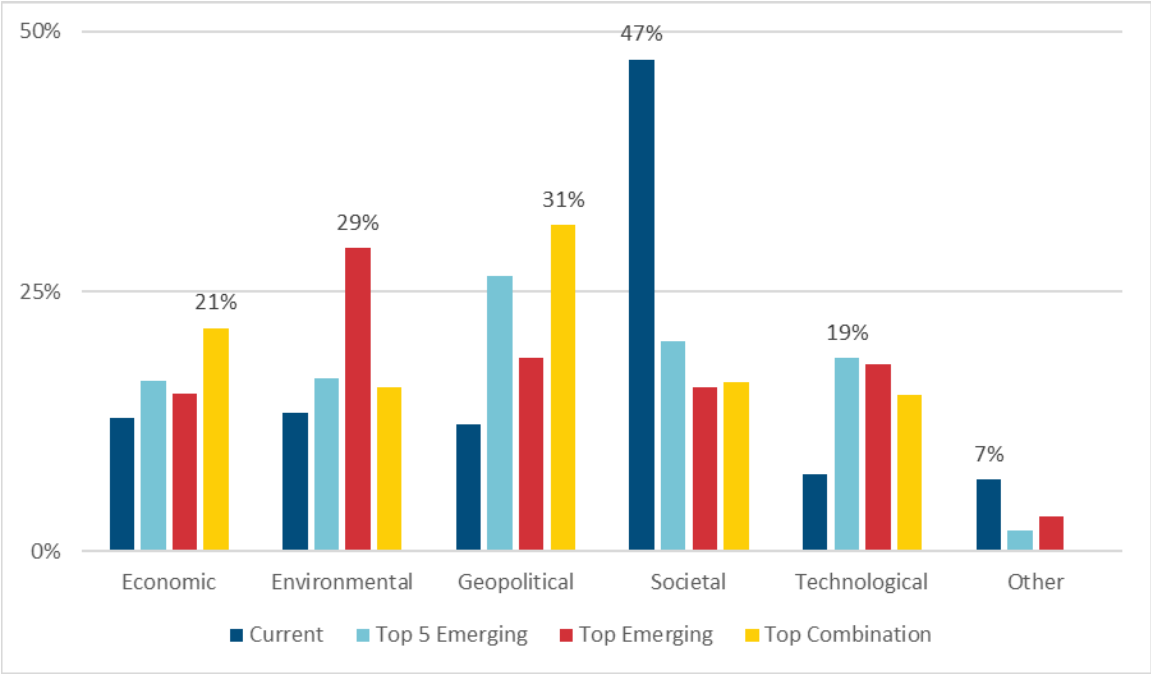
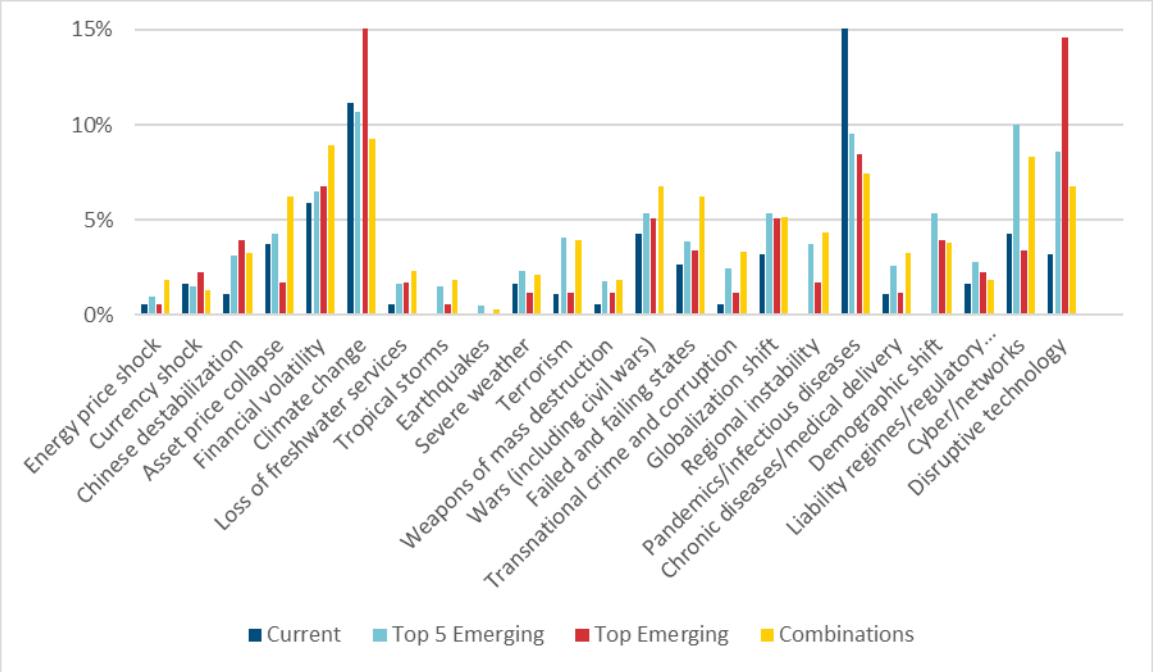


Figure 7 compares the current risk results with the top five, top emerging risk and combinations at the individual risk level. Hypothesizing why there are discrepancies is useful, and readers may have different viewpoints.

Figure 7

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 – an uncapped maximum is available in the appendix.)



The top risk with the greatest disparity favoring the current risk over the top emerging risk is *Pandemics/infectious diseases*.

The top risk with the greatest disparity favoring the top emerging risk over the current risk is *Climate change*.

The top risks with the greatest disparity favoring the top five emerging risks over the top emerging risk is *Cyber/networks*.

The top risk with the greatest disparity favoring the top emerging risk over the top five emerging risks is Climate change (15.7%).

The top risk with the greatest disparity favoring the top current risk over the top five emerging risks is *Pandemics/infectious diseases*.

The top risk with the greatest disparity favoring the top five emerging risk over the top current risk is *Cyber/networks*.

1.7 COVID-19

The ongoing coronavirus pandemic could have been much worse for insurers and other institutional investors. Central banks around the world quickly provided stimulus and backstopped some at-risk asset

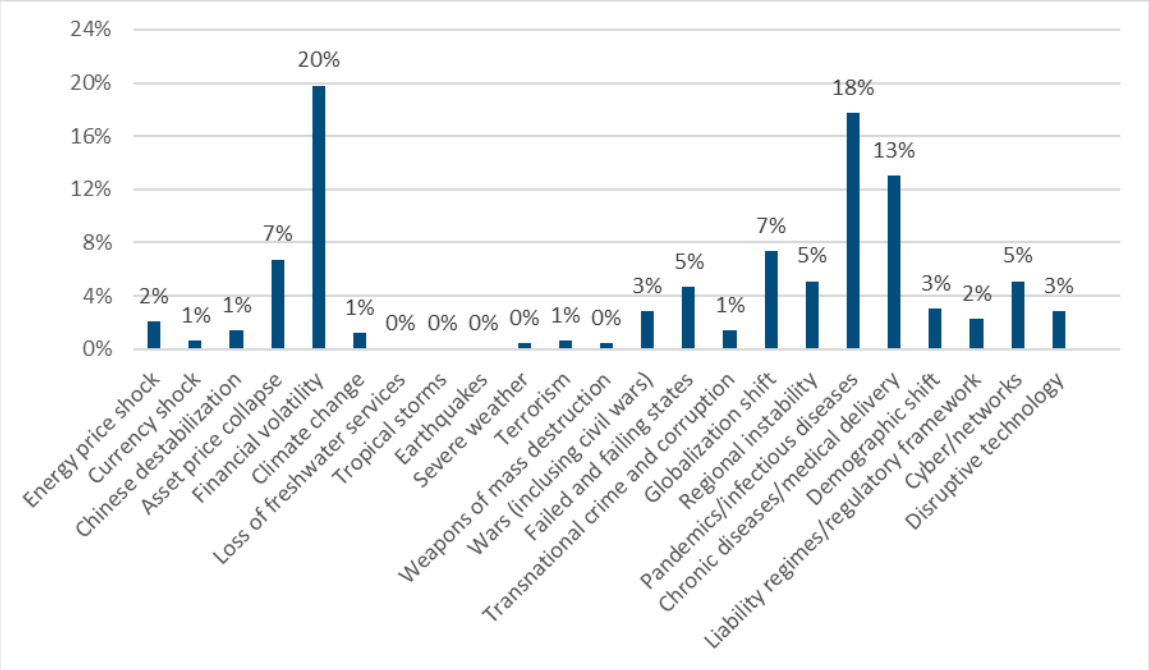
classes.[3] Based on number of lives lost, mortality impacted primarily retirees and those with co-morbidities. These groups typically have low net-amount-at-risk amounts if they own a life insurance policy, and mortality risk was offset by longevity benefits in payout annuities, so life insurer profitability was minimally impacted.[4] Autos were driven fewer miles and business interruption policies are being litigated regarding coverage. Morbidity risk has offsets with higher costs associated with those who got sick and lower costs from care deferred. Long COVID implications on disability and vaccine levels of success are likely to drive longer term implications of the pandemic. Many companies were prepared for a work-from-home scenario, with technology capabilities allowing office workers to complete many tasks securely from off-site.

The five risks considered most likely to interact with COVID-19 include some that are unsurprising like *Pandemics/infectious* diseases and *Chronic diseases/medical* delivery, but also *Financial* volatility, *Asset price collapse* and *Globalization shift*. Recognition of the impact on economic and geopolitical risks will help risk managers with future scenario planning.

Figure 8

Interaction with COVID-19

% of Responses to Selected Question



Responding to open-ended questions about previous planning for a pandemic, and how that planning is evolving, leads to some useful lessons. Many companies had previously tested their business continuity plans and found that work-from-home would work, a solution not available even in the recent past due to limited internet bandwidth. Many companies had already implemented regularly occurring remote access

[3] Schilling, Lisa. *COVID-19 Economic and Asset Impact Update, September 30, 2020.* https://www.soa.org/resources/experience-studies/2020/covid-19-economic-impact/

[4] Rudolph, Max. Life Pandemic Model Updates to US Life Insurance Industry Moderate Scenario. January 2021. https://www.soa.org/resources/research-reports/2021/life-pandemic-model/

capabilities, and had tested it. Those who had no plan reacted quickly to set up laptops for everyone. Some had personal protective equipment on site and an employee support network in place. Scenario planning provided a baseline for the response at some companies. It will be interesting to track the environment during reopening as work and business travel evolves.

Pandemic preparations at some companies were not prioritized in advance due to a low likelihood of occurrence. Others did more talking than doing, and one respondent noted that they prepared for disruption without focusing on specific reasons for it.

Noticeably absent from all but a few comments was any reference to asset planning or concerns about liquidity, although the large initial drops in asset values created large liquidity concerns.

Following the initial response to the pandemic, many risk teams were recognized for various risk management efforts and scenario planning. Others said there was minimal change, or that risk discussions had become more political. Companies now view working from home generally in a more positive light.

Risk planning moved from theoretical to relevant during this risk event, but sometimes has gone too far. Personal freedoms must be balanced against the greater good of the community. Perhaps the time is right to consider clusters of risks occurring simultaneously, and how those risks may interact.

1.8 EMERGING OPPORTUNITIES

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. Few listed any specifics, but those who did tended to look at diversification by risk (mortality/longevity risk) or company structure (e.g., captives). Technology driven distribution was another perceived opportunity.

1.9 BUBBLES

While a few respondents continued to argue that there is no such thing as a bubble (that is, market prices are always deemed correct), other respondents identified quite a few potential bubbles. These included liquidity shortfalls and a wide variety of asset classes. Concerns were also raised about firms with high acquisition cost and technology laggards.

1.10 UNKNOWN KNOWNS

Unknown knowns, where the analyst is ignorant of the probability distribution of a future event despite possessing historical data (thus the results are not predictive of the future), will be a great challenge for the next generation of risk managers. What will be the “new normal” post COVID? Most respondents manage the risk using scenario testing, holding additional capital and seeking diversification. Some in the group named gene therapy, taxes, climate events, cyber risk, interest rates and social attitudes among their concerns.

1.11 LEADING INDICATORS

As formal risk appetite policies and regulatory processes stabilize, less than half of firms formally identify emerging risks. A large subset of this group identifies leading indicators for emerging risks, and most who do also have criteria for action based on them. Examples of the process include tracking social unrest following the George Floyd killing and other risks with changing statistical distributions to identify tipping points.

1.12 RISK VERSUS RETURN

Over half of respondents (59%) said that enterprise risk management (ERM) had a positive effect in their company/industry, and 47% noted that ERM improved returns relative to risk (with only 8% saying it did not). Examples of positive ERM related to sharing of supplies with medical professionals and improved methods to allocate capital in a low interest rate environment and other strategic initiatives.

Respondents who stated that ERM does not improve returns relative to risk were concerned that actions were not practical, they focused too much on downside risk and process inflexibility. Responses to this question generally describe the risk culture at individual firms, and different organizations have found processes they believe work best for them.

The respondents who answered *Not sure* about the effect of ERM at their company noted that much of the effort seems to be for show and it depends on how the program is implemented.

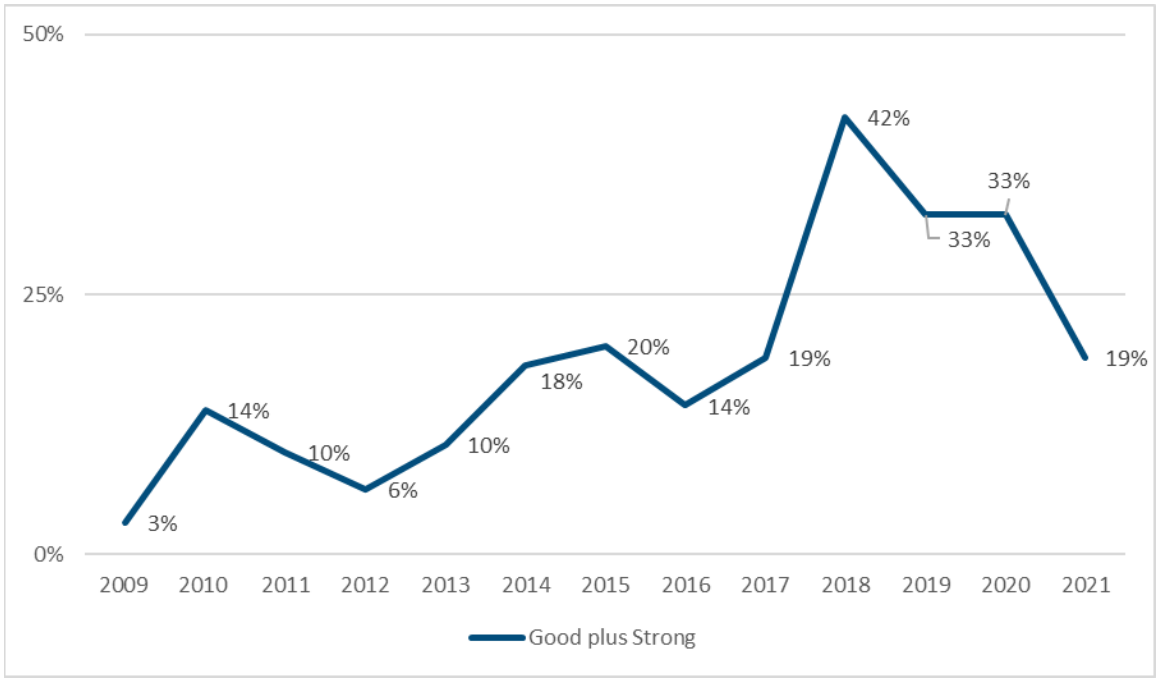
1.13 ECONOMIC EXPECTATIONS

Respondents were, not surprisingly, downbeat about global economic expectations for 2021, with only 19% reporting *Good* or *Strong* expectations, as shown in Figure 9. Interestingly, the respondents choosing *Poor* nearly doubled from 13% to 25%, the highest response since 2013.

Figure 9

Combined Good + Strong Economic Expectations

% of Responses



1.14 RISK ACTIVITIES

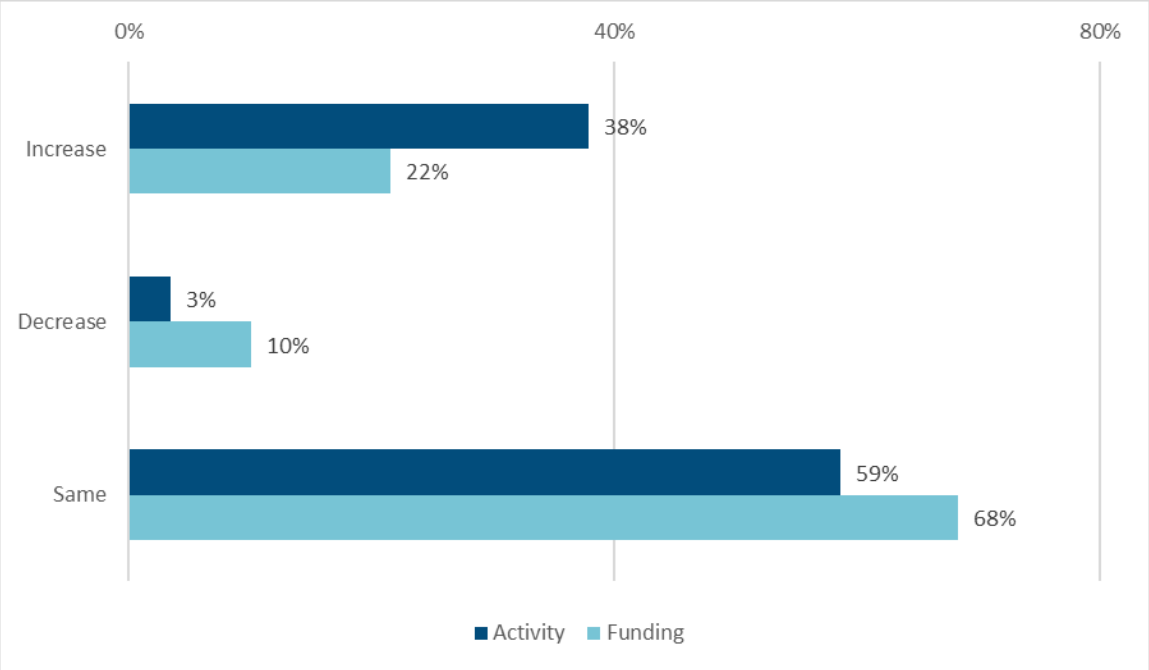
Over half of respondents (53%) reported that activities related to ERM continued to grow in 2020 (but only 15% of respondents reported experiencing staff growth), with 38% expecting activity growth in 2021. As seen in Figure 10, only 22% of respondents anticipate an increase in funding. Risk managers continue to improve efficiency as they complete implementation of projects related to regulatory requirements. In a

year where the value of risk management was demonstrated it is disappointing to see a continued view of the risk team as a cost center and not strategic.

Figure 10

Anticipated ERM Levels in 2021

% of Responses to Given Question



1.15 STRATEGIC OPPORTUNITY

Risk managers reported a higher level of inclusion in decision making surrounding strategic opportunities than in the past (17%, up from 9%, can say no), but the opposite was also true as those without input grew from 4% to 11%. These higher percentages came at the expense of the choice where the ERM function has input and a vote.

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 alternative comments. For those interested, the entire data set is reproduced in Appendix II.

2.1 WHAT RISK MANAGERS ARE THINKING

- *Pandemics/infectious diseases* dominated the top current risk and at least doubled results in every question. This also increased the Societal category in all rankings.
- The *Climate change* risk is the first-ranked risk across all questions except top current risk.
- By category, Technological risks continue to be highly ranked. *Cyber/networks* risk concerns have stabilized or fallen but remain near the top of the rankings, joined by an increasingly cited *Disruptive technology* risk.
- 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. *Globalization shift*, led by trade wars and populist rhetoric, continued its upward trend.
- Global economic expectations fell, with only 19% of respondents expecting 2021 to be good or strong and 25% expecting a poor economic outcome.

2.2 LEADING-EDGE ACTIONABLE PRACTICES

- Risk management teams continue to be asked to complete additional activities with the same or fewer staff.
- Pandemic preparation pre-COVID focused on business continuity and financial scenarios. Little focus was made on stresses to assets or a severe pandemic with lockdowns.
- Many risk managers were recognized for managing their company through the pandemic.
- ERM has a mixed track record for adding returns relative to risk, driven primarily by when culture encourages engaged and proactive discussions.
- Leading indicators are being generated for emerging risks and actionable criteria established for some risks at best-practice companies.

2.3 CONCLUSIONS

In contrast to previous surveys, emerging risks seemed to be everywhere at once in 2020, providing a platform for those with a process and culture in place to succeed. Some risk managers were recognized for their efforts and others used the pandemic as an argument for greater advance planning. Many white-collar companies were able to use stimulus programs and work from home expertise created over the last few years to successfully show the value they add. Several emerging risks are moving closer to breaking out, and interactions with other risks are likely to become threat multipliers.

The pandemic was a good example showing that accumulation of capital, with assumptions building into a quantitative assessment of risk, does not provide a complete analysis of risk exposure. Putting a specific probability distribution around an event is less important for these risks than getting them on the table and discussing their ramifications. Climate change provides higher order interactions with risks tied to regional conflicts and fresh water, but the likelihood of tipping points makes it important to limit the time horizons used to price liabilities. If mortality isn't stable over 40 years, and asset assumptions aren't stable over 40 years, then why would you price a product with a 40-year life span?

Risk culture remains an important component of best-practice risk management. Risk managers who are encouraged to provide input on strategic decisions and recognized for actions taken are more likely to evolve to lead best-practice risk teams.

Emerging risks play a key part in preparing for the future. Unknown knowns, where historical data is not predictive, need experienced practitioners to anticipate assumption changes. Artificial intelligence does an excellent job showing what has occurred in the past, but need help when a course change is under way.

Risk managers should have gained knowledge and confidence when dealing with emerging risks over the past year. The best ones will leverage this experience to add competitive advantage. Good luck!

Section 3: Background

This research project was sponsored by the JRMS of the CIA, CAS and SOA.[5] 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 188 responses were received. This represents a material percentage relative to the number distributed (more than 2,500 to the JRMS). This is the 14th 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 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 and November 2019. The current-year survey was conducted in November 2020, opening just past the U.S. national election and closing just before the U.S. Thanksgiving holiday. All 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/

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

October 2012—Sixth survey

- Research report: www.soa.org/research-reports/2013/research-2012-emerging-risks-survey/
- 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: 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, 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 and Research Insights podcast: www.soa.org/resources/research-reports/2018/11th-emerging-risk-survey/
- SOA News Canada blog, February 2019: https://blog.soa.org/2019/02/22/how-a-risk-team-adds-value/
- Key findings: www.soa.org/globalassets/assets/Files/resources/research-report/2018/11th-emerging-risk-survey.pdf

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/

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. 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. Responses to open-ended questions have been minimally edited.

One risk that will be revisited in future surveys is *Chinese destabilization*, defined as China's economic growth slows, potentially as a result of protectionism, demographics, internal political, or economic difficulties. While China has driven world economic growth since 1960, there are many reasons why economic and political stability are at risk. Many of these are also true for the United States, but there is not a separate risk included for any other country (although respondents periodically suggest that it be added). Definitions of other risks have been updated over the years to reflect the two-sided nature of risk and it is expected that this risk name and definition will be updated in the future to better represent the risk and improve consistency.

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, Brian Fannin, Jan Schuh, David Schraub and Ronora Stryker 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 J. 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
5002 S. 237th Circle
Elkhorn, NE 68022
402-895-0829
max.rudolph@rudolph-financial.com
www.rudolph-financial.com
Twitter: @maxrudolph

Section 4: Results

The *14th Survey of Emerging Risks*, sponsored by the Casualty Actuarial Society (CAS), Canadian Institute of Actuaries (CIA) and Society of Actuaries (SOA, with specific thanks to the Financial Reporting and Reinsurance Sections) and logistically managed by the Joint Risk Management Section (consisting of members from each of the three sponsoring organizations) includes sections covering current risk, emerging risks, leading indicators, enterprise risk management and current topics. Highlights of each section are presented here, with complete results found in Appendix II. Respondents submitted a total of 188 surveys (down from 232 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 determine their own conclusions.

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 very 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, 52% of respondents reported that they also participated in the past and 45% have been a risk manager for at least 10 years. Repeat respondents, especially those with great familiarity of the topic, might change their responses based on new or recent experiences. While the actual result (to the near one percent) is provided, the survey should be interpreted based on directional and relative changes between iterations. Increases and decreases in response rates reflect the respondents' relative perception of the risk, not actual changes in assessment of the risk itself. A risk may not have changed at all, but another risk may be perceived as higher or lower, and that affects the relative importance of other risks.

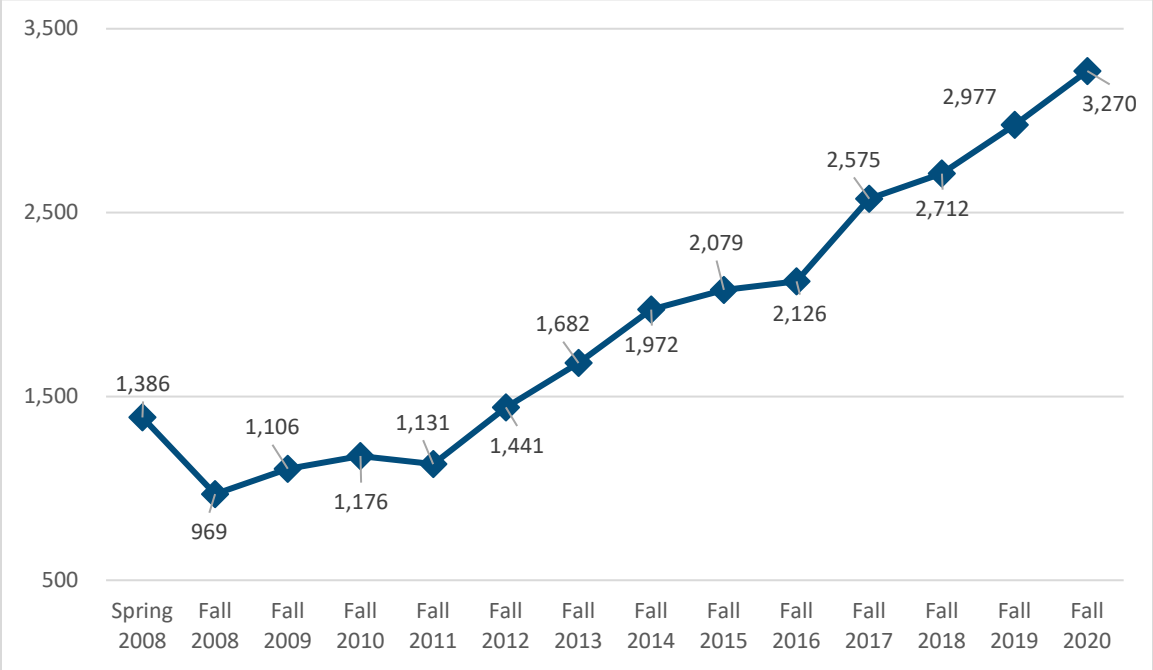
It can be confusing to talk about percentage changes when survey results are reported in percentages, so changes are always reported as absolute percentage point changes. For example, if the previous survey reported a 10% response rate and this year's response rate is 15%, this is a 5% change (not 50%).

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 11), the price of a barrel of oil (Figure 12) and the exchange rate of the Euro relative to the U.S. dollar (Figure 13) 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 11

S&P 500, 2008–20

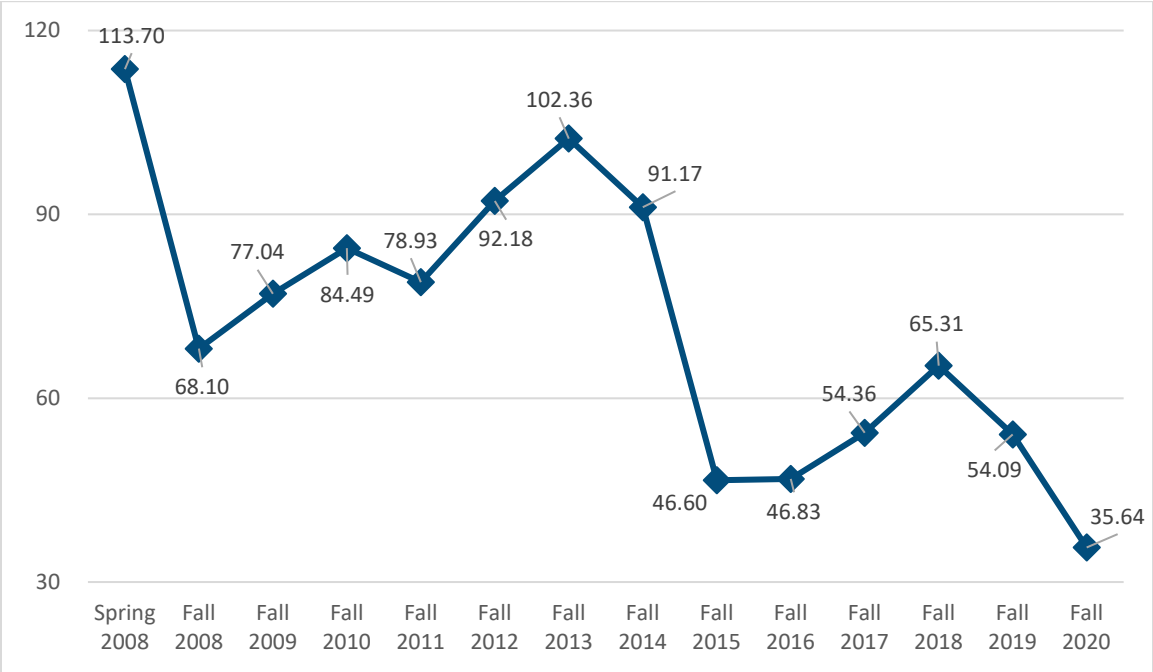


Source: S&P Dow Jones Indices LLC, S&P 500 [SP500], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/SP500, February 24, 2021.

Figure 12

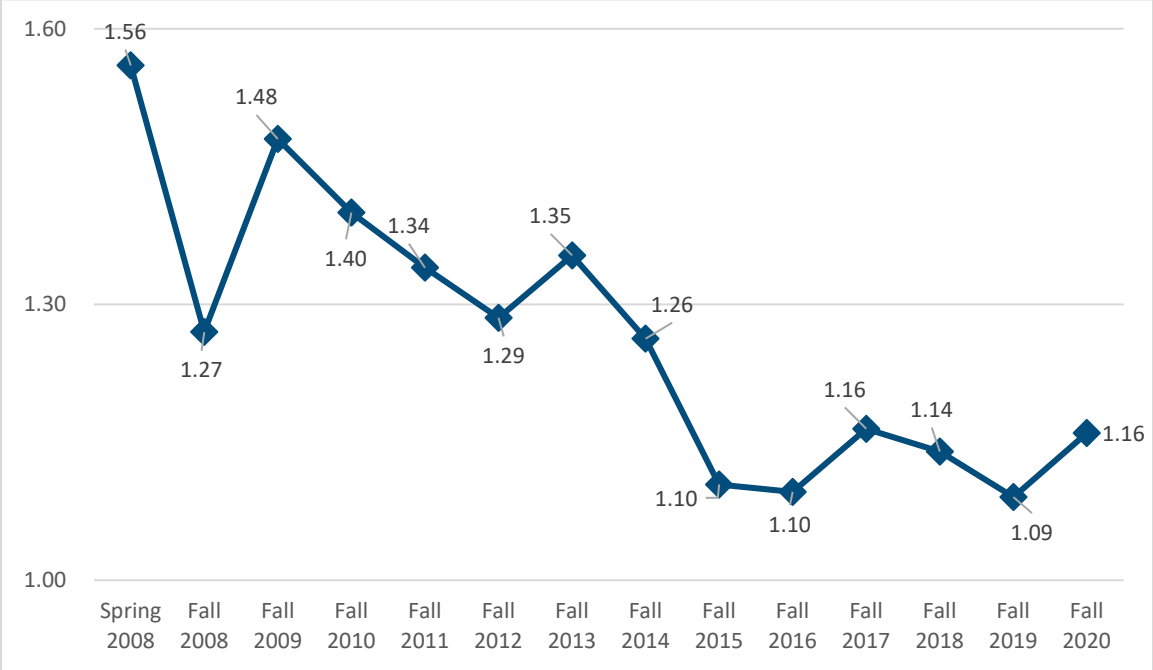
Price of Oil, 2008–20

$ per barrel



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

Figure 13
Exchange Rate, U.S. Dollars per Euro, 2008–20



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. 2020 has been referred to as a lot of things, but it was no doubt memorable. The regional coronavirus epidemic became a pandemic in March, but the year also included wildfires, protests tied to the Black Lives Matter movement, Brexit, the U.S. election and its aftermath, along with continued interest in climate change, geopolitical intrigue and computer hacks.

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%)
4. *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, from 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. *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 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 called *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%)
5. *Oil price shock* (32%)
6. *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 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 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.[6]

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 ago, 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%)

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%)

[6] 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.

The COVID-19 pandemic emerged into a worldwide event as global trade 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%)

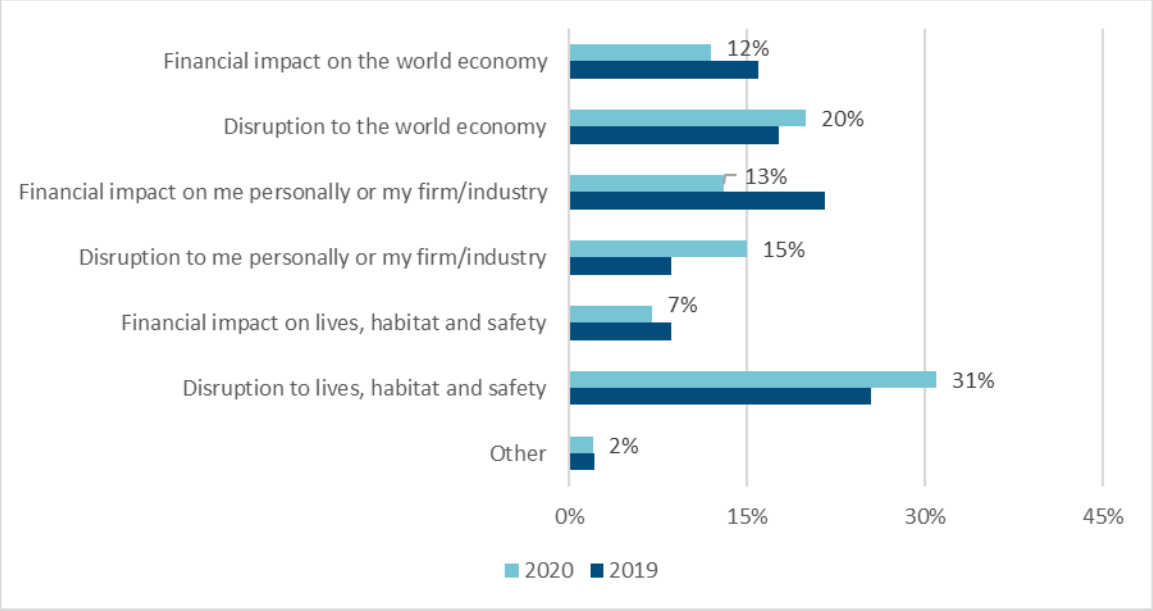
4.3 INTRODUCTORY QUESTIONS

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). Disruption responses increased and financial responses decreased in every case. Among the response options for defining strategic impact, five were selected by at least 12% of respondents, with a large increase in the response *Disruption to me personally or my firm/industry*. As shown in Figure 14, the most commonly selected definition was *Disruption to lives, habitat and safety* (31%).

Figure 14

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 convenience. They are consistent with the prior survey.

Economic Risks

1. *Energy price shock*
2. *Currency shock*
3. *Chinese 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, but seven risks had their definitions updated. Some of the changes, described in more detail in Appendix I, were to improve consistency. Other changes refer to the role of Central Banks in currency wars, social rifts (*Failed and failing states*), populism (*Globalization shift*), and to specifically mention coronavirus as an infectious disease.

The distribution of results by category follows, along with prior-year results.

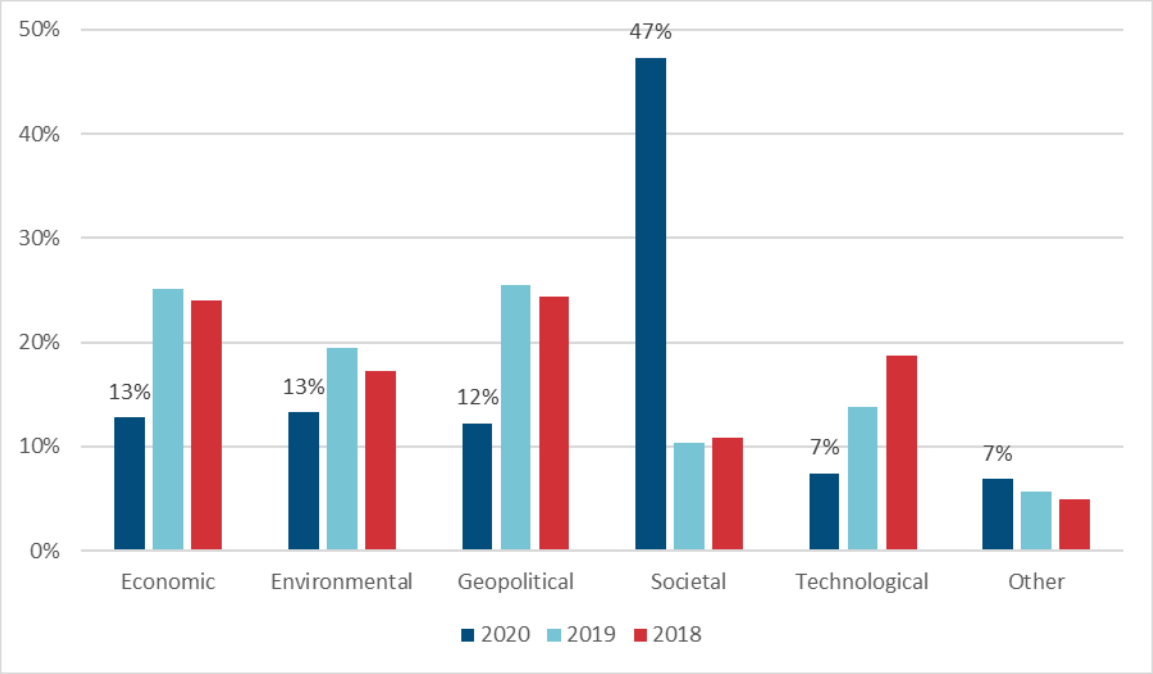
- Economic 13%/25%/24% (2020/2019/2018 surveys)[7]
- Environmental 13%/19%/17%
- Geopolitical 12%/26%/24%
- Societal 47%/10%/11%
- Technological 7%/14%/19%
- Other 7%/6%/5%

As shown in Figure 15, 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.[8]

Figure 15
Current Risk with Greatest Impact

% of Responses in Given Year

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



From an individual risk perspective, *Pandemics/infectious diseases* spiked from 2% to 45% between surveys. *Climate change* fell to the second spot, decreasing to 11% of respondents selecting it as having the greatest current impact. It finished well ahead of *Financial volatility*, *Cyber/networks* and *Wars (including civil wars)*. At 5%, the greatest drops were *Asset price collapse* and *Climate change*.

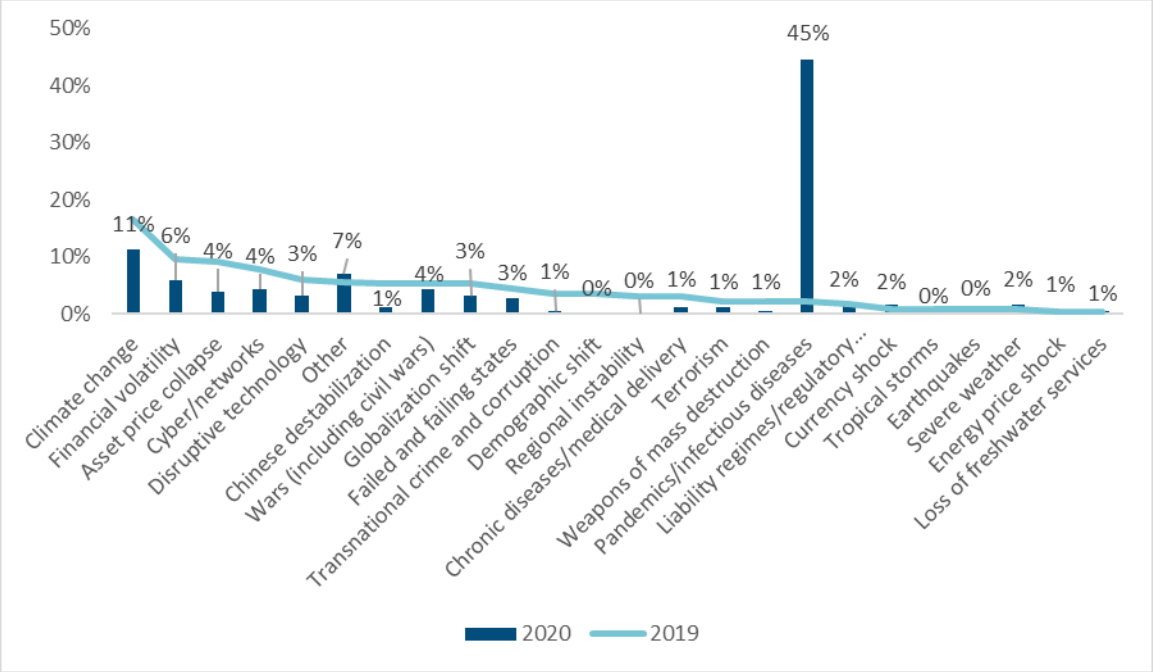
All but four risks were chosen as the top current risk by at least one respondent. *Natural catastrophe: tropical storms*, *Natural catastrophe: earthquakes*, *Regional instability* and *Demographic shift* were not chosen.

Figure 16 shows how current risks can change between surveys. Data labels reflect 2020 results.

Figure 16

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, in a different order but the same five from the prior survey:

1. *Pandemics/infectious diseases* (45%)
2. *Climate change* (11%)
3. *Financial volatility* (6%)

4T. Cyber/networks (4%)

4T. Wars (including civil wars) (4%)

4.5 SECTION A: EMERGING RISKS

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

4.5.1 Top Five: Societal and Technological 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 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 increases for *Pandemics/infectious diseases* were not surprising, but other risks that were in the news did not see gains. These included *Natural catastrophes: tropical storms*, *Regional instability* and *Cyber/networks*. Even *Climate change* saw a reduction after six consecutive years of increases.

While 84% of respondents chose the full complement of five 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. This allows consistent comparison with previous and subsequent survey iterations.

The Geopolitical category maintained its lead (26% of the total selections came from this category), despite placing no individual risks in the top five (top responses were *Wars (including civil wars)* and *Globalization shift*), with the Societal category in second place, followed by Technological, Environmental and Economic. The results distributed by category (using percentages of total responses) are as follows:

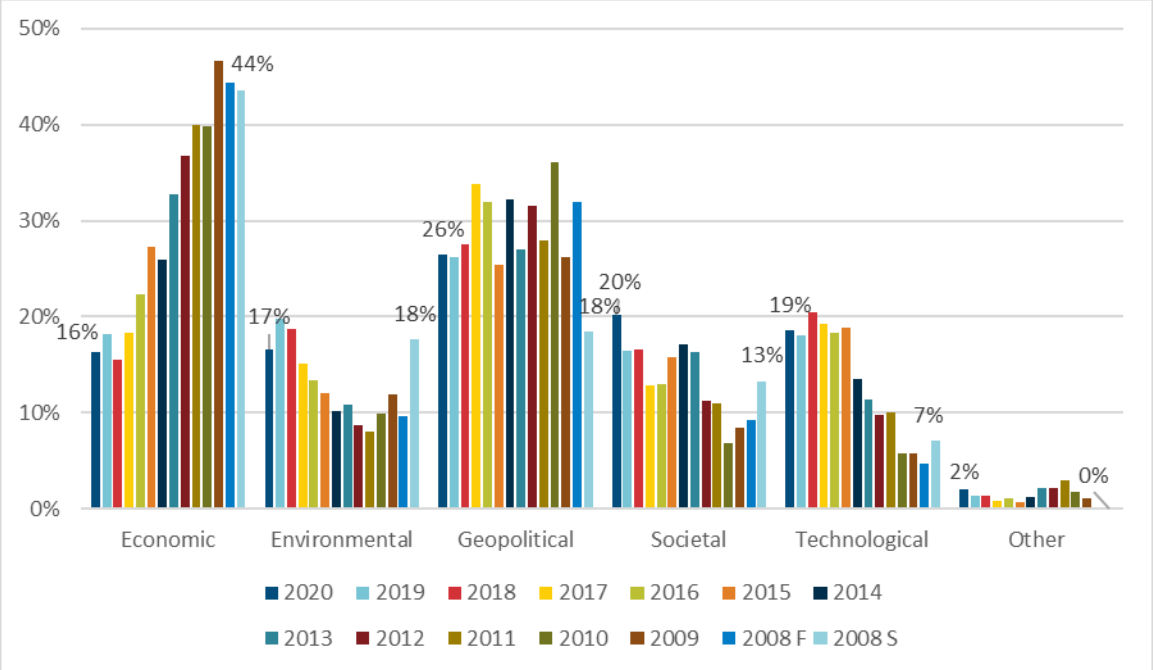
1. Geopolitical 26%/26%/27% (2020/2019/2018 surveys)
2. Societal 20%/16%/17%
3. Technological 19%/18%/20%
4. Environmental 17%/20%/19%
5. Economic 16%/18%/15%

As Figure 17 shows, each category has its own story across the history of the survey. Environmental risks had grown materially over time, but seem to have paused.

Figure 17

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.

There were material increases in a few individual risks. *Globalization shift* was selected by 25% of respondents, up from 20% in 2019, its highest result since 2016. *Pandemics/infectious diseases* doubled from 22% to 45%, and *Disruptive technology* reverted to 40% after falling to 35% in the previous survey.

Material decreases were found throughout, mostly to offset the success of *Pandemics/infectious diseases*. *Chinese destabilization* reverted to 15% from 23%, *Natural catastrophe: severe weather* dropped from 16%

to 11%, *Regional instability* dropped from 22% to 17%, *Demographic shift* fell to 25% from 33% and *Natural catastrophe: earthquakes* fell from 4% to 2%.

The top five specific responses were spread across the Economic, Environmental, Societal and Technological categories. Multiple responses—up to five—were encouraged. The percentages shown here use the number of respondents in the divisor, so totals are much greater than 100%. The top five total 213%, more concentrated than last year's 195%, and each of the top five risks was selected on at least 31% of the surveys.

1. 50%/54%/49% (2020/2019/2018) *Climate change*
2. 47%/51%/56% *Cyber/networks*
3. 45%/22%/25% *Pandemics/infectious diseases*
4. 40%/35%/40% *Disruptive technology*
5. 31%/29%/27% *Financial volatility*

Trends of at least two consecutive years may act as a leading indicator. The lone increasing trend was *Financial volatility* (two years). Decreasing trends include *Weapons of mass destruction*, *Loss of freshwater services*, *Natural catastrophe: earthquakes*, *Failed and failing states* and *Cyber/networks* (with each trending down for two years). *Climate change* broke its string of six consecutive increases.

The Other category had 17 responses. While many could have fit into the standard 23 risks, interesting ideas include infrastructure and changes in social order.

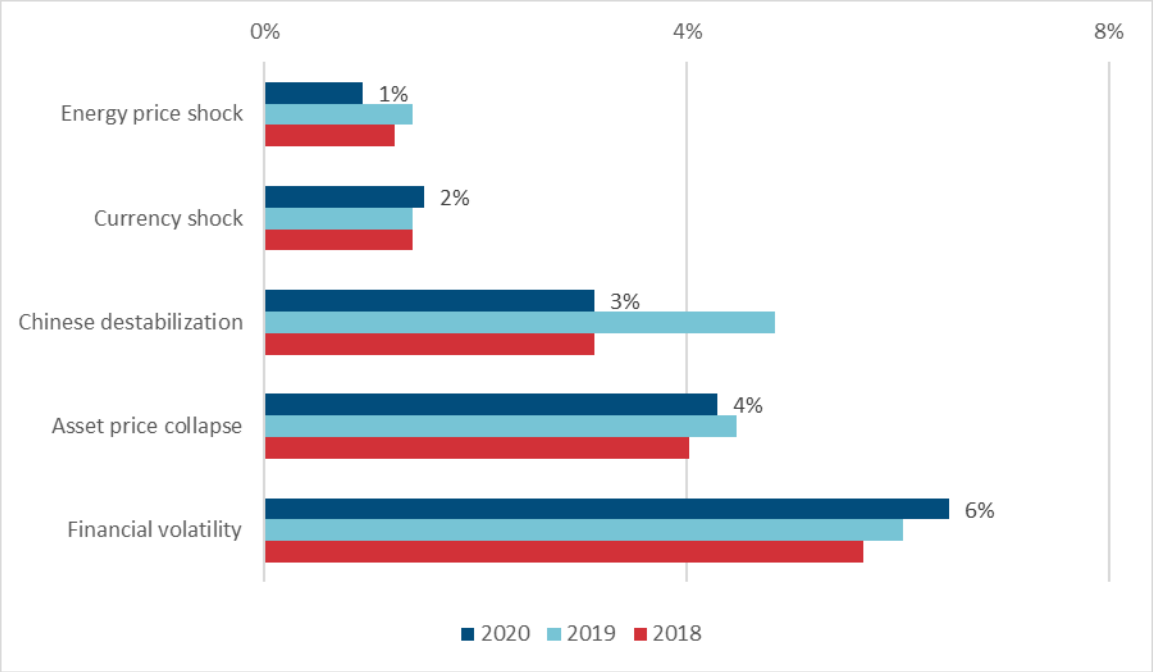
One method for analyzing this data over time is to highlight those risks reported in the current survey that are above long-term averages. For this purpose, the data was analyzed as a percentage of all responses. Three of the five categories were higher than their average over the 14 survey cycles. Environmental (17% vs 13% average), Societal (20% vs 13% average) and Technological (19% vs 13% average) each satisfied this criterion, while Economic (16% vs 31% average) and Geopolitical (26% vs 29% average) were lower. Among individual risks, 7 of the 23 had above-average results. The greatest positive differential was 5% for *Pandemics/infectious diseases*, *Climate change* and *Disruptive technology*. Two other risks were above average by more than 1%, with *Wars (including civil wars)* and *Chronic diseases/medical delivery* higher by 2%. Ten trended below average, including all of the Economic risks. These were led by *Energy price shock*, at 4% below average. *Currency shock*, *Chinese destabilization* and *Financial volatility* fell 3% below average and *Asset price collapse*, *Terrorism* 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 less often than in the previous survey, except for *Financial volatility* and *Currency shock*, as shown in Figure 18.

Figure 18
Emerging Risk Trends: Economic Risks

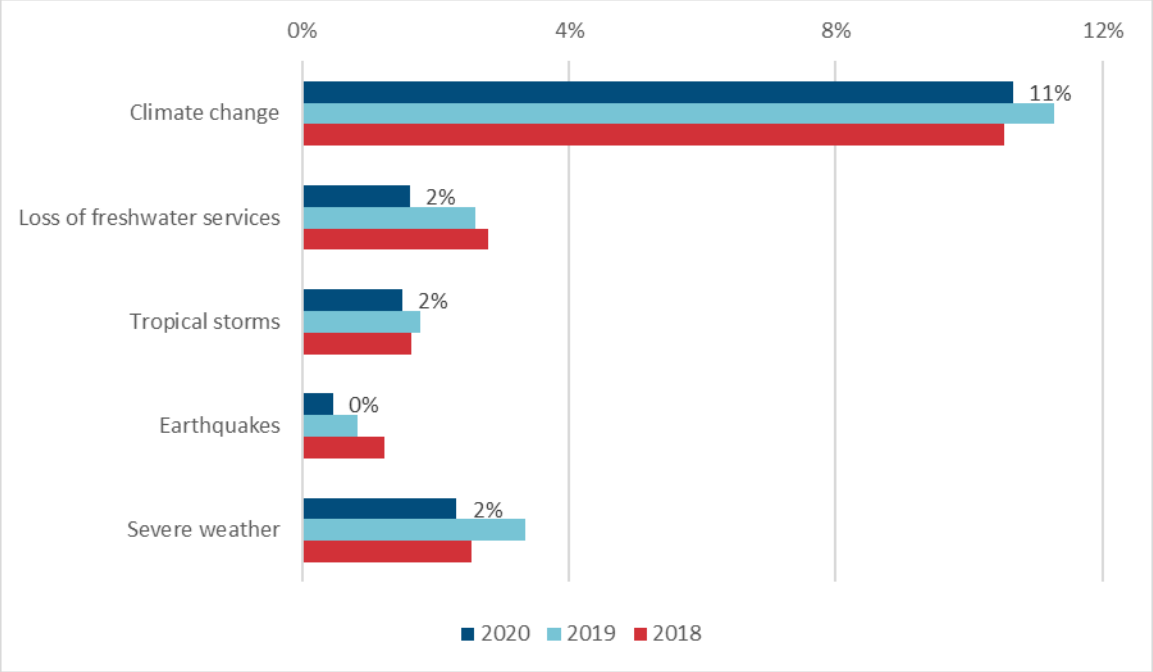
% of Total Responses



As shown in Figure 19, Environmental risks were selected less often in the current survey. This is interesting given the large number of tropical storms and coverage of climate change during 2020.

Figure 19
Emerging Risk Trends: Environmental Risks

% of Total Responses

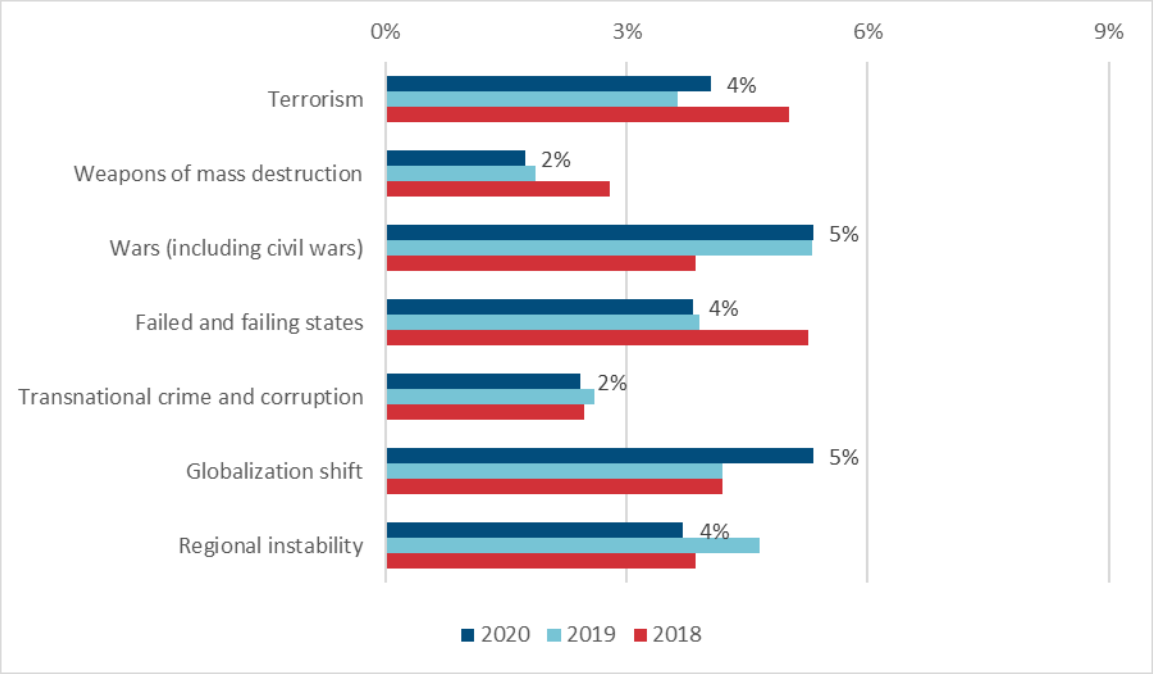


In the Geopolitical category, the rate of selection increased in the current survey for three of seven risks—some materially, as shown in Figure 20.

Figure 20

Emerging Risk Trends: Geopolitical Risks

% of Total Responses

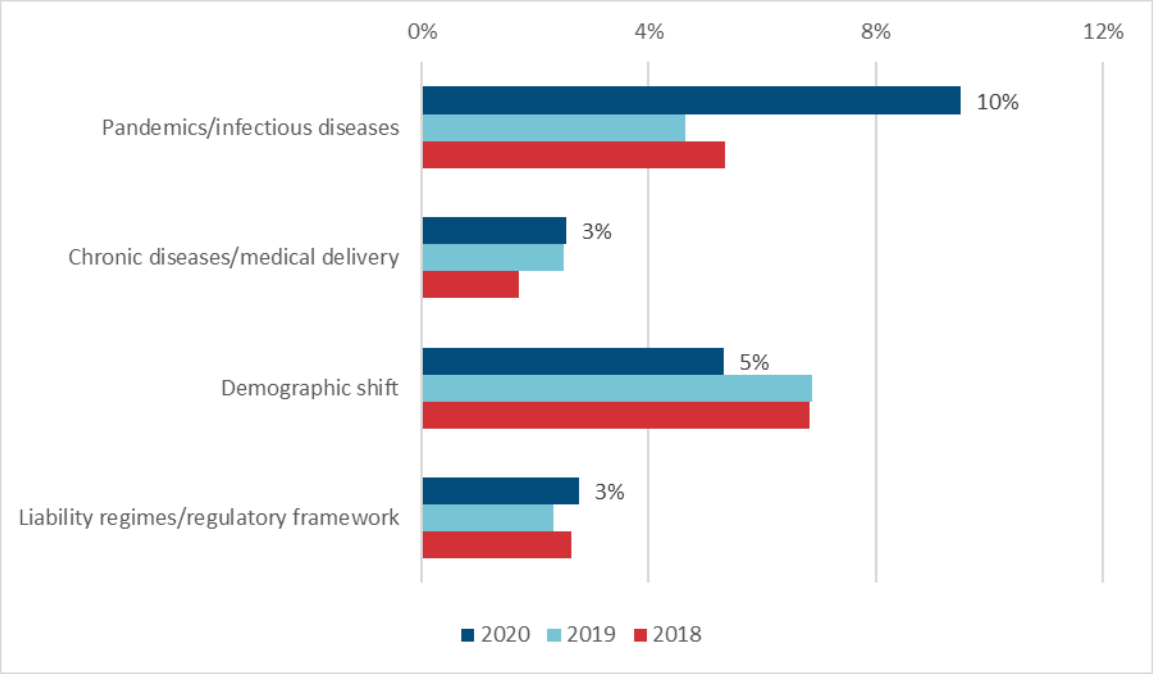


Pandemics/infectious diseases, not surprisingly, led the increase in the Societal risks chosen. This can be seen in Figure 21.

Figure 21

Emerging Risk Trends: Societal Risks

% of Total Responses

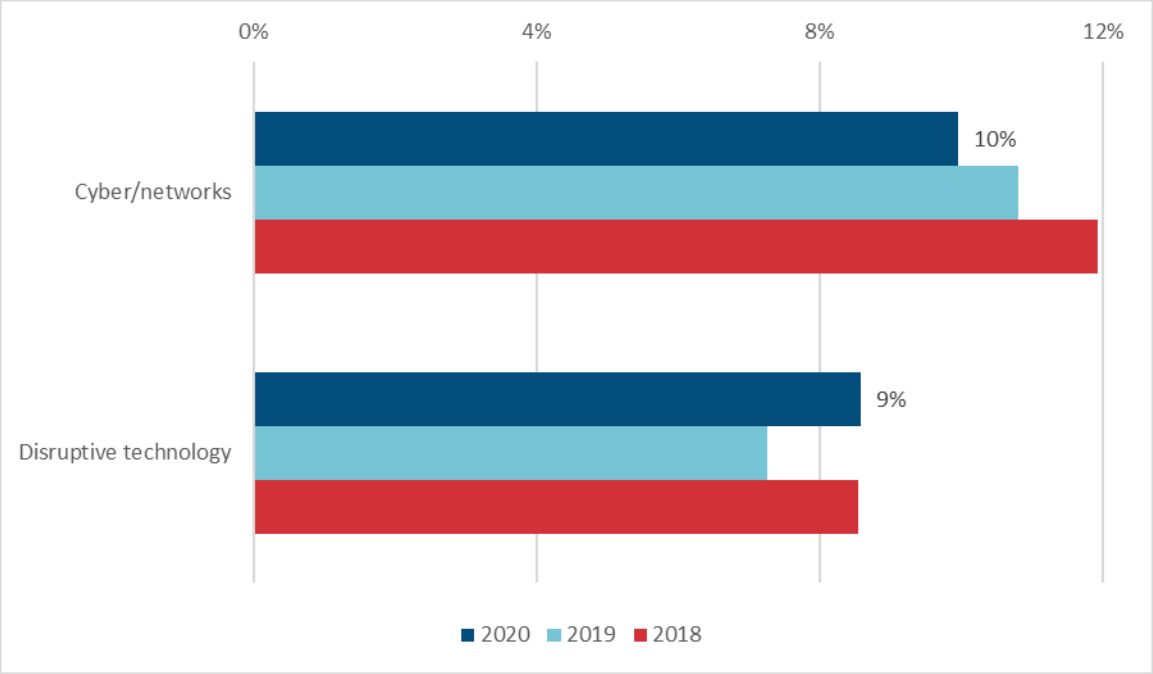


Cyber/networks continued its slide from its 2015 peak of 14%, as seen in Figure 22. Both *Disruptive technology* and *Cyber/networks* remain among the top risks chosen.

Figure 22

Emerging Risk Trends: Technological Risks

% of Total Responses

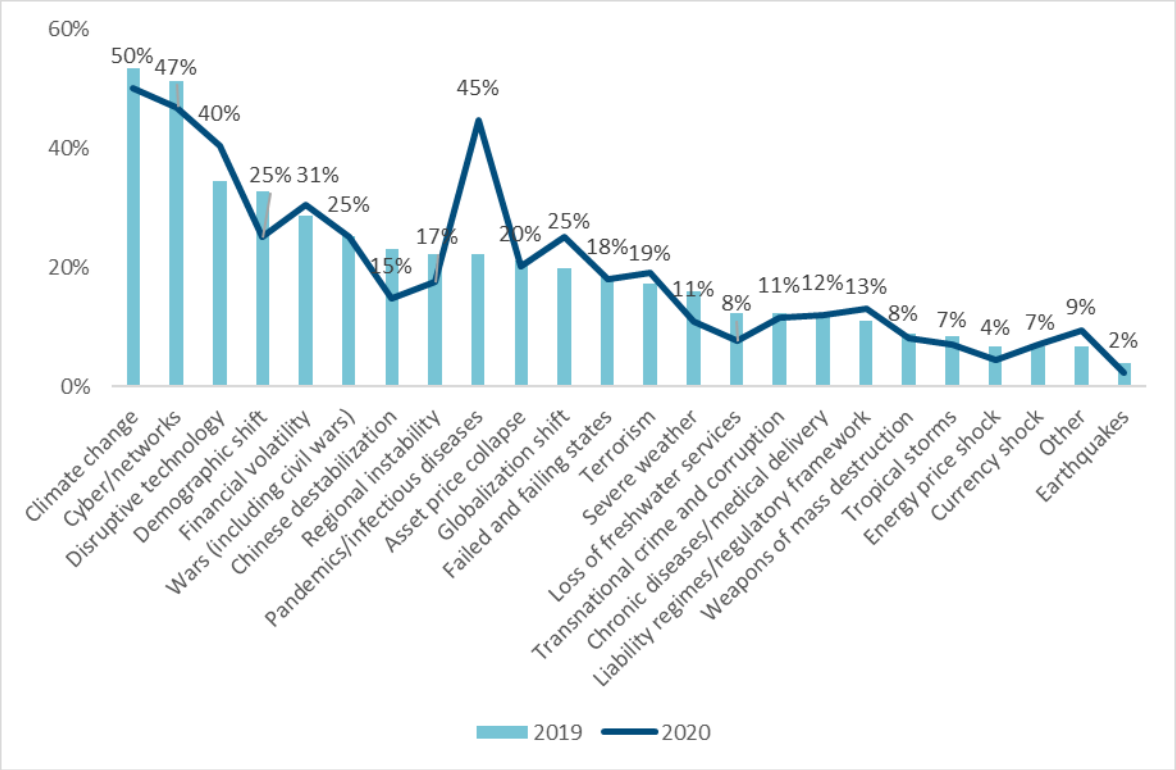


Some of the changes over time are highlighted in Figure 23. It is interesting to see how certain risks change between years. The data labels presented are from 2020, with risks sorted based on 2019 results. While pandemics were on risk managers' radar, the current survey reflects a material increase.

Figure 23

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 they expected to have the greatest impact. The responses to this question can be volatile between years but recently have stabilized. Behind *Climate change* the categories continued to fluctuate. That volatility between years resulted in entire categories of risks shifting in prominence. The Environmental category maintained the top ranking, with Geopolitical second. *Climate change* would be the leading category all by itself and is well ahead of second place *Disruptive technology* with 15%. The largest drop was *Cyber/networks*, from 10% to 3% (from a high of 23% in 2015). The largest increase, not surprisingly, was *Pandemics/infectious diseases*, increasing from 2% to 8% and now occupies third place.

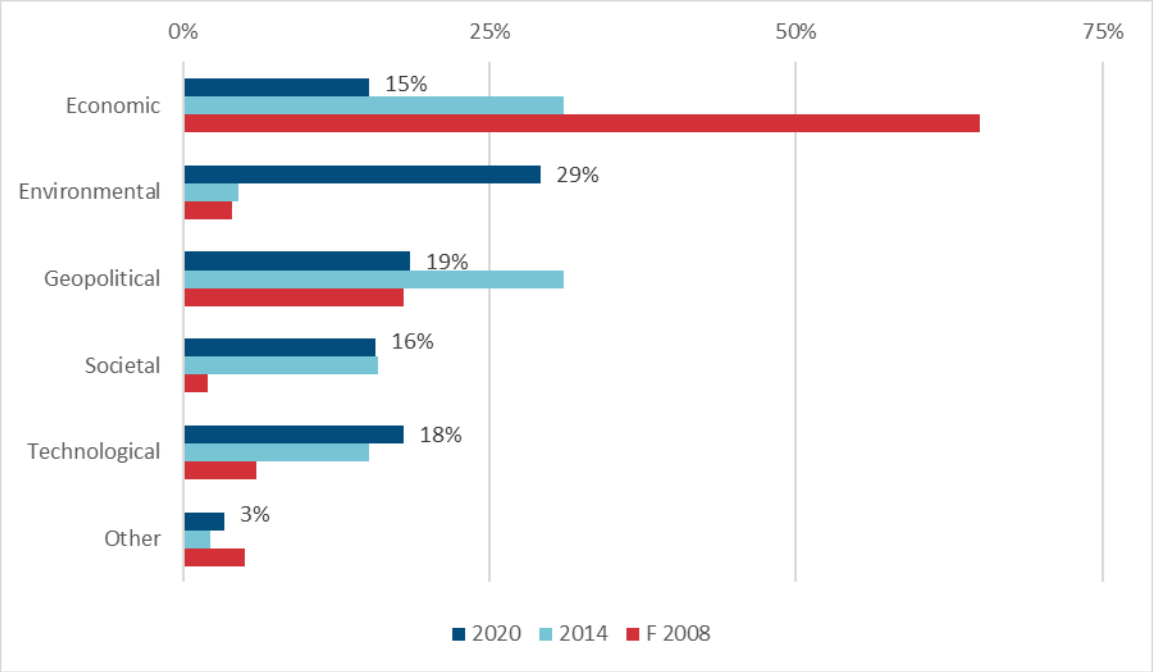
1. 29%/32%/26% Environmental
2. 19%/18%/18% Geopolitical
3. 18%/21%/28% Technological
4. 16%/9%/12% Societal
5. 15%/18%/13% Economic

Figure 24 compares the top emerging risks at the category level from the fall 2008, 2014 and 2020 surveys. The chart shows how risk categories have shifted since the financial crisis. 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.

Figure 24

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. *Disruptive technology* is second, ahead of *Pandemics/ infectious diseases*. Here are the leading responses (note that responses for *Climate change* are about the same as the next two ranked risks):

1. 26%/27%/22% *Climate change*
2. 15%/11%/13% *Disruptive technology*
3. 8%/2%/4% *Pandemics/infectious diseases*
4. 7%/6%/5% *Financial volatility*

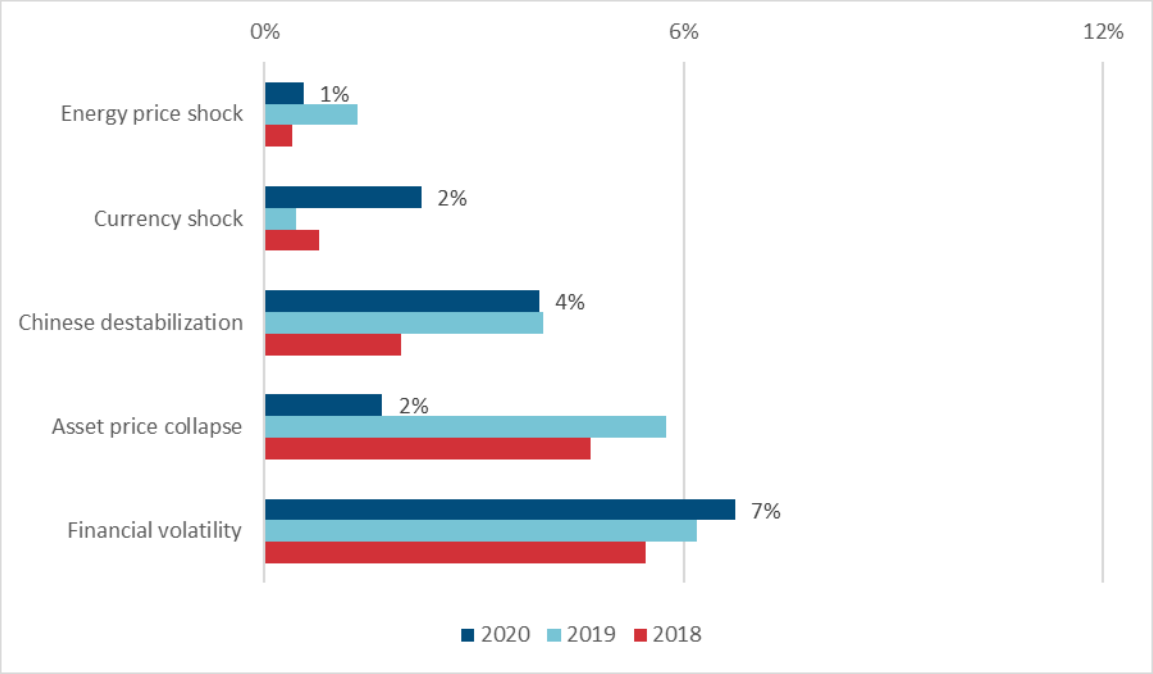
For each risk category, Figures 25 through 29 shows how respondents answered the top emerging risk question within the category for the most recent three surveys. Note that the *x*-axis for each chart is chosen to highlight the data and is not consistent between categories. Data labels are rounded to the nearest percentage point and are shown for the most recent survey.

As shown in Figure 25, the Economic category showed the highest result in the *Currency shock* risk since 2015 and the lowest result in the history of the survey for *Asset price collapse*.

Figure 25

Top Emerging Risks—Economic

% of Total Responses

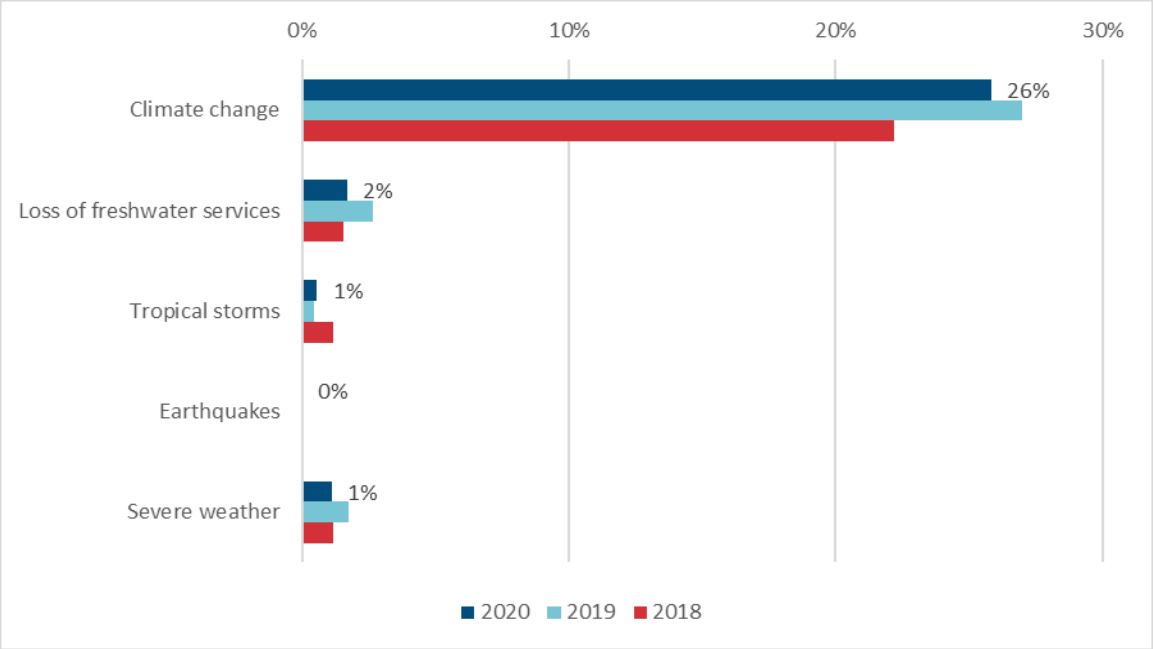


Environmental category risks, shown in Figure 26, remain small, except for *Climate change*, which remains the top overall risk for the third consecutive year.

Figure 26

Top Emerging Risks—Environmental

% of Total Responses

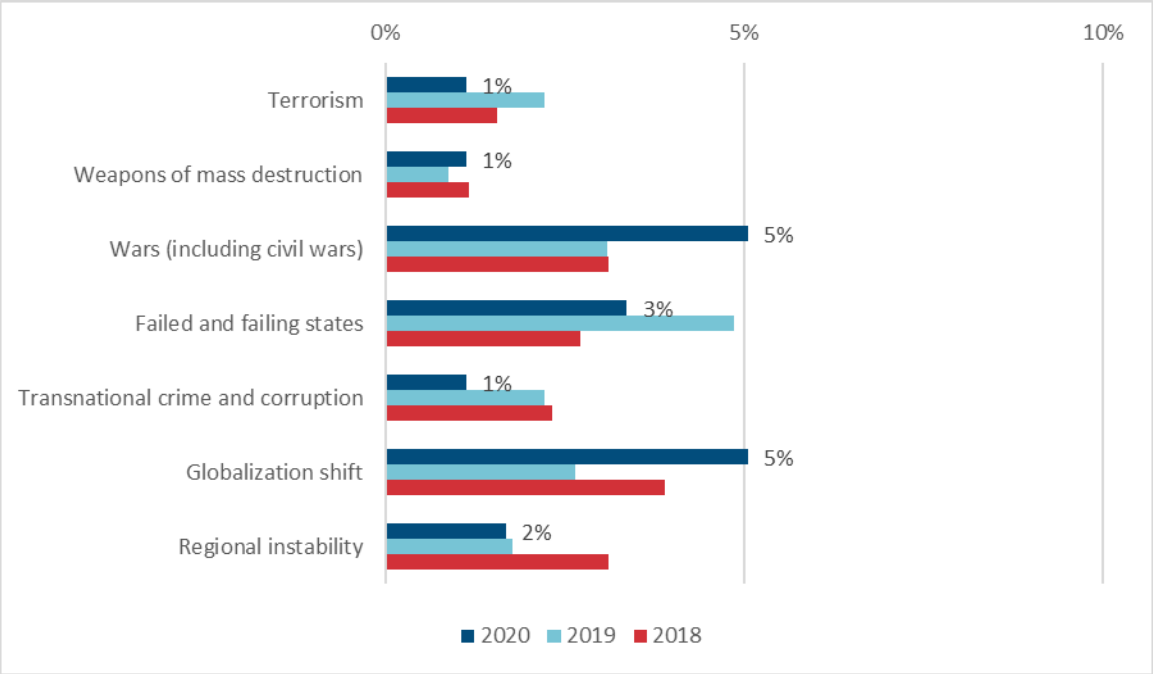


Geopolitical risks tend to be the most volatile in the survey, so it is not surprising to see in Figure 27 that many of these risks whipsaw, with *Wars (including civil wars)* (highest result since 2010) and *Globalization shift* (second highest result to 2016 10% spike) increasing to levels in the top five.

Figure 27

Top Emerging Risks—Geopolitical

% of Total Responses

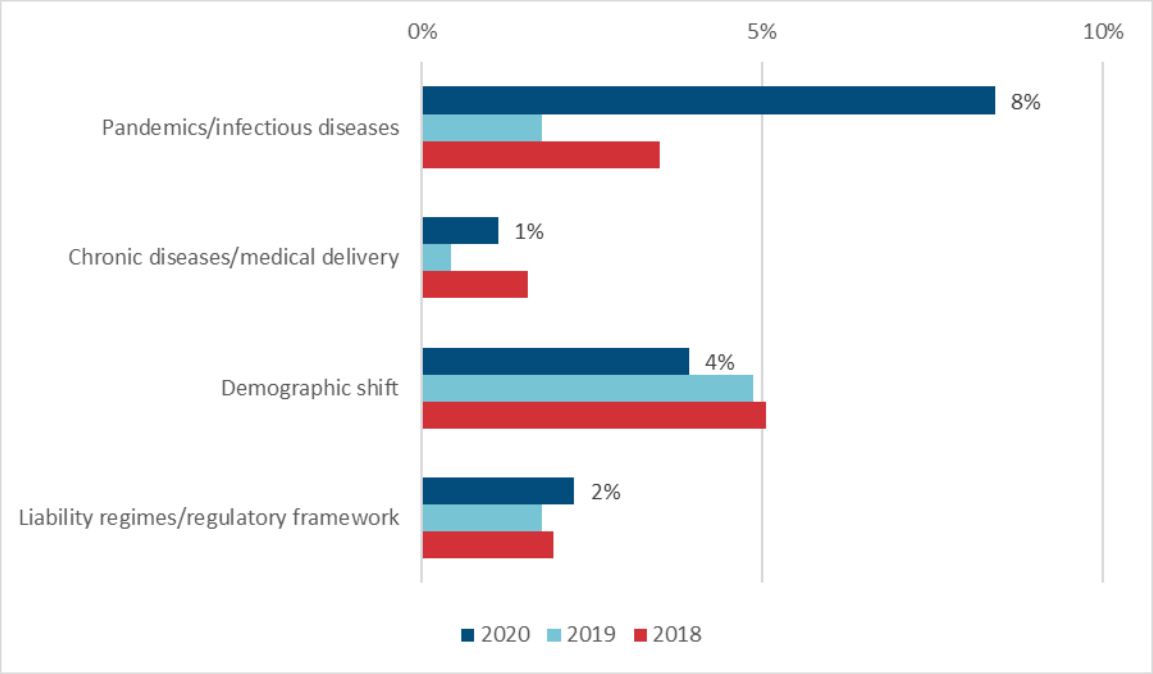


Not surprisingly the changes in the Societal category results, shown in Figure 28, were led by *Pandemics/ infectious diseases* which moved up to third overall with its highest result.

Figure 28

Top Emerging Risks—Societal

% of Total Responses



In the Technological category, shown in Figure 29, *Disruptive technology* rebounded to its highest level while *Cyber/networks* was down for the fifth consecutive year to its lowest level in the survey.

Figure 29
Top Emerging Risks—Technological

% of Total Responses

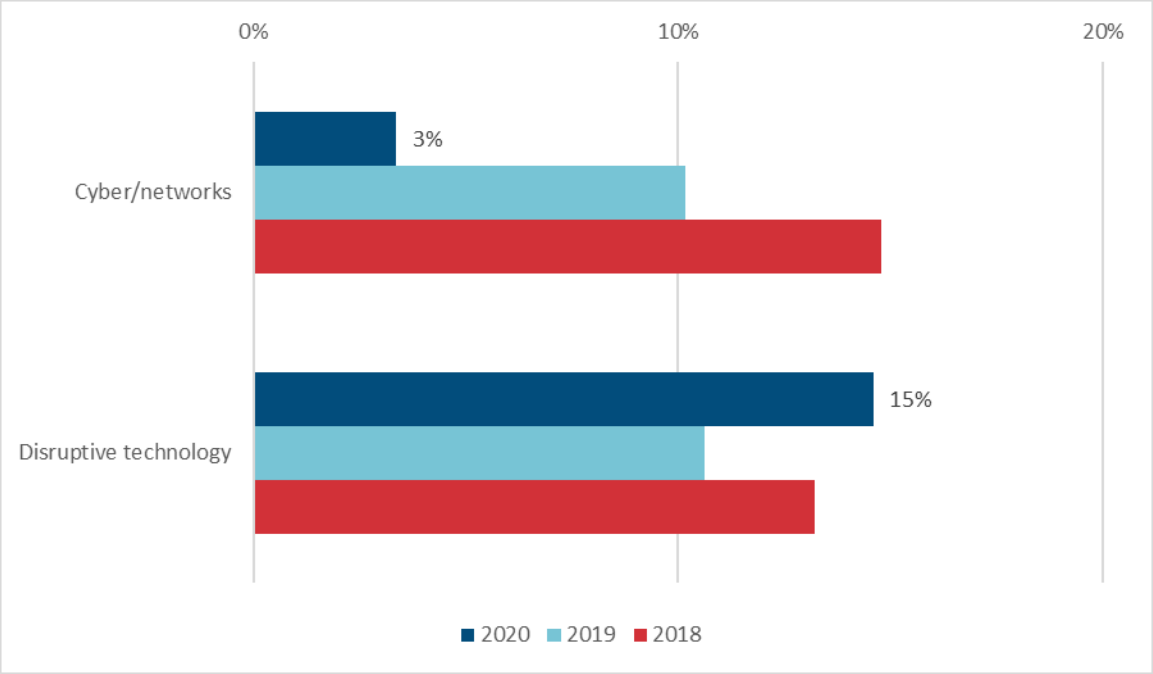
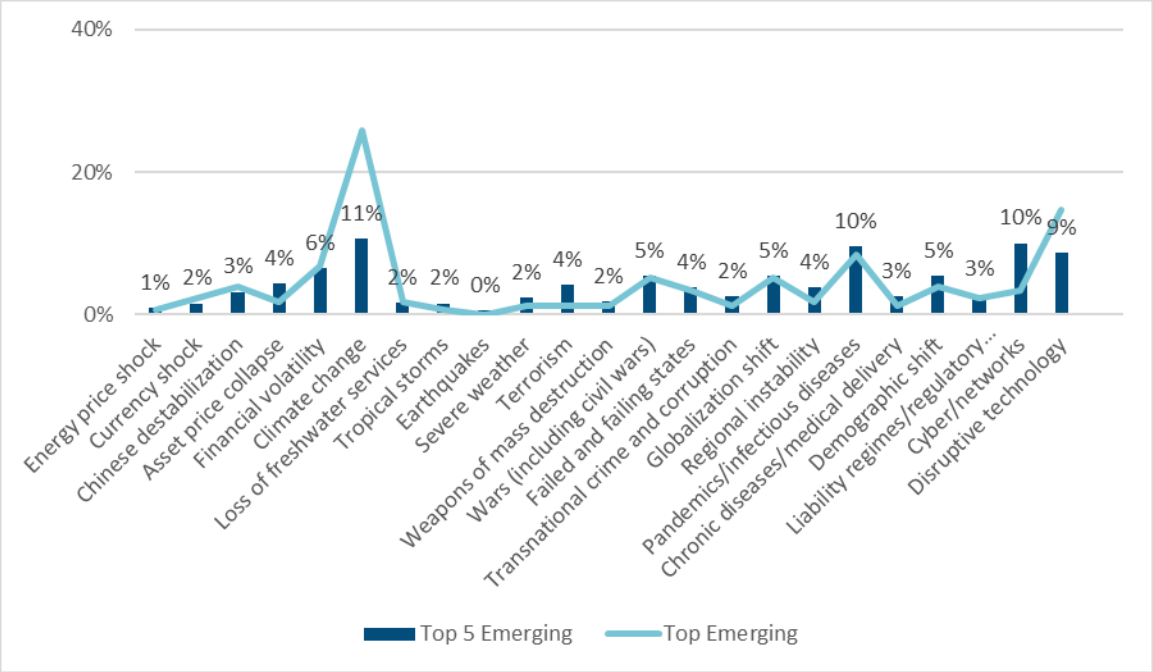


Figure 30 compares the percentages selecting each risk as the top risk with the percentages selecting each risk as one of the five top risks. For several risks, these two measures of perceived importance vary. If we use the highest absolute positive differential to mark the importance of being the top overall risk relative to inclusion in the top five list, that risk was again *Climate change*, at 15%. The greatest negative differential is *Cyber/networks* at −7%, with one interpretation being that risk managers believe cyber risk and the grid is being managed in a way that makes it less disruptive. Future surveys may come to a different conclusion based on attacks to the Colonial Pipeline and CNA, among others.

Figure 30

Emerging Risks Selected for Top Five and Top Risk

% of Responses to Given Question

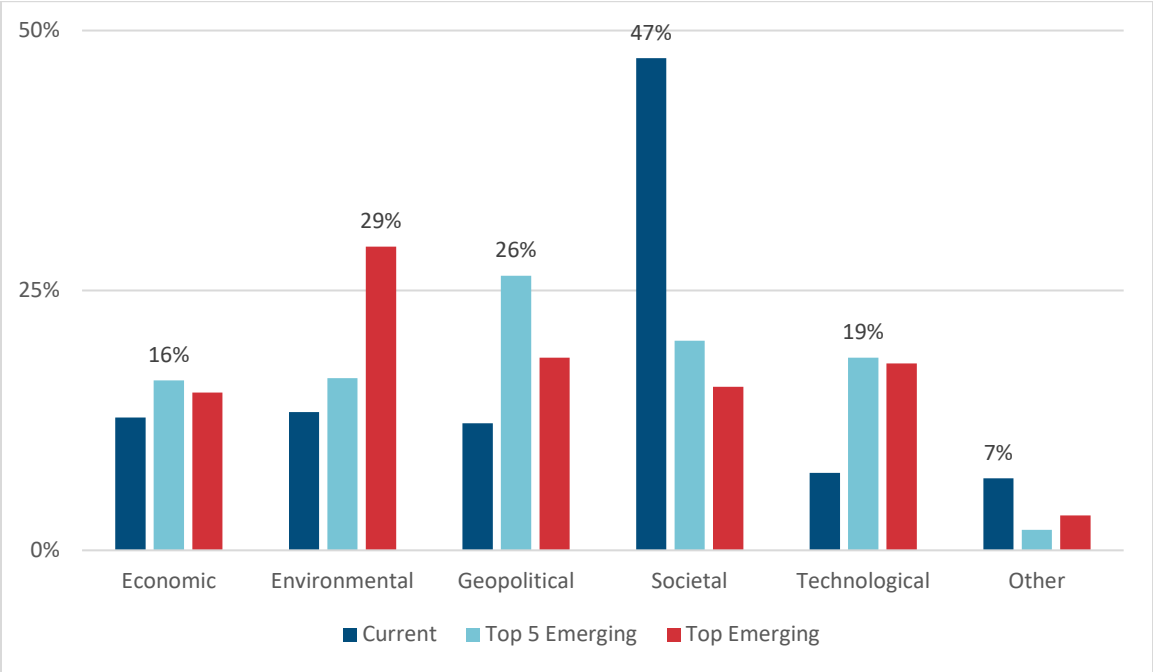


An interesting comparison is to look at which of three metrics—current risk with the greatest impact, top five emerging risks and top emerging risk—is highest for each risk category. The results of this comparison are shown in Figure 31. Risks were identified as current risks more frequently than as emerging risks in only the Societal category (driven by *Pandemics/infectious diseases*). Three of the five categories, namely Economic, Geopolitical and Technological, show their highest percentages as top five emerging risks. The Environmental category, led by *Climate change*, identifies as the top emerging risk more than as the most impactful current risk or a top five emerging risk.

Figure 31

Risk Perception, by Risk Category and Question

% of Responses Selected from Category for Given Question



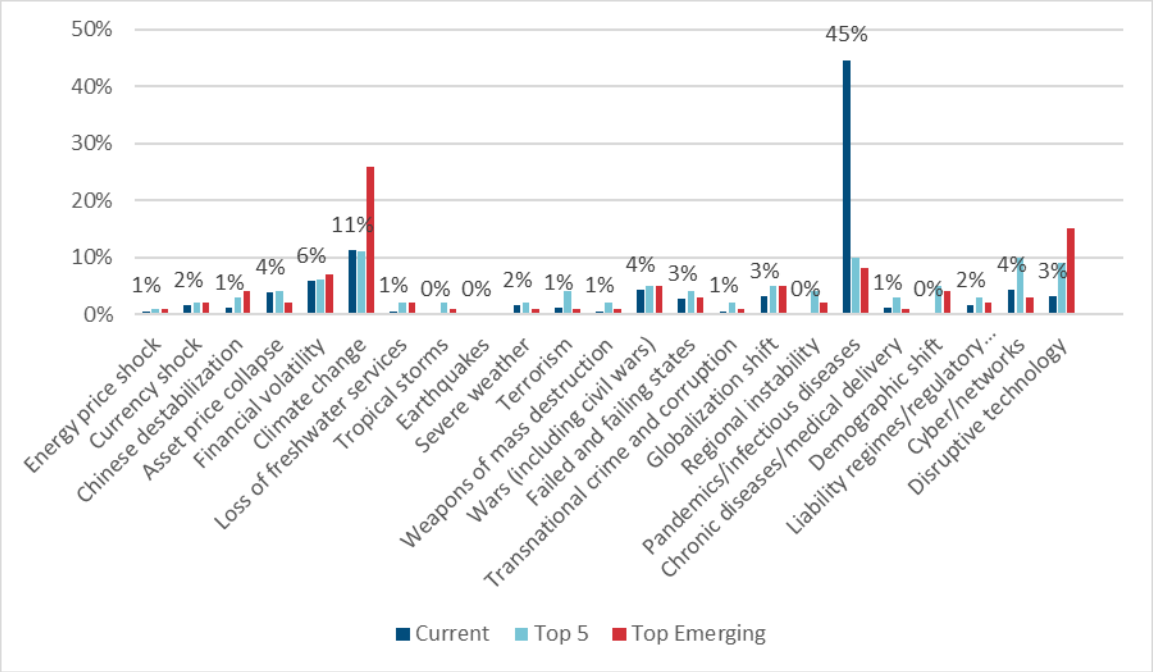
A comparison of the top current risk and top emerging risk suggests which risks are expected to be relatively more important in the future. The largest absolute negative differential (current less than top emerging risk) is *Climate change*, at 15%, followed by *Disruptive technology* and *Demographic shift*. The largest absolute positive differentials, suggesting an expectation of lower risk in the future, are *Pandemics/infectious diseases* at 36%, *Asset price collapse* at 2% and *Cyber/networks* at 1%. They are the only risks with positive differential between the current risk and top emerging risk results.

While the top five 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, those risks are *Climate change* and *Disruptive technology*. This is consistent with the prior survey. Only *Cyber/networks* has a positive differential, at 7%, greater than 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 it being the most important risk. These could also be risks seen more in combination with others. As shown in Figure 32, this characteristic is seen with 16 of the 23 risks. More interesting in this survey, because one risk dominates both current risk and top emerging risk, is which risks has their maximum score outside top five emerging risk. For current risk the only risk where it is the top score across the three questions is *Pandemics/infectious diseases*. The risks where the top emerging risk is the top score include six risks: *Currency shock*, *Chinese destabilization*, *Financial volatility*, *Climate change*, *Loss of freshwater services* and *Disruptive technology*.

Figure 32
Risk Perception, by Risk and Question

% of Responses to Given Question



4.5.3 Risk Combinations

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 most entities this is the driver for solvency. Risk management efforts manage most regular risks, but risk interactions are hard to plan for. This is why companies manage their leverage and liquidity.

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 33 provides a graphical representation of the results that follow.

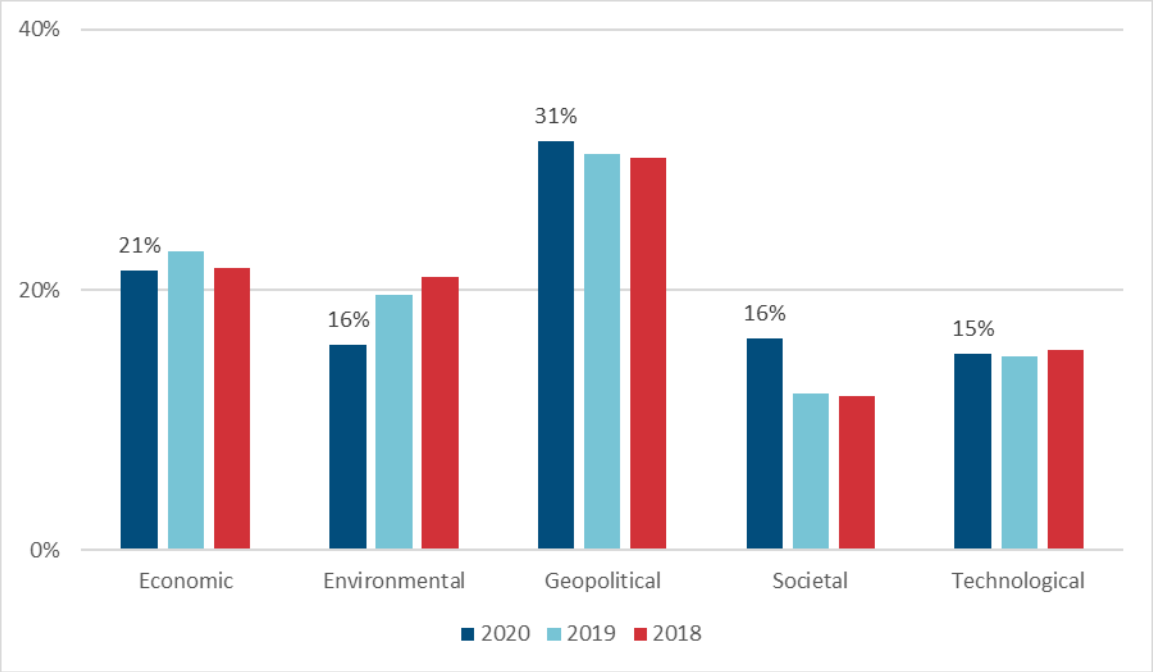
1. 31%/30%/30% Geopolitical (2020/2019/2018)
2. 21%/23%/22% Economic
3. 16%/12%/12% Societal
4. 16%/20%/21% Environmental
5. 15%/15%/15% Technological

Pandemics/infectious diseases and *Disruptive technology* exceeded the mean for the risk by the greatest amount in the current survey at 4%, and *Currency shock* fell short the most at 5%.

Figure 33

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*, *Financial volatility* and *Cyber/networks*.

1.	9%/12%/11%	*Climate change*
2.	9%/7%/8%	*Financial volatility*
3.	8%/8%/9%	*Cyber/networks*
4.	7%/3%/4%	*Pandemics/infectious diseases*
5.	7%/7%/7%	*Disruptive technology*
5.	7%/6%/4%	*Wars (including civil wars)*

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 448 responses were as follows:

1. 6%/7%/9%, No. 1 in previous survey
   Cyber/networks
   Disruptive technology

2. 4%/3%/6%, No. 4
   Asset price collapse
   Financial volatility

3. 3%/3%/2%, No. 5
   Wars (including civil wars)
   Failed and failing states

4. 3%, Not rated in previous survey
   Financial volatility
   Pandemics/infectious diseases

5. 3%/2%/3%, No. 10T
   Terrorism
   Cyber/networks

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

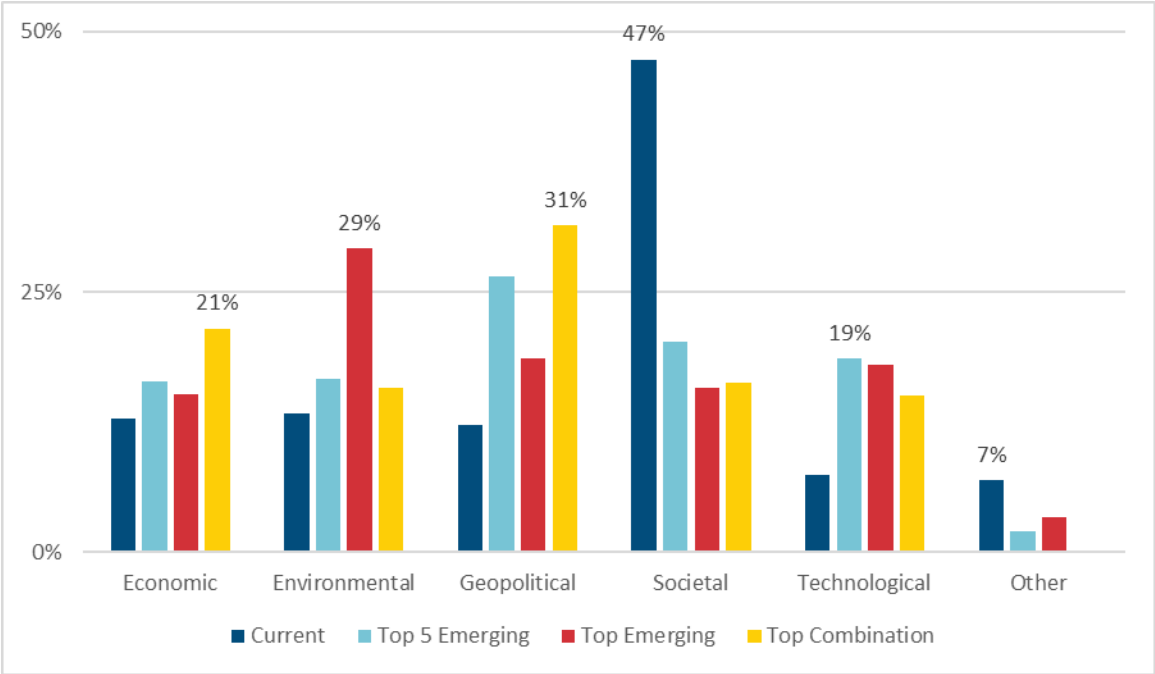
14%/16%/16%	Geopolitical–Geopolitical
11%/12%/11%	Economic–Geopolitical
9%/7%/7%	Geopolitical–Technological
9%/4%/4%	Economic–Societal
8%/11%/13%	Environmental–Environmental
8%/11%/11%	Economic–Economic
7%/4%/5%	Geopolitical–Societal
6%7%/9%	Technological–Technological
6%/6%/4%	Environmental–Geopolitical
5%/6%/7%	Environmental–Societal
4%/3%/2%	Societal–Technological
4%/5%/3%	Economic–Technological
4%/4%/3%	Societal–Societal
3%/5%/3%	Economic–Environmental
1%/2%/1%	Environmental–Technological

By category, frequency of responses generally does not vary by a large amount when viewed across the four major questions. As shown in Figure 34, exceptions occur for the Societal category (the frequency of including these risks as the top current risk is high), Economic and 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).

Figure 34

Selection of Risks in Category, by Question

% of Responses Selected from Category for Given Question

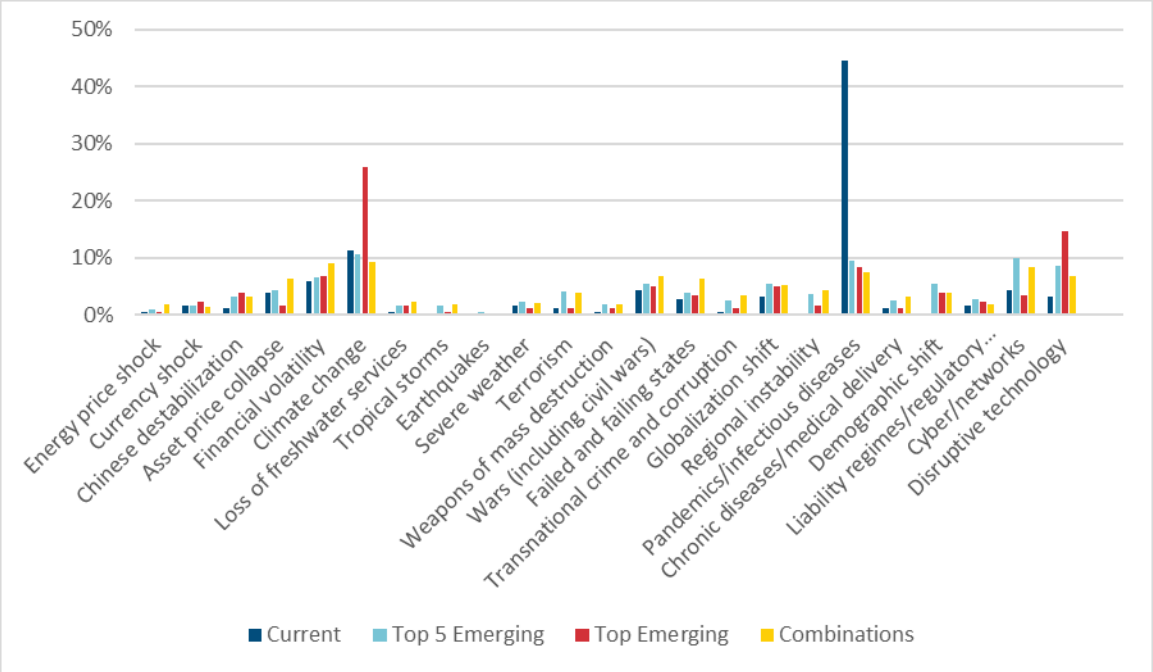


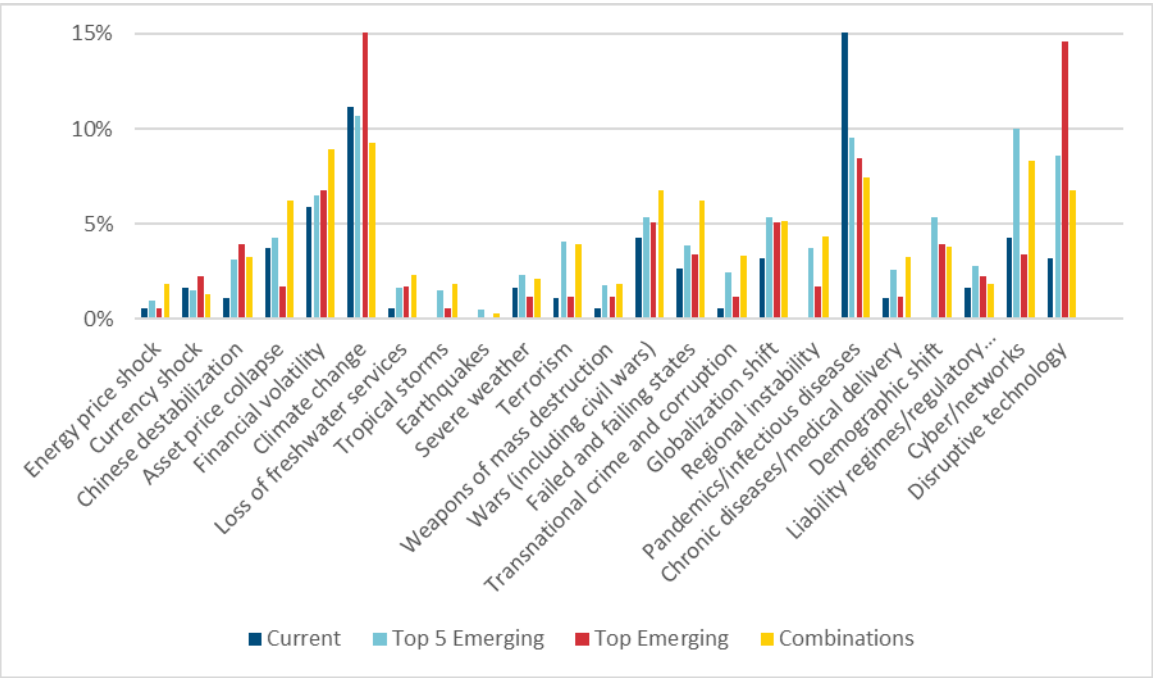
Risk by risk, there is much more variation, as shown in Figure 35.

Figure 35

Selection of Risk, by Question

% of Responses to Given Question (note that two versions of the chart are provided; one with results uncapped and another 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):

- *Pandemics/infectious diseases*

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

- *Natural catastrophe: earthquakes*
- *Natural catastrophe: severe weather*
- *Terrorism*
- *Globalization shift*
- *Demographic shift*
- *Liability regimes/regulatory framework*
- *Cyber/networks*

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

- *Currency shock*
- *Chinese destabilization*
- *Climate change*
- *Disruptive technology*

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

- *Energy price shock*
- *Asset price collapse*
- *Financial volatility*
- *Loss of freshwater services*
- *Natural catastrophe: tropical storms*
- *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 moved toward reduced concentration. That trend continued throughout this survey compared to the previous two iterations of the survey, as shown in Figure 36.

Figure 36

Cumulative Distribution of Risk Combinations Selected

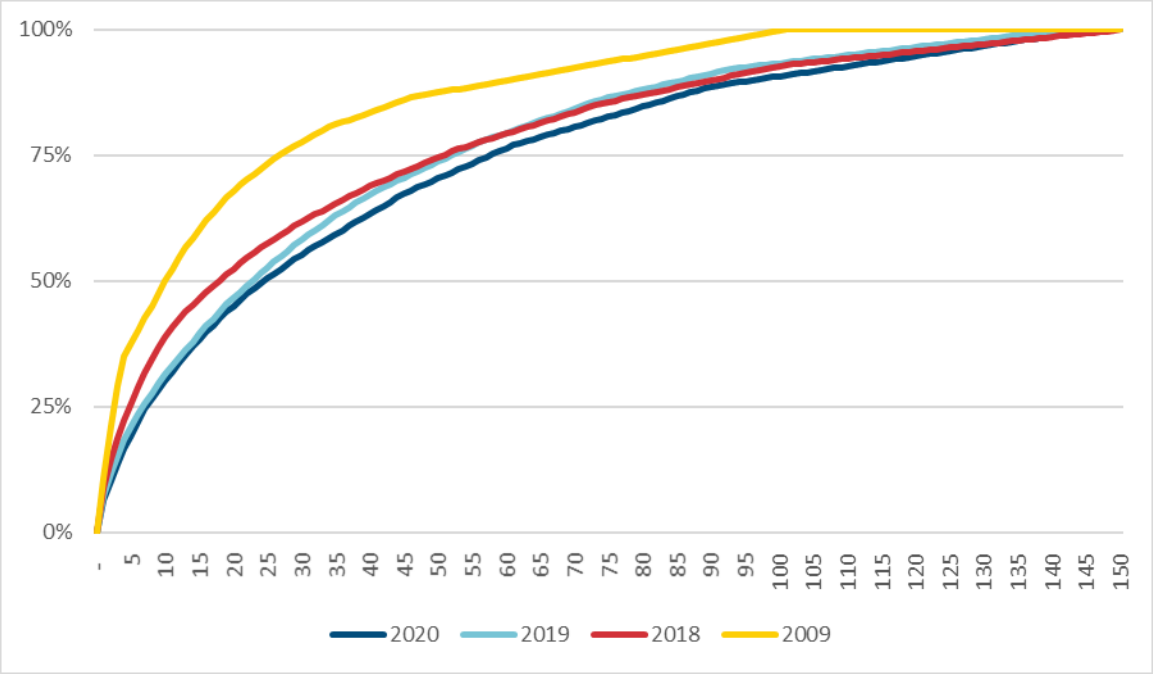
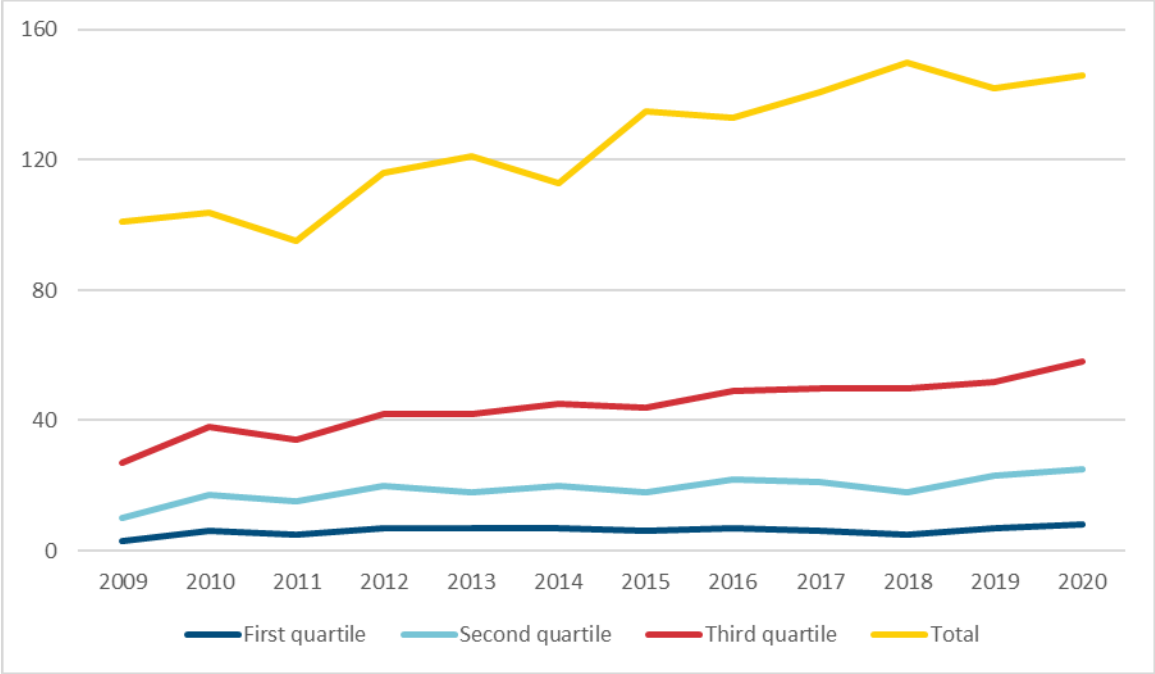


Figure 37 shows the number of combinations selected each year, with data listed cumulatively and the first quartile representing the most frequent responses. The past several surveys suggest a trend toward broader consideration of risks, especially in the third and fourth quartile (total) results. More than half of the possible two-risk combinations were again selected. With so many risk events during the year, respondents had lots to think about and did not concentrate on just a few risks.

Figure 37
Number of Risk Combinations Selected, by Year

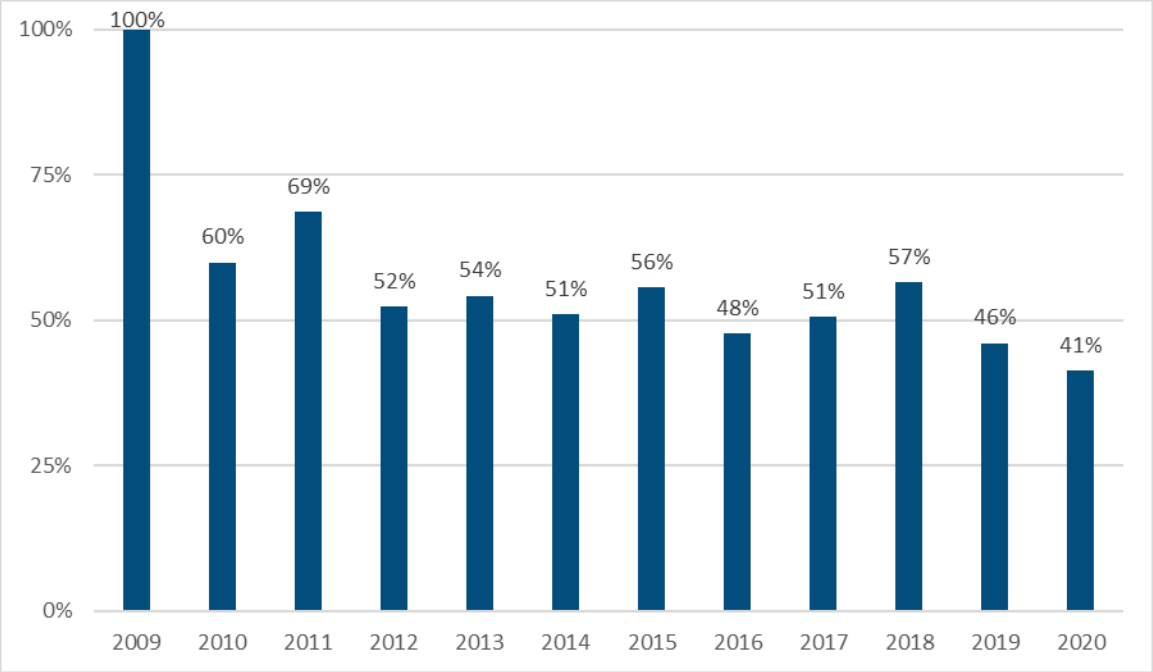


The broad representation can be considered an indicator of the current risk environment, with each quartile being considered against the extreme example of 2009 and then averaged across the three quartile results.[9] Shown in Figure 38, this year's risk concentration ratio of 41% is the lowest rate seen in the survey, a full 5% lower than the previous low recorded in the previous iteration.[10] Since 2020 was anything but a calm year, interpretation is difficult. It may be that the lack of an economic focus led to a broad spread of the risks.

[9] 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.
[10] 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 38
Risk Concentration Ratio

Base 2009 = 100%



4.5.4 Risks that interact with COVID-19

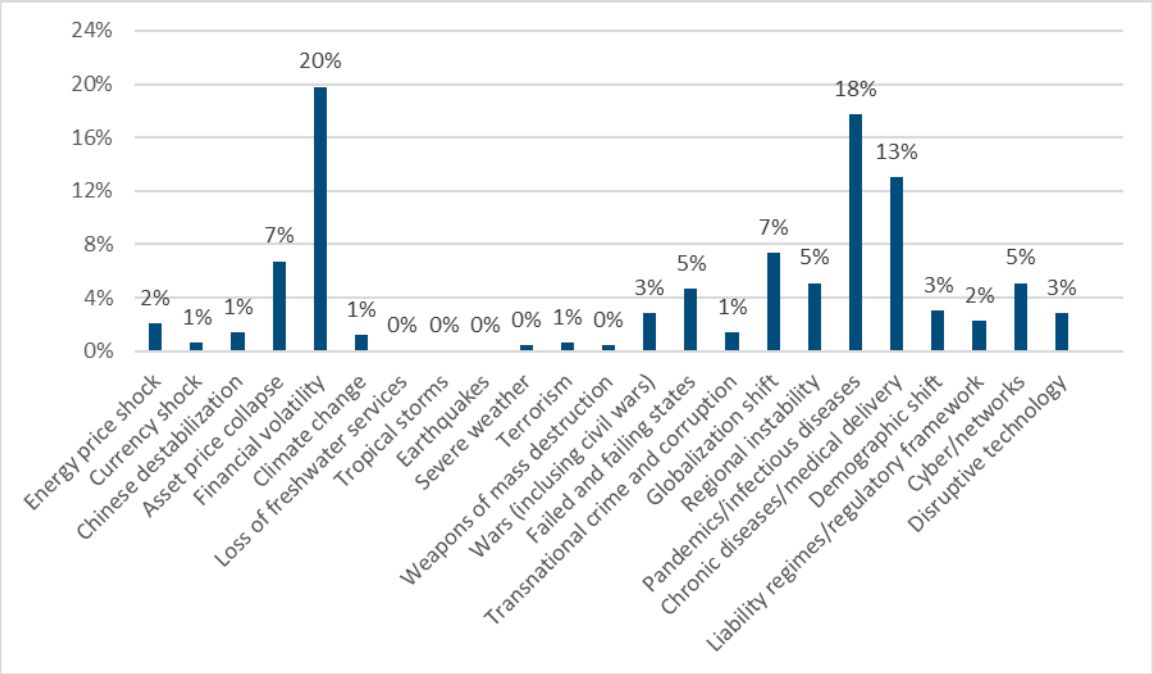
This survey includes a rotating question allowing a choice of up to three risks that fit specified criteria. In this survey, respondents were asked, "Which THREE emerging risks do you believe interact most prominently with COVID-19?" Figures 39 through 41 show the results from this question by risk, as a comparison with the question about top-five emerging risks, and comparing risks against the top emerging risk. While *Financial volatility* (20%) finished first, the rest of the top five included *Pandemics/infectious diseases*, *Chronic diseases/medical delivery*, *Globalization shift* and *Asset price collapse*. Of the 23 risks, 18 received at least 1%.

There are similarities and differences between risks that interact with COVID-19 and those in the top five emerging risks. The Environmental and Societal categories were less common than the top current risks, and Environmental and Technological less common than the top five emerging risks, compared to the COVID-19 interactions.

Figure 39

Risks that Interact with COVID-19

% of Responses

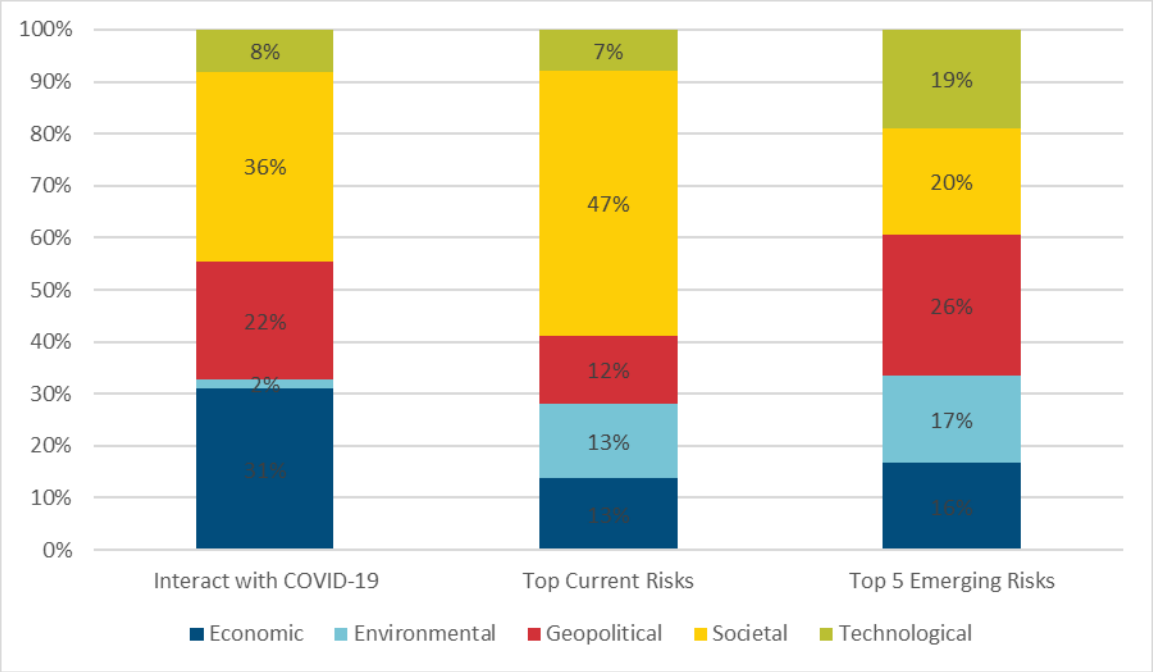


The Economic category was chosen relatively more frequently as a collection of risks that interact with COVID-19 than as top current or top five emerging risk, and the Environmental category was less likely to be chosen.

Figure 40

Categories that Interact with COVID-19 Compared with Current and Top Five Emerging Risks

% 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 of the typical suggestions:[11]

- *Sexual immorality*
- *Social unrest*
- *Religious extremism*
- *Loss of trust in institutions/governments*
- *Shortage of efficient antibiotics*
- *Political destabilization*
- *Mental / behavioral health*
- *Inequality leading to polarization and deadlock*
- *Reduction in natural resources (polluted waters, depleting forests, polluted air)*

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 resource depletion. Some of these

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

were incorporated into the risk definitions in this survey 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 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 influenza cases in a hospital), indicating that an emerging risk is more likely to materialize. This allows quicker responsive action.

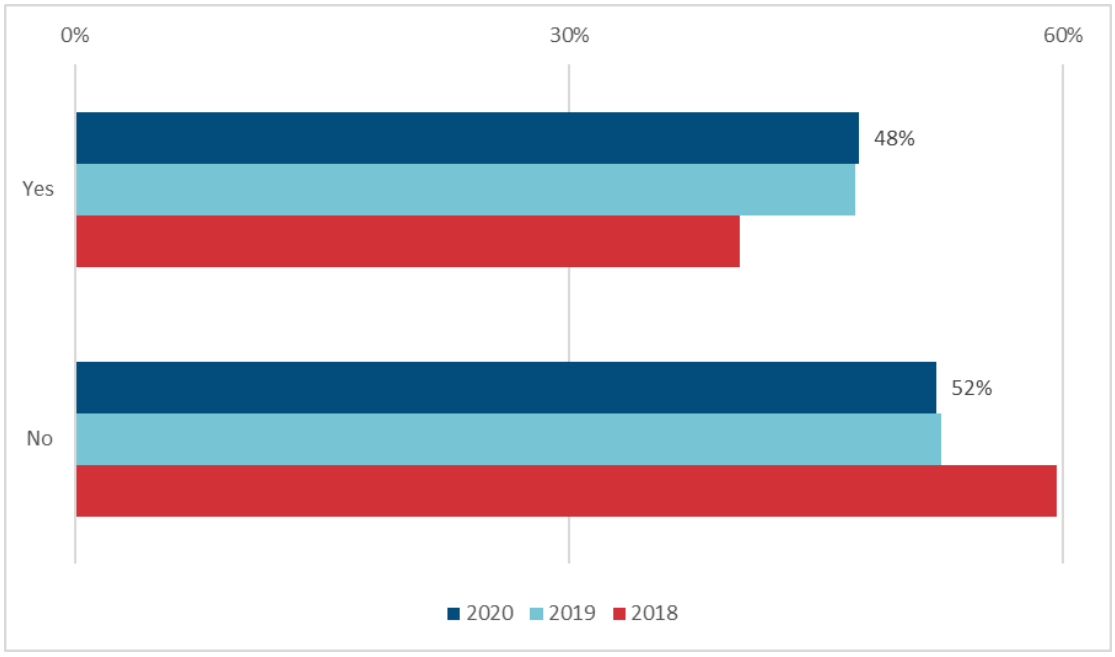
Indicators that trend over time, like GDP or the consumer price index (CPI), can provide macroeconomic KRIs, as can revenue and expense metrics. These measure historical results. Leading indicators provide information earlier in the process. For example, for a government entity a higher unemployment 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 enaction 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 encourages deterministic scenario planning.

The survey asked about the use of leading indicators that provide a firm with actionable information. As shown in Figure 41, 48% of respondents said they formally identify emerging risks, slightly higher than recent surveys.

Figure 41

Whether Respondents Formally Identify Emerging Risks

% of Responses in Given Year



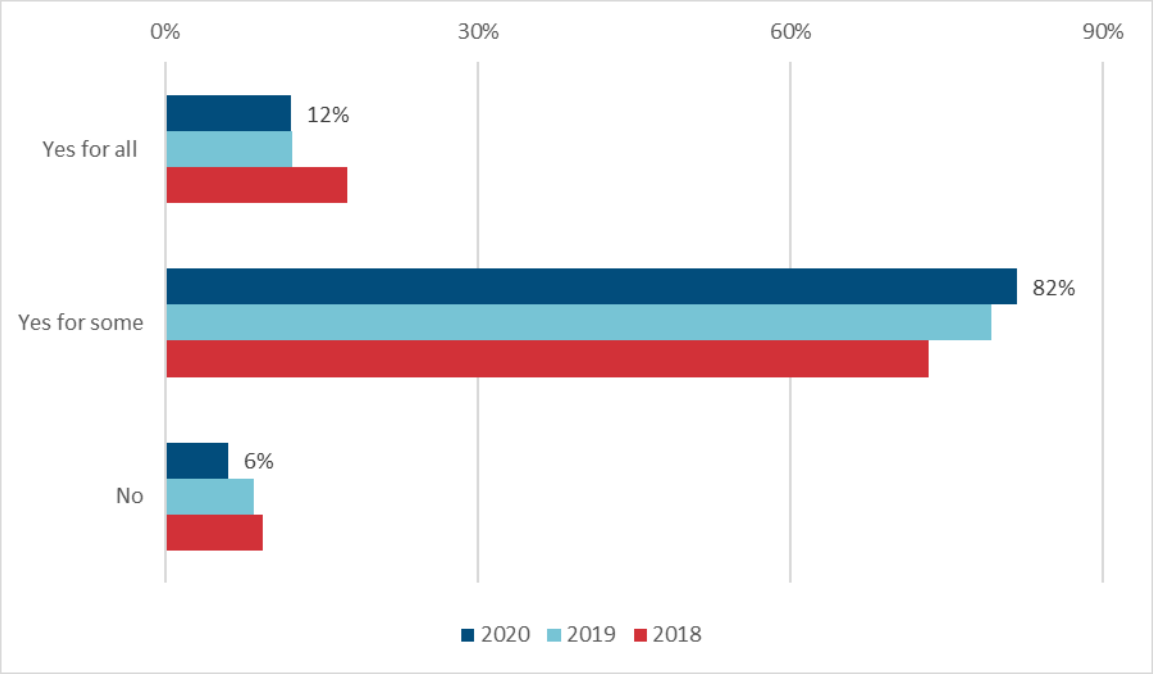
For respondents who reported having a formal process (those without one were not asked to respond to the remaining questions, moving directly to Section C), the survey asked about measuring, monitoring and mitigating an emerging risk once it has been identified. Figure 42 shows that nearly all respondents said they do this for some or all of their identified emerging risks. The trend toward having a process for some,

but not all of the identified emerging risks makes sense as many emerging risks have a long time horizon and should only be considered qualitatively. However, 6% still report having no process in place.

Figure 42

Whether Respondents Have a Process to Measure, Monitor, Mitigate Emerging Risks

% of Responses in Given Year



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

Most of the comments about actual processes used talked about 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:

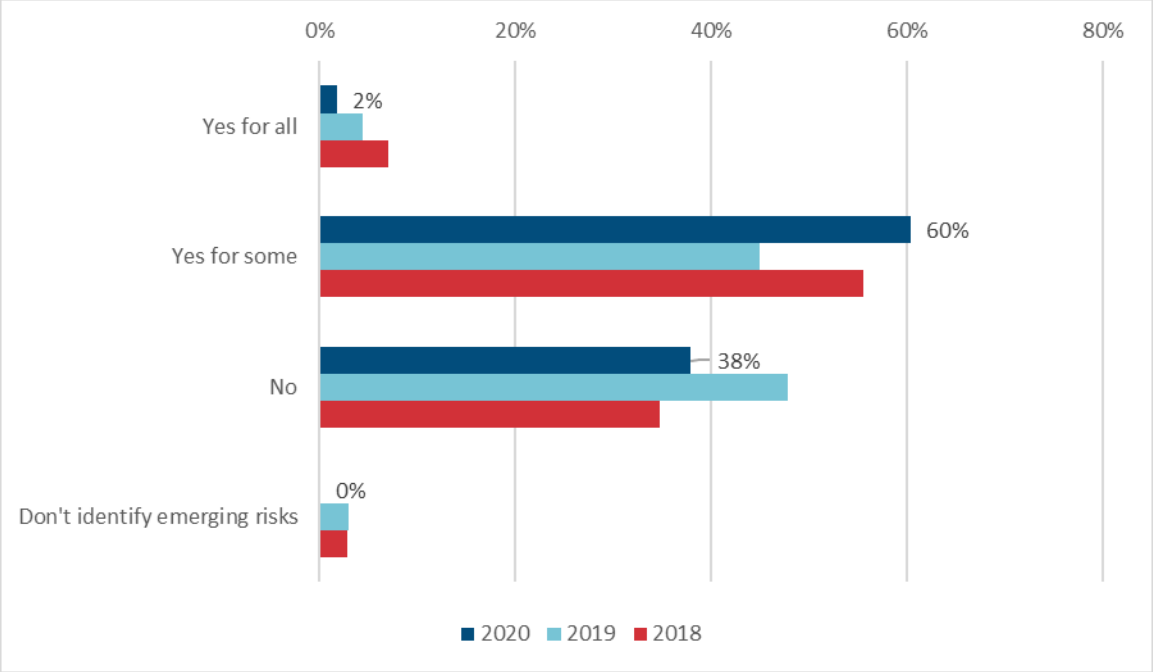
- *Social unrest, ran stress tests to assess, identifying drivers to monitor to evolution of the risk and how it could impact underwriting and our operations in general*
- *Measuring is tough so we focus on monitoring by assigning an owner and then consider what processes are in place to mitigate or if there are gaps for ones we feel are material then we will look to close those gaps*
- *Change of Market Value Surplus due to change of the volatility of Financial Markets*
- *Climate change - change to underwriting rules for mortgage loans*

A follow-up question asked, "Once an emerging risk is identified, do you select leading indicators to measure changing likelihoods?" As shown in Figure 43, 62% of respondents noted that they had leading indicators for some or all identified emerging risks, returning to the level of two years ago after a drop in the prior survey. These results show that most risk managers are aware of the need for leading indicators and the examples provided show they have a good understanding of what is required, although many of the examples reflected lagging indicators.

Figure 43

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 risk of LTC insurer insolvency, seem to reflect similar methods to those used by investors. The broader group of respondents allows the survey to include additional practices (e.g., only recently has the survey been sent to health and pension practitioners). Here are a few of the responses:

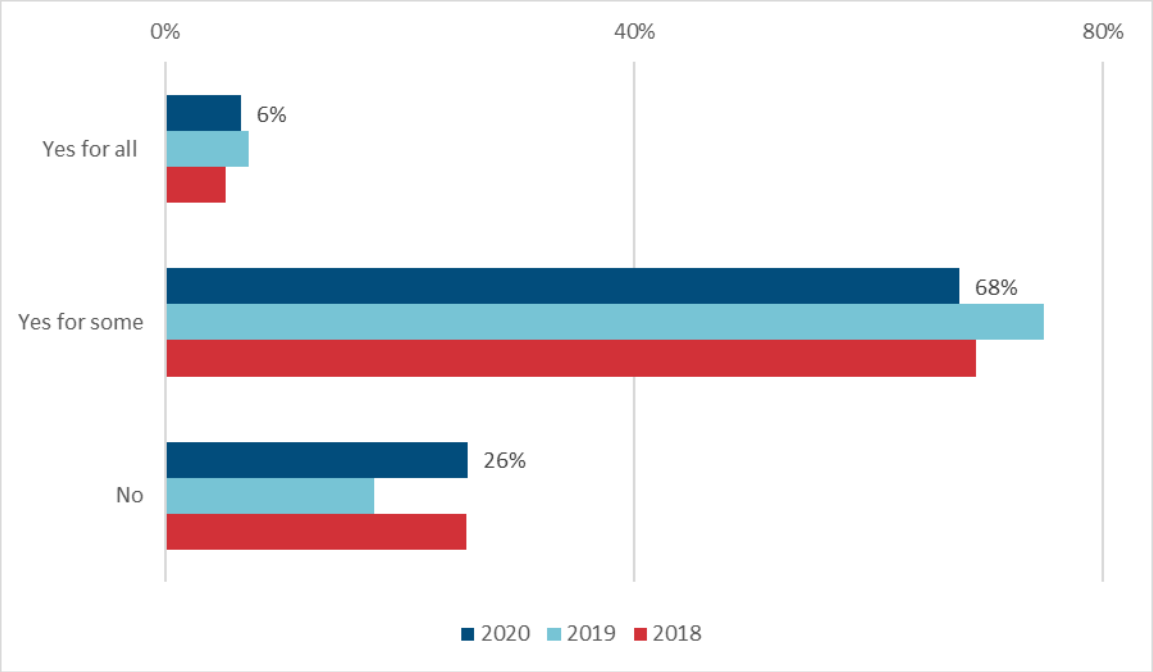
- *Health insurance: Risk-scoring new members to predict future costs via initial diagnoses*
- *Number of attempted cyber attacks*
- *Top 5 - 10 emerging risks are tracked more closely. Stress testing has been used to identify potential impact of these risks. Metrics used look at whether the risk is becoming more proximate, its velocity could be increasing, nature of risk is changing, etc.*
- *Can check betting odds or discuss with SMEs*
- *For the biggest risks, I deliberately cull data when pricing a renewal or prospect, whether through ICD 10 codes or direct/correlated drugs to the greatest extent possible, which varies data I have from the customer. I need to do this for the future sustainability of my division, but others should be caring about this risk, as it is systemic.*
- *Movement of people, changes in ruling regimes, is more telling than money flows*

The survey asked whether these leading indicators include criteria that would lead to action to mitigate or accept the risk. About three-quarters (74%) stated that criteria exist for some or all of their emerging risks, as shown in Figure 44. This is an evolving practice, but the high percentage is encouraging.

Figure 44

Whether Leading Indicators Include Criteria for Action

% of Responses in Given Year



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

- *Involve underwriters and legal teams to look at policy wording more closely*
- *Choose a value of the impact that means it's time for more than just monitoring*
- *Use reinsurance to reduce tail risk*
- *I review the deductible level of the case at hand and find that often a risk for one account is not a risk at all for others. Leading indicators include drugs that are used before the very extreme ones. For example, hemophilia factor use portends a future risk of hemophilia gene therapy use.*
- *In our business, the most dangerous risk is illiquidity. Gauge probable max outflow, prioritize assets from most to least expendable.*

4.7 SECTION C: ENTERPRISE RISK MANAGEMENT (ERM)

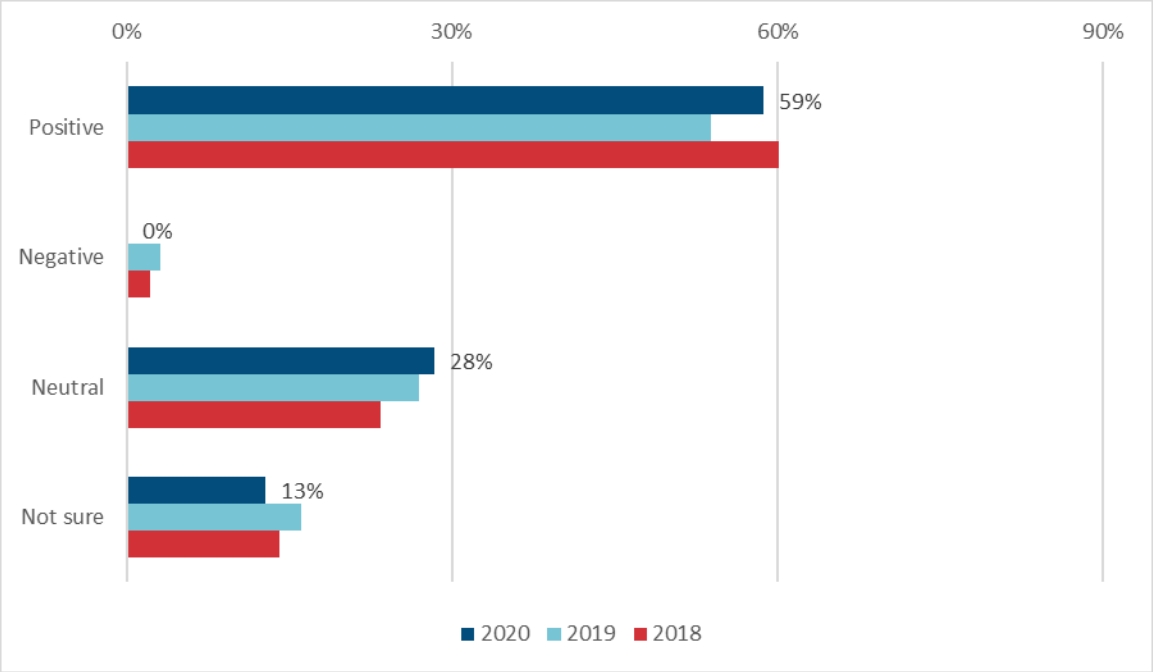
This section solicits input from practitioners on the overall health of ERM. Several open-ended questions complement the emerging risk trends asked about in Section A. Each risk management program is unique. The reader's experience will differ from that of the researcher, so each of us will pick out and interpret comments in unique ways. The reader is encouraged to scan all the comments 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 45 shows, none said it has had a negative effect, and a majority (59%) responded that the effect has been positive. The high number of *Neutral* or *Not sure* responses (41%) is also telling, as ERM continues to evolve toward company-specific levels consistent with unique governance goals and company risk culture.

Figure 45

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. The comments included the following, with many showcasing how ERM interacts with strategic planning:

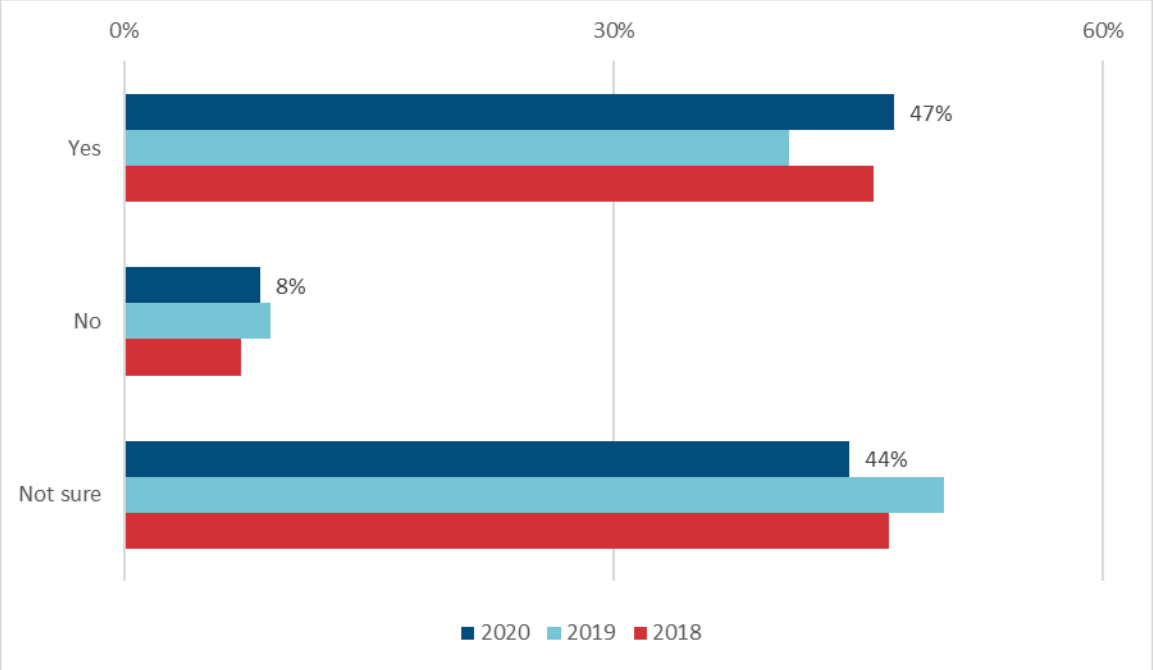
- *Used ERM to identify other methods of funding redundant reserves*
- *ERM functions plugged into and monitored business continuity plans in action as a result of C19*
- *I saw companies who had planned for medical emergencies send PPEs to hospitals/first responders during the COVID crisis.*
- *H-E-B pandemic preparation (Texas supermarket chain)*
- *Capital decisions in a rapidly changing interest rate and economic turbulent time. Having a structure to test stresses helped when decisions had to be made*
- *Due to the low interest rate environment a decision was made to suspend sales of a particular product due to its negative return in that environment. It had been determined through prior stress testing that this course was the prudent one to take.*
- *Hospital system aggregated all risks amidst COVID-19 to understand interplay*
- *Seamless transition to 100% remote work globally in current pandemic*
- *A university tests human waste to scan for dorms that have COVID, though many schools are taking a less scientific but important approach.*
- *SAS did big investment to promote remote work (laptops, cloud, human resource policies, etc.) that now are giving benefits.*
- *Cyber-attack planning led to robust training efforts for staff.*
- *We were aware of the lack of business interruption coverage for a pandemic, having previously identifying it as a self-insured risk*
- *AIG has announced they are spinning off their life insurance companies - with low growth scenarios so likely and the NAIC reactive to the threat*

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 46 show a split between *Yes* (47%) and *Not sure* (44%). 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 46

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 improved strategy and proactive risk mitigation:

- *Stability helps stock price*
- *ERM forces focus on the future and consequences.*
- *Yes because it helps inform management so that they are aware of the risks involved in the decisions they make*
- *It provides information that builds trust*
- *Advanced ERM techniques result in less surprises for Senior Management and the Board.*
- *Improves risk culture across company*
- *Deciding whether to mitigate or exploit strategic decisions and associated risks.*
- *Silos pose a risk to companies in terms of general efficiency. ERM establishes a wide view of many moving parts to make better decisions overall.*

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 8% 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:

- *Sometimes ERM is more focused on theory rather than practical and tactical events that affect a company's financials.*
- *ERM at our company tends to focus more on avoiding risks rather than identifying risks that we can exploit.*
- *The mechanics of setting up an ERM program takes a long and dedicated period of time. However, once it is set up, it becomes more inflexible. Frequently, you are only concerned with the impact of the same worst-case scenario. You gain little to no additional insight since you already know the extreme condition that hurts your company.*
- *Only matters if risk materializes.*
- *In my experience risk management came before ERM. ERM is just documenting all the risk management that was already done.*
- *Most ERM that our company has adopted is effectively increased bureaucracy.*
- ***The enterprise must be willing to change; we don't look at "keep this business model" but rather "how best to deploy this collection of assets and strengths"***

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

- *ERM is not yet fully integrated with the company's strategic planning.*
- *ERM still tends to be quite detached from the actual business. There needs to be more interaction between risk management and the business to identify potential risks / opportunities but more importantly act on those.*
- ***It should, but suspect there's a lot done for show, with little real teeth.***
- ***If done properly, ERM is simply a disciplined business decision process, not an additional layer of infrastructure - making it difficult to quantify its impact. Further the goal of ERM decisions may be to reduce short term volatility rather than increase long term returns.***
- ***While ERM certainly mitigates tail risk in some cases, those types of scenarios happen so rarely that the cost of an ERM program might not pay off if the "tail" scenario doesn't come to pass.***
- *ERM is an important component that should be looked at periodically, but the internal cost of whole departments focused on this may outweigh the positive gains.*
- *From looking at some data, it doesn't seem to help that much, currently. New ways of looking at ERM need to be developed.*
- ***ERM exists in a non-formal manner even when an organization does not formally address it.***
- *It depends on how the ERM program is implemented and the stated goals of the program. It would be foolish to make the blanket statement that ERM improves or does not improve all company's returns relative to risk. Returns may go down relative to the decrease in risk and that might be the desired outcome.* ***This is not a good question.***
- ***Mitigating or hedging idiosyncratic business risks usually improve business returns. The most serious challenge is in measuring these risks correctly in time to do something about it. How many life insurers correctly hedged the zero rate environment we have been forced back into?***
- *I don't think companies' operations were prepared as much as we would have liked for the pandemic.* ***Business continuity preparation was a very positive contribution****, but more planning could have been done*

Two new open-ended questions were asked this year. The first asked how the respondent proactively prepared for an infectious disease pandemic. While some admitted to having no plan in place, many others shared the common theme that their business continuity plan was not specific to pandemics but had been

previously tested. A key to success has been the computer infrastructure put in place over the past 20 years. None of the risk managers shared any plans for their investment operations (e.g., opportunity or threat?). The following shares a few examples:

- *We had PPEs at large corporate sites.*
- *Implemented business continuation plan, **employee wellness and support network**,...etc.*
- *Management took action to cut pay while promising job security, paying the cuts with interest after cash flow.*
- ***Did not. It was mentioned and then ignored last year since frequency appeared very low.***
- ***At the time, I was in a regulator role. The industry paid lip service to pandemic risk, which could be gleaned from their filings. They were wholly unprepared, despite inquiries and prompts.***
- ***You prepare for disruption. You don't prepare for disruption for only certain causes. Another silly Q.***
- ***I personally built up a large emergency fund. As an actuary 15 years ago, I helped encourage RBC requirements and tried to encourage my company to be proactive. I was not encouraged.***
- *Prior business continuity and disaster recovery assessments as well as ERM scenario analyses provided the baseline for our pandemic response. Our ERM planning was heavily referenced particularly when addressing the disruptions to our supply chain.*

Respondents were also asked how risk evaluation and risk mitigation, both implemented and planned, changed under COVID-19. The following are examples of their responses:

- *There is an increased appreciation for risk management overall - people are more open to discuss scenarios, look at ways to manage activities, etc.*
- *Minimal change*
- *More political.*
- *Working from home is now a solution, instead of a problem.*
- *The risk managers are no longer teased about the absurdity of their scenarios. We spend more time considering the impact of multiple risk events occurring simultaneously. We are becoming more creative in considering ancillary effects.*
- ***Happy we had what we had. Observed it had gaps. Still, not sure we'll do much differently as cost of attempting to fill all gaps likely exceeds value. Also recognize not all gaps will be recognized and addressed. Have a base and be agile.***
- *I think that risk planning will be more focused and relevant post-pandemic. It was somewhat theoretical previously.*
- *Paying greater attention to the risks that are under the radar. Pandemic was certainly near the bottom of the likelihood list from an early 2019 perspective.*
- *It's been overemphasized to an extreme.*
- *They haven't changed, that's the biggest problem. COVID-19 is far less lethal to the majority of the population than first thought/feared, but the initial extreme mitigation methods haven't changed and continue to overreach into personal freedoms.*
- ***When it comes to pandemic risk, we are much more aware of previously unforeseen situations. The past evaluations very much focused on direct health care costs, mortality, billing delays, and the work from home transition. Other major issues such as asset risk, credit risk, substance use disorder, mental health, averted health care, and the loss/gain of premium volume by market have been unearthed by experiencing an actual pandemic.***
- *Additional analysis around the health of assets. Also, staff reductions due to decreased premium.*
- *Supply chain risks have been re-evaluated.*
- *Health care costs are much more difficult to forecast.*

- *This is contentious. We have multiple offices with varying political views so consistent approaches are nearly impossible.*
- *We have evaluated vendors more critically in light of the COVID pandemic.*
- *People are more interested in thinking about what is not insured, and that it is important for stakeholders to think about disasters more prominently than they may have in the past.*
- *COVID-19 was one of the events that was on the radar screen but low probability. There will be a tendency to overweight this in risk scenarios going forward. Perhaps low probability events like this will get more one-off deterministic scenario checks.*
- *I think risk managers are more likely to look at interactions between risks. While I anticipated the quick drop in asset values, I did not expect the Fed and Treasury to be so active so quickly. Now it looks like we might see what happens when Treasury pulls back its stimulus.*

4.8 SECTION D: CURRENT TOPICS

More than a decade after the event, the 14th survey in this series continues to reflect on the period since the global financial crisis. The Current Topics section reflects this, showing changing expectations. It will be interesting to see results from this section in future surveys as the 2020 risk events extend into 2021.

Asked their expectations about the global economy in 2021, respondents were less positive than respondents the previous year, with 56% having a moderate and 16% a good outlook, as shown in Figure 47. At its highest level since 2012, 25% (up from 13%) had poor expectations. As can be seen in Figure 48, combined good and strong expectations fell by a material amount to 19%.

Figure 47

Expectations for the Global Economy

% of Responses in Given Year

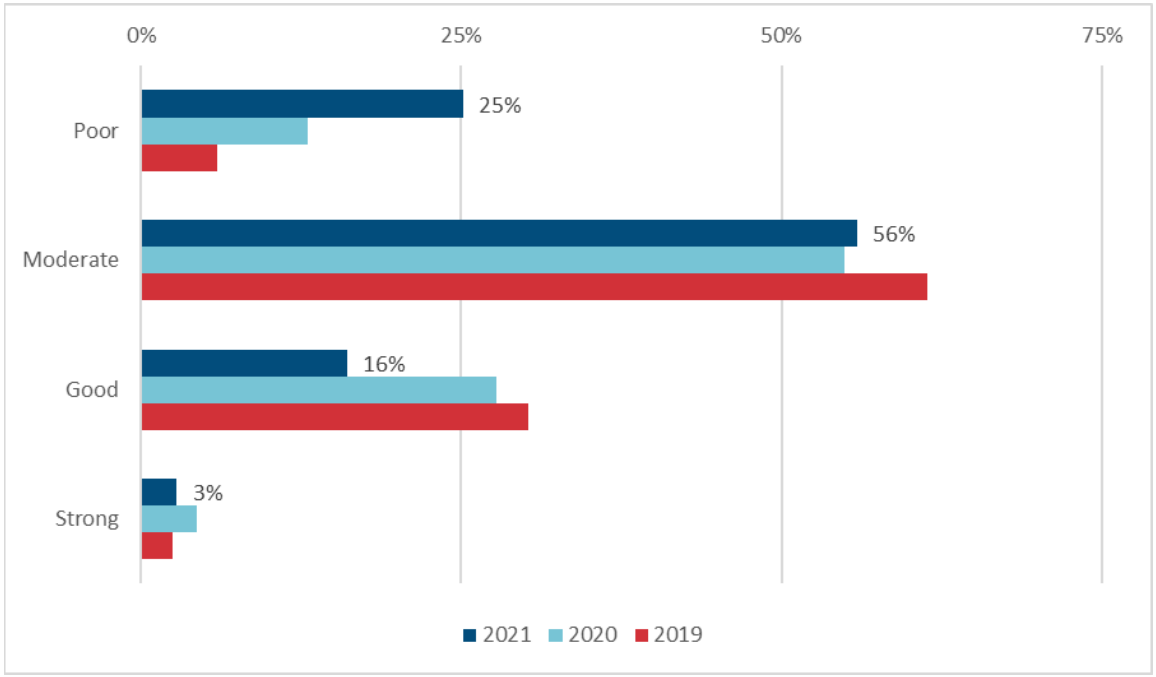
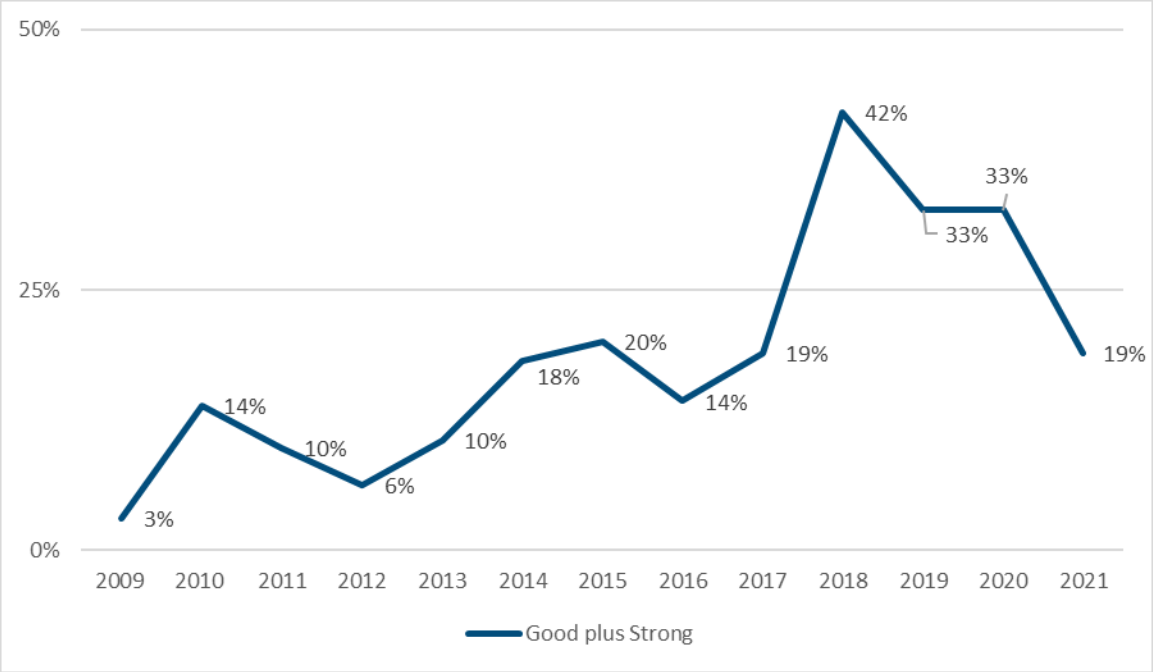


Figure 48
Combined Good and Strong Economic Expectations, 2009–2021

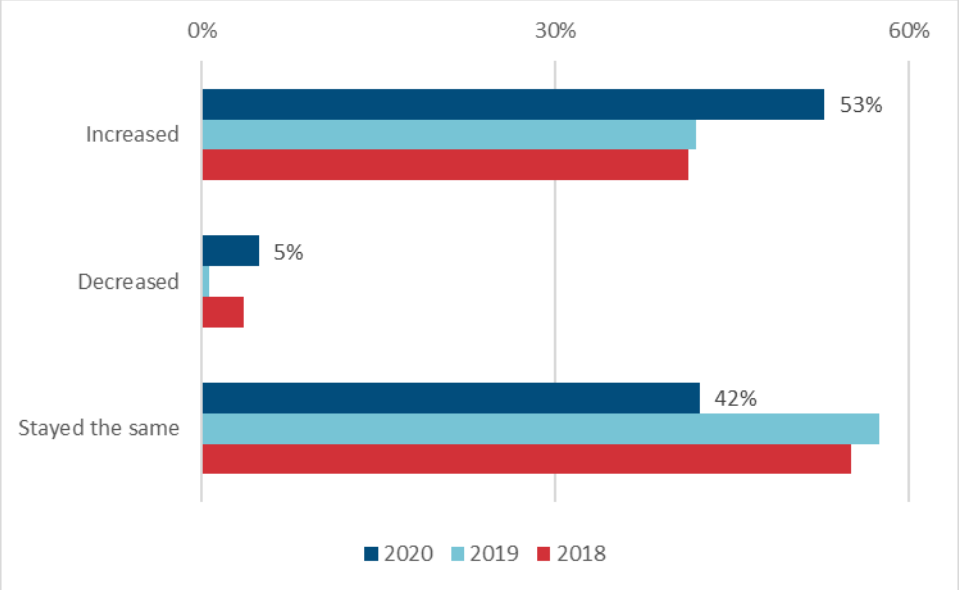
% of Responses in Given Year



Reflecting the higher state of risk perception, most risk managers (53%) reported increased ERM activity in 2020, as shown in Figure 49.

Figure 49
Perceived Level of ERM Activity

% of Responses in Given Year



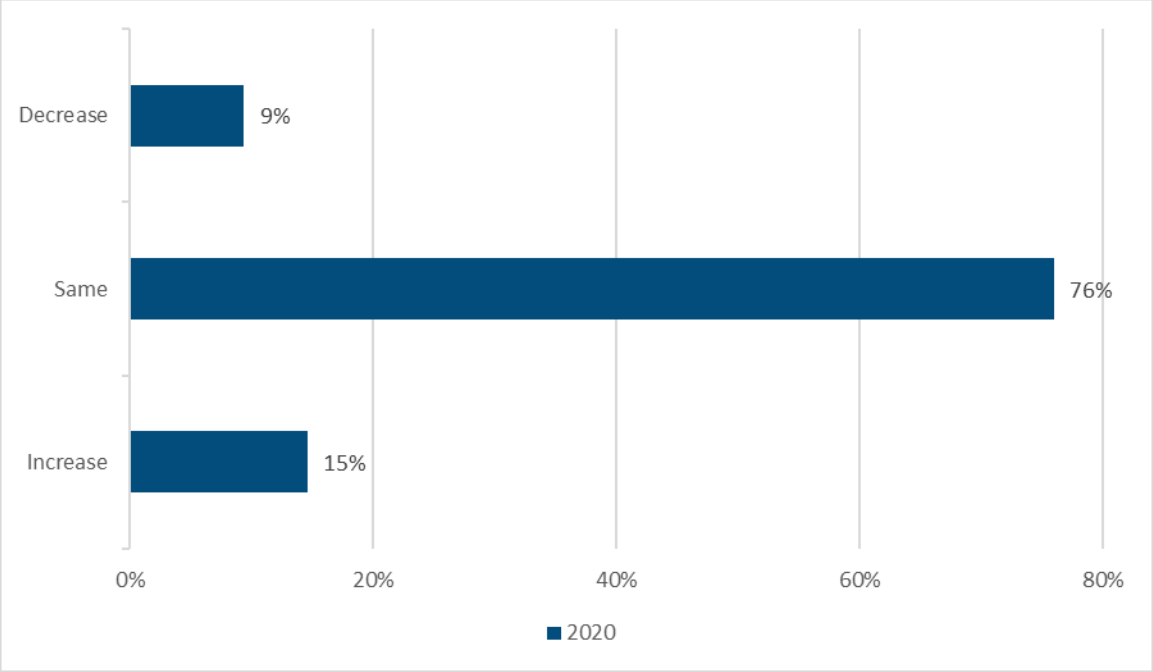
Higher ERM activity led to internal staff growth for only 15% of the respondents in 2020, as shown in Figure 50. Even in a year when risk events were material, staff on average did not grow with nearly as many

reporting decreases as increases in staff. This is a bad sign for the units when things calm down and risk teams are considered a cost center rather than a strategic planning team. (Note that this question was modified somewhat to be consistent with the wording of nearby questions so comparisons to earlier surveys are inappropriate and left out of the chart.)

Figure 50

ERM Internal Staff Growth

% of Responses in Given Year

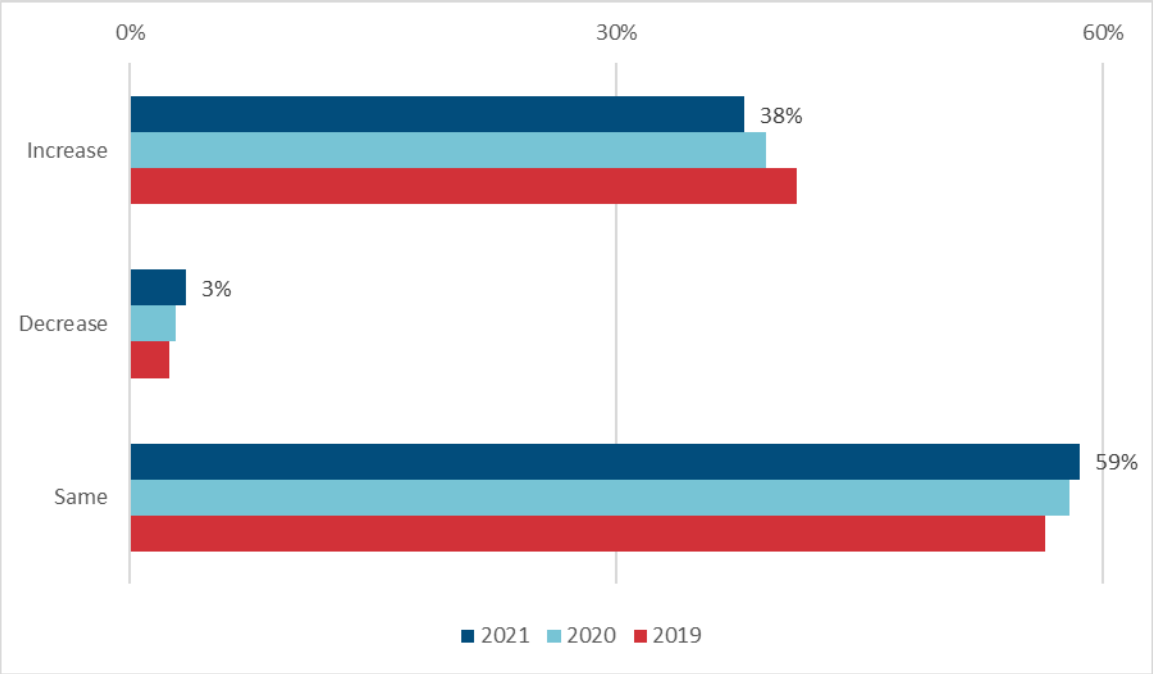


ERM activity is expected to increase for 38% of the respondents in 2021, as shown in Figure 51, with 3% expecting ERM activity to decrease after a pandemic year that also had spikes in other risk events.

Figure 51

ERM Activity Growth 2021

% of Responses in Given Year

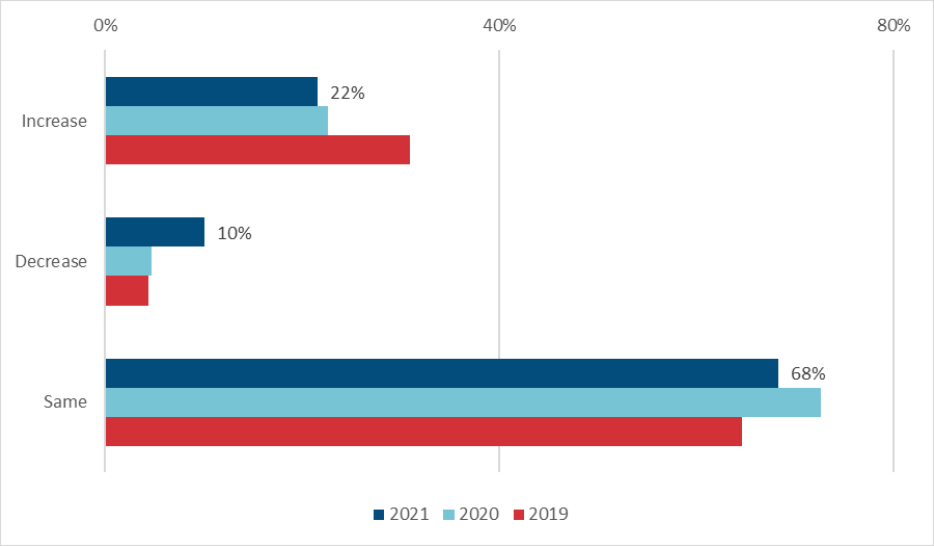


Respondents indicated that levels of funding for ERM are expected to be stable in 2021. Figure 52 shows that 10% expect funding to decrease for the upcoming year.

Figure 52

Anticipated Levels of ERM Funding in 2021

% of Responses to Given Question



Technological risks have grown in importance in this survey over the years. Although *Cyber/networks* took a step back in 2020, *Disruptive technology* continued to meet new highs. Respondents were asked about specific scenarios they use to analyze these risks. They include:

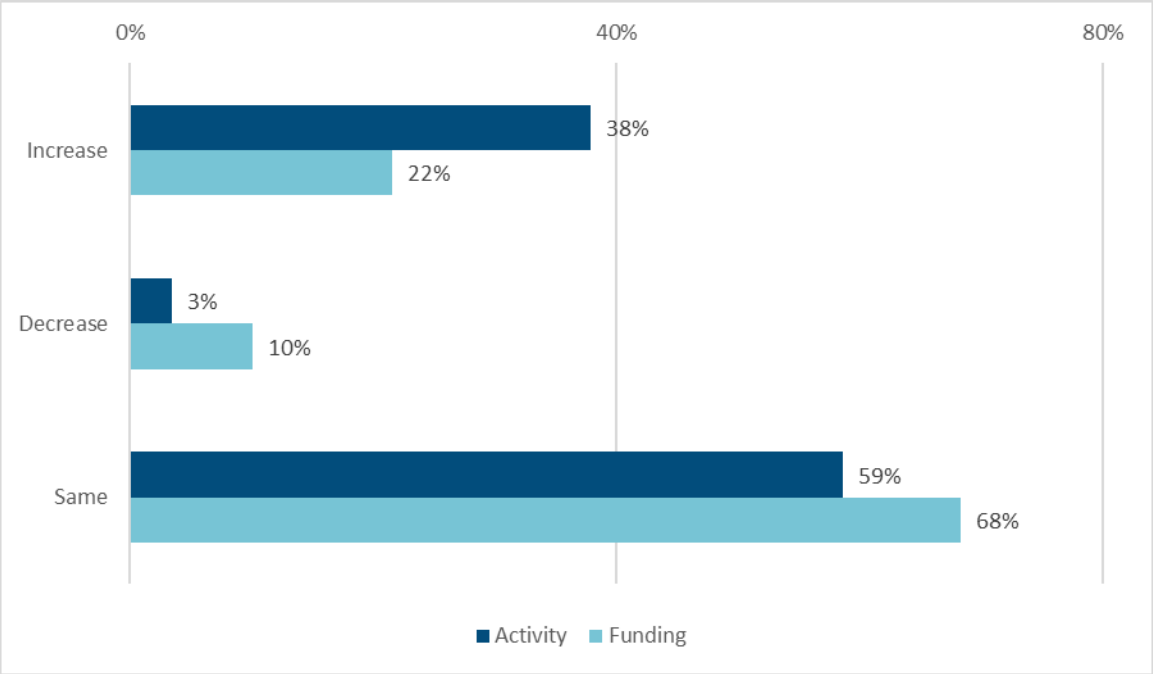
- *We model a "cyber event" scenario which focuses on the expense component of the recovery. The IT area performs a table-top ransomware/malware walk through every year.*
- *Tech companies creating an Uber for insurance that takes substantial market share from traditional insurers but is unregulated.*
- *CRISPR*
- *Need for adequate backup storage.*
- *Network and power outages, hacking, phishing scams, ransomware.*
- *Redundancy, and more redundancy; dispersal of at-risk assets.*

In Figure 53, respondents show that activity levels are expected to increase in 2021 more than funding. This could be due to a perception that risk managers did not anticipate the pandemic, but is a concerning development.

Figure 53

Anticipated Levels of ERM Activity and Funding in 2021

% of Responses to Given Question

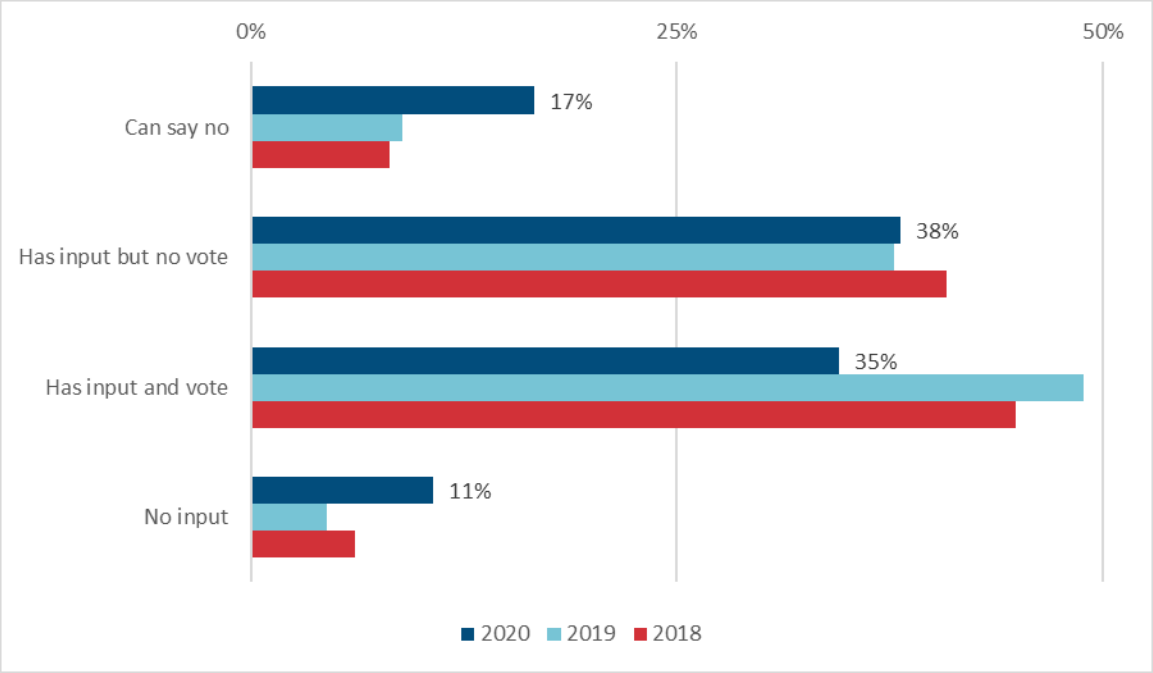


The survey asked how the ERM team is used when a strategic opportunity is presented to a firm. As illustrated in Figure 54, while 89% (down from 96%) of respondents said they can either say no to a strategic opportunity and/or have input, the number without input appears to be growing.

Figure 54

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:

- *The Board, CEO and Senior Management have recognized the CRO for leading the company's COVID response.*
- *The CEO of my organization is an actuary, and has e-mails and videos, and messages to investors, that highlight ERM topics, especially during this pandemic. It is constantly part of her messaging.*
- *Our team was recognized for being able to transition to remote work quickly, showcasing all the planning over the past years being worth the effort.*
- ***AM Best has favorably received improvements to my clients' rating agency ERM packets - they weren't close to change in rating but with little expense moved in a positive way***

Many risk managers view risk as two-sided, with opportunities drawn from the same tools and data sets used for risk mitigation. Identifying trends and leading indicators earlier than your competitors can provide an advantage. The survey asked which emerging "opportunities" are being monitored. In this survey, responses included asset class opportunities as well as waiting until excesses had worked off. Here are some specific examples:

- *Mortality and longevity risk offset*
- *Investments in health care delivery companies*
- *We are monitoring newly formed captives and relatively new insurers as opportunities to take advantage of mispricing and diversification.*
- *We do not try to arbitrage*
- ***The pandemic was an opportunity to benefit from a digital and technology driven distribution model.***

Respondents were asked if they had identified bubbles. Only one indicated concern with the general concept. Debt of various kinds, shadow banks and localized real estate markets were suggested:

- ***Not sure what you are asking***
- ***Much of the annuity risk. Certain Asian economies.***
- *You have to wonder about today's stock market, especially with respect to where the countries stand in their response to Covid...*
- ***Liquidity everywhere***
- *I am concerned valuations of "growth" companies are excessively high, particularly in digital and health care industries; acquisition costs are far too steep except for the most "cash rich" companies*
- ***Some pharmaceutical companies, and bitcoin.***
- *Real estate, given much less use of commercial property, and people stressed to pay mortgages and rent.*
- ***BBB- bonds, especially if Fed takes away safety net, most equities, housing, anything with collateralized in the name***
- *Historically, bubble only recognized in hindsight. Caution and cut-offs at growth triggers, regret of missed additional upside never as painful as burst.*

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:

- *Correlations between defaults and interest rates (historical links seem broken). Diversification of assets is key.*
- *COVID in 2021, planning on a return to normal but keeping track of what to do if it doesn't*
- *Taxes. Climate events. Risk mitigation includes diversification and purchase of insurance.*
- *The rising cost of expensive medications; it is clear this will continue to rise in cost, but we need to seek more proactive solutions to manage and contract with providers versus increasing premiums or purchasing reinsurance*
- *Cyber insurance product for data breach, data restoration, business interruption*
- *There are so many future gene and cell therapies on the horizon that will further escalate health care trend.*
- *Future path of inflation. We are aware that the range of inflation outcomes is very wide now. Strong risk of explosive inflation over next 20-30 years but no way to predict.*
- ***Climate change - hitting tipping points - use qualitative scenarios and try to convert into quantitative analysis - tell a story***

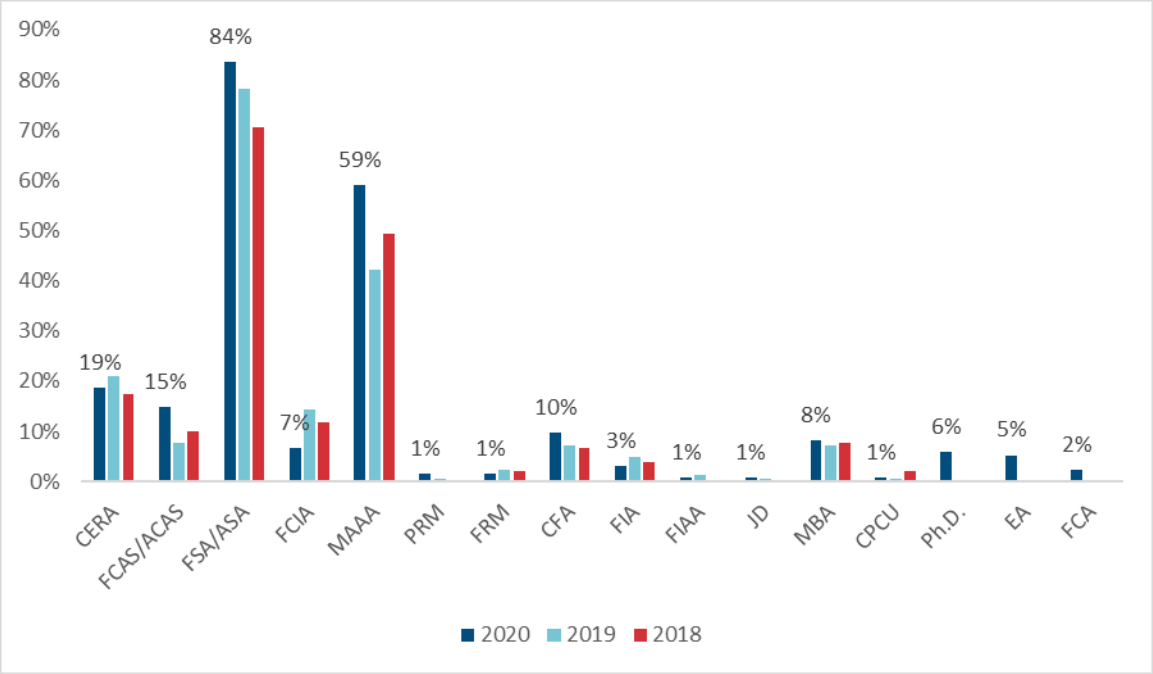
4.9 SECTION E: DEMOGRAPHICS

Each year, the *Survey of Emerging Risks* is distributed using targeted emails and social media. For this survey, 52% reported filling out the survey in the past. Those holding the CERA credential from an actuarial organization represented 19% of the total. One of the sponsors, the JRMS, was well represented in the survey, with 84% of respondents holding a credential from the SOA, 15% from the CAS and 7% from the CIA (see Figure 55). Other groups strongly represented were CFA charter holders (10%), those holding the FIA credential from the Institute of Actuaries (3%), those with a master's degree in business administration (8%) and those with a Ph.D. (6%). Many respondents held multiple credentials.

Figure 55

Credentials Held by Respondents

% of Responses in Given Year

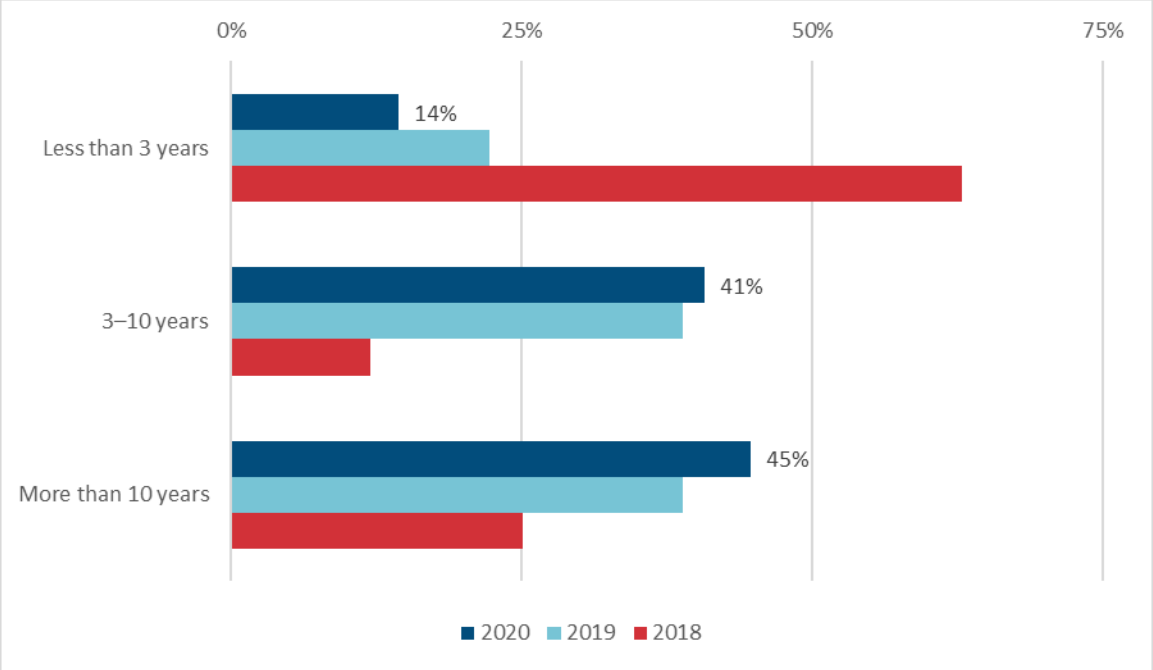


This year's survey was completed by more experienced practitioners, with only 14% having less than three years of experience as risk managers (see Figure 56). The researcher is again indebted to respondents who share their experiences. Most respondents work at an insurer/reinsurer (63%) or consulting firm (25%).

Figure 56

Respondents' Risk Management Experience

% of Responses in Given Year



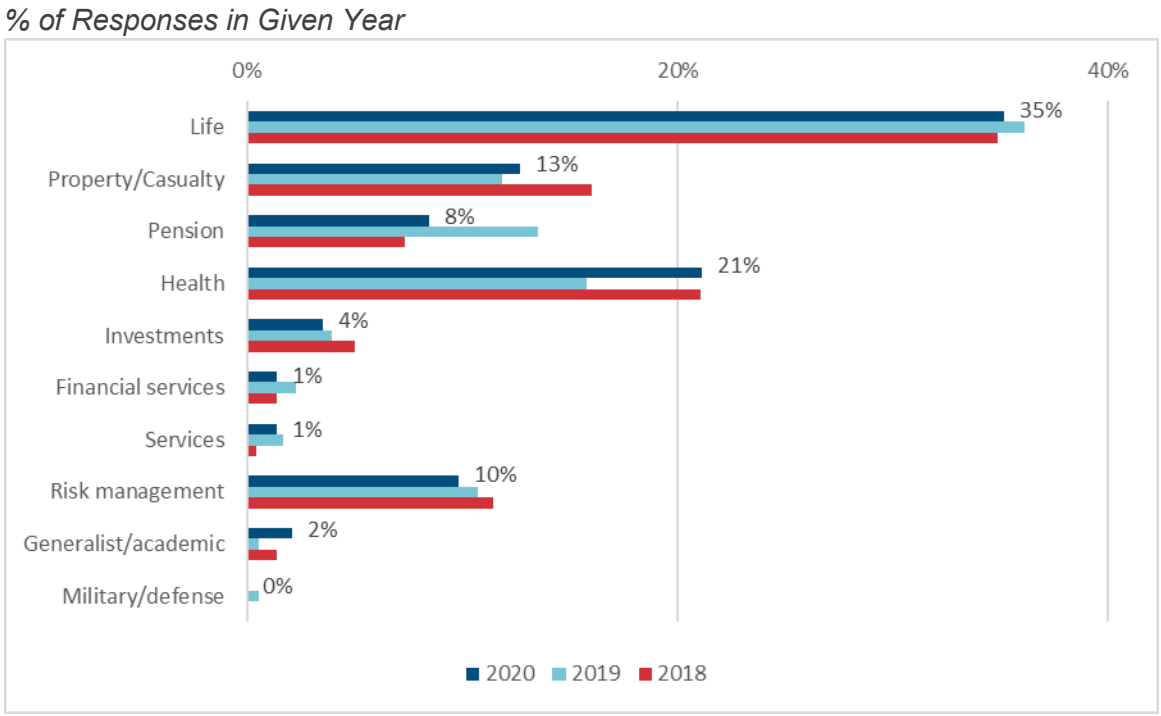
The survey was sent directly to all JRMS, INARM and IAA AFIR-ERM members, some targeted social media groups on LinkedIn and Twitter, and to the members of many SOA sections.

The survey continued to be dominated by North Americans (89%), with a significant minority coming from Europe (4%) and Asia (4%). 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 57, the primary areas of practice were led by life insurance, health, pensions, property/casualty and risk management.

Figure 57

Respondents' Practice Areas



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 you. Many respondents shared news services, the *Wall Street Journal*, magazines (e.g., *The Economist*, *Insurance ERM*, *National Geographic*), reinsurer and consultant publications, rating-agency reports, seminars, blogs, government agencies, professional actuarial organizations (e.g., the IAA, IFOA, CAS, SOA and CIA), the WEF, the CDC and WHO, and the CRO Forum. Others conducted Delphi studies, spoke with underwriters and other experts, 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:

- *Add cyclones to tropical storms*
- *consider loss of freedom/tyranny and government money printing as additional risks.*
- *Add "regime takeover" as a risk category*
- *Review Chinese destabilization risk name and definition*
- *Can we examine the risk of model oversimplification or improper models?*
- *I appreciate the consistency of questions and risk categories, but the world has evolved substantially over the past 15 years. It may be time for a refresh.*
- *Add customized questions by life, health and P/C business*
- *this survey should/must also accommodate undergraduate students studying degrees like actuarial science, insurance, and risk management, etc., such that this group will grasp better skills and experience in answering questions from similar surveys in the future.*
- *For Figure showing risk combinations selected consider using a Stacked Area Chart, so it's easier to understand Total in relation to the components. Also, think about dropping the Remaining line, because (a) it goes to say that as more combinations are selected, combinations remaining is falling at the inverse rate, and (b) having the top lines cross rather than a 100% scale being filled is visually confusing. (Ed. Note: this was done in Appendix II) Ed. Note: first part of this comment was implemented in Appendix II but not preferred. Points a and b were implemented.*
- *Combinations table in Appendix II should be larger, perhaps rotated to a full page - done*
- *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*

Appendix I: Glossary of Risks

Initially, 23 core risks were defined by the World Economic Forum in *Global Risks 2007: A Global Risk Network Report*. An active link for the report can be found at https://www.mccombs.utexas.edu/~/media/Files/MSB/Centers/CRMI/GlobalRisks2007.pdf. What follows is a description of the current 23 risks used by the *Survey of Emerging Risks*.

Economic Risks

- Energy price shock—Energy prices change abruptly.
- Currency shock—Material disruptions to currency equilibrium. Central banks may engage in currency wars.
- Chinese destabilization—China's economic growth slows, potentially as a result of protectionism, demographics, internal political, 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, shellfish), and human lives. (Drivers include, but are not limited to, space weather and human influence.)
- Loss of freshwater services—Water shortages impact agriculture, businesses, and human lives. (Drivers include, but are not limited to, climate change and human influence.)
- Natural catastrophe: tropical storms—Hurricanes and typhoons lead to disruption, catastrophic economic losses, and/or high human loss of life.
- Natural catastrophe: earthquakes—Strong seismic/volcanic activity leads to disruption, catastrophic economic losses, and/or high human loss of life.
- Natural catastrophe: severe weather—Meteorological phenomena lead to disruption, catastrophic economic losses, and/or high human loss of life. Includes inland flooding, tornados, thunderstorms, drought, wildfires, high winds, snowstorms, and dust storms.

Geopolitical Risks

- Terrorism—Attacks lead to disruption, catastrophic economic losses, and/or high human loss of life.
- Weapons of mass destruction—Nuclear, biological, radiological, or chemical technologies 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, and trade wars. 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 and cardiovascular become widespread. Material changes to medical delivery.
- Demographic shift—Evolving populations (e.g., age, size, race, migration trends) 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 (i.e., 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 lead to disruption and/or catastrophic economic losses (e.g., drones, self-driving cars, additive manufacturing, the internet of things, nanoparticles).

Evolution of Risks

The survey has attempted to maintain consistent risk definitions as much as possible.

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.

Appendix II: 14th Survey Results (Compiled Fall 2020)

This appendix includes the survey as well as the responses. There were 188 respondents. Not all of the respondents answered every question. The percentages reflect the number of responses received, divided by the number who answered the specific question. Some 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*.

The following text introduced the survey to recipients via email.

> ## Take Part in the 14th Survey of Emerging Risks
>
> The Joint Risk Management Section of the Canadian Institute of Actuaries, the Casualty Actuarial Society, and the Society of Actuaries is overseeing an online survey to help understand individual risk managers' perspectives on emerging risks. We value your insights and invite you to participate in this annual survey.
>
> **Please complete this survey by Nov. 23rd.** 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 jschuh@soa.org.
>
> Thank you for your participation.

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

> Emerging risks have either not previously occurred or have not occurred for so long that they are not considered possible. The lack of credible historical data creates a formidable challenge for risk managers. While completing the survey, please consider a time horizon that extends beyond a business plan time frame (often 3–5 years).
>
> This survey is sponsored by 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. 23, 2020**.

A glossary of terms is available for reference: Glossary of risks 2020. [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
	Spring 2008	1,385.59	113.70	1.56
	Fall 2008	968.75	68.10	1.27
	Fall 2009	1,106.41	77.04	1.48
	Fall 2010	1,176.19	84.49	1.40
End of September	Fall 2011	1,131.42	78.93	1.34
	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

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 $113.70 and one euro cost $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 doubling of the S&P 500, much lower prices for oil and a stronger dollar.

Default Question Block

> 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 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.

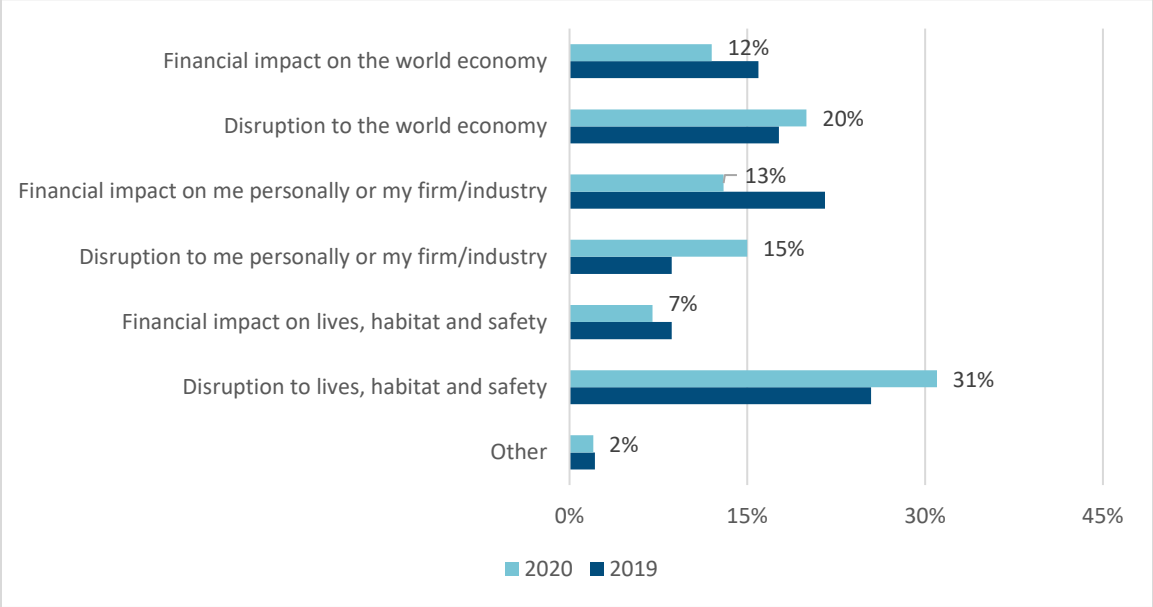
The original list of risks was developed by the World Economic Forum (WEF) for their inaugural Global Risks Survey. There is a balance required between keeping the list current and being able to show trends. The WEF has regularly updated its list, despite a stated time horizon of 10 years, and recent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

188 total responses

- 22 responses (12%/16%) Financial impact on the world economy
- 37 responses (20%/18%) Disruption to the world economy
- 25 responses (13%/22%) Financial impact on me personally or my firm/industry
- 28 responses (15%/9%) Disruption to me personally or my firm/industry
- 13 responses (7%/9%) Financial impact on lives, habitat and safety
- 59 responses (31%/25%) Disruption to lives, habitat and safety
- 4 responses (2%/2%) Other
    - *Financial and reputational impacts on the firm which is P&C North-American Insurer*
    - *Geopolitical conflict.*
    - *Disruption leading to financial impact on my firm/industry*
    - *Prepare for tradeoffs, alternatives, options for inevitable interruptions of plans.*

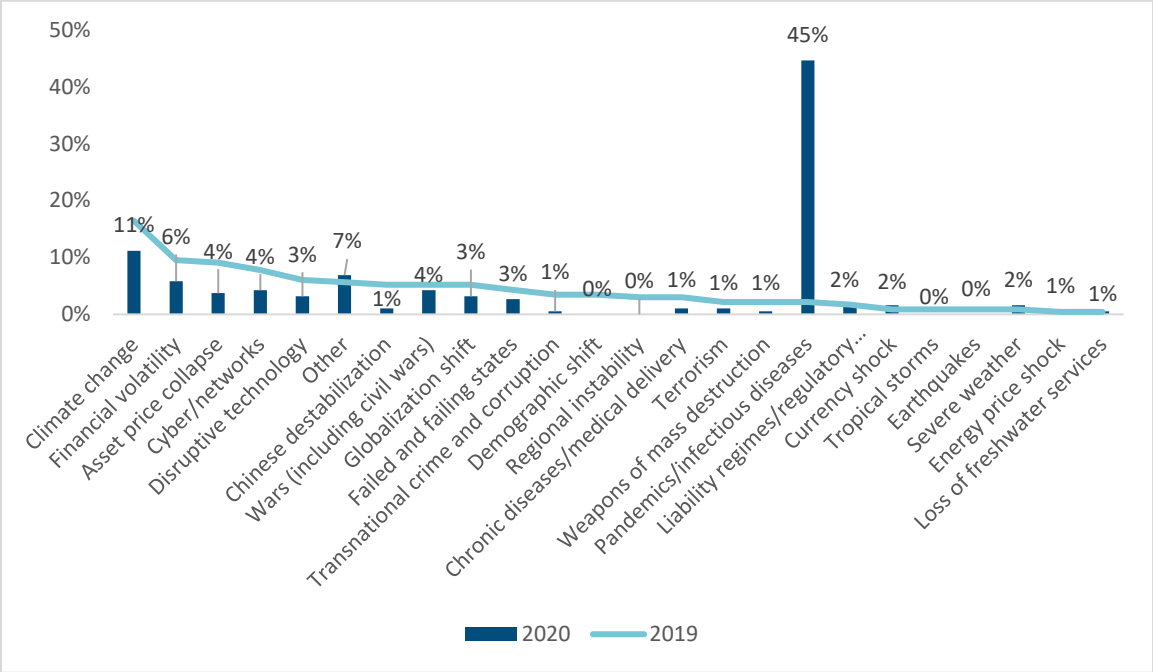
Greatest Impact



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, when previous results were above 2%, **boldface** is used to indicate a five percentage point increase or doubling, and *italics* indicate a five percentage point decrease or halving. The leading responses are numbered 1 through 5 to the left of the terms for those risks. This practice is found throughout Appendix II.

188 total responses

In the detail shown in this appendix, the amounts in parentheses are shown with the most recent to the far left and as you move to the right the responses for previous surveys are shared. The numbers listed in a column prior to the risk name show the top five risks for the question, including ties.

Economic—24 responses (13%/25%/24%/22%/27%/33% in 2020/2019/2018/2017/2016/2015)

• 1 response	(1%/0%/0%/1%/2%/4%)		Energy price shock
• 3 responses	(2%/1%/2%/0%/0%/2%)		Currency shock
• *2 responses*	*(1%/5%/3%/1%/2%/4%)*		*Chinese destabilization*
• *7 responses*	*(4%/9%/8%/10%/10%/10%)*		*Asset price collapse*
• 11 responses	(6%/10%/11%/9%/12%/12%)	3	Financial volatility

Environmental—25 responses (13%/19%/17%/16%/13%/15%)

• *21 responses*	*(11%/16%/12%/11%/10%/8%)*	*2*	*Climate change*
• 1 response	(1%/0%/1%/1%/1%/2%)		Loss of freshwater services

• 0 responses	(0%/1%/3%/2%/0%/1%)		Natural catastrophe: tropical storms
• 0 responses	(0%/1%/0%/1%/0%/1%)		Natural catastrophe: earthquakes
• 3 responses	(2%/1%/2%/0%/1%/3%)		Natural catastrophe: severe weather

Geopolitical—23 responses (12%/26%/24%/33%/29%/19%)

• 2 *responses*	*(1%/2%/4%/6%/6%/6%)*		*Terrorism*
• *1 response*	*(1%/2%/3%/6%/4%/2%)*		*Weapons of mass destruction*
• 8 responses	(4%/5%/3%/6%/4%/4%)	T4	Wars (including civil wars)
• 3 responses	(3%/4%/5%/4%/5%/2%)		Failed and failing states
• *1 response*	*(1%/3%/2%/2%/1%/0%)*		*Transnational crime and corruption*
• 6 responses	(3%/5%/5%/4%/8%/1%)		Globalization shift
• *0 responses*	*(0%/3%/3%/5%/0%/4%)*		*Regional instability*

Societal—89 responses (47%/10%/11%/10%/9%/12%)

• 84 responses	**(45%/2%/2%/3%/4%/3%)**	**1**	**Pandemics/infectious diseases**
• *2 responses*	*(1%/3%/2%/1%/0%/0%)*		*Chronic diseases/medical delivery*
• *0 responses*	*(0%/3%/4%/2%/2%/3%)*		*Demographic shift*
• 1 response	(2%/2%/3%/4%/3%/5%)		Liability regimes/regulatory framework

Technological—14 responses (7%/14%/19%/18%/15%/18%)

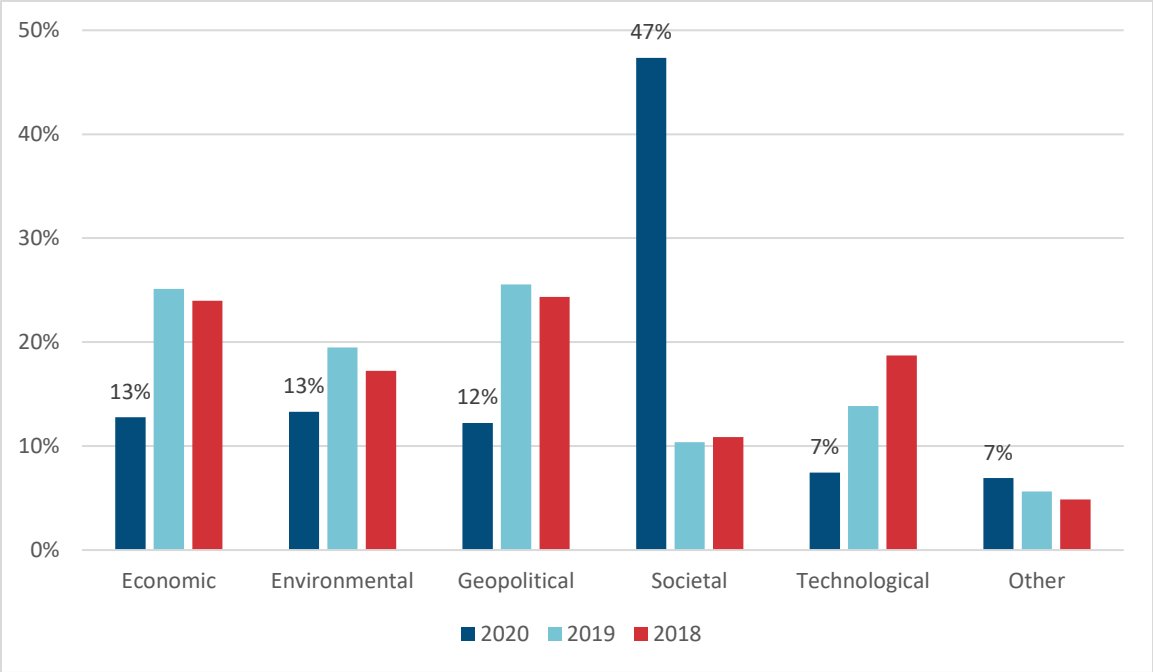
• *8 responses*	*(4%/8%/12%/13%/11%/15%)*	*T4*	*Cyber/networks*
• *6 responses*	*(3%/6%/7%/6%/4%/3%)*		*Disruptive technology*

Other—13 responses (7%/6%/5%/1%/7%/3%)

- *Low interest rates*
- *Rebelling against God*
- *Model error*
- *Extremely low interest rate environment*
- *Loss of freedom*
- *Shift from free markets to command economies*
- *Political Risk*
- *Increased fracturing of US citizenry leading to domestic terrorism and potential failure of the democratic experiment which is the USofA*
- *Destabilizing political trends leading to bad socioeconomic policy.*
- *Social unrest*

- *Disinformation crippling the ability properly respond to challenges*
- *Rise of nationalism and populism and breakdown of societal institutions*
- *"Regime shift" in political/economic sense. Broader than China destabilize, failed states, etc. Game theory - players decide to break comity, rules change.*

Current Risk with Greatest Impact



The categories of risks having the current greatest impact were:

- Economic 13%/25%/24%/22%/27%/33% in 2020/2019/2018/2017/2016/2015
- Environmental 13%/19%/17%/16%/13%/15%
- Geopolitical 12%/26%/24%/33%/29%/19%
- Societal 47%/10%/11%/10%/9%/12%
- Technological 7%/14%/19%/18%/15%/18%
- Other 7%/6%/5%/1%/7%/3%

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.

863 total responses from 183 surveys

Average of 4.72 risks selected per survey (4.68 in prior survey)

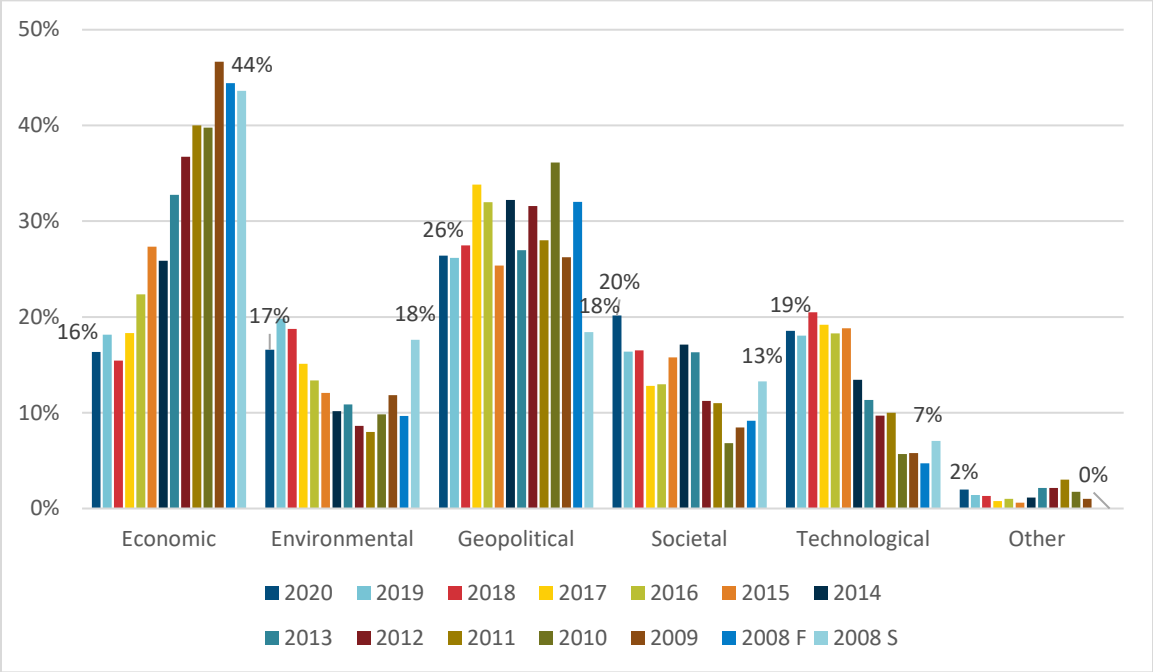
Divisor in percentages for major categories is 863; for individual risks, it is 183. Note that due to multiple responses, the sum of all percentages will be materially greater than 100%.

Number of responses selected (maximum of 5):

- 1: 4 surveys (1%)
- 2: 0 surveys (2%)

- 3: 9 surveys (3%)
- 4: 18 surveys (11%)
- 5: 152 surveys (84%)

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



Economic—141 responses (16%/18%/15%/18%/22%/27%/26%/33%/37%/40%/40%/47%/44%/44% in November 2020, November 2019, November 2018, November 2017, November 2016, November 2015, October 2014, October 2013, October 2012, October 2011, October 2010, December 2009, November 2008, April 2008, usually listed as 2019/2018/2017/2016/2015/2014/2013/2012/2011/2010/2009/F2008/S2008)

• 8 responses	(4%/7%/6%/5%/10%/14%/13%/7%/31%/32%/40%/45%)		Energy price shock
• 13 responses	(7%/7%/7%/7%/10%/14%/7%/27%/26%/25%/49%/66%)		Currency shock
• *27 responses*	*(15%/23%/15%/16%/17%/25%/27%/28%/31%/32%/41%/33%)*		*Chinese destabilization*
• 37 responses	(20%/21%/19%/30%/26%/31%/31%/30%/24%/22%/31%/49%)		Asset price collapse
• 56 responses	(31%/29%/27%/29%/43%/45%/44%/59%/62%/68%)	5	Financial volatility

Environmental—143 responses (17%/20%/19%/15%/13%/12%/10%/11%/9%/8%/10%/12%/10%/18%)

• 92 responses	(50%/54%/49%/29%/28%/26%/19%/16%/20%/14%/25%/27%)	1	Climate change
• 14 responses	(8%/12%/13%/11%/9%/8%/8%/9%/11%/6%/9%/10%)		Loss of

		freshwater services
• 13 responses	(7%/8%/8%/16%/8%/6%/5%/8%/6%/5%/4%/8%)	Natural catastrophe: tropical storms
• *4 responses*	*(2%/4%/6%/6%/9%/7%/5%/6%/2%/6%/5%/7%)*	*Natural catastrophe: earthquakes*
• *20 responses*	*(11%/16%/12%/10%/9%/10%/11%/11%/1%/4%/2%/5%)*	*Natural catastrophe: severe weather*

Geopolitical—228 responses (26%/26%/27%/34%/32%/25%/32%/27%/32%/28%/36%/26%/32%/18%)

• 35 responses	(19%/17%/23%/41%/39%/37%/41%/27%/28%/20%/43%/30%)	Terrorism
• 15 responses	(8%/9%/13%/21%/9%/8%/9%/5%/14%/9%/18%/14%)	Weapons of mass destruction
• 46 responses	(25%/25%/18%/19%/16%/19%/19%/13%/14%/10%/10%/9%)	Wars (including civil wars)
• 33 responses	(18%/19%/25%/14%/21%/18%/28%/29%/33%/42%/38%/18%)	Failed and failing states
• 21 responses	(11%/12%/12%/14%/10%/5%/10%/8%/5%/3%/12%/7%)	Transnational crime and corruption
• 46 responses	**(25%/20%/20%/20%/30%/6%/8%/13%/13%/11%/25%/18%)**	**Globalization shift**
• *32 responses*	*(17%/22%/18%/31%/26%/26%/37%/29%/42%/32%/25%/28%)*	*Regional instability*

Societal—174 responses (20%/16%/17%/13%/13%/16%/17%/16%/11%/11%/7%/8%/9%/13%)

• 82 responses	**(45%/22%/25%/14%/16%/17%/30%/19%/12%/13%/22%/30%) 3**	**Pandemics/ infectious diseases**
• 22 responses	(12%/12%/8%/8%/6%/8%/5%/3%/3%/2%/4%/4%)	Chronic diseases/ medical delivery
• *46 responses*	*(25%/33%/32%/23%/24%/26%/23%/30%/30%/30%/26%/27%)*	*Demographic shift*
• 24 responses	(13%/11%/12%/16%/15%/24%/22%/23%/8%/7%/6%/6%)	Liability regimes/

			regulatory framework

Technological—160 responses (19%/18%/20%/19%/18%/19%/14%/11%/10%/10%/6%/6%/5%/7%)

• 86 responses	(47%/51%/56%/53%/53%/65%/58%/47%/40%/38%/23%/21%)	2	Cyber/networks
• 74 responses	**(40%/35%/40%/38%/34%/24%/5%/5%/6%/5%/4%/7%)**	**4**	**Disruptive technology**

Other—17 responses (2%/7%/1%/6%/1%/1%/1%/1%/2%/2%/3%/2%/1%/4%/4%)

- *Civil unrest encouraged by godless leaders*
- *National debt(s)*
- *Natural catastrophe: solar flare*
- *Deterioration of social trust*
- *Geopolitical changes*
- *Ineffectiveness of the United States as a world leader*
- *Loss of freedom, imposition of tyranny*
- *Natural catastrophe: forest fires*
- *Political Risk*
- *American destabilization*
- *Destruction of Electrical Grids (via any means: terrorism, natural disaster, etc.)*
- *Weaponization of misinformation*
- *Inequality within each nation leading to polarized political parties*
- *Social unrest*
- *Godlessness*
- *Regime change, sudden shift in perspective of players that game has changed.*
- *Infrastructure deterioration*

Another way to review this data is as a percentage of the total responses. For example, *Climate change* had 92 responses in this survey. In the previous analysis just shared, 92/190 = 50%. In the following tables, we will look at 92/863 = 11% and compare the results with the average across all of the surveys and against other questions in the current survey. **Bold** signifies higher than the average in the current survey, and *italics* signifies lower than the average.[12]

Results are presented with the average across all 14 surveys first, then listing each result starting with the most recent survey.

Economic (31% average—16%/18%/15%/18%/22%/27%/26%/33%/37%/40%/40%/47%/43%/42%)

• 5%—1%/1%/1%/1%/2%/3%/3%/2%/6%/7%/9%/10%/8%/13%	*Energy price shock*
• 5%—2%/1%/1%/1%/2%/3%/1%/6%/5%/6%/10%/14%/10%/9%	*Currency shock*
• 6%—3%/5%/3%/3%/4%/5%/6%/6%/7%/7%/9%/7%/6%/9%	*Chinese destabilization*
• 6%—4%/4%/4%/6%/5%/6%/7%/7%/5%/5%/6%/10%/14%/5%	*Asset price collapse*

[12] 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%.

• *9%—6%/6%/6%/6%/9%/9%/9%/13%/13%/15%*	*Financial volatility*

Environmental (13%—17%/20%/19%/15%/13%/12%/10%/11%/9%/8%/10%/12%/9%/17%)

• **6%—11%/11%/11%/6%/6%/6%/4%/4%/4%/3%/5%/6%/5%/9%**	**Climate change**
• 2%—2%/3%/3%/2%/2%/2%/2%/2%/2%/1%/2%/2%/2%/3%	Loss of freshwater services
• 2%—2%/2%/2%/3%/2%/1%/1%/2%/1%/1%/1%/2%/1%/2%	Natural catastrophe: tropical storms
• *1%—0%/1%/1%/1%/2%/1%/1%/1%/0%/1%/1%/1%/1%/2%*	*Natural catastrophe: earthquakes*
• 2%—2%/3%/3%/2%/2%/2%/2%/2%/0%/1%/0%/1%/0%/1%	Natural catastrophe: severe weather

Geopolitical (29%—26%/26%/27%/34%/32%/25%/32%/27%/32%/28%/36%/26%/31%/18%)

• *6%—4%/4%/5%/9%/8%/8%/9%/6%/6%/4%/9%/6%/6%/4%*	*Terrorism*
• *3%—2%/2%/3%/4%/2%/2%/2%/1%/3%/2%/4%/3%/3%/4%*	*Weapons of mass destruction*
• **3%—5%/5%/4%/4%/3%/4%/4%/3%/3%/2%/2%/2%/2%/3%**	**Wars (including civil wars)**
• *5%—4%/4%/5%/3%/4%/4%/6%/6%/7%/9%/8%/4%/6%/2%*	*Failed and failing states*
• 2%—2%/3%/2%/3%/2%/1%/2%/2%/1%/1%/3%/2%/2%/2%	Transnational crime and corruption
• **4%—5%/4%/4%/4%/6%/1%/2%/3%/3%/2%/5%/4%/5%/2%**	**Globalization shift**
• *6%—4%/5%/4%/7%/5%/6%/8%/6%/9%/7%/5%/6%/7%/1%*	*Regional instability*

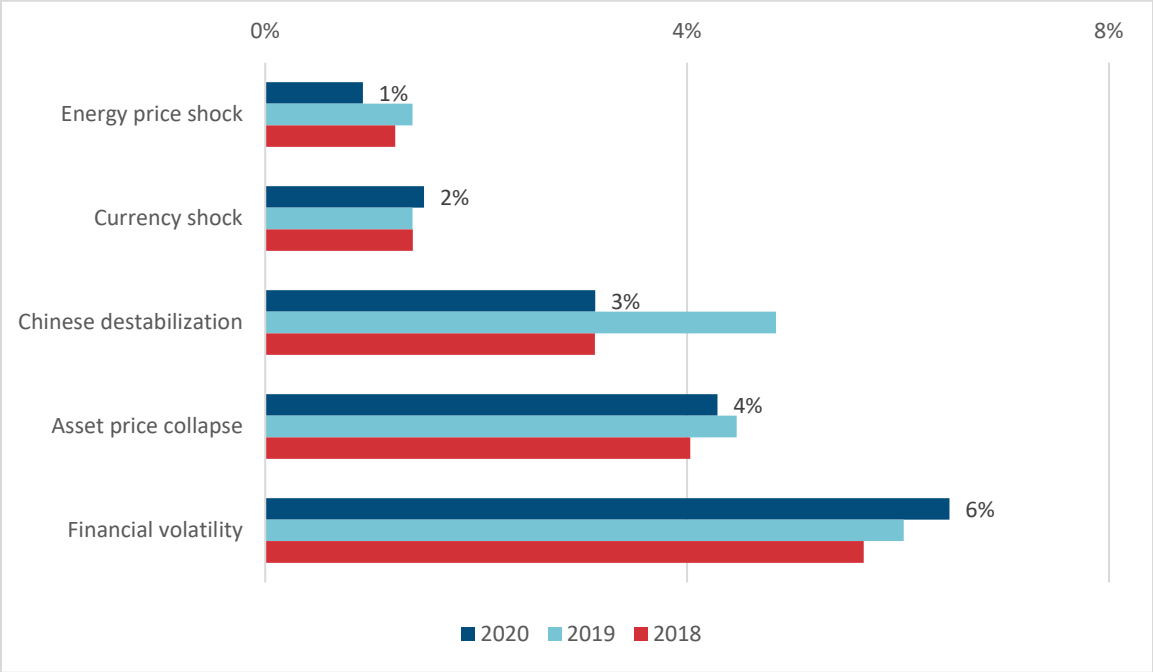
Societal (13%—20%/16%/17%/13%/13%/16%/17%/16%/11%/11%/7%/8%/9%/12%)

• **5%—10%/5%/5%/3%/3%/4%/6%/4%/3%/3%/5%/6%/7%/8%**	**Pandemics/infectious diseases**
• **1%—3%/3%/2%/2%/1%/2%/1%/1%/1%/2%/1%/1%/1%/2%**	**Chronic diseases/medical delivery**
• *6%—5%/7%/7%/5%/5%/6%/5%/6%/6%/7%/6%/6%/5%/6%*	*Demographic shift*
• 3%—3%/2%/3%/3%/3%/5%/5%/5%/2%/2%/1%/1%/1%/2%	Liability regimes/regulatory framework

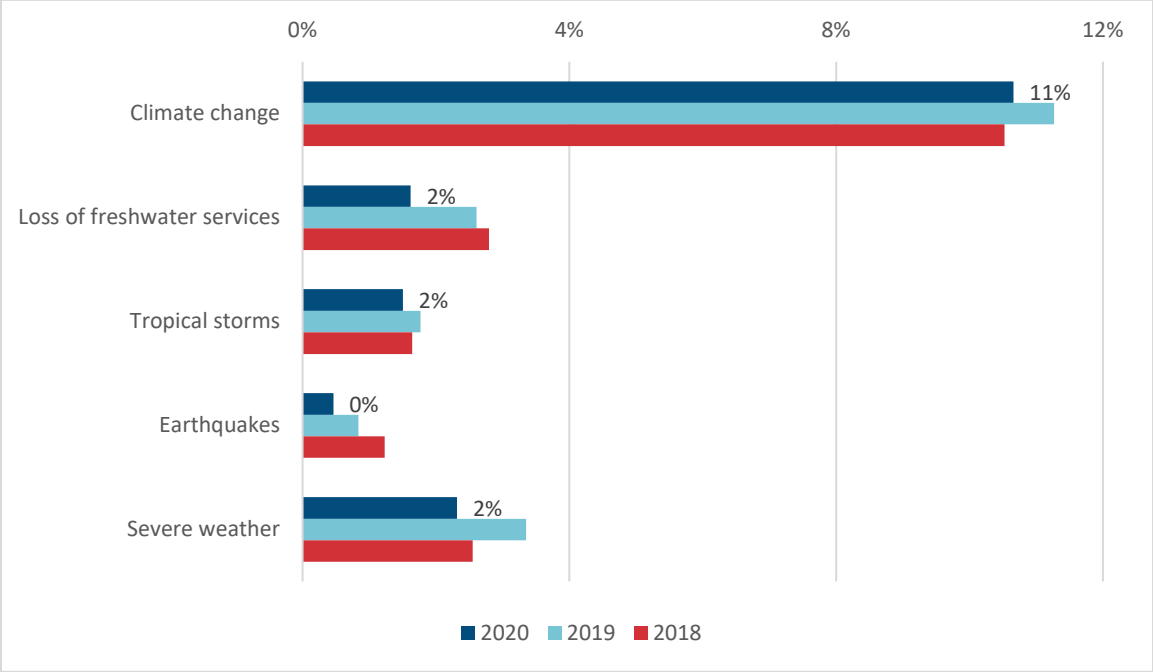
Technological (13%—19%/18%/20%/19%/18%/19%/13%/11%/10%/10%/6%/5%/4%/7%)

• **9%—10%/11%/12%/11%/11%/14%/12%/10%/8%/8%/5%/4%/3%/5%**	**Cyber/networks**
• **4%—9%/7%/9%/8%/7%/5%/1%/1%/1%/1%/1%/1%/1%/2%**	**Disruptive technology**

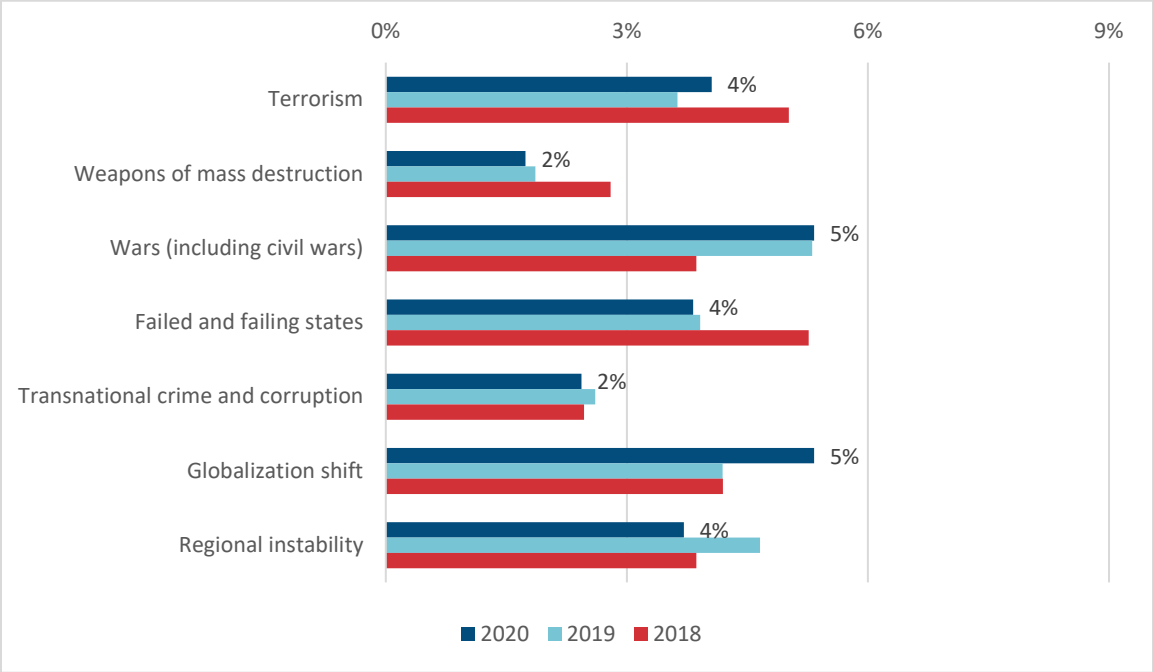
Emerging Risk Trends – Economic (% of Total)



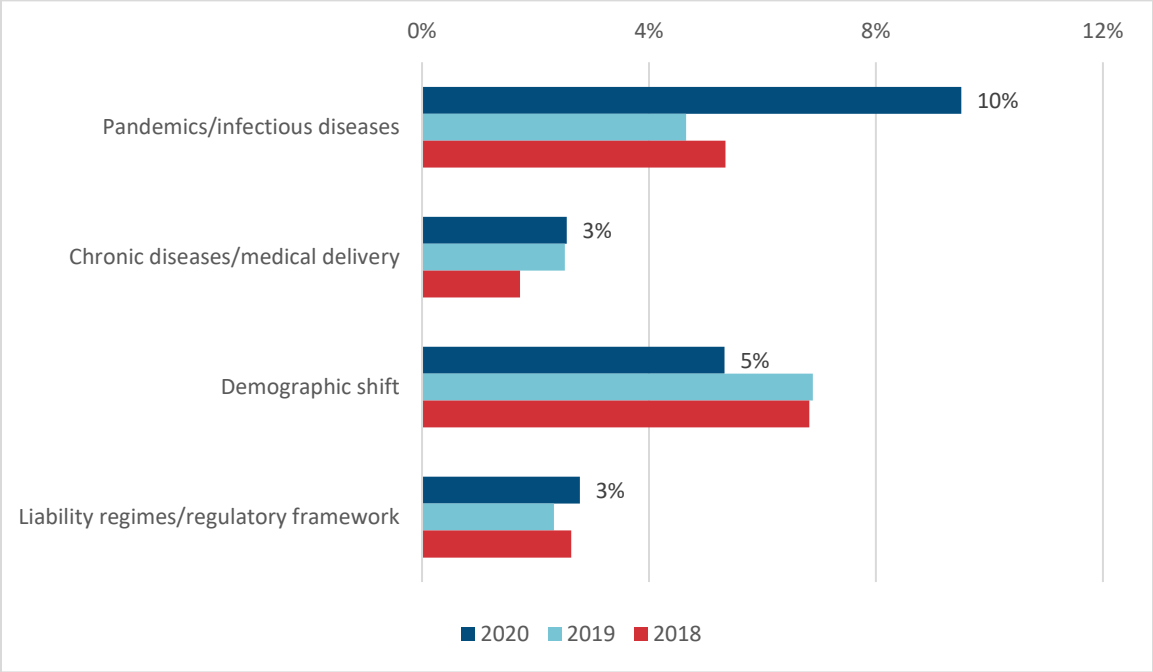
Emerging Risk Trends – Environmental (% of Total)



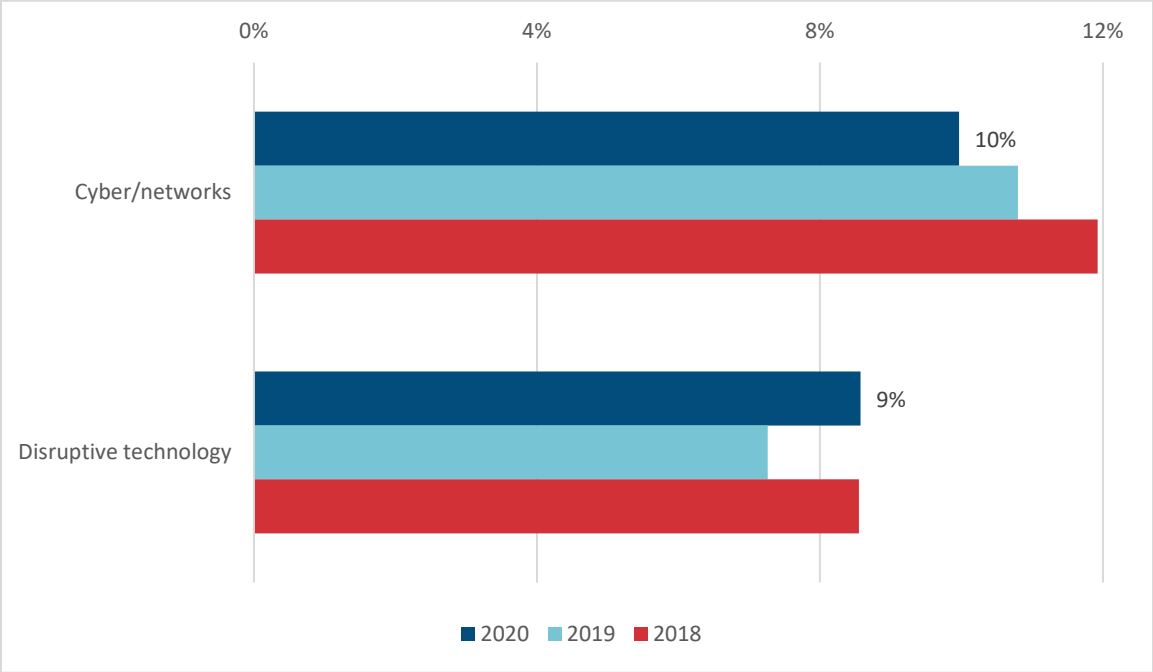
Emerging Risk Trends – Geopolitical (% of Total)



Emerging Risk Trends – Societal (% of Total)

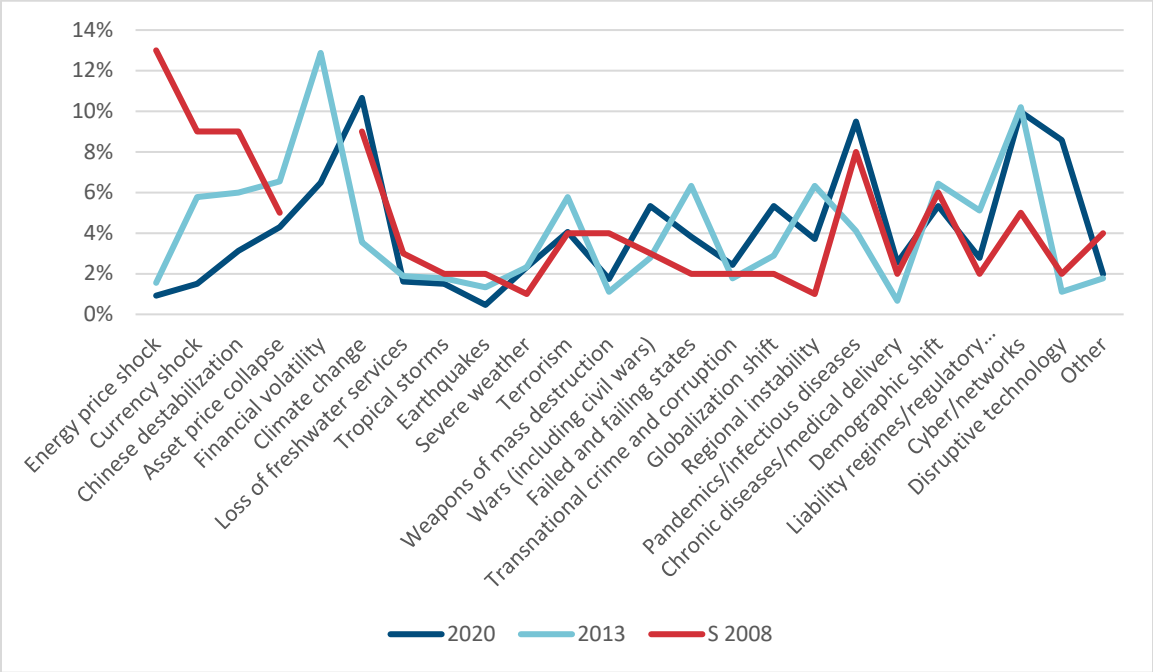


Emerging Risk Trends – Technological (% of Total)



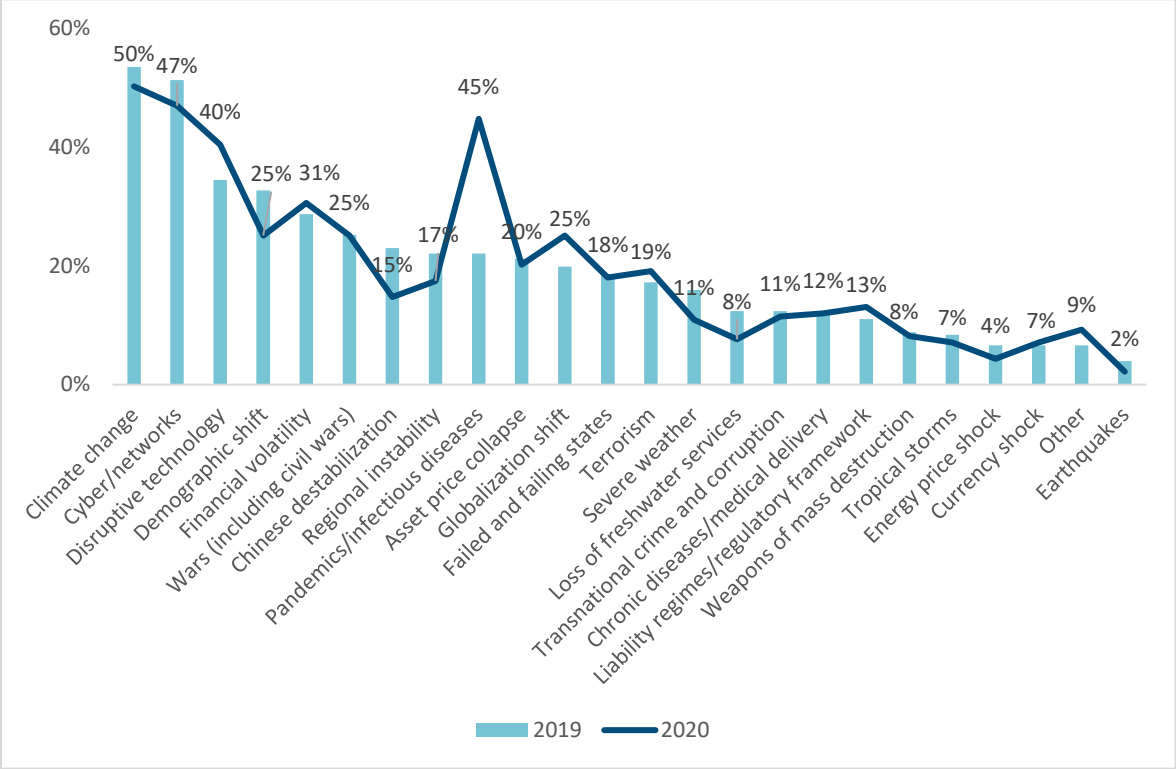
Top Five Emerging Risks as Percentage of Total (Not by Number of Surveys)																
		2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	F 2008	S 2008	Average
1	Energy price shock	1%	1%	1%	1%	2%	*3%*	3%	2%	6%	7%	9%	10%	8%	13%	5%
2	Currency shock	2%	1%	1%	1%	2%	*3%*	1%	6%	5%	6%	10%	14%	10%	9%	5%
3	Chinese destabilization	3%	5%	3%	3%	4%	*5%*	6%	6%	7%	7%	9%	7%	6%	9%	6%
4	Asset price collapse	4%	4%	4%	6%	5%	*6%*	7%	7%	5%	5%	6%	10%	14%	5%	7%
5	Financial volatility	6%	6%	6%	6%	9%	*9%*	9%	13%	13%	15%					10%
6	Climate change	11%	11%	11%	6%	6%	6%	4%	4%	4%	3%	5%	6%	5%	9%	6%
7	Loss of freshwater services	2%	3%	3%	2%	2%	2%	2%	2%	2%	1%	2%	2%	2%	3%	2%
8	Tropical storms	2%	2%	2%	3%	2%	1%	1%	2%	1%	1%	1%	2%	1%	2%	2%
9	Earthquakes	0%	1%	1%	1%	2%	1%	1%	1%	0%	1%	1%	1%	1%	2%	1%
10	Severe weather	2%	3%	3%	2%	2%	2%	2%	2%	0%	1%	0%	1%	0%	1%	2%
11	Terrorism	4%	4%	5%	9%	8%	8%	9%	6%	6%	4%	9%	6%	6%	4%	6%
12	Weapons of mass destruction	2%	2%	3%	4%	2%	*2%*	2%	1%	3%	2%	4%	3%	3%	4%	3%
13	Wars (including civil wars)	5%	5%	4%	4%	3%	4%	4%	3%	3%	2%	2%	2%	2%	3%	3%
14	Failed and failing states	4%	4%	5%	3%	4%	*4%*	6%	6%	7%	9%	8%	4%	6%	2%	5%
15	Transnational crime and corruption	2%	3%	2%	3%	2%	*1%*	2%	2%	1%	1%	3%	2%	2%	2%	2%
16	Globalization shift	5%	4%	4%	4%	6%	*1%*	2%	3%	3%	2%	5%	4%	5%	2%	4%
17	Regional instability	4%	5%	4%	7%	5%	6%	8%	6%	9%	7%	5%	6%	7%	1%	6%
18	Pandemics/infectious diseases	10%	5%	5%	3%	3%	*4%*	6%	4%	3%	3%	5%	6%	7%	8%	5%
19	Chronic diseases/medical delivery	3%	3%	2%	2%	1%	2%	1%	1%	1%	2%	1%	1%	1%	2%	1%
20	Demographic shift	5%	7%	7%	5%	5%	6%	5%	6%	6%	7%	6%	6%	5%	6%	6%
21	Liability regimes/regulatory framework	3%	2%	3%	3%	3%	5%	5%	5%	2%	2%	1%	1%	1%	2%	3%
22	Cyber/networks	10%	11%	12%	11%	11%	14%	12%	10%	8%	8%	5%	4%	3%	5%	9%
23	Disruptive technology	9%	7%	9%	8%	7%	5%	1%	1%	1%	1%	1%	1%	1%	2%	4%
24	Other	2%	1%	1%	1%	1%	1%	1%	2%	2%	3%	2%	1%	4%	4%	2%

Top Emerging Risks (Choose Up to Five)

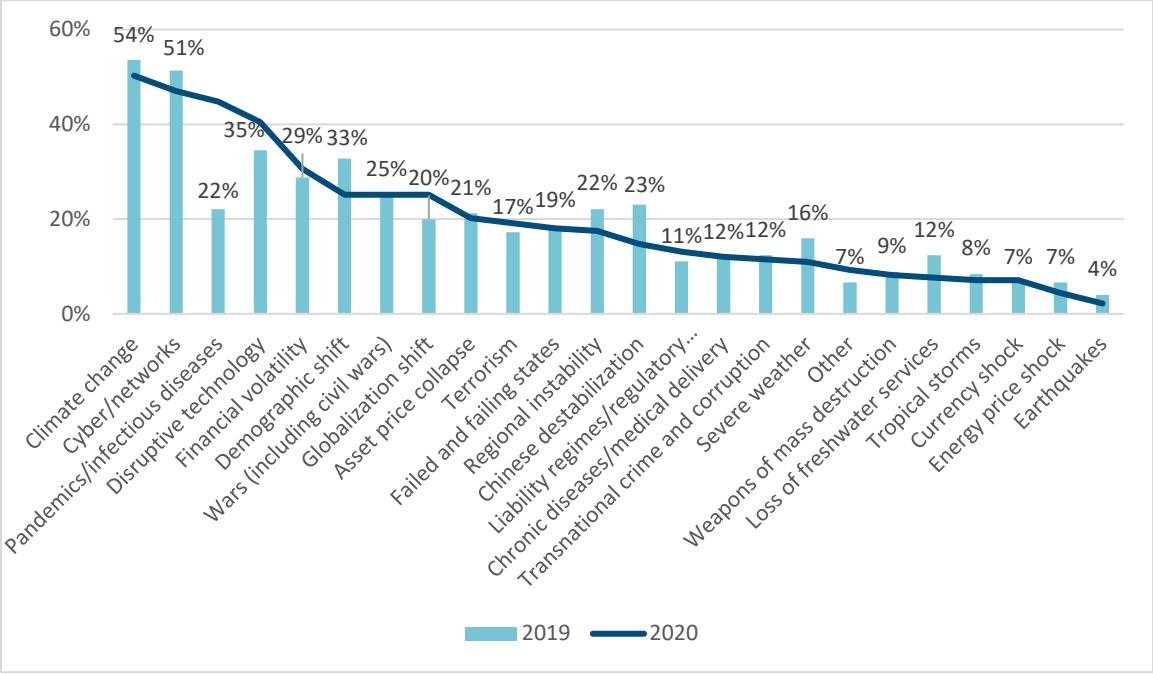


What follows are two versions of the same chart, with the first one sorted based on the prior survey's results. The data labels in the first chart reflect 2020 results.

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.)

178 total responses

Answers in **boldface** are up at least three percentage points; those in *italics* are down at least three percentage points. Top responses are numbered 1 through 5.

Economic—27 responses (15%/18%/13%/20%/27%/30%/31%/44%/54%/56%/48%/63%/65%)

• 1 response	(1%/1%/0%/0%/1%/3%/2%/1%/5%)		Energy price shock
• 4 responses	(2%/0%/1%/0%/0%/2%/1%/5%/7%)		Currency shock
• 7 responses	(4%/4%/2%/2%/2%/7%/5%/6%/5%)		Chinese destabilization
• *3 responses*	*(2%/6%/5%/12%/11%/5%/10%/8%/9%)*		*Asset price collapse*
• 12 responses	(7%/6%/5%/6%/13%/13%/14%/24%/28%)	4	Financial volatility

Environmental—52 responses (29%/32%/26%/9%/8%/8%/5%/6%/6%/4%/7%/12%/4%)

• 46 responses	(26%/27%/22%/7%/6%/6%/3%/4%/5%)	1	Climate change
• 3 responses	(2%/3%/2%/0%/0%/0%/0%/0%/0%)		Loss of freshwater services
• 1 response	(1%/0%/1%/0%/0%/0%/1%/0%/1%)		Natural catastrophe: tropical storms
• 0 responses	(0%/0%/0%/0%/0%/0%/0%/0%/0%)		Natural catastrophe: earthquakes
• 2 responses	(1%/2%/1%/0%/1%/1%/1%/0%)		Natural catastrophe: severe weather

Geopolitical—33 responses (19%/18%/18%/32%/29%/22%/31%/17%/23%/22%/28%/14%/18%)

• 2 responses	(1%/2%/2%/9%/3%/6%/8%/4%/1%)		Terrorism
• 2 responses	(1%/1%/1%/2%/3%/2%/2%/1%/1%)		Weapons of mass destruction
• 9 responses	(5%/3%/3%/4%/4%/4%/3%/2%/3%)	5T	Wars (including civil wars)
• 6 responses	(3%/5%/3%/4%/4%/3%/8%/4%/8%)		Failed and failing states
• 2 responses	(1%/2%/2%/1%/1%/0%/0%/1%/0%)		Transnational crime and corruption
• 9 responses	(5%/3%/4%/4%/10%/0%/2%/1%/3%)	5T	Globalization shift
• 3 responses	(2%/2%/3%/7%/3%/6%/8%/4%/7%)		Regional instability

Societal—28 responses (16%/9%/12%/11%/8%/10%/16%/13%/6%/5%/4%/2%/2%)

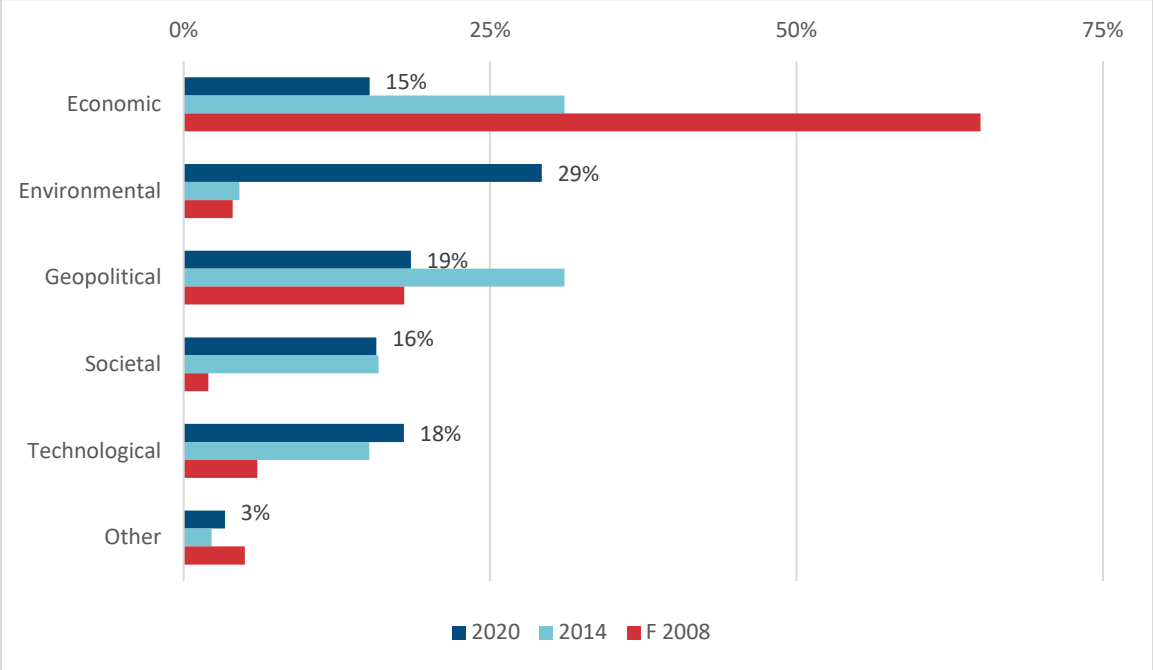
• 15 responses	**(8%/2%/4%/0%/2%/1%/3%/1%/1%)**	**3**	**Pandemics/infectious diseases**
• 2 responses	(1%/0%/2%/1%/0%/0%/0%/0%/1%)		Chronic diseases/medical delivery
• 7 responses	(4%/5%/5%/3%/3%/1%/4%/3%/2%)		Demographic shift
• 4 responses	(2%/2%/2%/6%/3%/7%/9%/10%/2%)		Liability regimes/regulatory framework

Technological—32 responses (18%/21%/28%/26%/24%/28%/15%/15%/8%/8%/9%/6%/6%)

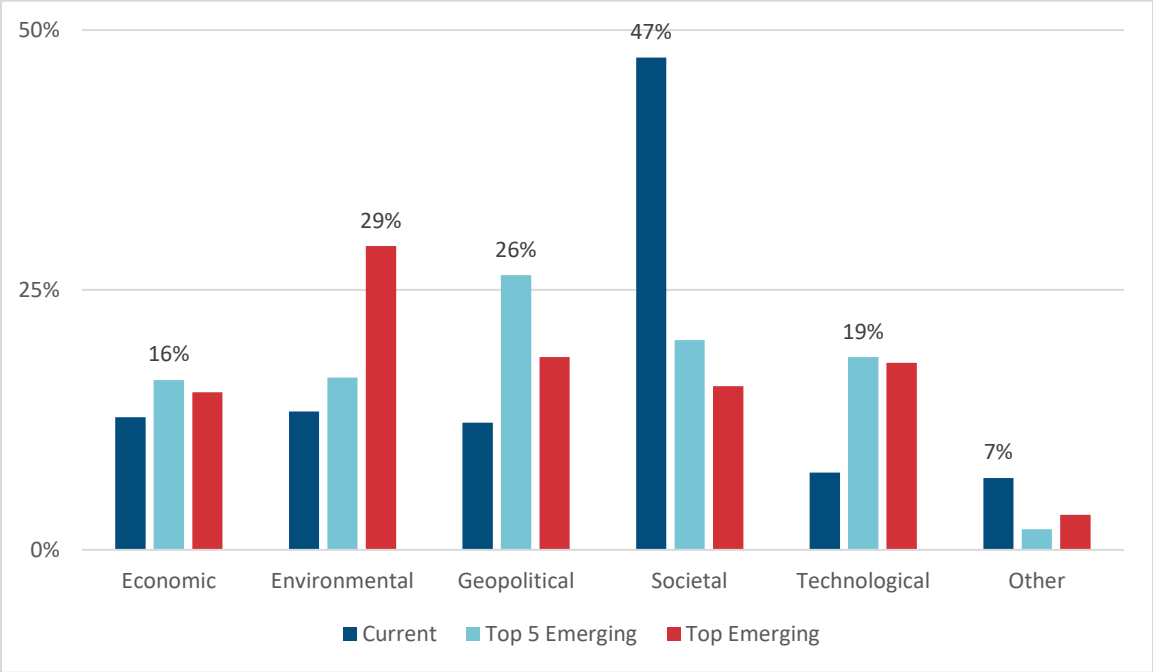
• 6 responses	*(3%/10%/15%/16%/17%/23%/14%/14%/7%)*		*Cyber/networks*
• 26 responses	**(15%/11%/13%/10%/7%/5%/1%/1%/1%)**	**2**	**Disruptive technology**

Other—6 responses (3%/3%/3%/3%/2%/3%/1%/2%/6%/4%/5%/3%/3%/3%)

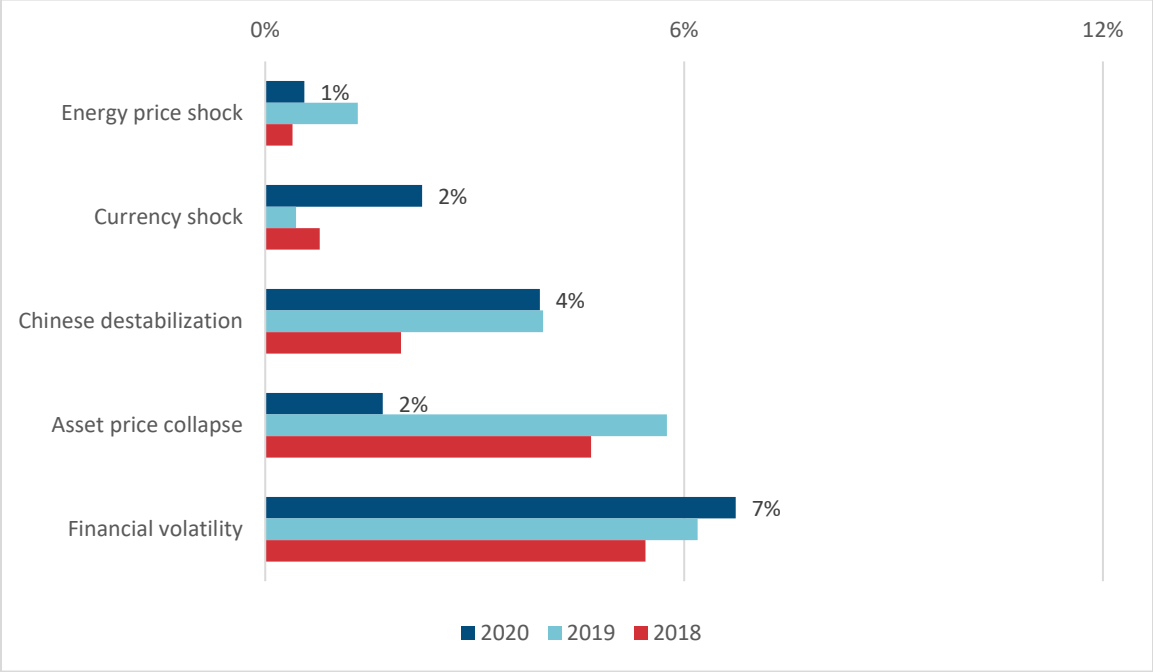
Top Emerging Risks by Category – Single Greatest Impact



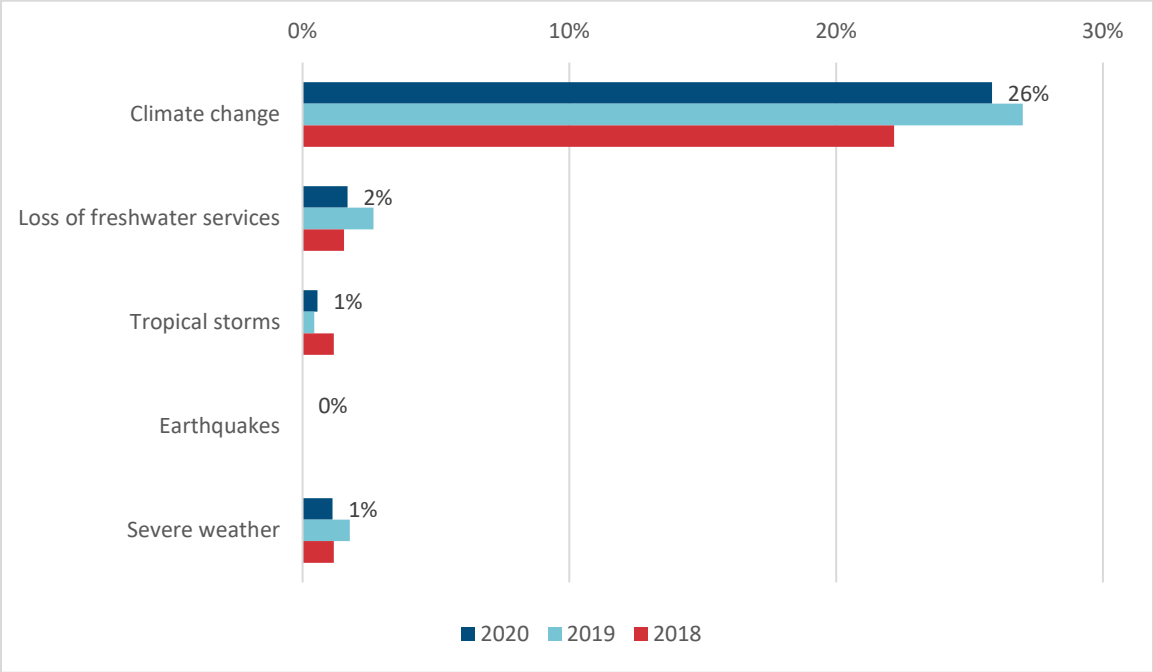
Category Comparison Across Three Questions



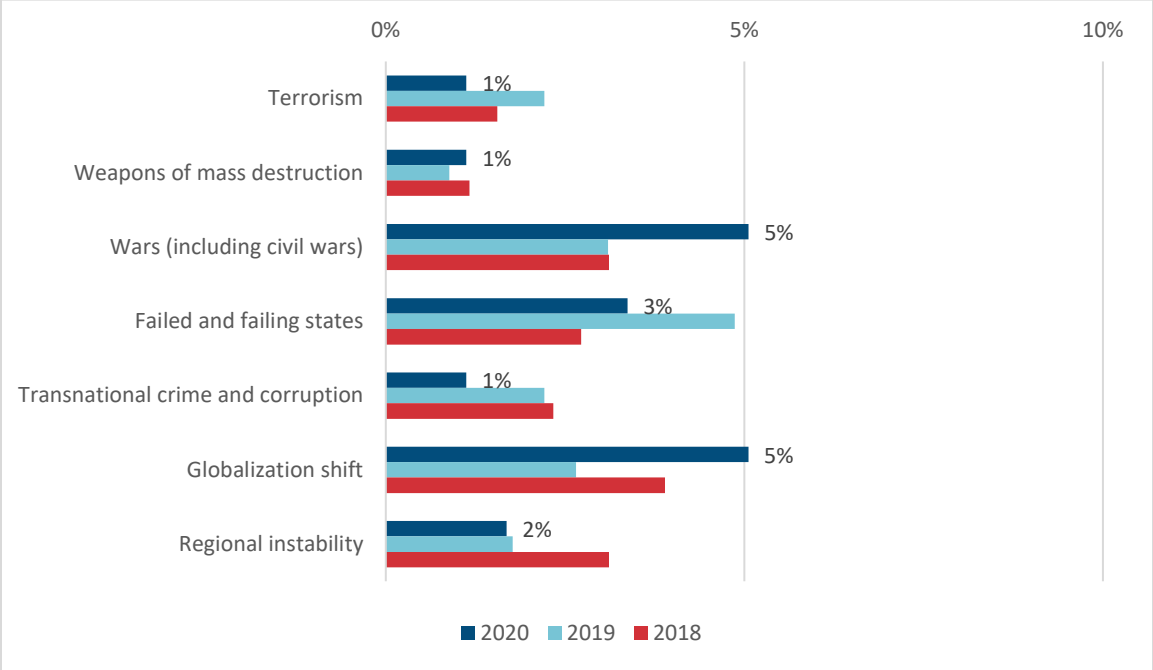
Top Emerging Risks – Economic (% of Total)



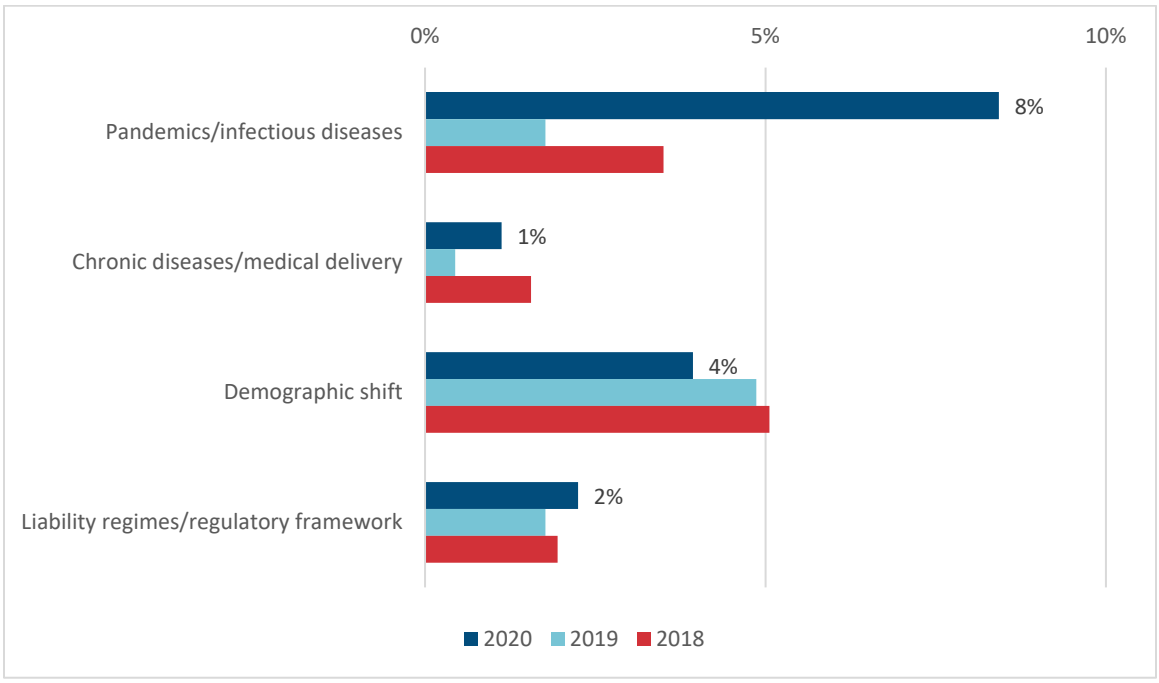
Top Emerging Risks – Environmental (% of Total)



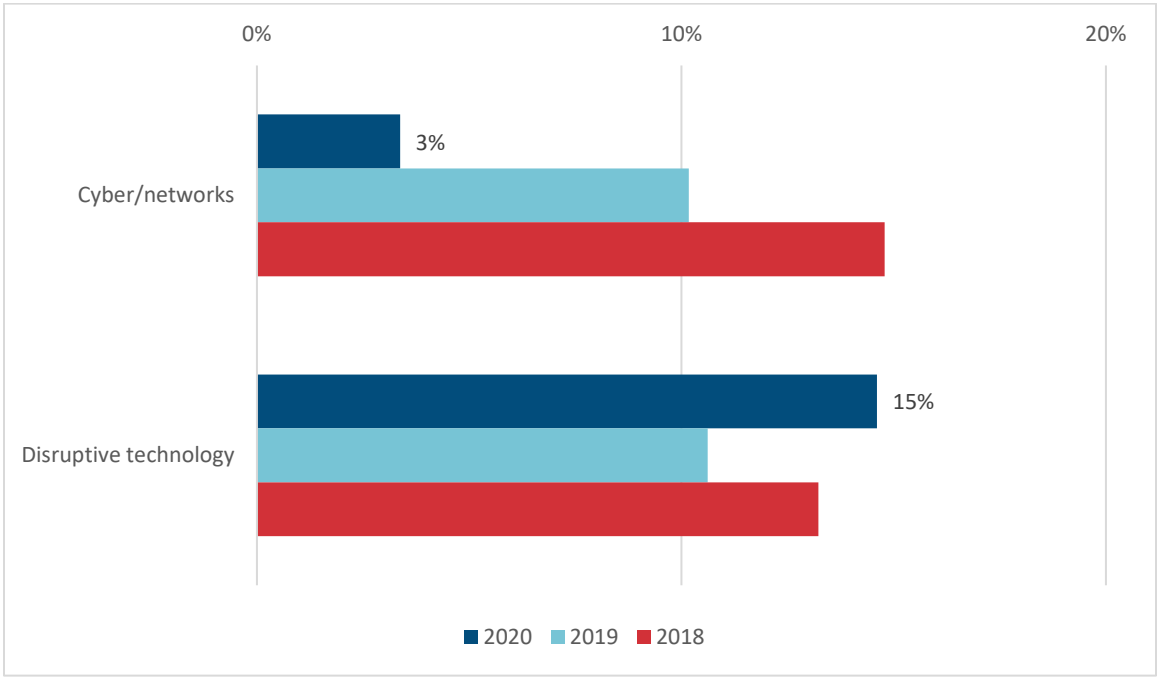
Top Emerging Risks – Geopolitical (% of Total)



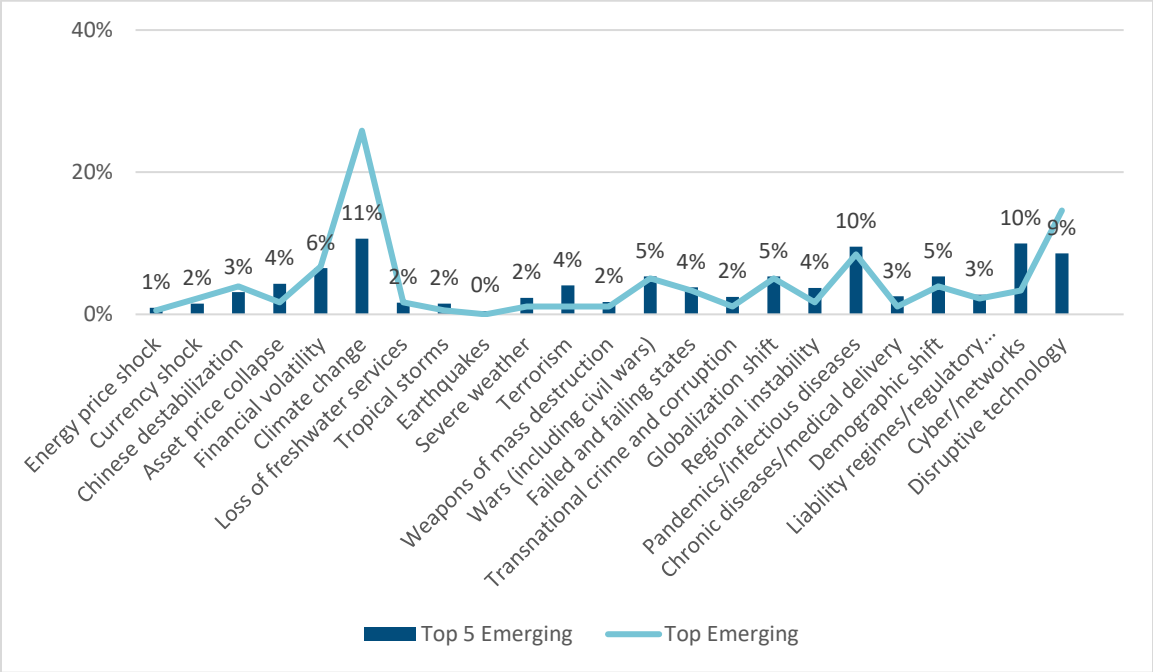
Top Emerging Risks – Societal (% of Total)



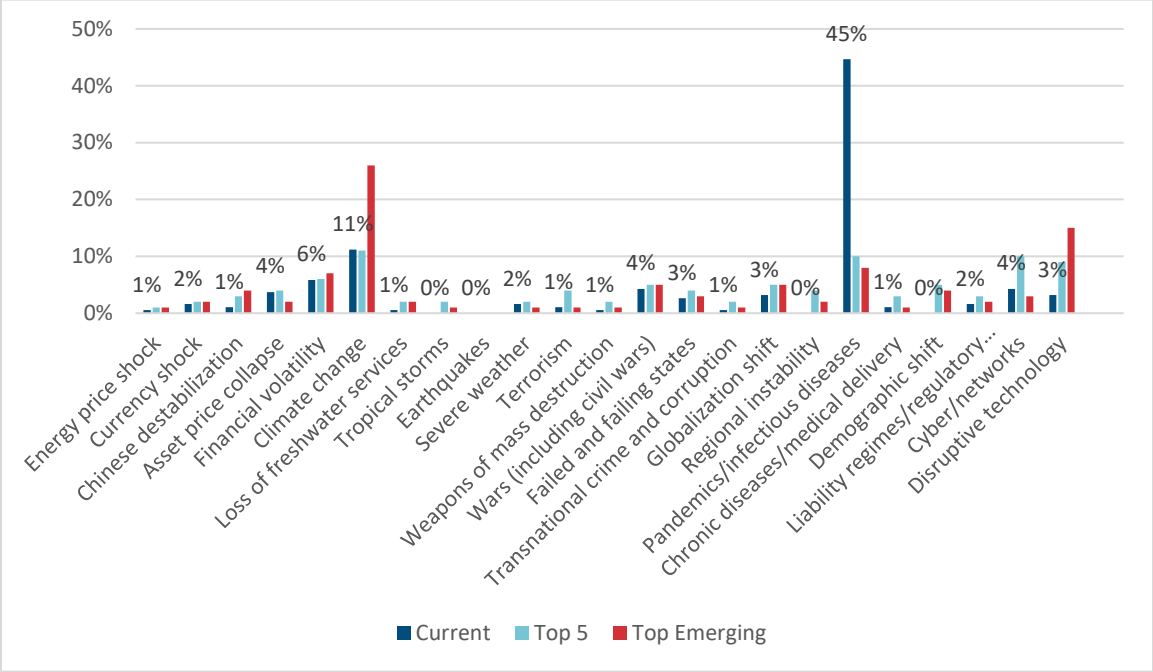
Top Emerging Risks – Technological (% of Total)



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

Economic 33% average (21%/23%/22%/23%/28%/33%/35%/40%/46%/48%/45%/53%/49%)

• 5-(2%/2%/2%/2%/2%/4%/4%/3%/9%)		Energy price shock
• 6-(1%/2%/2%/2%/3%/4%/2%/8%/6%)		Currency shock
• 6-(3%/5%/3%/3%/4%/5%/5%/6%/7%)		Chinese destabilization
• 8-(6%/6%/7%/7%/7%/8%/10%/7%/8%)		Asset price collapse
• 12-(9%/7%/8%/8%/11%/12%/13%/16%/15%)	2	Financial volatility

Environmental 13% average (16%/20%/21%/15%/12%/12%/10%/11%/9%/7%/11%/13%/9%)

• 6-(9%/12%/11%/7%/5%/4%/4%/4%/4%)	1	Climate change
• 2-(2%/3%/3%/2%/2%/2%/2%/2%/2%)		Loss of freshwater services
• 2-(2%/2%/3%/3%/2%/2%/1%/2%/1%)		Natural catastrophe: tropical storms
• 1-(0.3%/0.5%/1%/1%/1%/1%/0.4%/0.2%/1%)		Natural catastrophe: earthquakes
• 2-(2%/3%/3%/3%/2%/2%/2%/3%/1%)		Natural catastrophe: severe weather

Geopolitical 32% average (31%/30%/30%/35%/34%/28%/35%/32%/32%/32%/35%/25%/32%)

• 7-(4%/5%/5%/8%/9%/8%/9%/6%/6%)		Terrorism
• 3-(2%/2%/3%/4%/2%/2%/2%/4%/4%)		Weapons of mass destruction
• 4-(7%/6%/4%/4%/4%/4%/4%/4%/4%)	5T	Wars (including civil wars)
• 6-(6%/5%/6%/5%/5%/5%/7%/6%/8%)		Failed and failing states
• 2-(3%/2%/3%/3%/3%/2%/2%/4%/1%)		Transnational crime and corruption
• 4-(5%/4%/4%/5%/6%/1%/3%/3%/3%)		Globalization shift
• 6-(4%/6%/5%/7%/6%/5%/7%/6%/7%)		Regional instability

Societal 10% average (16%/12%/12%/11%/10%/10%/12%/9%/7%/6%/5%/5%/8%)

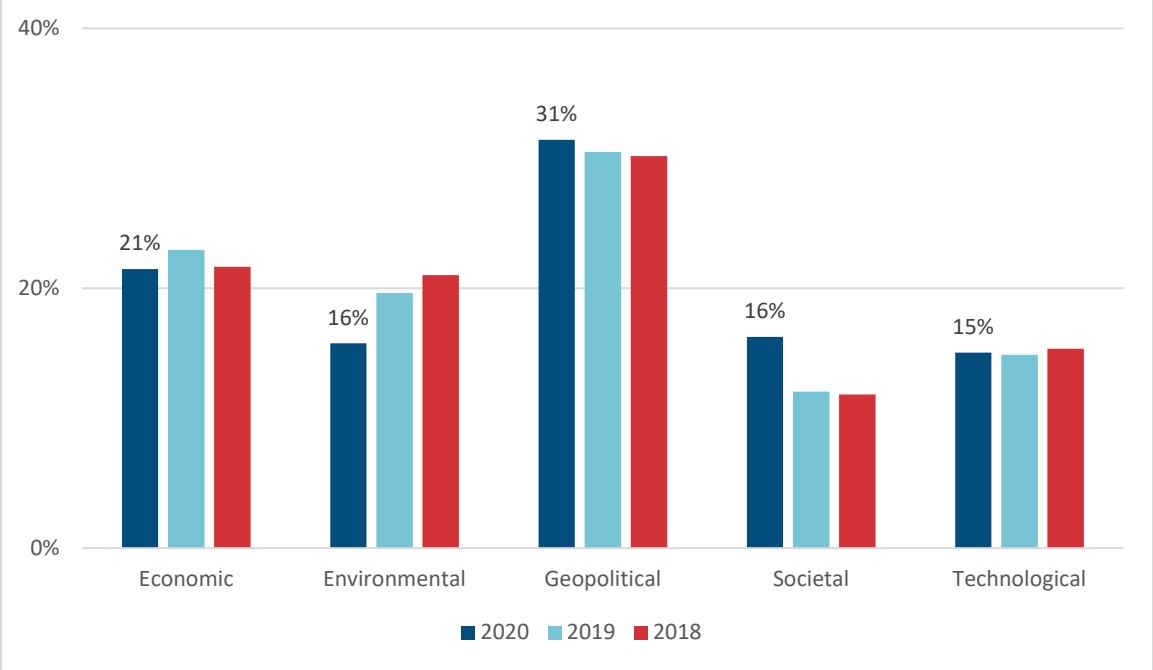
• 3-(7%/3%/4%/3%/3%/3%/4%/2%/2%)	4	Pandemics/infectious diseases
• 1-(3%/2%/2%/2%/1%/1%/1%/0.4%/1%)		Chronic diseases/medical delivery
• 4-(4%/5%/4%/3%/4%/3%/4%/3%/3%)		Demographic shift

• 2-(2%/2%/1%/3%/2%/3%/3%4%/1%)		Liability regimes/regulatory framework

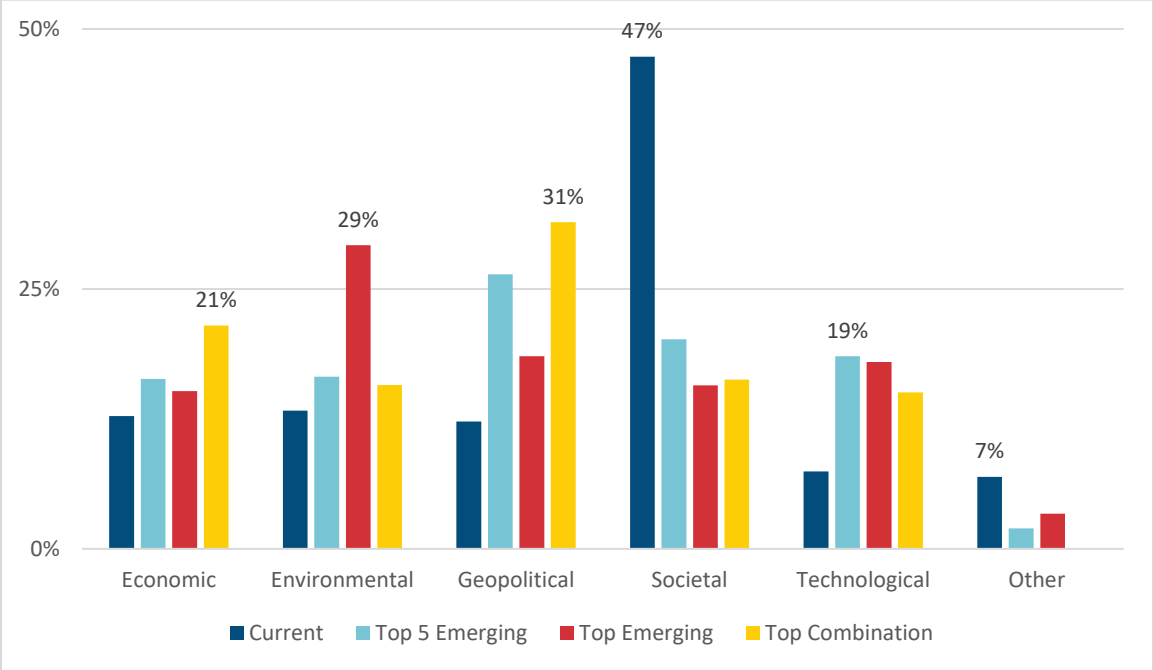
Technological 11% average (15%/15%/15%/17%/15%/17%/8%/9%/5%/7%/4%/3%/2%)

• 7-(8%/8%/9%/10%/10%/12%/7%/7%/5%)	3	Cyber/networks
• 3-(7%/7%/7%/6%/5%/5%/1%/1%/1%)	5T	Disruptive technology

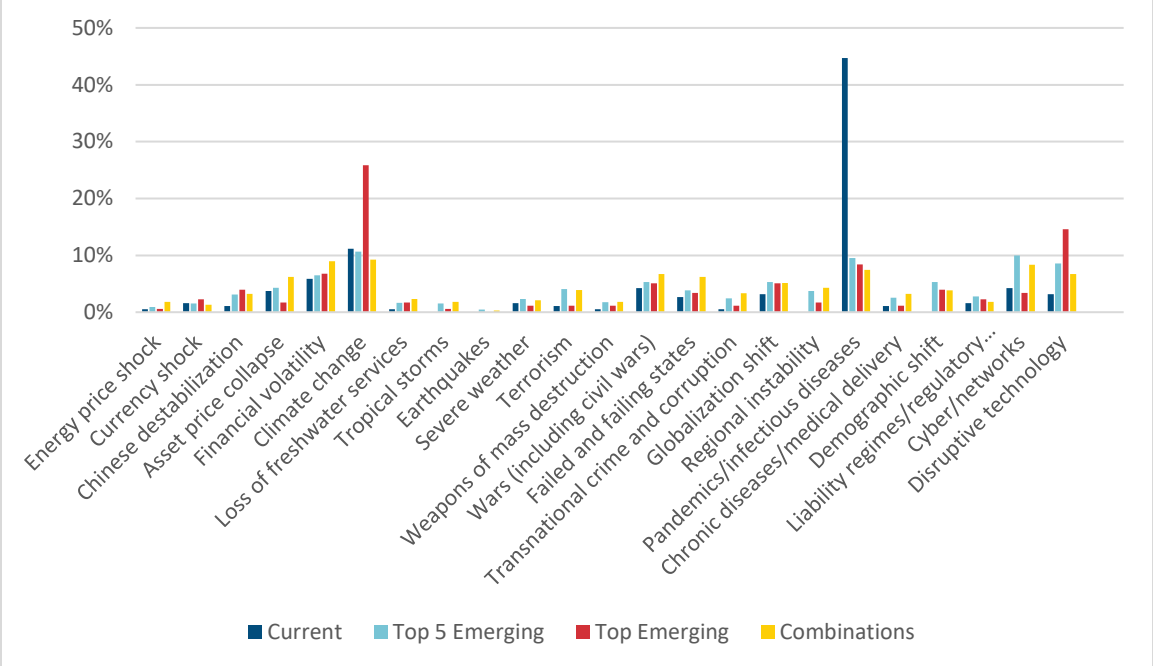
Risk Combinations



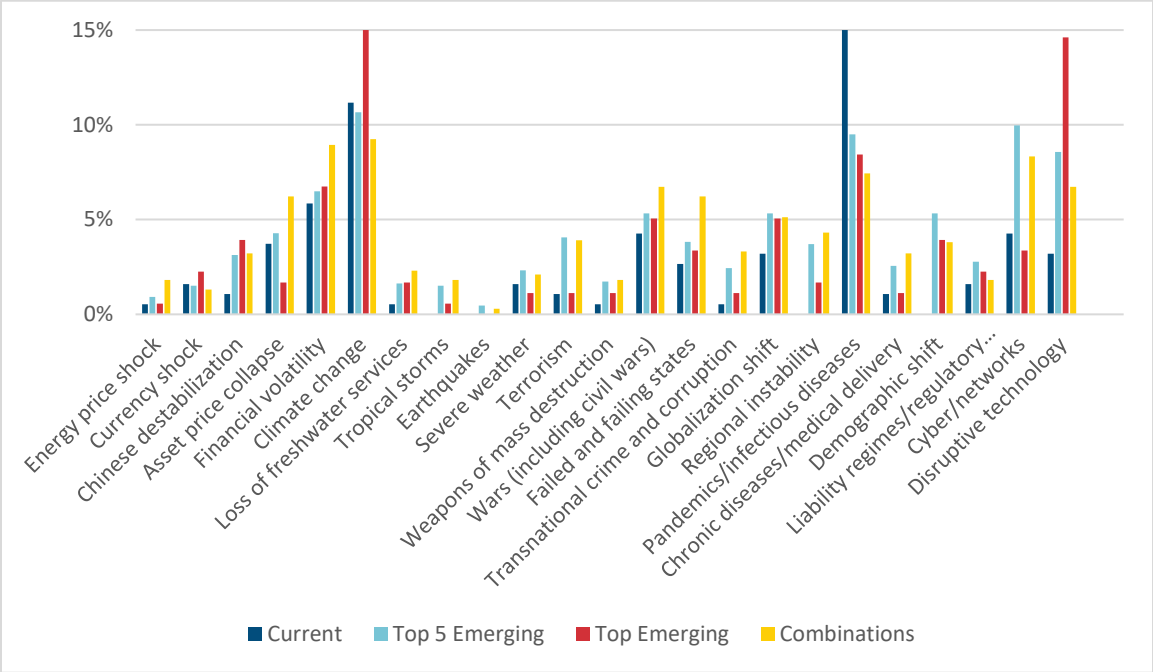
Category Comparison Across Four Questions



Risk Comparison Across Four Questions



Risk Comparison Across Four Questions (restricted y-axis)



Comparison Across Four Questions		Current	Top 5	Top	Combos
		2020	2020	2020	2020
Energy price shock		1%	1%	1%	2%
Currency shock		2%	2%	2%	1%
Chinese destabilization		1%	3%	4%	3%
Asset price collapse		4%	4%	2%	6%
Financial volatility		6%	6%	7%	9%
Climate change		11%	11%	26%	9%
Loss of freshwater services		1%	2%	2%	2%
Tropical storms		0%	2%	1%	2%
Earthquakes		0%	0%	0%	0%
Severe weather		2%	2%	1%	2%
Terrorism		1%	4%	1%	4%
Weapons of mass destruction		1%	2%	1%	2%
Wars (including civil wars)		4%	5%	5%	7%
Failed and failing states		3%	4%	3%	6%
Transnational crime and corruption		1%	2%	1%	3%
Globalization shift		3%	5%	5%	5%
Regional instability		0%	4%	2%	4%
Pandemics/infectious diseases		45%	10%	8%	7%
Chronic diseases/medical delivery		1%	3%	1%	3%
Demographic shift		0%	5%	4%	4%
Liability regimes/regulatory framework		2%	3%	2%	2%
Cyber/networks		4%	10%	3%	8%
Disruptive technology		3%	9%	15%	7%
Other		7%	2%	3%	

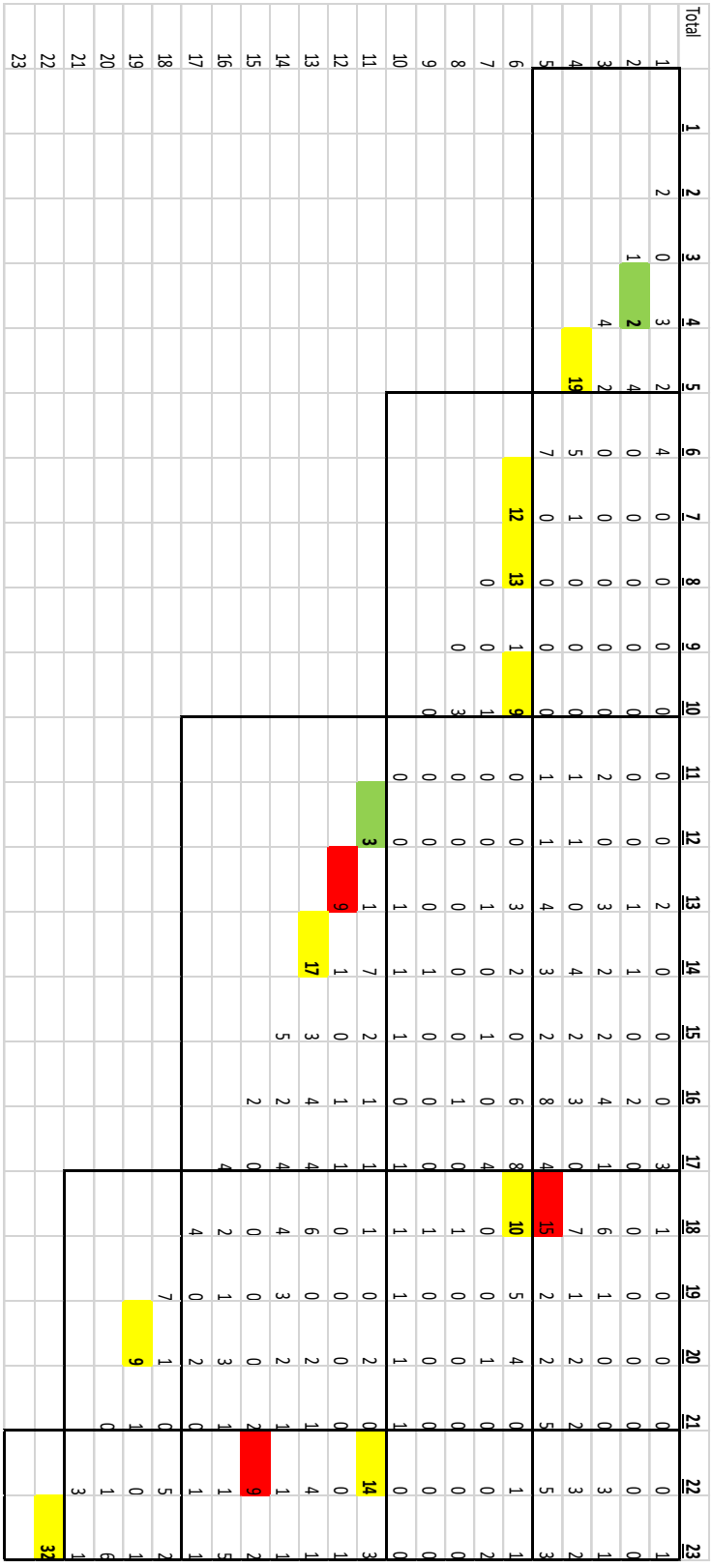
Comparison Across Four Questions		Current	Top 5	Top	Combos						
		2020	2020	2020	2020	C-top5	C-top	C-combo	top5-top	top 5-com	top-combos
Energy price shock		1%	1%	1%	2%	-0.4%	0.0%	-1.3%	0.4%	-0.9%	-1.2%
Currency shock		2%	2%	2%	1%	0.1%	-0.7%	0.3%	-0.7%	0.2%	0.9%
Chinese destabilization		1%	3%	4%	3%	-2.1%	-2.9%	-2.1%	-0.8%	-0.1%	0.7%
Asset price collapse		4%	4%	2%	6%	-0.6%	**2.0%**	-2.5%	2.6%	-1.9%	-4.5%
Financial volatility		6%	6%	7%	9%	-0.6%	**-0.9%**	-3.1%	-0.3%	-2.4%	-2.2%
Climate change		11%	11%	26%	9%	0.5%	**-14.7%**	1.9%	**-15.2%**	1.4%	16.6%
Loss of freshwater services		1%	2%	2%	2%	-1.1%	-1.2%	-1.8%	-0.1%	-0.7%	-0.6%
Tropical storms		0%	2%	1%	2%	-1.5%	-0.6%	-1.8%	0.9%	-0.3%	-1.2%
Earthquakes		0%	0%	0%	0%	-0.5%	0.0%	-0.3%	0.5%	0.2%	-0.3%
Severe weather		2%	2%	1%	2%	-0.7%	0.5%	-0.5%	1.2%	0.2%	-1.0%
Terrorism		1%	4%	1%	4%	-3.0%	-0.1%	-2.9%	2.9%	0.1%	-2.8%
Weapons of mass destruction		1%	2%	1%	2%	-1.2%	-0.6%	-1.3%	0.6%	-0.1%	-0.7%
Wars (including civil wars)		4%	5%	5%	7%	-1.1%	-0.8%	-2.5%	0.3%	-1.4%	-1.7%
Failed and failing states		3%	4%	3%	6%	-1.2%	-0.7%	-3.6%	0.5%	-2.4%	-2.9%
Transnational crime and corruption		1%	2%	1%	3%	-1.9%	-0.6%	-2.8%	1.3%	-0.9%	-2.2%
Globalization shift		3%	5%	5%	5%	-2.1%	-1.9%	-1.9%	0.3%	0.2%	-0.1%
Regional instability		0%	4%	2%	4%	-3.7%	-1.7%	-4.3%	2.0%	-0.6%	-2.6%
Pandemics/infectious diseases		45%	10%	8%	7%	35.2%	36.3%	37.3%	1.1%	2.1%	1.0%
Chronic diseases/medical delivery		1%	3%	1%	3%	-1.5%	-0.1%	-2.1%	1.4%	-0.7%	-2.1%
Demographic shift		0%	5%	4%	4%	-5.3%	-3.9%	-3.8%	1.4%	1.5%	0.1%
Liability regimes/regulatory framework		2%	3%	2%	2%	-1.2%	-0.7%	-0.2%	0.5%	1.0%	0.4%
Cyber/networks		4%	10%	3%	8%	-5.7%	**0.9%**	-4.1%	6.6%	1.6%	-5.0%
Disruptive technology		3%	9%	15%	7%	-5.4%	**-11.4%**	-3.5%	**-6.0%**	1.8%	7.9%
Other		7%	2%	3%		4.9%	3.5%		-1.4%		

Combinations

2019 chart (bold is top 11 due to ties)

Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1		1	1	3	4	10	0	0	0	0	1	0	0	0	0	1	6	0	0	0	1	0	1	1
2			3	**12**	5	0	0	0	0	0	1	0	0	2	0	0	0	1	0	0	0	1	2	2
3				10	8	1	0	0	0	1	0	0	4	3	4	9	6	0	0	1	1	6	1	3
4					**20**	4	0	0	2	0	0	1	4	5	0	4	1	3	1	3	2	3	2	4
5						10	0	0	0	2	1	0	0	3	0	8	10	2	0	4	4	8	5	5
6							**22**	**14**	0	**29**	0	0	9	3	2	4	9	**11**	3	6	1	7	2	6
7								0	0	0	0	0	3	1	0	1	2	6	1	4	0	0	0	7
8									1	1	0	0	0	0	0	0	1	1	0	1	0	0	0	8
9										0	0	0	1	0	0	0	0	0	1	0	1	0	0	9
10											0	0	0	0	1	1	0	0	0	0	0	0	1	10
11												**14**	10	7	1	2	3	0	0	3	0	**11**	3	11
12													6	3	1	0	2	1	0	0	0	1	1	12
13														**18**	2	5	7	0	0	2	0	4	2	13
14															7	2	8	1	0	2	1	1	0	14
15																0	1	0	0	1	0	7	1	15
16																	4	0	0	5	2	3	3	16
17																		2	0	4	0	3	1	17
18																			7	4	0	0	1	18
19																				**13**	0	0	3	19
20																					1	1	7	20
21																						1	5	21
22																							**45**	22
23																								23

2020 top 12 due to ties (yellow top 10 in both 2019/2020, red new to 2020, green no longer top 10)



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

32 responses (6%/7%/9%/7%/5%/9%), No. 1 in previous survey

Cyber/networks

Disruptive technology

19 responses (4%/3%/6%/6%/4%/7%), No. 4

Asset price collapse

Financial volatility

17 responses (3%/3%/2%), No. 5

Wars (including civil wars)

Failed and failing states

15 responses (3%), not rated in previous survey

Financial volatility

Pandemics/infectious diseases

14 responses (3%/2%/3%/5%/6%/9%), No. 10T

Terrorism

Cyber/networks

13 responses (3%/2%/4%/3%/2%), No. 6T

Climate change

Natural catastrophe: tropical storms

12 responses (2%/3%/4%), No. 3

Climate change

Loss of freshwater services

10 responses (2%/2%/3%), No. 10T

Climate change

Pandemics/infectious diseases

9 responses (2%/5%/4%/3%/2%/2%), No. 2

Climate change

Natural catastrophe: severe weather

9 responses (2%/2%), No. 8

Chronic diseases/medical delivery

Demographics

9 responses (2%), not ranked in previous survey

Weapons of mass destruction

Wars (including civil wars)

9 responses (2%), not ranked in previous survey

Transnational crime and corruption

Cyber/networks

The following two risks were ranked (top 10) in the previous survey but not in the current one.

3 responses (1%/2%/2%/3%/3%), No. 6T

Terrorism

Weapons of mass destruction

2 responses (0%/2%), No. 9

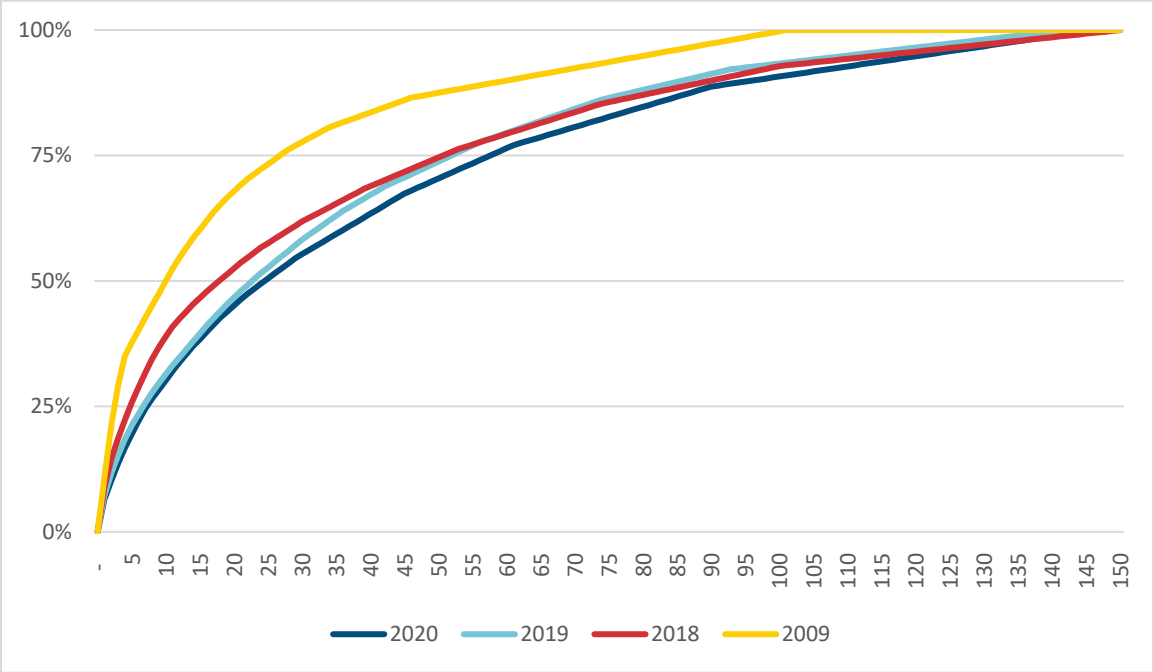
Currency shock

Asset price collapse

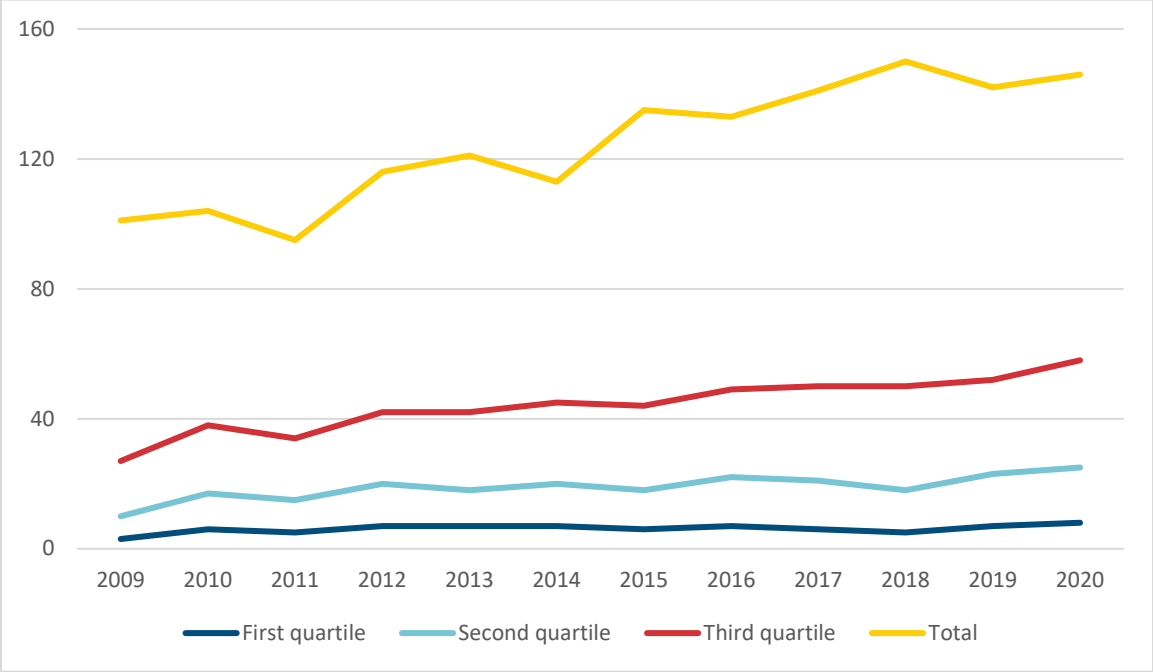
Combinations by Category		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Economic	Economic	34%	42%	29%	29%	29%	24%	19%	21%	14%	13%	11%	11%	8%
Economic	Environmental	2%	3%	5%	3%	3%	2%	2%	2%	2%	2%	3%	5%	3%
Economic	Geopolitical	22%	16%	21%	24%	21%	18%	15%	10%	15%	10%	11%	12%	11%
Economic	Societal	2%	3%	2%	6%	6%	7%	9%	7%	6%	4%	4%	4%	9%
Economic	Technological	1%	1%	3%	4%	3%	4%	4%	5%	4%	4%	3%	5%	4%
Environmental	Economic	7%	9%	7%	4%	6%	7%	7%	8%	8%	9%	13%	11%	8%
Environmental	Geopolitical	2%	2%	3%	2%	2%	4%	2%	3%	3%	4%	4%	6%	6%
Environmental	Societal	5%	3%	2%	2%	1%	2%	1%	3%	4%	4%	7%	6%	5%
Environmental	Technological	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	2%	1%
Geopolitical	Geopolitical	16%	14%	20%	14%	18%	15%	19%	15%	19%	20%	16%	16%	14%
Geopolitical	Societal	4%	2%	2%	1%	2%	4%	7%	2%	2%	4%	5%	4%	7%
Geopolitical	Technological	1%	2%	3%	7%	4%	9%	8%	12%	11%	13%	7%	7%	9%
Societal	Societal	2%	1%	2%	1%	2%	2%	2%	3%	3%	4%	3%	4%	4%
Societal	Technological	1%	0%	1%	0%	1%	1%	2%	3%	4%	2%	2%	3%	4%
Technological	Technological	0%	1%	0%	1%	1%	2%	1%	7%	5%	7%	9%	7%	6%

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

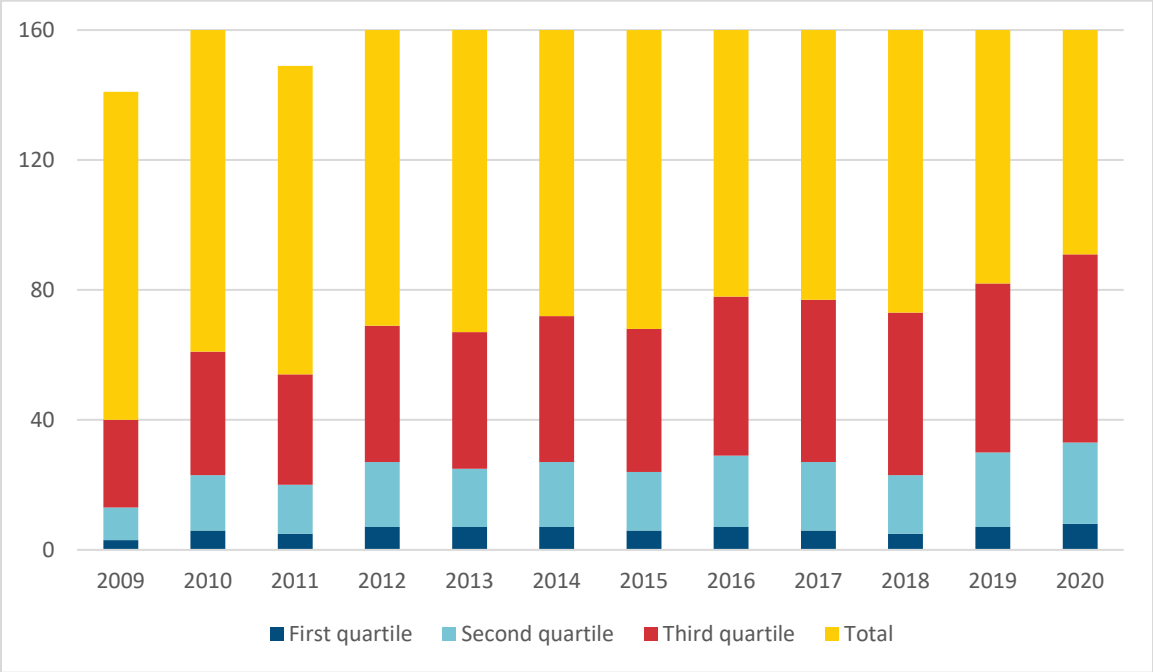
Cumulative Distribution of Combinations (253 total possible)



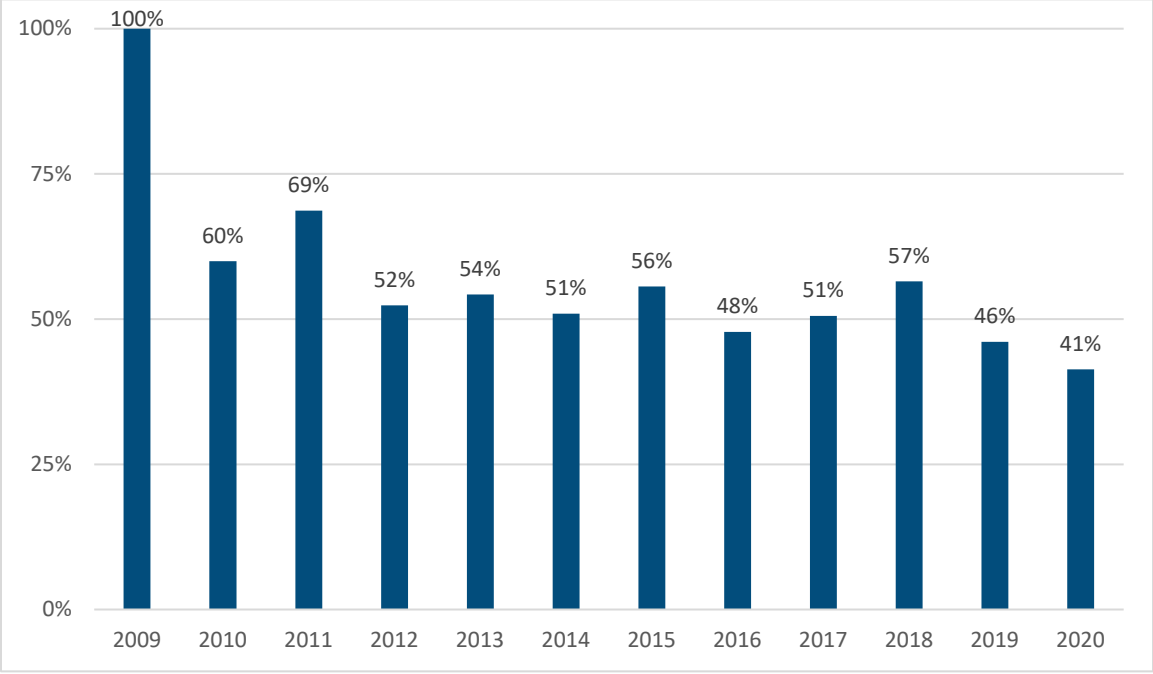
Risk Combinations



Risk Combinations



Risk Concentration Ratio (Base 2009 = 100%)



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

> Question 6. Which THREE emerging risks do you believe interact most prominently with COVID-19? (Please select no more than three.)

168 respondents chose at least one risk, for a total of 490 responses (average of 2.92 risks selected per survey).

Economic—31%

• 2%		Energy price shock
• 1%		Currency shock
• 1%		Chinese destabilization
• 7%	5	Asset price collapse
• 20%	1	Financial volatility

Environmental—2%

• 1%		Climate change
• 0%		Loss of freshwater services
• 0%		Natural catastrophe: tropical storms
• 0%		Natural catastrophe: earthquakes
• 0%		Natural catastrophe: severe weather

Geopolitical—22%

• 1%		Terrorism
• 0%		Weapons of mass destruction
• 3%		Wars (including civil wars)
• 5%		Failed and failing states
• 1%		Transnational crime and corruption
• 7%	4	Globalization shift
• 5%		Regional instability

Societal—36%

• 18%	2	Pandemics/infectious diseases
• 13%	3	Chronic diseases/medical delivery
• 3%		Demographic shift
• 2%		Liability regimes/regulatory framework

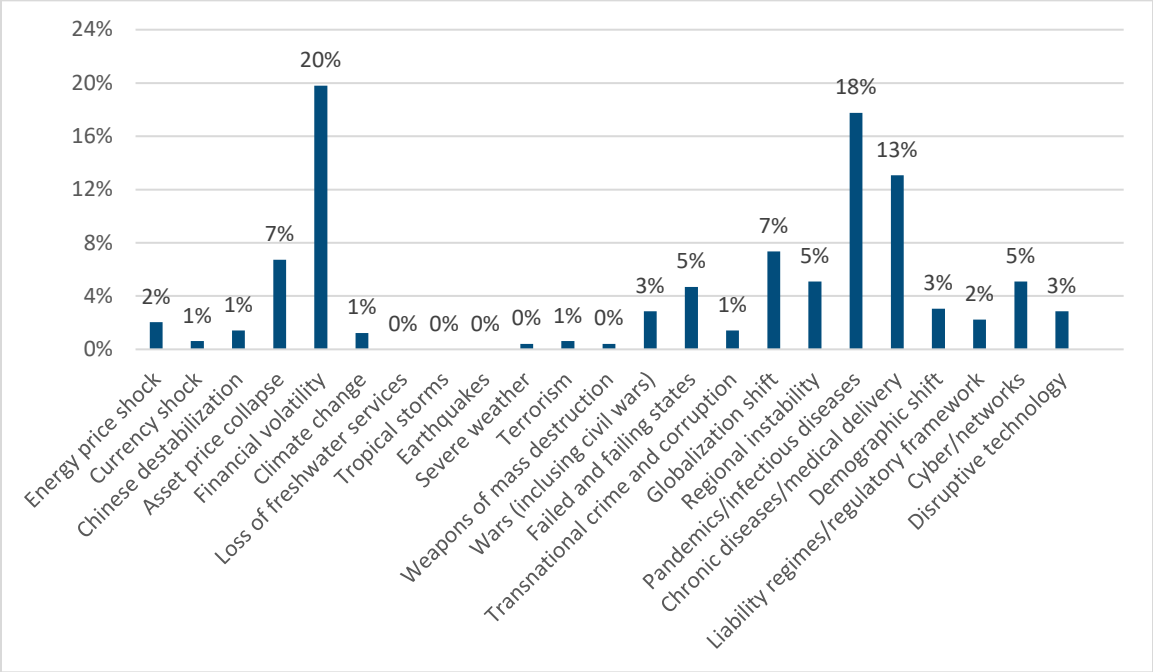
Technological—8%

• 5%		Cyber/networks
• 3%		Disruptive technology

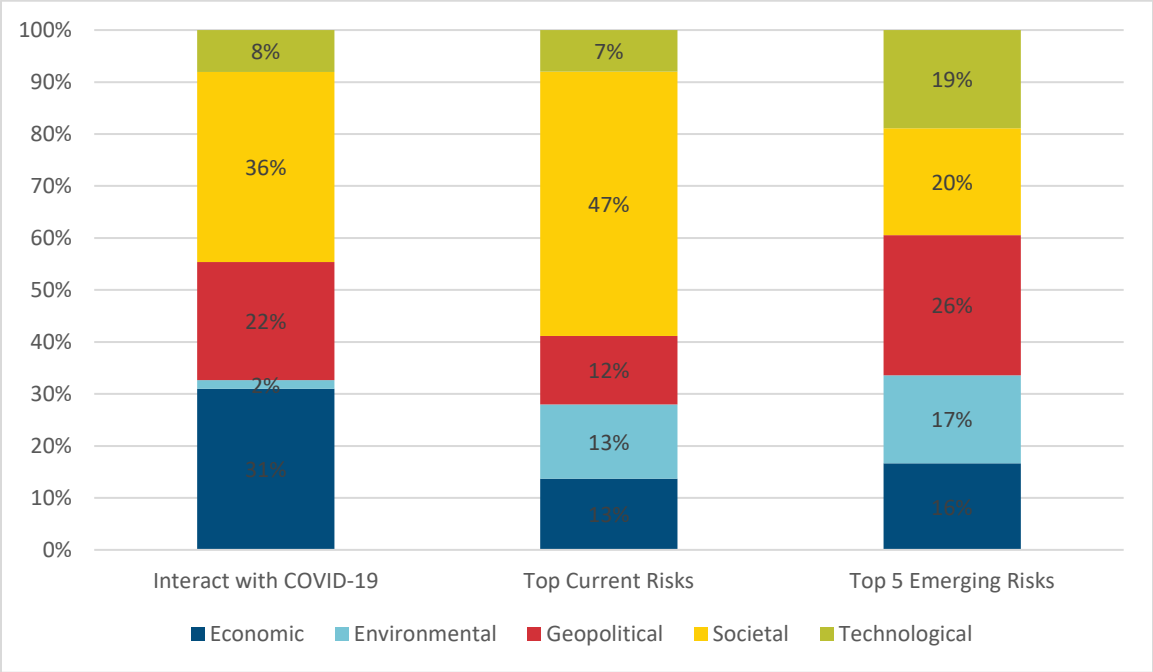
Other—1%

- Loss of freedom; tyranny
- Not important
- Systematic disinformation
- Weaponization of misinformation
- Social unrest
- Infrastructure deterioration

Risks that interact with COVID-19



Categories that interact with COVID-19



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 2020.

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

- *Election tensions in the US*
- *Civil unrest in the USA*
- *Driverless cars*
- *Sexual immorality*
- *Global and Regional Income Wealth Inequality*
- *Social unrest*
- *Natural disaster: solar flare*
- *Religious extremism*
- *Mental Health Risk*
- *Loss of trust in institutions/governments*
- *Shift towards Socialism from Capitalism*
- *Specific populations impacted by medical conditions and access to care*
- *Smaller percentage of people living life as though they believe in the God of the Bible.*
- *Political polarization*
- *Wealth divide - increasing division between affluent and poor, skilled and unskilled labor sectors, value placed on different types of roles*
- *Reputation of Modelers*
- *Long term reduction in economic output*

- *US Government Instability*
- *Civil disorder*
- *Political risks*
- *Low Interest Rate Environment*
- *Shortage of efficient antibiotics*
- *Artificial Intelligence threat*
- *Blackouts / disruption to power grids*
- *Economic warfare*
- *Social division*
- *Breakdown of democratic institutions*
- *Misinformation*
- *Loss of freedom; tyranny*
- *Solar Storm*
- *Shift from free markets to command economies*
- *Political destabilization / attacks on democracy*
- *Natural Catastrophe: Forest fires*
- *Health provider monopolization*
- *World taken over by communism*
- *Multi-nationalization*
- *Improper strategic models*
- *Food shortages, lack of adequate farms*
- *Instability in workforce, driven by increased turnover, both voluntary and involuntary.*
- *Increasing government power/intervention*
- *Political Risk*
- *Space conflicts*
- *Widespread medical harm from a vaccine that is not adequately tested*
- *Dictators*
- *American destabilization*
- *Disruption to Electrical Supply*
- *Disconnected elites/populism*
- *Fracturization of US society*
- *Solar flares and catastrophic power grid failure - not emerging but very serious risk*
- *Mental / behavioral health*
- *Inequality leading to polarization and deadlock*
- *Failing States*
- *National politics subverting globalization*
- *Continued Political Divisiveness*
- *Change in Workforce (demographics and remote working)*
- *Social unrest*
- *Decentralization of Media/Rise of Social Media - i.e., algorithms that cater to a user's bias*
- *Election of President Trump, Brexit, rise of authoritative regimes in Europe -- all suggest to me a global move away from democracy*
- *Shift in global power (China, post-Brexit world, and New US direction)*
- *Political uncertainty*
- *Income inequality*
- *Data Privacy/Integrity*
- *Failing Public Trust in Institutions (of government, society, each other)*
- *Ultra-nationalism / sectarianism*
- *Reframe failed states as the inability of a political regime to address and resolve conflict*
- *Inequality*

- *Workplace of the Future*
- *Perceptions - populace sees "rules of life" change dramatically.*
- *Natural Catastrophe: Cyclones*
- *Widespread drought*
- *Infrastructure Deterioration*
- *American destabilization*

Suggestion 2

- *Narcotic usage/crime*
- *Free speech*
- *Political activism*
- *Demise of post-cold war nuclear detente*
- *Mass migrations (population shifts)*
- *US Civil Unrest*
- *New bacterial infections from North pole melting*
- *Pollution*
- *Breakdown of alliances/trade between developed nations*
- *Stability change in countries*
- *Government fiat money printing*
- *Quantum computing*
- *Civil unrest*
- *Price gouging*
- *Chinese Communist Party taking over countries in the far east*
- *Process automation*
- *Agent risk*
- *Reduction in natural resources (polluted waters, depleting forests, polluted air)*
- *Rise of nationalism and totalitarianism*
- *Disruption of food supply*
- *Immorality*
- *Systematic disinformation*
- *Weaponization of misinformation*
- *Asset Price Collapse*
- *Mass displacement of people due to various reasons*
- *Space weather*
- *New business model from COVID (impact to e-commerce, Commercial Real Estate, travel, ...)*
- *Societal stability*
- *Digitalization*
- *Rising nationalism/populism*
- *Spur to mass migration; from "out of Africa" to Huns into Europe, now Africa to Europe*
- *Wars (Post-Election Wars)*
- *Forced migration*
- *Poor distribution of wealth across the world*
- *Societal polarization*
- *Loss of biodiversity*
- *Fake News*
- *Lack of food*
- *Global Food Shortage*

Section B: Leading Indicators

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

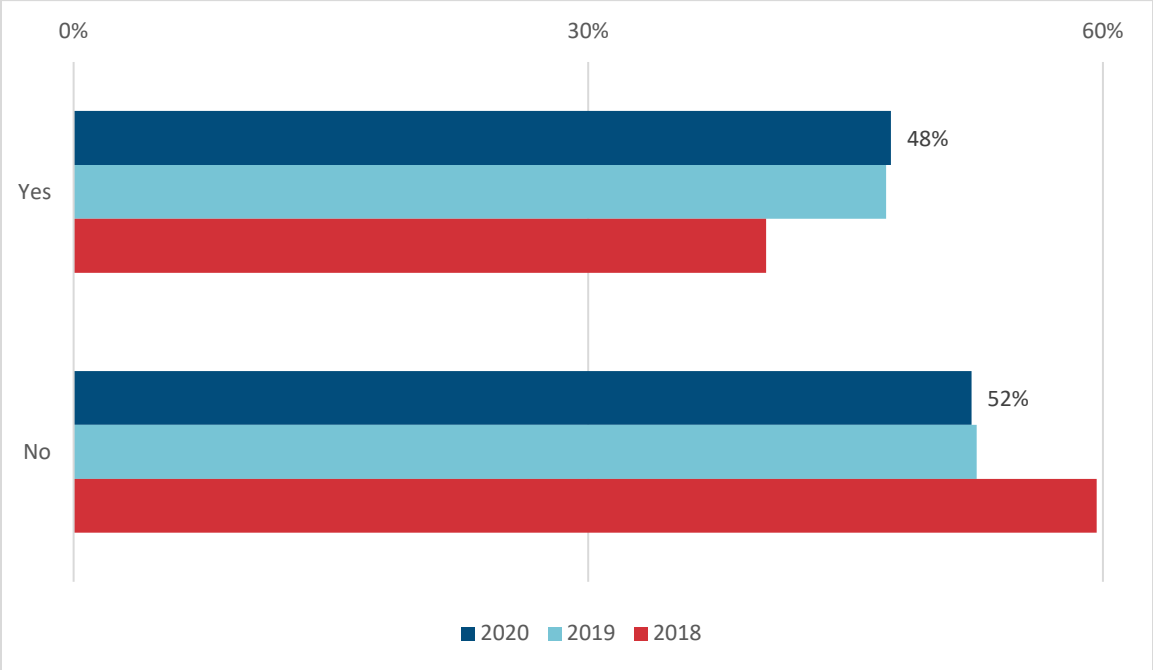
In this section, once a respondent answers a question *No* or *Not applicable*, the survey moves that respondent immediately to Section C.

Question 1. Do you formally identify emerging risks?

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

- 48%/47%/40% Yes
- 52%/53%/60% No

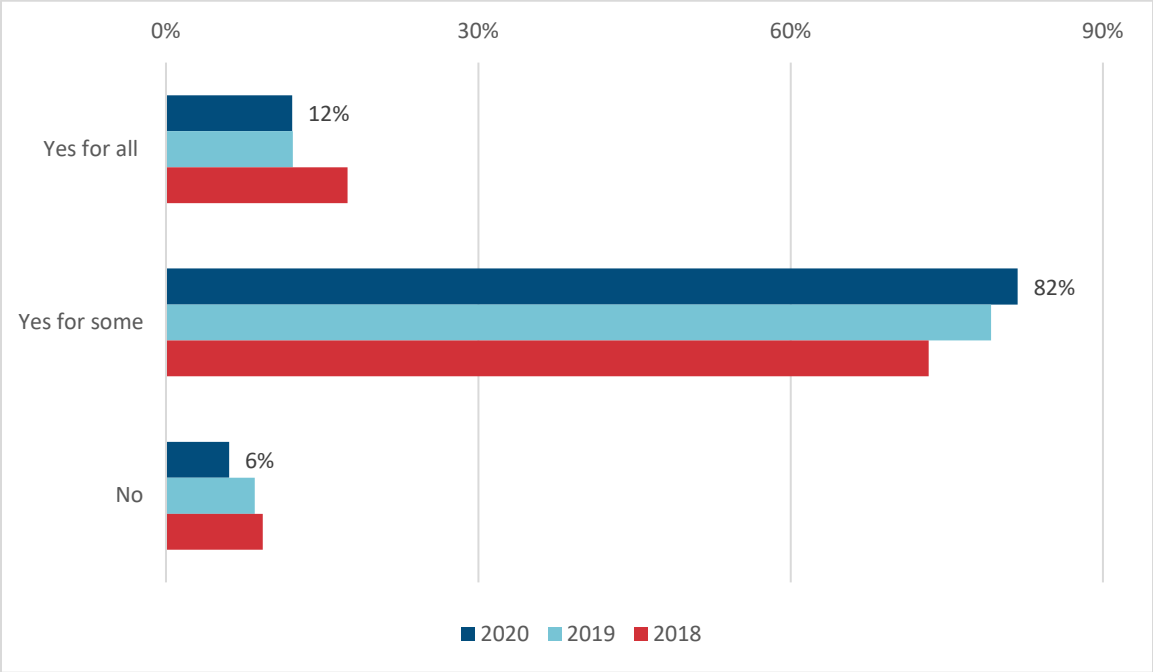
Formally Identify Emerging Risks



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

- 12%/12%/17% Yes for all
- 82%/79%/73% Yes for some
- 6%/9%/9% No

Process to Measure/Monitor/Mitigate



Question 3. If yes, please provide examples.

From those who responded *Yes for all*:

- *For example, we may flag a market disruptor and then try to estimate the impact to future sales and persistency of our business.*
- *Share with Exec team (add to risk register), determine potential impact (gross and residual risk).*
- *Social unrest, ran stress tests to assess, identifying drivers to monitor to evolution of the risk and could impact on underwriting and our operations in general*
- *Risk register*
- *I follow US and Global extreme events, every month.*

From those who responded *Yes for some*:

- *Measuring is tough so we focus on monitoring by assigning an owner and then consider what processes are in place to mitigate or if there are gaps for ones we feel are material then we will look to close those gaps*
- *Specific types of chemicals and pharmaceuticals*
- *Monitor claims as risk emerges compared to historical claims*
- *Change of Market Value Surplus due to change of the volatility of Financial Markets*
- *Industry studies, economic indicators*
- *Gather experience data over several years, and study the correlations.*
- *Health insurance: Individual product market changes*
- *Monitor regulatory and industry trends and activities.*
- ***Climate change - change to underwriting rules for mortgage loans***
- *For cyber risk and climate change, we monitor data and scientific studies to quantify potential impact on underwriting and claims*
- *Cyber Risk: Controls are put in place with playbook such that the information security team is ready and knows how to recover in such an event*

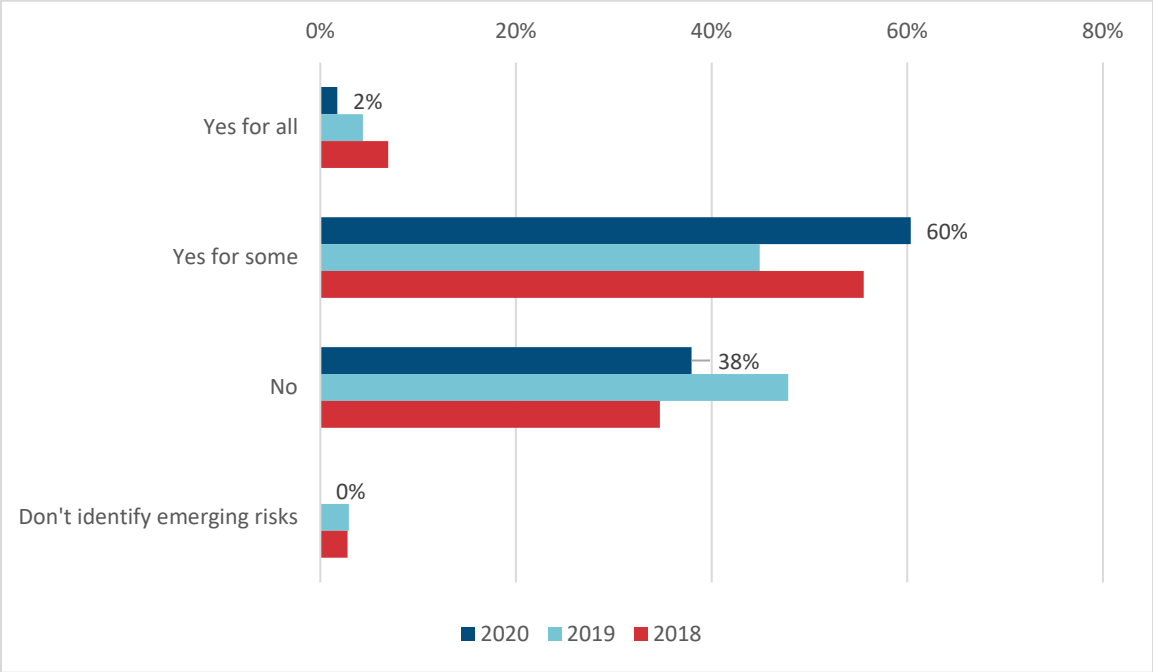
- *Those identified as being strategically important to the business*
- *Stress testing*
- *Inflation shift is measured; studies of volatility of market returns*
- *Cyber Insurance - Measure and Monitor the risk, after gaining a better understanding of the risk.*
- *Pandemic leading to changes in supply chain, government approval (permits), extended litigation/payment patterns, increased claim possibility from financially compromised companies.*
- *Significant active work (over a decade) on impacts of climate change*
- *Cyber risk: formations, couvertures assurance*
- *Price gouging: following unit cost and utilization trends from pharma and certain provider types (dialysis, air ambulance, etc.).*
- *Risk of war and its connection to Student Health product demand*
- *Disruptive Technology*
- *Investment risk measures*
- *Climate change models impact on GDP and asset classes, etc.*
- *I am unable to provide these details due to company confidentiality requirements.*
- *Determining financial impact, determining if business focus should change, education of stakeholders of what we are talking about and impact.*
- *I am on a board of directors with the power to enact risk mitigation measures following identification of certain risks.*
- *Assign key risk indicators which are leading indicators to identify shifting trends in the underlying risk triggers that changes either the velocity (how soon the risk becomes relevant) or the likelihood of occurrence.*
- *Qualitative Risk Assessment and any Risk Mitigation Identified*
- *Risk Dashboards*
- *Part of ORSA process, ALM modeling*
- *Minimum wage salary increases*
- *e.g., climate change - try to quantify exposure, and provide information on risk limits*
- *impact of covid-19 on business*
- *Pandemic risk was assessed and quantified*
- *Risk databased maintained; regular review by management; accountability for responses established*
- *Formation of working group*
- *Financial volatility: define investment thresholds in base to bond's grades*
- *At minimum, weigh probability times severity. E.g., Xi loses grip in China, internal power struggle disrupts neighboring regimes*
- *Stress testing and scenario analysis*

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.

- 2%/4%/7% Yes for all
- 60%/45%/56% Yes for some
- 38%/48%/35% No
- 0%/3%/3% We do not formally identify emerging risks

Emerging Risk Leading Indicators



Question 5. If yes, please note how many you have identified and provide examples of these methods, including the specific emerging risk and leading indicators.

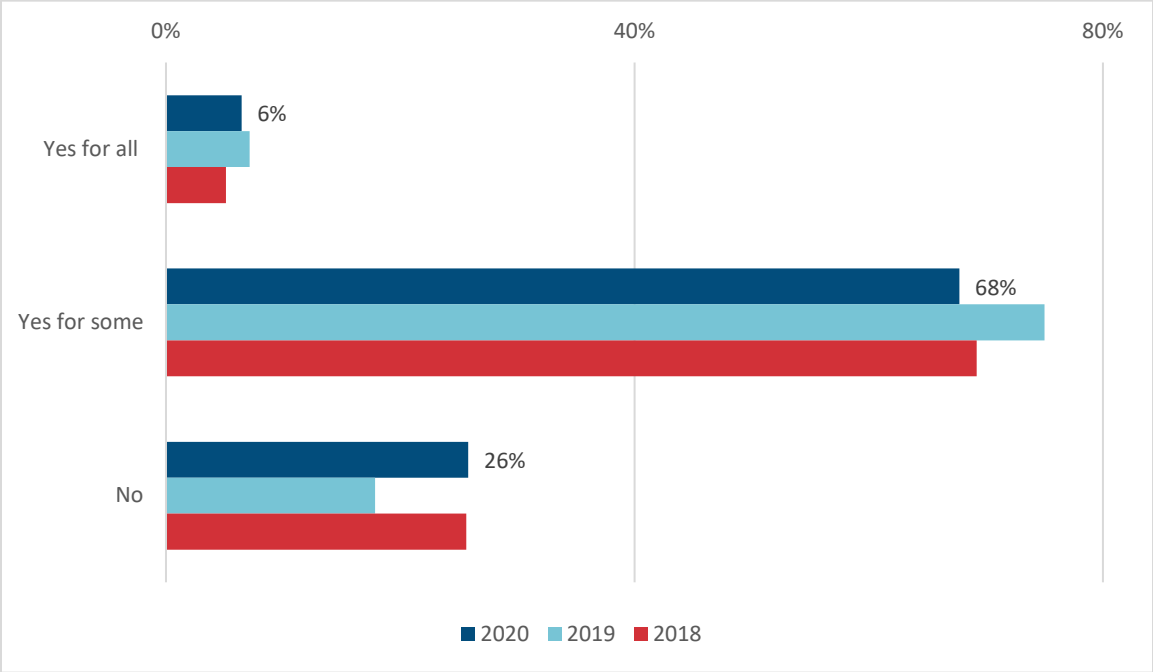
- *We tend to focus on a handful of the emerging risks and track the emergence of news / research articles, actual claims*
- *Webcasts, articles, association discussions and monitoring of metrics*
- *Market based approaches from interest rate, currency, and market indices.*
- *Health insurance: Risk-scoring new members to predict future costs via initial diagnoses*
- *Generically speaking - developing meaningful KRI's to determine trends.*
- *Cyber risk: frequency & severity; climate change: weather data and HMM models for prediction of severity of flood and hurricane*
- *Number of attempted cyber attacks*
- *Early warning indicators depend on the nature and type of the emerging risk*
- *Top 5 - 10 emerging risks are tracked more closely. Stress testing has been used to identify potential impact of these risks. Metrics used look at whether the risk is becoming more proximate, its velocity could be increasing, nature of risk is changing, etc.*
- *Can check betting odds or discuss with SMEs*
- *Inflation, discount rate, devaluation of stocks.*
- *Follow industry risks already identified individually. Metrics include inherent risk compared to residual risk.*
- *Social unrest, 1 out of 5*
- *For example, I follow industry news, FDA actions, and CMS data on unit cost and utilization of high cost drugs and also follow cell and gene therapy. This issue does and will play a large role in future trend. For the biggest risks, I deliberately cull data when pricing a renewal or prospect, whether through ICD 10 codes or direct/correlated drugs to the greatest extent possible, which varies data I have from the customer. I need to do this for the future sustainability of my division, but others should be caring about this risk, as it is systemic.*
- *Low interest rates tied to other economic and political indicators.*
- *I cannot provide this info due to company confidentiality requirements*

- *Identifying the risk to actuaries of LTC insurer insolvencies. We measure abnormal increases in reserve levels, the number of actual insolvencies, and market transactions.*
- *The Changes from one risk assessment cycle to another.*
- *Disruption to production: monitor production by product type vs. plan*
- *KRIs were developed for Cyber risk for prevention, detection, response, - number of controls in place / essential controls.*
- *Movement of people, changes in ruling regimes, is more telling than money flows*
- *I track the seven extreme events with NCEI's Billion Dollar disaster data quarterly, both frequency and costs. I use LOESS methods to discern the trend rates.*

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?

- 6%/7%/5% Yes for all
- 68%/75%/69% Yes for some
- 26%/18%/26% No

Criteria for Action Based on Leading Indicators



Question 7. If yes, please provide examples.

- *Involve underwriters and legal teams to look at policy wording more closely*
- *Choose a value of the impact that means it's time for more than just monitoring*
- *For cyber risk, define and practice business continuation plan.*
- *No example*
- *We control risk exposure through underwriting and reinsurance*
- *Indicators that breaches internal red amber thresholds are escalated to senior management for further deliberation*

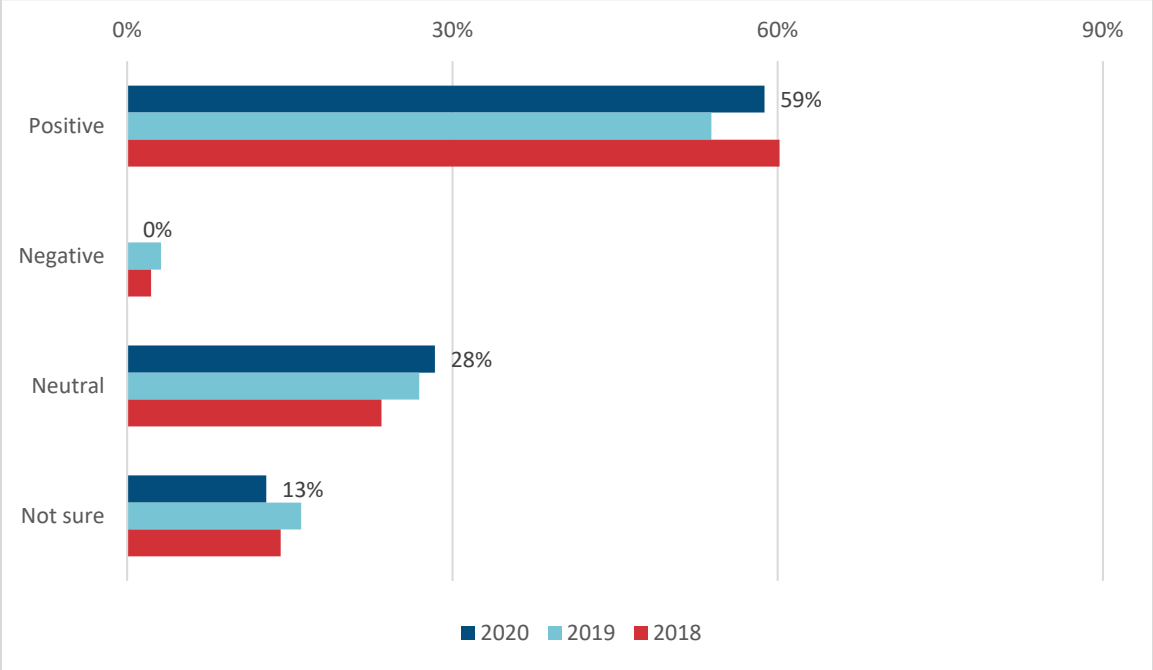
- *It would be captured under the standard risk management framework for the risk - the potential impact to the business, how it impacts on risk appetite and potential management actions to mitigate the risk*
- *Use reinsurance to reduce tail risk*
- *When discount rate movement may cause a 10% shift in funding level to below 100% funded pension plan.*
- *I review the deductible level of the case at hand and find that often a risk for one account is not a risk at all for others. Leading indicators include drugs that are used before the very extreme ones. For example, hemophilia factor use portends a future risk of hemophilia gene therapy use.*
- *Thresholds for interest rates and political actions.*
- *% limits on asset classes*
- *We put in KRIs to monitor the risk and risk limits to control the amount of risk taken*
- *In our business, the most dangerous risk is illiquidity. Gauge probable max outflow, prioritize assets from most to least expendable.*

Section C: Enterprise Risk Management

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

- 59%/54%/60% Positive
- 0%/3%/2% Negative
- 28%/27%/23% Neutral
- 13%/16%/14% Not sure

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.

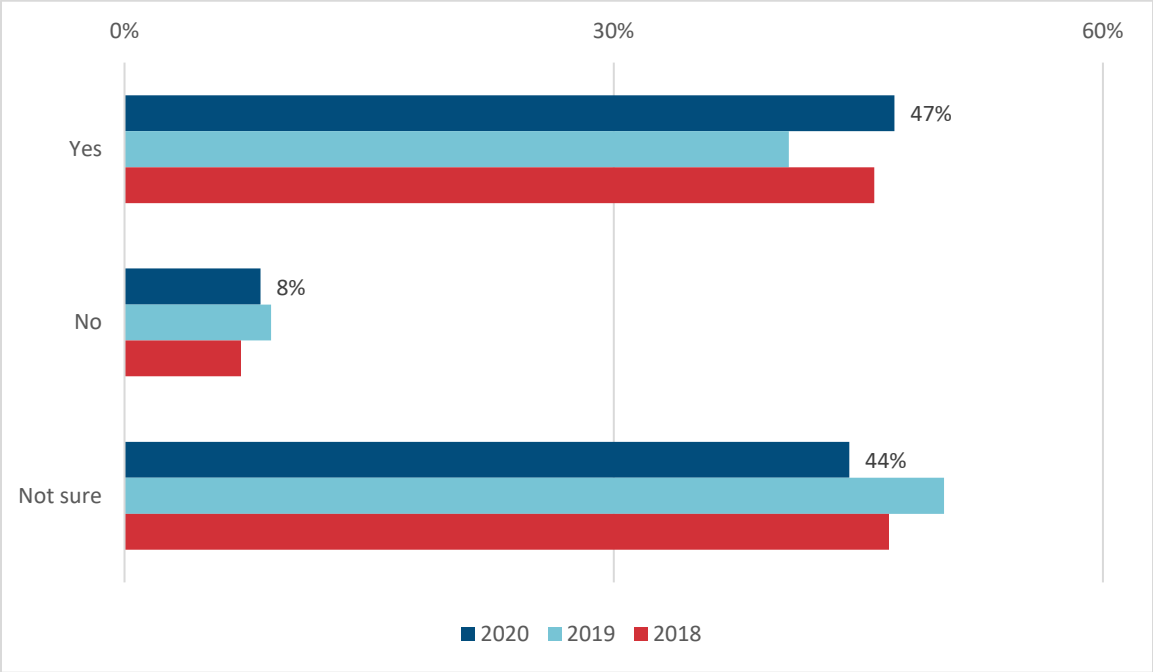
- *Identification of tail risks, used to hedge against those risks.*
- *Used ERM to identify other methods of funding redundant reserves*
- *Shutting down offices and travel in response to Covid 19.*
- *ERM functions plugged into and monitored business continuity plans in action as a result of C19*
- *I saw companies who had planned for medical emergencies send PPEs to hospitals/first responders during the COVID crisis. ERM analysis had led to the companies having this available, and with no employees on site (risk mitigation?), the PPEs were not needed on-site. The hospitals were not prepared for the pandemic (poor ERM practices?) and that corporate ERM planning pulled them through.*
- *Management of COVID-19 pandemic through business continuity plans.*
- *Most companies were aware of the potential for a pandemic so it has been part of the risk management process for a while (both underwriting and operations perspective)*
- *What a wild question to ask on November 5th of 2020. However, I think the forestry/fish and wildlife folks did a good job having a plan for the murder hornets (at least so far)*
- *Lead role in decision-making during COVID response.*
- *H-E-B pandemic preparation (Texas supermarket chain)*
- *monitoring medical claims and provider resources for impact of COVID-19 and provide resources where possible to members and providers*
- *The use of ERM to manage COVID response*
- *Capital decisions in a rapidly changing interest rate and economic turbulent time. Having a structure to test stresses helped when decisions had to be made*
- *Principal based valuation*
- *Electricity and water resources distribution*
- *First lines are more risk aware and is more willing to put in controls to address risk identified*
- *Most financial services companies' disaster recovery planning allowed continuation during covid*
- *ERM Program Helped to Identify Lack of Controls and Procedures*
- *Acting versus pandemic risk*
- *Greater awareness and more open discussions of emerging risks. IT department is taking measures to reduce impact from regional disasters and pandemics*
- *A few companies conducted meaningful pandemic scenario tests and plans well before the pandemic actually happened. For these companies, it was a lot easier to respond to the pandemic than those that hadn't thought about what could happen until the risk was already at their doorstep in March 2020.*
- *I believe our ERM framework helped us in the early stages of pandemic planning since we had already identified a pandemic as a possible risk*
- *Due to the low interest environment a decision was made to suspend sales of a particular product due to its negative return in that environment. It had been determined through prior stress testing that this course was the prudent one to take.*
- *Hospital system aggregated all risks amidst COVID-19 to understand interplay*
- *Seamless transition to 100% remote work globally in current pandemic*
- *The most recent examples are universities, where risk management and other professors have contributed to informing student policies related to the pandemic. The best example is one university that tests the human waste to scan for dorms that have COVID, though many schools are taking a less scientific but important approach.*
- *Use of vnb and vif to reduce tax arbitrage*
- *My company deals with financial risks, I personally do not.*
- *I don't see much on the positive side. I do see a massive failure on the negative side. From a US governmental perspective, it seems to have been penny-wise, pound-foolish to abolish the pandemic response team at the White House.*

- *SAS did big investment to promote remote work (laptops, cloud, human resource policies, etc.) that now are giving benefits.*
- *N/A*
- *Cyber-attack planning led to robust training efforts for staff.*
- *I am not an expert on other company's successful use of ERM*
- *We were aware of the lack of business interruption coverage for a pandemic, having previously identifying it as a self-insured risk*
- *I am not an enthusiastic supporter of ERM. Every risk is "local" to a business, just as they say in real estate. Enterprise wide risk management is important but only when the local inputs are meaningful. Attempts to incorporate climate change into ERM are an absurd overreach of the original principles of ERM.*
- *Chase*
- *Pension Industry*
- *Risk Culture was created and all of Executive Team bought in and adhering to it*
- *Planning around business continuity risk was likely used by many, some positive some likely not as robust as desired*
- *Identified top risks*
- *ERM is used to reduce risk and income volatility for the Company and protect the credit rating.*
- *Leadership interviews identifying top risks for the organization. Implementing their response into the ERM framework.*
- *SOA has used it to identify key challenges facing the profession and its membership.*
- *State a risk appetite policy and performance indicators were fundamentals to cap risk exposure and redirect efforts. In an Insurance company we identify an Exposure in specific products*
- *AIG has announced they are spinning off their life insurance companies - with low growth scenarios so likely and the NAIC reactive to the threat*
- *unsure*
- *ERM principles were leaned on heavily in response to COVID-19. The agility to identify, assess, monitor, and mitigate permeated to new areas of organizations*
- *None*

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

- 47%/41%/46% Yes
- 8%/9%/7%/10% No
- 44%/50%/47% Not sure

Does ERM Improve Returns Relative to Risk?



Question 4. Why or why not?

For those who answered *Yes*:

- *ERM looks to manage risk not eliminate it - sometimes risks create opportunities - it is all about how you manage them. ERM should also be proactive - building risk techniques into initiatives and processes at the earliest stages to support decision making, avoid re-work, etc.*
- *Not thinking about risk-return relationships causes more risk or less return*
- *Stability helps stock price*
- *Can contemplate numerous scenarios and plan for contingencies*
- *The quantity of risk is identified more realistically relative to the return.*
- *ERM forces focus on the future and consequences.*
- *Helps companies explicitly identify risks in product development / pricing and provides insights into exploration of large deals*
- *Inhibits Risks that are difficult to manage and can destroy value*
- *Helps with planning for the fluctuations. Risks will not go away, but company ERM practices can help manage the impact.*
- *Yes because it helps inform management so that they are aware of the risks involved in the decisions they make*
- *Although the answers may not be completely correct. It provides the necessary framework to house assumptions and the results of stress testing. Hindsight testing adds value as it helps improve the assumptions.*
- *Business units are measured with risk adjusted return*
- *Understanding the exposure and whether the company is willing to undertake the particular risks in pursuit of its strategic goals (as part of its plan), if not they need to understand how to de-risk. All should understand up front regarding the potential risk/reward.*
- *Risk return trade offs are better considered using ERM*
- *Believe it provides information that builds trust*

- *In risk taking industries, it is important to have a risk management framework to control the process of risk selection*
- *Identifying such risks will help to adopt an interdisciplinary approach versus probable challenges*
- *Risk needs to be paid*
- *Reduces risk of large sudden losses*
- *Advanced ERM techniques result in less surprises for Senior Management and the Board.*
- *I believe ERM adoption is simply table stakes for any organization in today's complex and volatile environment*
- *Successful ERM may not directly increase returns but over the long-term boosts return by limiting downside events.*
- *From being just oversight. ERM participates in the followings:*
    - *Asset allocation optimisation*
    - *Reinsurance optimisation*
    - *Pricing process*
    - *New products*
    - *Capital optimisation*
    - *M&A*
    - *Risk culture across company*
    - *Strategic planning*
- *Better measurement metrics support better decision-making*
- *It allows us to feel supported by management about walking away from certain products/risks or pricing others more aggressively, and it provides a framework for periodic, strategic discussion amongst both leaders and practitioners.*
- *I don't know, but that department indicates that it produces higher profits.*
- *We need to think about what can happen for which we may wish to prepare. Opening up on the potentials, how we may be impacted*
- *Deciding whether to mitigate or exploit strategic decisions and associated risks.*
- *Silos pose a risk to companies in terms of general efficiency. ERM establishes a wide view of many moving parts to make better decisions overall.*
- *Yes. Work was not interrupted with COVID19.*
- *Planning for risk should help reduce exposure to it, without lowering returns significantly.*
- *Identification of risks and (hopefully) a plan to respond*
- *Helps a company better understand and quantify risks, which improves risk/return assessments*
- *Helps focus on the longer term*
- *Informs decision making*
- *Focus on top risks and their mitigation to ensure proper surplus levels*
- *Understanding sources of risk and their interdependencies allows for improvements in risk-return profile.*
- *if you don't measure and monitor risks, you can't proactively deal with them; instead, you become reactive, which is less effective.*
- *ERM fosters decisions that maximize the return for the risk taken.*
- *Thinking through the various scenarios allows you to anticipate events you might not have thought of otherwise*
- *ERM encourages companies to think more holistically about the type of risks they are willing to take and what influences their willingness to accept risks. Further, by considering risks out of silo, their benefits are more identifiable.*
- *Better preparation for the unknowns*

For those who answered *No*:

- *Sometimes the ERM is more focused on theory rather than practical and tactical events that affect a company's financials*
- *ERM spends too much time validating risk that are well understood just to show something is being done!*
- *ERM at our company tends to focus more on avoiding risks rather than identifying risks that we can exploit.*
- *The mechanics of setting up an ERM program takes a long and dedicated period of time. However, once it is set up, it becomes more inflexible. Frequently, you are only concerned with the impact of the same worst case scenario. You gain little to no additional insight since you already know the extreme condition that hurts your company.*
- ***Only matters if risk materializes.***
- *In my experience risk management came before ERM. ERM is just documenting all the risk management that was already done.*
- *Most ERM that our company has adopted is effectively increased bureaucracy.*
- ***The enterprise must be willing the change; we don't look at "keep this business model" but rather "how best deploy this collection of assets and strengths"***

For those who answered *Not sure*:

- *ERM is not yet fully integrated with the company's strategic planning*
- *ERM still tends to be quite detached from the actual business. There needs to be more interaction between risk management and the business to identify potential risks / opportunities but more importantly act on those.*
- *I am not an enterprise risk management professional*
- *I think it's very hard to provide a quantification of the value of ERM. Qualitatively, it makes sense - not sure if there's quantified proof of the value.*
- *Not so much not sure as I think it's not so much about the amount of risk - like we could be taking on more risk but we are more aware of what those risks are, that is its more explicit.*
- ***It should, but suspect there's a lot done for show, with little real teeth.***
- *Too many variables involved - type of industry, type of risk(s), regulatory environment, horizon, management approach and strategy*
- ***If done properly, ERM is simply a disciplined business decision process, not an additional layer of infrastructure - making it difficult to quantify its impact. Further the goal of ERM decisions may be to reduce short term volatility rather than increase long term returns.***
- ***While ERM certainly mitigates tail risk in some cases, those types of scenarios happen so rarely that the cost of an ERM program might not pay off if the "tail" scenario doesn't come to pass.***
- *It is hard to quantify. Efforts made before but assumptions are challenged.*
- *With the mitigating controls in place, losses, in terms of likelihood and impact should be reduced. However, it is difficult to quantify this in terms of monetary value.*
- *ERM can become too routine to the point of losing efficacy.*
- *ERM is an important component that should be looked at periodically, but the internal cost of whole departments focused on this may outweigh the positive gains.*
- *It is hard to allocate value to ERM.*
- *From looking at some data, it doesn't seem to help that much, currently. New ways of looking at ERM need to be developed.*
- ***ERM exists in a non-formal manner even when an organization does not formally address it.***
- *Not sure*
- *Sometimes can focus too much on risks that ultimately won't affect the organization directly or the organization really can't do much to prevent / mitigate certain risk.*
- *It depends on how the ERM program is implemented and the stated goals of the program. It would be foolish to make the blanket statement that ERM improves or does not improve all company's*

returns relative to risk. Returns may go down relative to the decrease in risk and that might be the desired outcome. ***This is not a good question.***

- *Having an awareness of the risks is key for better decisions, just hard to always quantify or we have not taking the time to quantify impact.*
- *Mitigating or hedging idiosyncratic business risks usually improve business returns. The most serious challenge is in measuring these risks correctly in time to do something about it. How many life insurers correctly hedged the zero rate environment we have been forced back into?*
- *Not sure about the risk adjusted return.*
- *It certainly could, but dependent on follow-up on risks and buy-in from top.*
- *ERM team not implemented into strategy yet; still a growing concept*
- *Depends on how effectively it's implemented and the skill with which people address the risks. Implementing ERM programs is a good idea, but by itself, won't necessarily improve a company's rate of return.*
- *I don't think companies' operations were prepared as much as we would have liked for the pandemic.* ***Business continuity preparation was a very positive contribution****, but more planning could have been done*
- *It depends on how proactive a company is in implementing ERM across the enterprise.*
- *Lack consistency of approaches*

Question 5. How did you proactively prepare for an infectious disease pandemic?

- ***We had conducted work from home pilots a year earlier to determine where we had gaps - this planning wasn't specific to a pandemic but definitely served us well***
- *We typically run sensitivity tests on the short-term financial impact of a pandemic*
- *Business continuance operations, diversified portfolio*
- *Risk modeling*
- *Economic capital, annual test of continuity of business, where possible included means to mitigate experience.*
- *Social distancing. Respectful toward others.*
- *Worked on a company work from home policy.*
- *Committee meetings as COVID19 was just beginning to have impact in the US.*
- *Business continuity*
- *Insurance contract covenants*
- *We had PPEs at large corporate sites. We had a plan sketched out that was similar to WFH in case of natural disaster.*
- *Run actuarial pandemic stress scenarios and had a business continuity plan in place.*
- *Stress tests with varying degrees of gravity had been developed and are being refreshed regularly at my company*
- *I am not in a position to implement or influence any preparations.*
- *Business interruption plans*
- *Inventory of supplies, all employees were allowed to WFH prior to pandemic, responded early*
- *N/A*
- *Had a set of measures that historically represented non-pandemic values, such as claims, or services or provider measures*
- *Set up a team to be on the lookout for possible risk events, include pandemic response in disaster recovery and business continuity plans*
- *Work from home tests. When H1N1 hit, we took it seriously and had the playbook ready for the elevated levels we reached in March, 2020.*
- *Implemented business continuation plan,* ***employee wellness and support network****,...etc.*
- *Document, scenarios, table tests around disaster recovery/continuation of business.*

- *We didn't per se. But our portfolio mix is diverse and from a personnel perspective we already had the tools for all to work from home.*
- *Business Continuity Planning*
- *We did not*
- *Monitored industry activity. Already had a remote-capable workforce and strong business continuity plan.*
- *Strong cash reserves and financial preparation, otherwise we did not.*
- *Continuity planning*
- *Contingency plan and testing before to be able to work from home and lockdown the offices.* ***Management takes action to cut pay while promising job security and paid the cuts with interest after cash flow risk is low.***
- *BCP is beefed up, alternate sites being ready for staff, facilities in place for staff to work from home*
- *Our company has modeled pandemic mortality annually for a risk report.*
- *Office closure drills*
- *Do Not*
- *Gains in technology have proved tremendous for both continuing sales as well as home office support*
- ***Did not. It was mentioned and then ignored last year since frequency appeared very low.***
- *We didn't*
- *NA*
- *Considered potential impacts on the operational, financial and control environments, keeping the safety of staff front and center, and considered a* ***"playbook" reaction for the potential pandemic***
- *Encouraged vaccines, have wellness programs which encourages better nutrition and health and exercise/mobility.*
- *Began monitoring for the risk in late 2020, well before it came to North America or Europe. Tried to understand how serious the risk really was. Then, once it was understood that people could spread the disease without any symptoms, it was clear that there was no way to stop the disease from spreading outside of China unless the borders were closed.*
- *Built up sufficient capital/surplus and diversified investment portfolio, had already invested in IT infrastructure to support broad adoption of remote work*
- *Technology for remote work*
- *We had a pandemic monitoring group set up prior to COVID-19 and had previously laid out both operational and financial plans for dealing with a pandemic.*
- *None*
- *Ensure running frequent tabletop exercise with Executives. Adequate and coordinate role and responsibility. Proper committee structure and membership. Proper communication between committees from the top and down to the operations. Proper documentation is maintained.*
- *Stocked up on dry foods*
- *Always practice good hygiene (hand/body washing, food prep)*
- *Pandemic preparedness plan in place. BCM plans in every location, tested regularly. Incident management teams established at each location and trained in advance.*
- *Ability to work remotely*
- ***At the time, I was in a regulator role. The industry paid lip service to pandemic risk, which could be gleaned from their filings. They were wholly unprepared, despite inquiries and prompts.***
- *Work from home.*
- *Didn't*
- *I believe, that as an industry, we had not particularly plan. However, we reacted well once people became ill in the US.*
- *We identified several risks and indicators that would suggest a pandemic effect.*
- *Team responsible for monitoring emerging diseases.*

- *There were some contingency plans for a situation where individuals would need to work from home, but not for the scale of an infectious disease pandemic.*
- *We didn't.*
- *We made sure that employees of our clients had medical coverage.*
- *Visualize steps taken in order to prepare for the contingency.*
- *Collecting information of good sources about the pandemic and following the policies of the health authorities.*
- *Stock up on food and essentials. Acquire technology needed to support more work from home and more virtual meetings.*
- *No*
- *Working from home exercises*
- *Had done some scenario planning.*
- *As poorly as everyone else.*
- *Backup of data, having technology for shift to working remotely for almost entire workforce, ORSA modeling to ensure capital available to address increased claims, etc.*
- *We had high level plans/actions available to tap in the event of a pandemic*
- *You prepare for disruption. You don't prepare for disruption for only certain causes. Another silly Q.*
- *Having IT systems that could allow for remote work, we spent years planning for an event like a disaster so when the pandemic hit we were ready to move employees home quickly and had the technology to support it for the most part.*
- *Manage office closures, back-up plans etc.*
- *Exclude the uninsurable risks*
- *Social distancing*
- *We didn't.*
- *Prudent exposure*
- *Not necessarily for the Pandemic, but for employee absence => proactively prepared for almost everyone to work from home*
- *Shift to more digital means of doing business, shift to more use of laptops in workplace.*
- *We had identified the pandemic risk, and had catastrophic reinsurance coverage (albeit insufficient capacity)*
- *In the past, ran Pandemic scenarios as part of scenario testing; discussed this with senior mgmt and the board*
- *Current events have proved that engaging the public is the most important task. US COVID disaster was due to Trump convincing large numbers of US citizens that COVID was no problem.*
- *Stress scenarios*
- *Using our business continuity process we were able to provide the ability for employees to work from home.*
- *We didn't. We reacted and responded well, but we didn't see it coming.*
- *Business continuity planning, succession planning, technological capabilities*
- *Reshaping procedures, updating the recoverability plan*
- *I personally built up a large emergency fund. As an actuary 15 years ago, I helped encourage RBC requirements and tried to encourage my company to be proactive. I was not encouraged.*
- *IT work from home Bus. Cont.*
- *Prior business continuity and disaster recovery assessments as well as ERM scenario analyses provided the baseline for our pandemic response. Our ERM planning was heavily referenced particularly when addressing the disruptions to our supply chain.*
- *Not in fact possible. Disperse assets at risk, both human and other.*
- *Buying Health Insurance*
- *There were no advanced preparations - only reactive*
- *Margin of safety in business planning; cloud-based business; remote working setups*
- *Modeled in Economic Capital calculation*

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

- *There is an increased appreciation for risk management overall - people are more open to discuss scenarios, look at ways to manage activities, etc.*
- *Not really*
- *New scenarios are being tested*
- *Senior management had to change their reluctance to WFH*
- *Minimal change*
- *Only normal refinements; no shifts in methods*
- *More political.*
- *Working from home is now a solution, instead of a problem.*
- *There's now a larger focus on the disruptive effect of risk (i.e., tech and HR). Previous focus tended to be on the named (i.e., mortality) impact.*
- *n/a*
- *Greater integration of data analytics into risk management*
- *The risk managers are no longer teased about the absurdity of their scenarios. Remote work has proven the concept that work can be handled in different geographic locations. We spend more time considering the impact of multiple risk events occurring simultaneously. We are becoming more creative in considering ancillary effects.*
- *Closer look now at "what we might be missing" (unknown unknowns) and how to proactively address these in policy coverage*
- *Added another facet to potential risk discussions we previously ignored.*
- *Much more firmness around assumptions on timeframes and mobilization capabilities*
- *Risks that are not related to pandemic were evaluated to determine if they would be impacted or could be set at lower priority. Added evaluation and mitigation for many scenarios as the pandemic played out so that we were prepared*
- *They have become more hands on aspects of ERM, and more visible to the rest of the company.*
- *Management/board appreciates that the playbook was in place and executed. Also showed importance of stress testing multiple items.*
- *Implemented as planned with additional items which were not considered in the pandemic events such as low interest rate environment.*
- *Happy we had what we had. Observed it had gaps. Still, not sure we'll do much differently as cost of attempting to fill all gaps likely exceeds value. Also recognize not all gaps will be recognized and addressed. Have a base and be agile.*
- *I think that risk planning will be more focused and relevant post-pandemic. It was somewhat theoretical previously.*
- *Created models studying costs, utilization, supply, disease spread.*
- *No impact on my company.*
- *Everyone is still in limbo as to what to do, how to plan, how to strategically plan the "day after", and how to implement*
- *No material change.*
- *Yes*
- *It is a new scenario but the company takes the most cautious approach to make almost everyone work from home and forbid business travels.*
- *More towards the BCP front, as described in 5 above*

- *Strict mortality/ morbidity tracking and discussion around new product changes (none currently implemented)*
- *More peripheral risks identified. Other Emerging trends also made more clear*
- *Have Not*
- *More focus throughout the company that things can and do happen.*
- *We do it remotely.*
- *Terms we provide has been changed*
- *NA*
- *It has raised in importance to help manage the financial and operational resilience and control environment for the business*
- *More immediate and more concrete action anticipating further downside pressures from quarantine and lack of office interaction when working remotely*
- *Paying greater attention to the risks that are under the radar. Pandemic was certainly near the bottom of the likelihood list from an early 2019 perspective.*
- *I believe our evaluation has improved because we have more real data points to support 'stress testing'; mitigation techniques have likely not changed much*
- *Expanded the scope of what scenarios are possible and how preparations must be made*
- *Data availability has changed, as has how we work together.*
- *Not changed*
- *It's been overemphasized to an extreme.*
- *Minimally*
- *They haven't changed, that's the biggest problem. COVID-19 is far less lethal to the majority of the population than first thought/feared, but the initial extreme mitigation methods haven't changed and continue to overreach into personal freedoms.*
- *No significant changes other than studying current pandemic to enable better predictions.*
- *When it comes to pandemic risk, we are much more aware of previously unforeseen situations. The past evaluations very much focused on direct health care costs, mortality, billing delays, and the work from home transition. Other major issues such as asset risk, credit risk, substance use disorder, mental health, averted health care, and the loss/gain of premium volume by market have been unearthed by experiencing an actual pandemic.*
- *Pandemics were not previously a focus for most companies. Now, it is probably more of a focus.*
- *Additional analysis around the health of assets. Also, staff reductions due to decreased premium.*
- *A pandemic was never planned for. I think it is now happening. We realize that even if this one ends, we are susceptible to other viruses.*
- *Yes. The thought processes related to various catastrophe contingency plans have been updated to better reflect the experiences and to anticipate future challenges.*
- *Supply chain risks have been re-evaluated.*
- *More aware of pandemic impact*
- *Yes, there have been changes to speed up the process of getting remote access to employees, tools to improve efficiency of teams not working from a central location, and plans for dealing with the disease at the office, when employees return.*
- *It hasn't.*
- *Health care costs are much more difficult to forecast.*
- *COVID-19 has hurt them by making it more difficult to informally engage in discussions.*
- *No one could predict and quantify this impact, but a quick response was needed.*
- *More focus on impact of COVID.*
- *Company shifted to prepare for next pandemic and starts to look into other emerging risks*

- *It hasn't.*
- *Probably more likely to consider black swan events; things once thought very rare will be taken more seriously.*
- *This is contentious. We have multiple offices with varying political views so consistent approaches are nearly impossible.*
- *Not really changed.*
- *No change*
- *We have evaluated vendors more critically in light of the COVID pandemic.*
- *People are more interested in thinking about what is not insured, and that it is important for stakeholders to think about disasters more prominently than they may have in the past.*
- *COVID-19 was one of the events that was on the radar screen but low probability. There will be a tendency to overweight this in risk scenarios going forward. Perhaps low probability events like this will get more one-off deterministic scenario checks.*
- *Further assess the pandemic risk and avoid it if it's uninsurable*
- *Hasn't*
- *Contingency planning*
- *Increased interest in risk tolerances & protocols and on ensuring strategic spend will be within these tolerances and support revised strategic plan*
- *Pace has increased, short-term spending increased on the mitigation side.*
- *Risk evaluation: consciousness and possibilities have been enlarged; monitoring now has a higher frequency. Risk mitigation: creativity has been required.*
- *More frequent review of risks; more extensive/detailed scenario testing*
- *US problem was not risk evaluation and mitigation. We knew how to do these -- but a sizeable fraction of US citizens chose not to do them.*
- *Added COVID risk evaluation*
- *The process has not changed much.*
- *Significant review of risk identification procedures, new redundancies put into our risk mitigation systems, Risk Committee strengthened.*
- *I think risk managers are more likely to look at interactions between risks. While I anticipated the quick drop in asset values, I did not expect the Fed and Treasury to be so active so quickly. Now it looks like we might see what happens when Treasury pulls back its stimulus.*
- *Unsure*
- *I think the lens of ERM has been more focused based on the available resources during the pandemic, however, I'm finding that the evaluations are more comprehensive for the items we've prioritized.*
- *Surprised and disappointed by apparent incompetence of government medical infrastructure.*
- *Risk evaluation and risk mitigation implemented under COVID-19 largely helped in reducing the effects as well as rate of spread of the virus.*
- *Greater focus on emerging risks and potential scenario outcomes based on the progression of the disease and its cure*
- *Still in progress of understanding impacts of COVID-19*

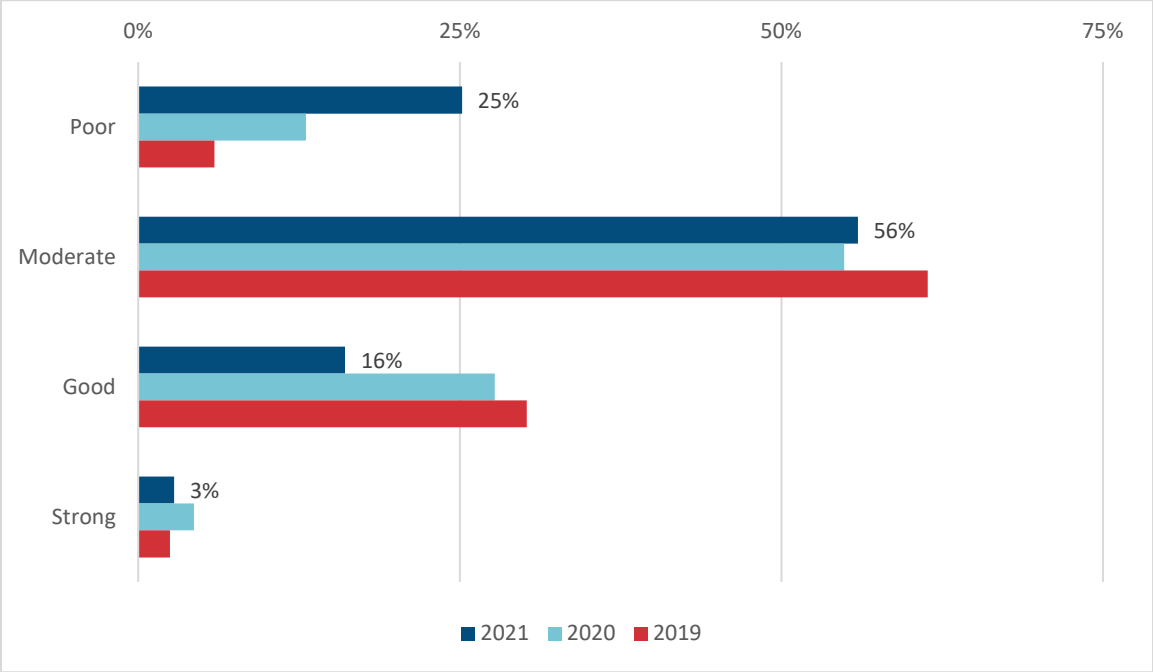
Section D: Current Topics

Question 1. Your expectation for the 2021 global economy is:

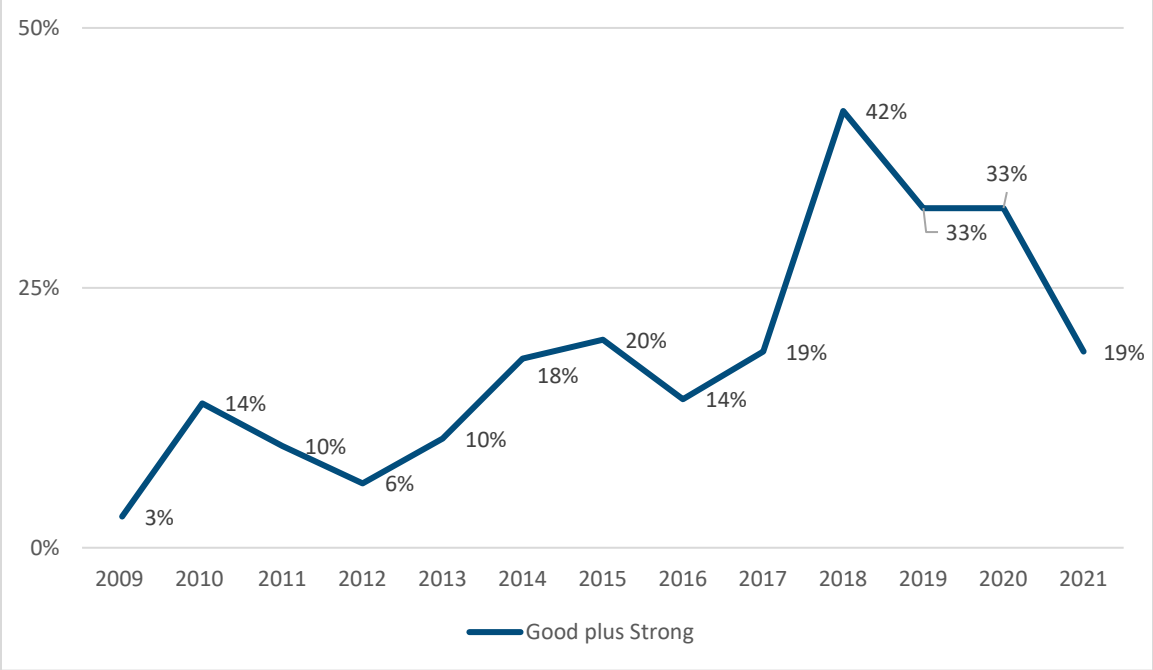
- 25%/13%/6% Poor
- 56%/55%/61% Moderate

- 16%/28%/30% Good
- 3%/4%/2% Strong

Global Economic Expectations



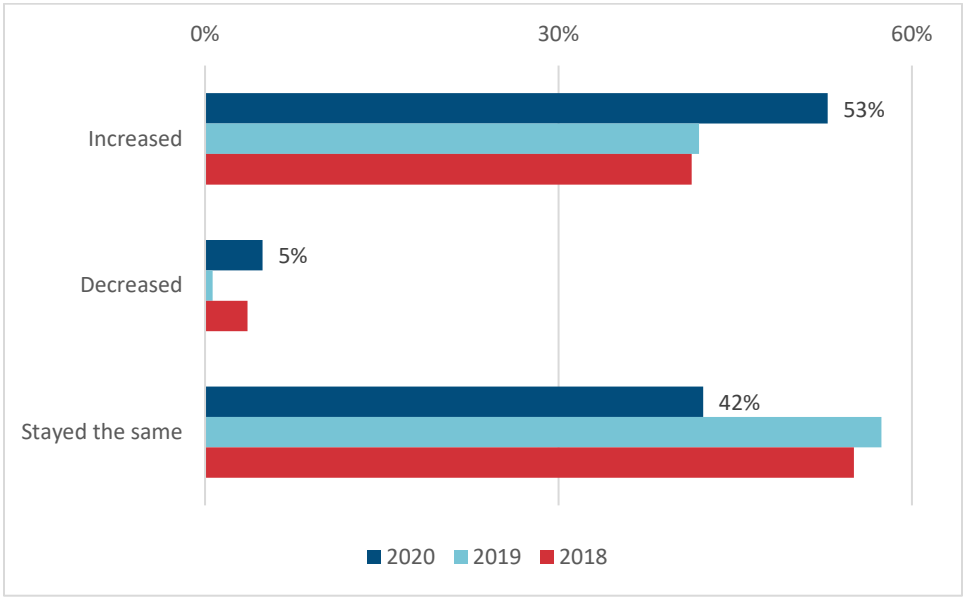
Combined Good + Strong Economic Expectations



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

- 53%/42%/41% Increased
- 5%/1%/4% Decreased
- 42%/57%/55% Stayed the same

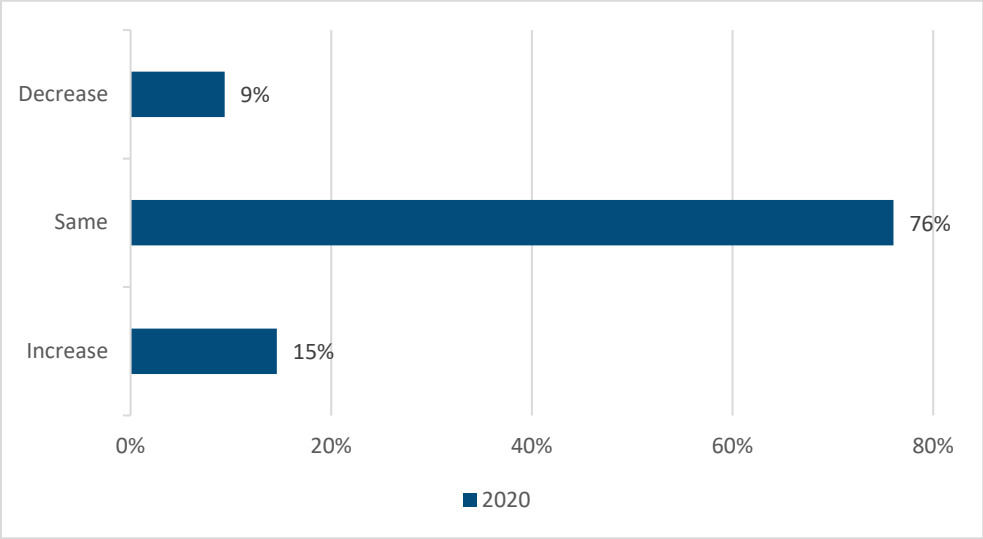
ERM Activity



Question 3. Did your internal ERM staff increase in 2020?

- 15% Yes
- 76% No – same size
- 9% No – reduced

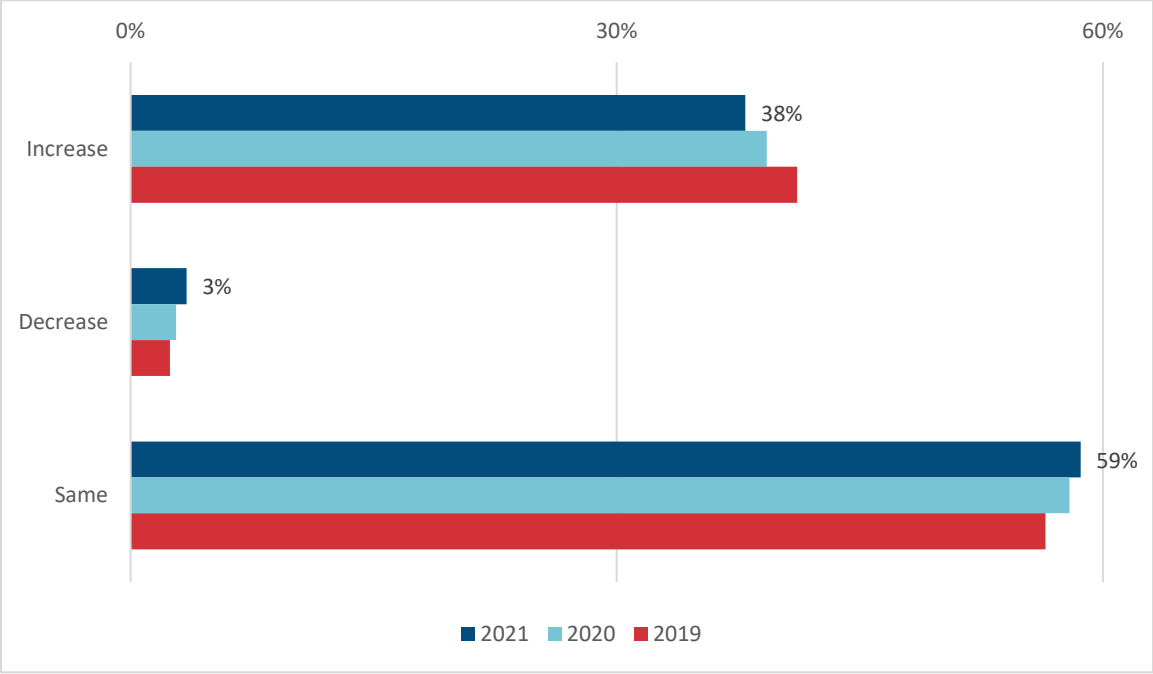
ERM Internal Staff Growth



Question 4. Do you anticipate a change in the level of ERM-focused activities for your organization or clients in 2021 relative to 2020?

- 38%/39%/41% Increase
- 3%/3%/2% Decrease
- 59%/58%/56% Stay the same

Future Expectations – Activity



Question 5. What types of Cyber/networks and Disruptive technology scenarios do you analyze?

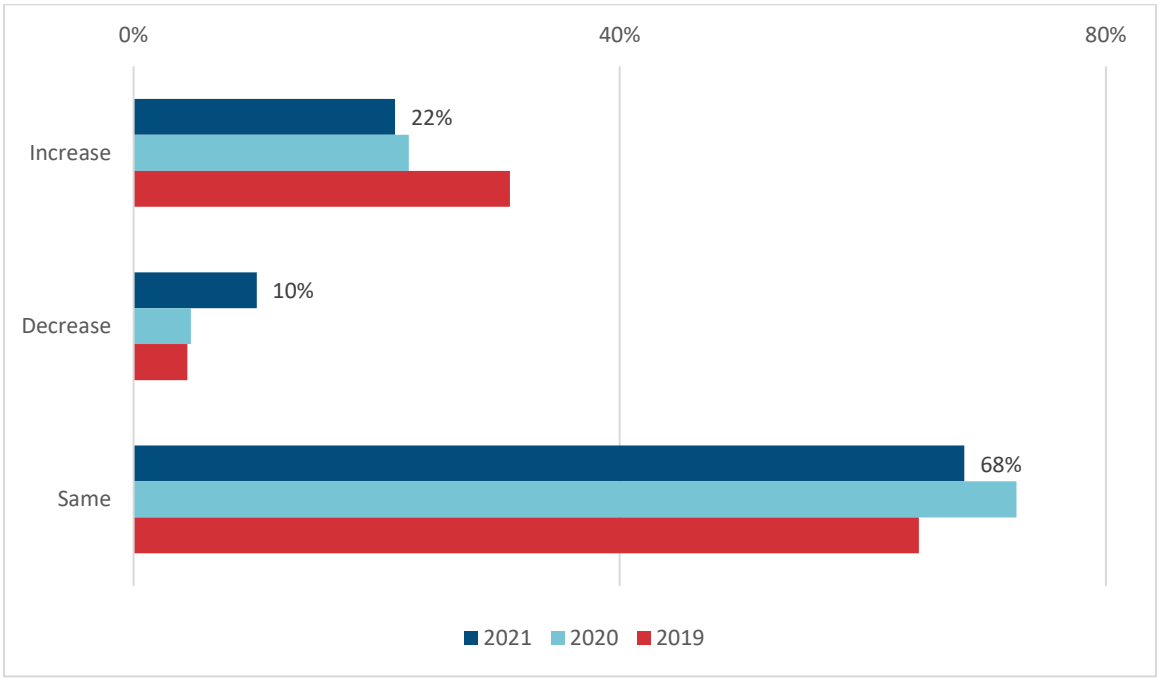
- *We consider security breaches, network/system failures, risk of not embracing new technology such as machine learning*
- *We model a "cyber event" scenario which focuses on the expense component of the recovery. The IT area performs a table-top ransomware/malware walk through every year.*
- *We consider cyber crime in multiple ways - major hacking, such as ransomware, data breach, etc., as well as that affecting individual customers, such as identity theft situations. Disruptive technology could change sales, underwriting, investments, mortality.*
- *Mostly affirmative cyber scenarios of all kinds (ransomware, cloud attacks, business interruption), but there is a need to look more closely at silent coverage too going forward*
- *Sensitive data disclosure, market disruptors, service expectations*
- *Any potential for malware attacks, how easily we might be able to recover and priority for systematic recovery*
- *A new technology revolutionizes the way we do things but has an inherent vulnerability*
- *I don't analyze cyber risk or disruptive technology scenarios.*
- *Malware, ransomware.*
- *# of disruptions, or if a ransomware attack occurs*
- *Cyber - large scale data breach, internal breaches*
- *Disruptive technology - no specific scenarios*
- *Look at weaknesses in cyber security and education of employees regarding cyber security. The loss of new business/in force business if not identifying and implementing new technology.*
- *Loss of internet connection; ransomware; third party vendor issues*
- *Data being compromised with threat actor ransoming the company*
- *Do Not*
- *Tech companies creating an Uber for insurance that takes substantial market share from traditional insurers but is unregulated.*
- *Data breach.*
- *AI impact*
- *A number of scenarios*
- *CRISPR*
- *A cyber attack that would impact multiple companies at the same time - what would be the impact on the insurance provider?*
- *Major technology outages--impacts to operations, customers, providers*
- *Data breach; phishing; systems failure; etc.*
- *None*
- *Cyber war, cyber attack on critical infrastructure, ransomware, data breach, third party failure*
- *Not my area of expertise.*
- *I am not directly involved in this' analysis. I can only communicate that my employer has many communications to employees about the increased risk and has greatly upped the training and phishing testing of employees. I was tested just two days ago. My company's testing has gotten much more advanced.*
- *NA*
- *Vendor actions, redundancy planning, staffing, locality strategy.*
- *I don't know.*
- *This is not my job, so none.*
- *Phishing, virus, cyber-fraud.*
- *Need for adequate backup storage.*
- *Not sure*
- *Network and power outages, hacking, phishing scams, ransomware.*
- *Various disruptions to ability to conduct business. Multiple strategic planning scenarios.*

- *We analyze outages, disruptions, impairments, failures and breaches.*
- *Not sure, as not involved in that facet of our business. Personally I know we continue to update technology, train our people and invest in all technologies that allow for greater efficiency or that make it easier for our customers to do business with us.*
- *Large cyber attacks. Artificial intelligence as a replacement for some insurance/actuarial services.*
- *Security breaches*
- *Ransomware, DOS*
- *Board level*
- *All levels of cyber hacking and network failovers; none for disruptive technology*
- *Annual table top exercise lead by external party, annual penetration testing*
- *Despite knowing very little about it I am aware of: fraud, network collapse, data base breach.*
- *Cyber penetration testing conducted annually; random employee testing*
- *As a small company, we focus on a) having Cyber Insurance and b) taking reasonable precautions -- being careful when downloading, keeping a minimum of sensitive data, using strong passwords*
- *All*
- *Phishing, ransomware, malware, network failure, stolen records*
- *Redundancy, and more redundancy; dispersal of at-risk assets.*
- *Not sure. Not my area of expertise*

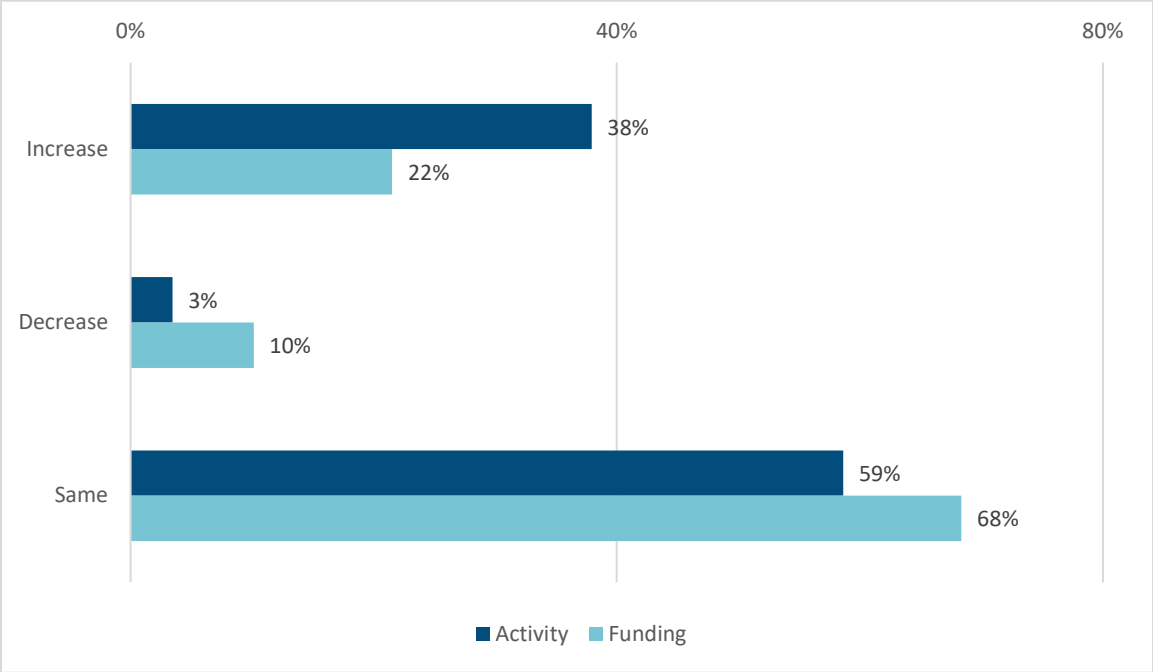
Question 6. Do you anticipate a change in the level of funding dedicated to ERM-focused activities for your organization or clients in 2021 relative to 2020?

- 22%/23%/31% Increase
- 10%/5%/4% Decrease
- 68%/73%/65% Stay the same

Future Expectations – Funding



2021 Anticipated ERM Levels



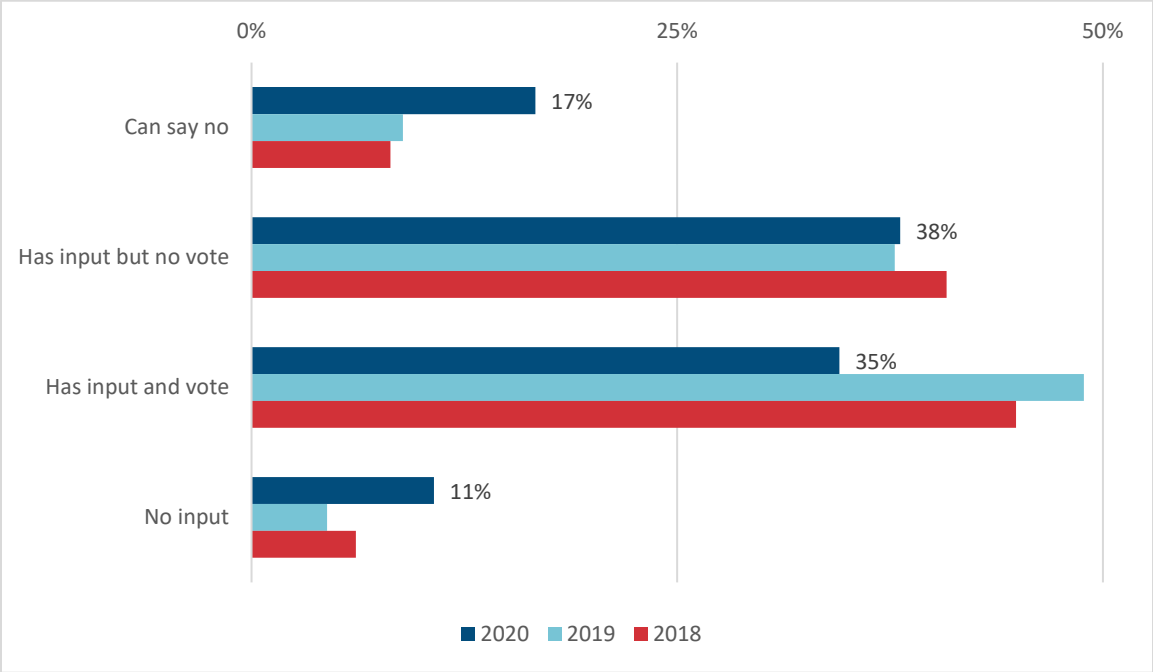
Question 7. The true measure of an ERM program is how it is received by the board and senior management. Which of these is true in your situation? (Please select all that apply.)

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

- 17%/9%/8% Our ERM function can say no to a strategic opportunity.
- 38%/38%/41% Our ERM function has input but not a vote when a strategic opportunity is being considered.
- 35%/49%/45% Our ERM function has input and a vote when a strategic opportunity is being considered.
- 11%/4%/6% Our ERM function has no input when a strategic opportunity is being considered.

- *The ERM function "vote" depends on the size of the strategic opportunity.*
- ***Our ERM function provides a risk opinion on significant initiatives but senior management/Board is accountable for the ultimate decision.***
- *I am not on the board but I am sure major risks are considered for key decisions.*
- *It can depend on the strategic opportunity*
- *No one owner of that responsibility*

Strategic Opportunity



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

- *During recent COVID pandemic, we refreshed all of our risk assessments, including mitigating activities to share with management and the board and were recognized positively for the thoroughness of the work. I would also say that we were recognized for work related to building out operational resilience pre-COVID as we were able to transition to remote work fairly easily*
- *n/a*
- *Many times throughout 2020 for the COVID response and financial assessment*
- *Recognition of scenario planning and communication of possible impacts*
- ***The Board, CEO and Senior Management have recognized the CRO for leading the company's COVID response.***
- *Contributions to the review of model risk, changes of models or assumptions.*
- *n/a*
- *Realized we had not satisfactorily considered pandemic risk and the multitude of effects on the company.*
- *Verbal recognition from senior management*
- *ERM is looked upon as a necessity not a proactive value added activity.*
- *Proposing approaches to managing market risk during a period of financial volatility*
- *N/A*
- *I have not observed formal recognition. I believe our Board and senior leadership respects the function, but is still not widely understood or recognized at middle to individual contributor levels in the organization.*
- *The pandemic response developed by the ERM team has been widely praised as it was utilized with COVID-19*
- ***The CEO of my organization is an actuary, and has e-mails and videos, and messages to investors, that highlight ERM topics, especially during this pandemic. It is constantly part of her messaging.***
- *NA*
- *Evaluating health and life coverages going forward and the viability.*

- *Not applicable.*
- *Cannot think of any.*
- *We do not have an ERM department*
- *None.*
- *COVID-19 pandemic response and monitoring was praised.*
- *The risk management function was appreciated in Jan 2020 when we had pandemic financial analysis to senior management as a result of having previously analyzed*
- *Our team was recognized for being able to transition to remote work quickly, showcasing all the planning over the past years being worth the effort.*
- *Effect of changing interest rates in assets under management and steps that were available to mitigate.*
- *Full review of investment returns and risk.*
- *Recognition of how well prepared the company was via its Business Continuity & Disaster Recovery Plans when moving to remote work due to the Pandemic*
- *Creation of BCP plans many years ago, proved effective in current environment*
- *Pandemic risk was being evaluated when Covid-19 erupted. ERM was recognized positively as useful.*
- *Through risk assessment*
- *ERM department recognized the business interruption risk due to COVID and motivated both IT and HR departments to take actions to continue operations*
- *AM Best has favorably received improvements to my clients rating agency ERM packets - they weren't close to change in rating but with little expense moved in a positive way*

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?

- *We do this implicitly by considering risks and determining if there are ways to reframe them into opportunities*
- *Asset types and their pricing*
- *None in this regard*
- *Longevity swap market*
- *Geopolitical opportunities as we expand globally*
- *n/a*
- *Nothing specific*
- *None*
- *Review of changes of models and assumptions at regular basis*
- *n/a*
- *None*
- *None*
- *None*
- *Considering if emerging risks could be opportunities for new products, etc.*
- *Mortality and longevity risk offset*
- *N/A*
- *Investments in health care delivery companies*
- *We are monitoring newly formed captives and relatively new insurers as opportunities to take advantage of mispricing and diversification.*
- *NA*
- *Positioning our products and added benefits given the marketplace.*
- *None*
- *Crisis events.*

- *N/A*
- *None.*
- *We do not try to arbitrage*
- *There are regulatory opportunities which are being created all the time. The pandemic was an opportunity to benefit from a digital and technology driven distribution model.*
- *Places where technology-driven services will be accepted as people get used to remote-working or inability to use paper-driven processes of the past.*
- *N/A*
- *Board level*
- *Reinsurance prices, although very incipient.*
- *n/a*
- *New products*
- *Very little is underpriced today in the asset markets - there will be opportunities to pick up cash cow situations that are not sustainable without temporary influx of cash, 5G chips seem to be a good 5 year value*
- *We operate on the idea "no bad markets, only a wrong side."*
- *Relative pricing differentials in capital markets*

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

- *Not sure what you are asking*
- *Real estate outside urban areas. Much of the annuity risk. Certain Asian economies.*
- *You have to wonder about today's stock market, especially with respect to where the countries stand in their response to Covid...*
- *Nothing specific*
- *No*
- *N/A*
- *n/a*
- *Possible bubbles in business property values - related to mortgage loans and assets backing up the loans.*
- *Liquidity everywhere*
- *Post covid-19 impact in 2021, potential sluggish global economy*
- *Housing Market Decrease in Value Due to US Political Climate.*
- *Certain asset prices are inflated*
- *COVID-19 risk may still be under-estimated in today's environment. Numerous businesses are being closed or have been negatively impacted by the pandemic.*
- *I am concerned valuations of "growth" companies are excessively high, particularly in digital and health care industries; acquisition costs are far too steep except for the most "cash rich" companies*
- *I have invested in several stocks where I think the market has underpriced stocks due to over-reacting to COVID...life insurance and reinsurance is an example. It is possible that some of the manufacturers of vaccine or treatment are over-evaluated by Wall Street, especially those with an inferior technology or a late profile.*
- *NA*
- *Tech and mindset.*
- *No*
- *Yes*
- *Some pharmaceutical companies, and bitcoin.*
- *Real estate, given much less use of commercial property, and people stressed to pay mortgages and rent.*
- *No*
- *No.*

- *No*
- *Maybe. If so, I am unable to provide any information or detail.*
- *Yes, competitors who have not transitioned to the latest technology will be way behind and unable to serve customers now, increasing our ability to take those customers and bring them to our company.*
- *General asset bubbles (equities, housing). China is in bubble but authoritarian rule means its resolution is unlikely.*
- *Risk appetite*
- *Employee expectations post-pandemic.*
- *No*
- ***Bond default bubble** due to covid*
- ***BBB- bonds, especially if Fed takes away safety net, most equities, housing, anything with collateralized in the name***
- *Historically, bubble only recognized in hindsight. Caution and cut-offs at growth triggers, regret of missed additional upside never as painful as burst.*
- *Signs of a housing bubble*

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

- *Correlations between defaults and interest rates (historical links seem broken). Diversification of assets is key.*
- *COVID in 2021, planning on a return to normal but keeping track of what to do if it doesn't*
- *Taxes. Climate events. Risk mitigation includes diversification and purchase of insurance.*
- *n/a*
- *Model different scenarios adjusting historical data to estimate impacts*
- *N/A*
- *Cyber/disruption of service: Be as tight as we think we need to be.*
- *n/a*
- *Not done!*
- *Combined with industry studies or judgment*
- *N/A*
- *The rising cost of expensive medications; it is clear this will continue to rise in cost, but we need to seek more proactive solutions to manage and contract with providers versus increasing premiums or purchasing reinsurance*
- *Cyber insurance product for data breach, data restoration, business interruption*
- *There are so many future gene and cell therapies on the horizon that will further escalate health care trend. I watch this issue constantly, but it really could be a full-time job onto itself. How much these will be used and how much each will cost is an unknown known. Their efficacy and durability are also a big question mark.*
- *Most equity models within a company have high volatility. This causes equity model results to swing back and forth over a 2 to 3 year period. Because of this, there is little to no build up of value. Most companies don't use trading range volatility models. This is a situation where there are long periods of low volatility and short periods of extreme volatility. In these types of scenarios, company results will grow for periods of times and then suddenly lose value, which is similar in the market. By using incorrect equity volatility models, the equity risk is actually understated. This may lead companies to not properly understand their books of business, since there is little to no build up of values through time.*

- *Cyber risk has not seen significant hits yet at our organization. Risk depends specifically on exposure.*
- *I don't know.*
- *Credit events - we model capital sufficiency.*
- *What is the "real" trend.*
- *Subscribe to a service that provides independent economic data and inflation indices that are much higher than the CPI.*
- *Use the closest possible and apply assumptions.*
- *N/A*
- *Unknown.*
- *Look no further than interest rates. Are they going up or down? Will they go negative (in the US) or not? Inquiring minds want to know.*
- *We manage based on where they are today, not where they were in the past.*
- *None are coming to mind right now.*
- *Future path of inflation. We are aware that the range of inflation outcomes is very wide now. Strong risk of explosive inflation over next 20-30 years but no way to predict.*
- *Board level*
- *Future of interest rates, we have increased use of sensitivity testing on new and existing products*
- *Minimum wage salary increase. We measure its potential effect under what we consider possible scenarios, and we are constantly seeking ways for mitigating it, such as transferring risk to government (although no successful solution has been found).*
- *n/a*
- *Cyber, use industry studies that have more data*
- *Climate change - hitting tipping points - use qualitative scenarios and try to convert into quantitative analysis - tell a story*
- *Social attitude changes. Sudden social-movements, abrogation of long-standing cultural attitudes and preferences.*

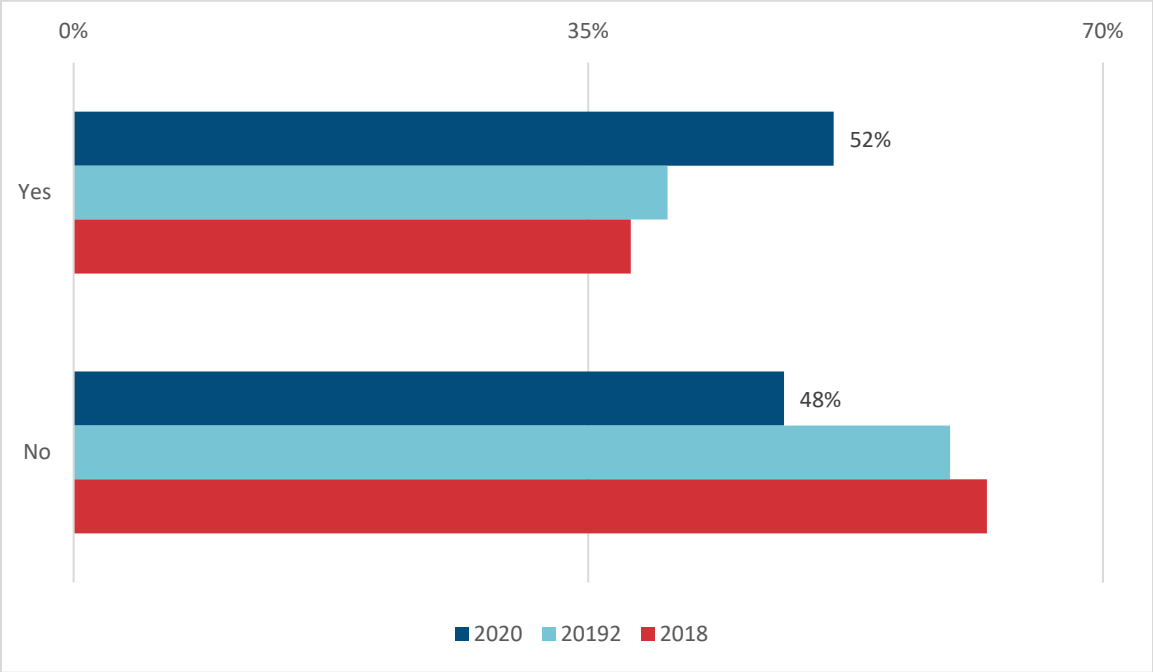
Section E: Demographics

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

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

- 52%/40%/38% Yes
- 48%/60%/62% No

Previous Survey Participant



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

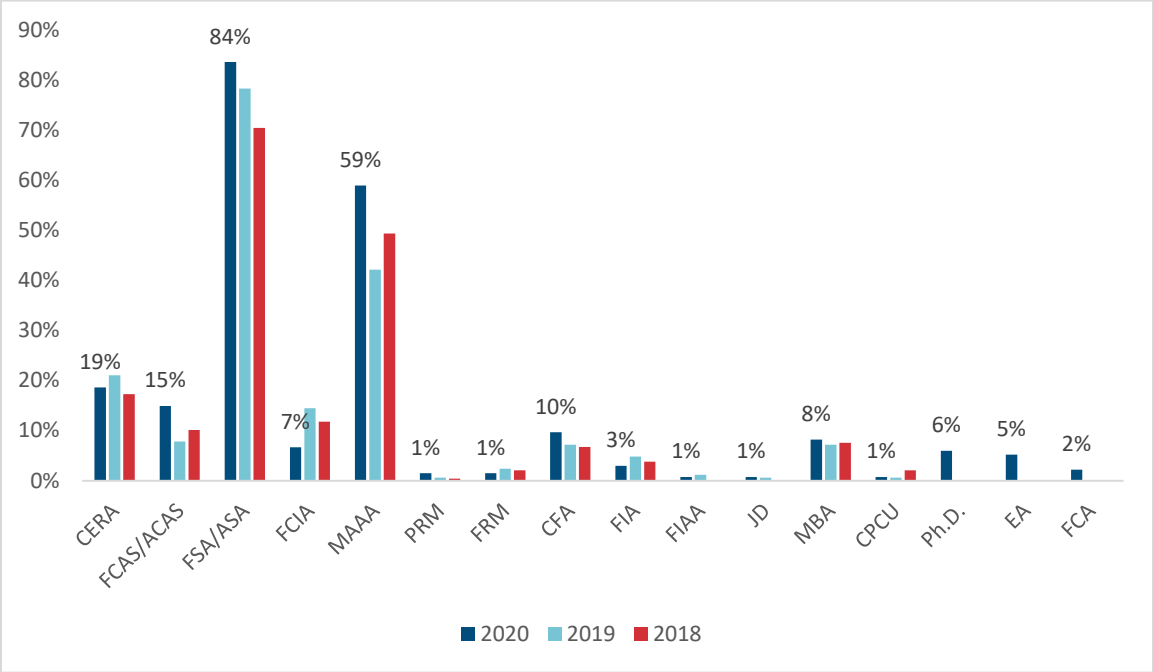
366 responses from 166 surveys (average of 2.2 responses per survey)

Percentages are based on 166 surveys.

- 19%/21%/17% CERA
- 15%/8%/10% FCAS/ACAS (Fellow/Associate, Casualty Actuarial Society)
- 84%/78%/70% FSA/ASA (Fellow/Associate, Society of Actuaries)
- 7%/14%/12% FCIA/ACIA (Fellow/Associate, Canadian Institute of Actuaries)
- 59%/42%/49% MAAA (Member, American Academy of Actuaries)
- 1%/1%/0% PRM (Professional Risk Manager, PRMIA)
- 1%/2%/2% FRM (Financial Risk Manager, GARP)
- 10%/7%/7% CFA (CFA charter, CFA Institute)
- 3%/5%/4% FIA (Fellow, Institute of Actuaries)
- 1%/1%/0% FIAA (Fellow, Institute of Actuaries of Australia)
- 8%/7%/8% MBA (Master of Business Administration)
- 1%/1%/2% CPCU (Chartered Property Casualty Underwriter, The Institutes)
- 6% Ph.D.
- 5% EA
- 2% FCA
- Other actuarial credential (please specify)
  - *MAAA*
  - *FFA*
  - *Fellow Israeli Actuarial Association*
  - *SAV*
  - *CSPA*
  - *Certified Specialist in Predictive Analytics*
  - *MSPA*
  - *France*
  - *BSc in Actuarial Science (Ongoing)*

- Other non-actuarial credential (please specify)
  - *FLMI, ACS*
  - *MS*
  - *CPA*
  - *MA*
  - *CIA, CRMA*
  - *FLMI*
  - *FLMI, CLU, ChFC*
  - *PStat*
  - *FLMI*
  - *CRM, ERMCP*
  - *FLMI, CLU, CIA, CISA, CISSP*
  - *Communications Diploma*
  - *FLMI RHU*
  - *BA*
  - *CAIA, CFP*

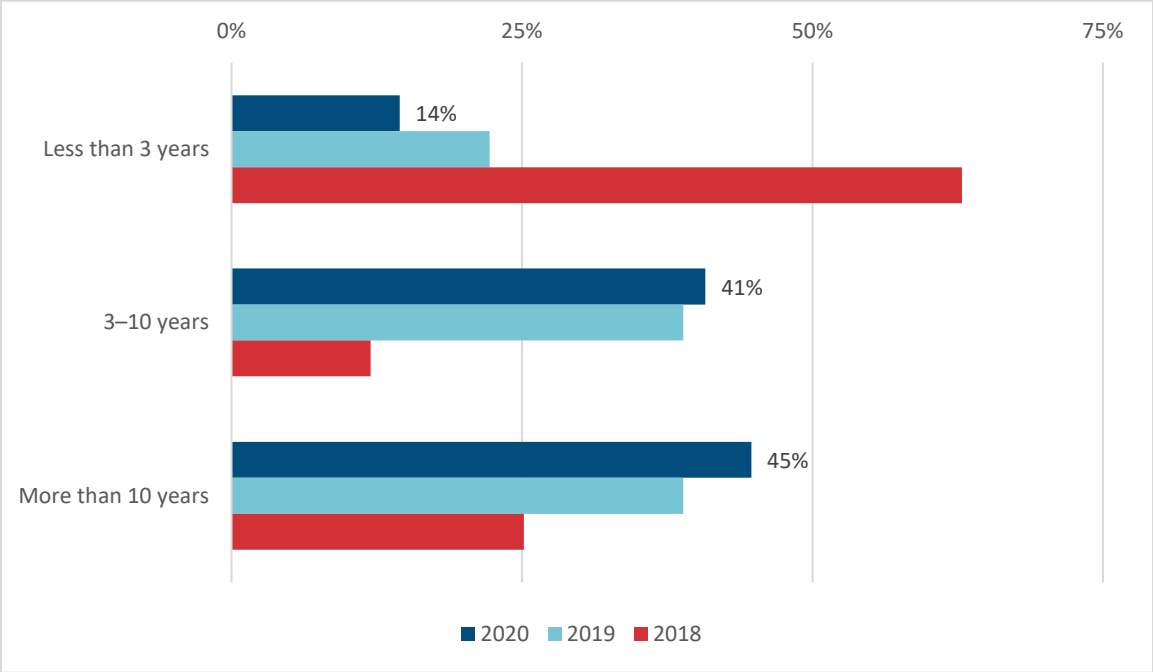
Credentials



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

- 14%/22%/63% Less than 3 years
- 41%/39%/12% 3–10 years
- 45%/39%/25% More than 10 years

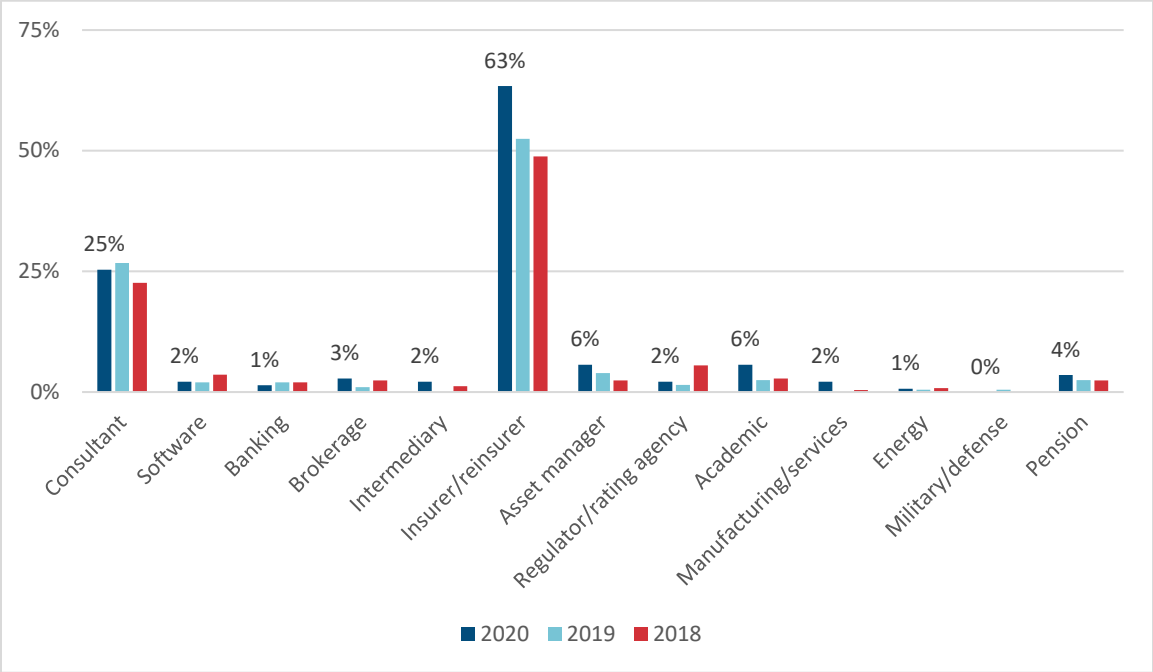
Experience



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

- 25%/27%/23% Consultant
- 2%/2%/4% Software
- 1%/2%/2% Banking
- 3%/1%/2% Brokerage
- 2%/0%/1% Intermediary
- 63%/52%/49% Insurance/reinsurance company
- 6%/4%/2% Asset management
- 2%/1%/6% Regulator/rating agency
- 6%/2%/3% Academic
- 2%/0%/0% Manufacturing/services
- 1%/0%/1% Energy
- 0%/0%/0% Military
- 4%/2%/2% Pension
- Other
  - *government advisor*
  - *Medical*
  - *Tech*
  - *Risk Advisor*
  - *Government Monopoly Insurer*
  - *Director*
  - *TPA*
  - *Pension Board Member*
  - *Government*
  - *Advisor on business model and execution*
  - *Speaker*

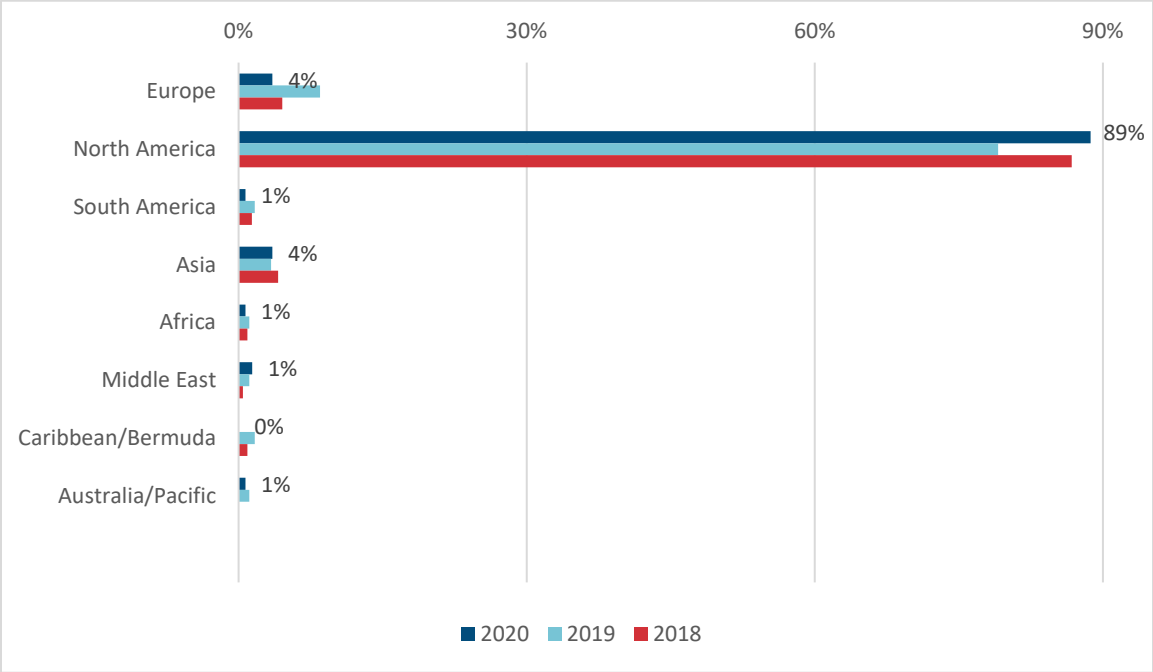
Employer Type



Question 5. Primary region (Please select one.)

- 4%/8%/5% Europe
- 89%/79%/87% North America
- 1%/2%/1% South America
- 4%/3%/4% Asia
- 1%/1%/1% Africa
- 1%/1%/0.5% Middle East
- 0%/2%/1% Caribbean/Bermuda
- 1%/1%S/0% Australia/Pacific
- 1%/2%/1% Other
    - *Half time U.S. and half time Israel*

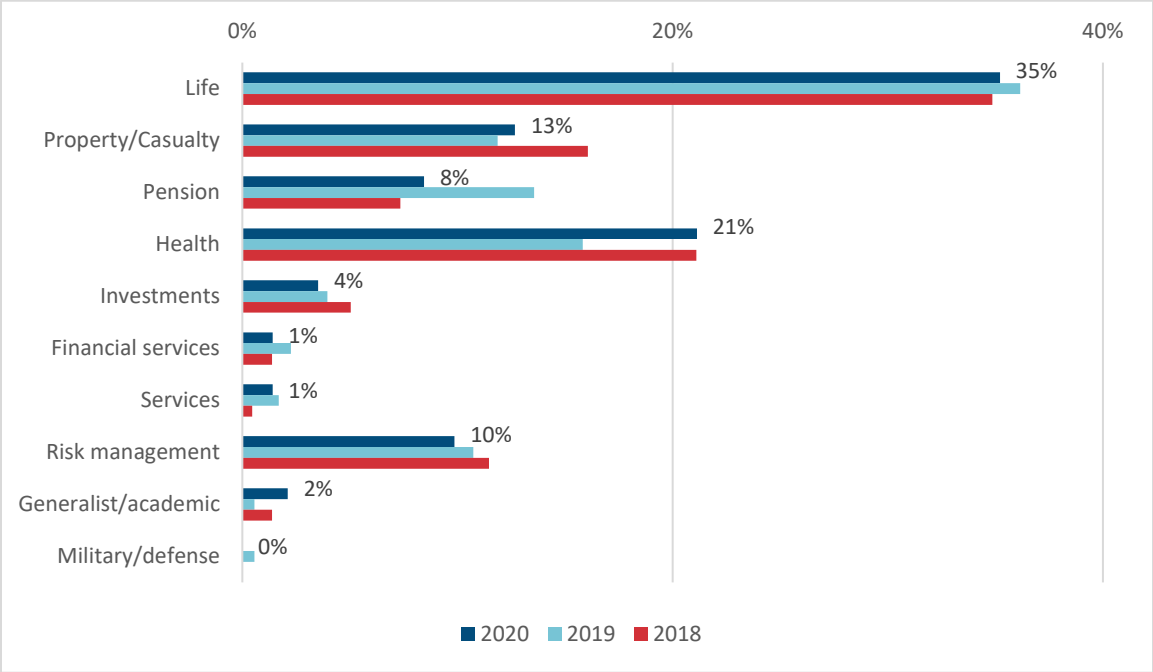
Region



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

- 35%/36%/35% Life
- 13%/12%/16% Property/casualty (general insurance, nonlife)
- 8%/14%/7% Pension
- 21%/16%/21% Health
- 4%/4%/5% Investments
- 1%/2%/1% Financial services (noninsurance)
- 1%/2%/0.5% Manufacturing/services
- 10%/11%/11% Risk management
- 2%/1%/1% Generalist/academic
- 0%/1%/0% Military/defense
- 4%/3%/1% Other
    - *currently cyber risk for internet voting*
    - *Executive*
    - *Analytics*
    - *Pension Board Member*
    - *Advisory service, integrating risk and finance*
    - *Yet to practice (still acquiring theoretical skills). Interested area of practice is Investments.*

Practice Area



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

- *Gartner emerging risk surveys as well as this survey*
- *SOA, world news*
- *Insurance ERM, other news feeds/subscriptions*
- *Wall Street Journal, CNN, Facebook*
- *Industry news, general news, talking to underwriters*
- *Blogs, academic working papers, key domain experts on twitter*
- *News media, Industry publications*
- *Associations that are specific to the risk*
- *Need to look at a wide array of news sources - not just traditional big-name sources*
- *As an FFA I also see what the Institute and Faculty of Actuaries are reporting*
- *industry conferences and publications*
- *Company own house view*
- *Actuarial organization (e.g., AAA, SOA, etc.)*
- *Papers from consulting firms*
- *Internet*
- *SOA publications, AAA publications, news.*
- *n/a*
- *Industry journals - e.g., monitoring activities of other companies*
- *News media*
- *Regulator activity*
- *Economic panel discussions*
- *General Trend identification*
- *Tipping point and amplification thinking*
- *AM Best, Fitch, World Bank*
- *LIMRA*

- *industry news*
- *intercompany sessions/conversations*
- *This survey.*
- *Research journals*
- *Publications, such as WEF data*
- *white papers, newsletters, magazines*
- *Emerging Risk Annual Survey*
- *Internal Risk Identification Process*
- *Reputable and less biased media sources or publications (Wall Street Journal, NPR, health industry articles)*
- *Alt media - Ron Paul Liberty Report, Corbett Report, Tom Woods*
- *CRO Forum, Swiss Re Sonar, SOA*
- *SOA publications, financial news*
- *Stat News, Endpoint News, NAIC Newswire, SOA Health Watch, SOA subgroups - especially Medicaid*
- *News events*
- *News reports and experience and Delphi studies.*
- *Major news sources, medical experts, technology announcements.*
- *TV News, friends/family, internet*
- *The Solari Report*
- *Various web sites, including shadowstats.com"*
- *Data from reinsurer, WFO, world bank*
- *N/A*
- *News / CNN / Wall Street Journal.*
- *None.*
- *WHO, CDC, State and local data*
- *News from the internet, TV, radio and anyone around me*
- *exclusions in insurance policies, what has happened to others in an industry (found via reading, research, trade journals) and interviewing of executives and compiling a master list over time.*
- *WSJ.com, Bloomberg.com, university library database*
- *Environment scanning for social, economic, technology and industry developing trends*
- *CIA*
- *AIMCo*
- *IAA*
- *Industry publications*
- *Gartner quarterly surveys*
- *Internal surveys*
- *Twitter (colleagues), International Association of Actuaries (IAA, and other actuarial associations such as SOA, CAS, IFoA), news sources (such as New York Times, The Guardian, CNN)*
- *current business news coverage*
- *reading periodicals -- Wall Street Journal, The Economist*
- *reading books on history and political science*
- *TV news and the internet*
- *CRO*
- *insurance/business industry activity and media (Property & Casualty 360, NAIC activity, etc.), investigative journalism sources (NPR, WSJ, etc.), security/risk blogs (Bruce Schneier, etc.)*
- *APCIA Emerging risk survey*

- *Deloitte Global risk survey*
- *Internal surveys*
- *Dave Ingram, books - lots of good climate material being released, Economist*
- *Track popular topics -- NOT the content thereof, but the direction of public attention, is a strong advance tool.*
- *Agency Records (Documentation)*
- *Experiments and researches*
- *Industry practice and experience*

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

- *Really liked the new look of this year's survey. Keep it up!*
- *no*
- *N/A*
- *The first questions about perspective and bias are hard to answer. I think I'm supposed to be answering the survey as it affects my company as those are the risks I have the greatest responsibility for and "control" over. But that doesn't mean that I don't think the world has emerging problems / that I'm narrowly focused on my company (or worse, only me: "What does this mean for me, Al Franken?")*
- *n/a*
- *No*
- *Continue the good work!*
- *Thinking more about underlying trends that drive the emerging risks (financial volatility is an outcome more than a risk)*
- *Survey Seems to Infer Companies Want and Have ERM Programs! Most Companies I Have Worked With See ERM as a Nuisance and a Check Box Activity*
- *make it shorter*
- *No - it is well done.*
- *Yes consider loss of freedom/tyranny and government money printing as additional risks.*
- *Add "regime takeover" as a risk category*
- *Can we examine the risk of model oversimplification or improper models?*
- *No*
- *No*
- *No*
- *No.*
- *I appreciate the consistency of questions and risk categories, but the world has evolved substantially over the past 15 years. It may be time for a refresh. (?)*
- *My thanks to all involved in building, administering, tabulation and summarizing this survey. Your efforts are appreciated by me. :-)*
- *These types of surveys are hard. I have worked with both Delphi studies and that framework has some advantages in helping to frame the respondents thinking.*
- *Add customized questions by life, health and P/C business*
- *Review of prior survey.*
- *Enjoy the survey, thanks for continuing each year*
- *no*
- *Like the Delphi method - you should ask a broad topic ask leading question, and drill down to "what if?" scenarios. That's more likely to uncover value than specific Q&A*

- *In a personal opinion, this survey should/must also accommodate undergraduate students studying degrees like actuarial science, insurance, and risk management, e.t.c, such that this group will grasp better skills and experience in answering questions from similar surveys in the future.*

Thanks for your participation!

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
  - Define bubble
  - Clarify definitions around
    - Inequality (economic and racial)
    - Food insecurity

Appendix III: Survey Results 2019 and Earlier

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