HOW ARE UTILITIES THINKING ABOUT RISK AND EMERGENCY PLANNING?

VARUNA

INTRODUCTION

Utilities constantly face major threats that compromise critical infrastructures. Those risk factors could occur internally, externally, or systematically. While utilities often have some type of emergency response strategy in place, emergency plans can quickly change or go out of date. Though having a solid risk assessment and emergency preparedness plan is imperative, there is a need to have a comprehensive planning procedure in place for utilities to become truly resilient. This paper aims to identify the highest risk areas and emergency planning procedures utilities, specifically water system leaders, are considering as they plan for resilience.

PREPARING FOR EMERGENCIES

Resilience is a fluid term that describes many levels of risk management and emergency preparedness. The US Environmental Protection Agency (EPA) defines resilience as the "capability to anticipate, prepare for, and recover from significant hazard threats with minimum damage to social well-being, the economy and the environment". Similarly, and more specifically to water systems, according to Varuna "a water system is judged as resilient if the risk of not providing clean drinking water to all customers is sufficiently low".

| Fragile | Durable | Prepared | Robust | Resilient |

* Source of graph with link
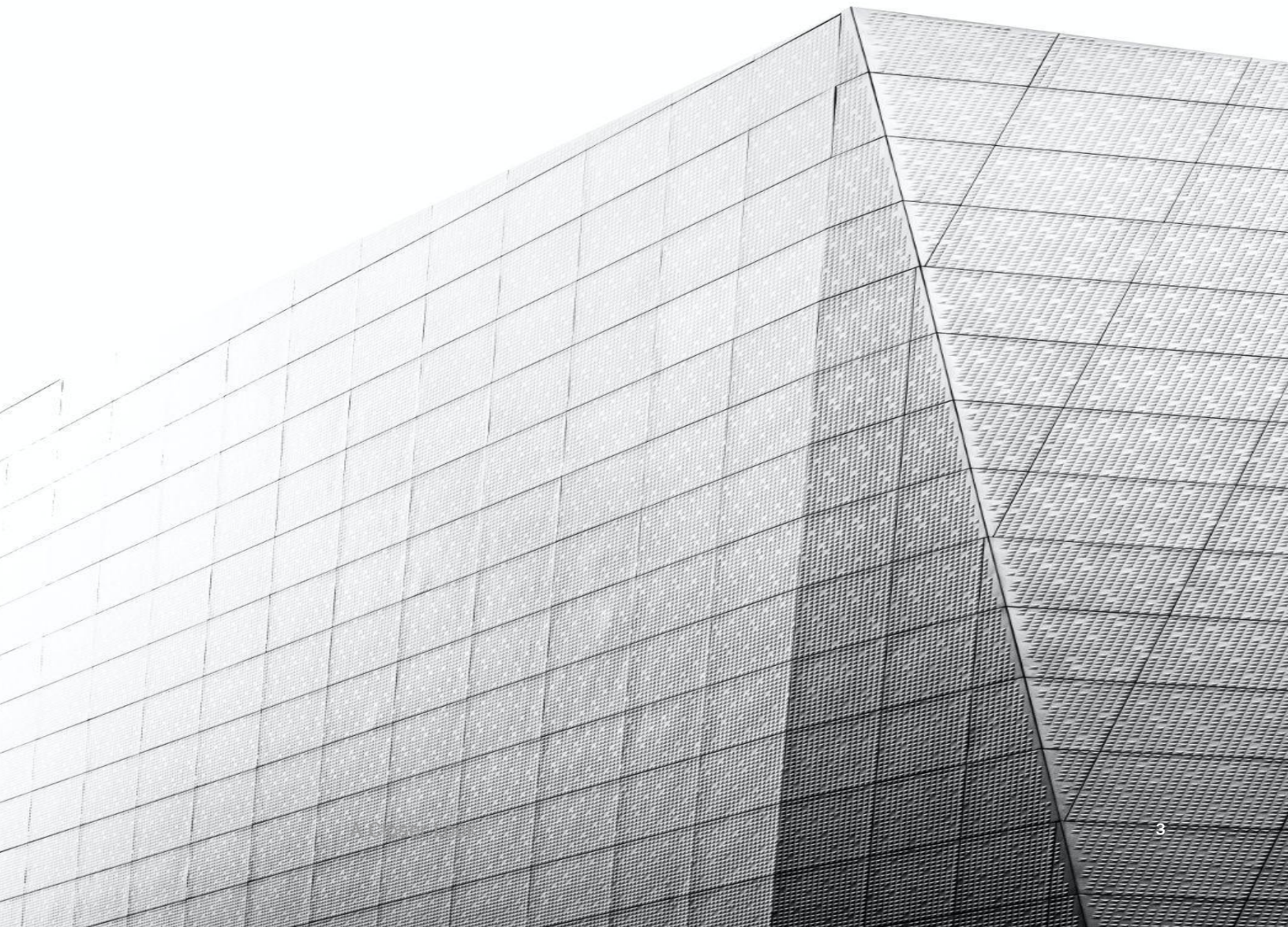
Most utilities have an emergency response plan (ERP) and that is sufficient preparation on our resilience spectrum shown above. In order for a utility to be resilient, it must have an adaptive emergency plan to face volatile risks coming from internal, external, or systematic factors. In order to help utilities assess their level of preparedness for risks and emergencies, Varuna created a resilience spectrum. The speculation that most utilities are 'prepared' on the resilience spectrum is confirmed by our survey results. The majority of respondents (46%) ranked themselves 'prepared' when asked where they believe their organizations are on the spectrum (Figure 1). Interestingly though, 33% of respondents said they fall on 'robust' on the resilience spectrum.

Figure 1: Where do you think your organization falls on the resilience spectrum?
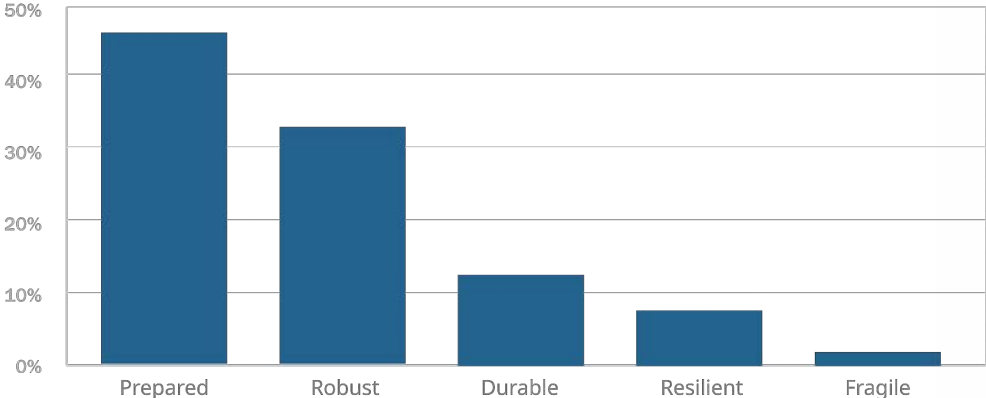
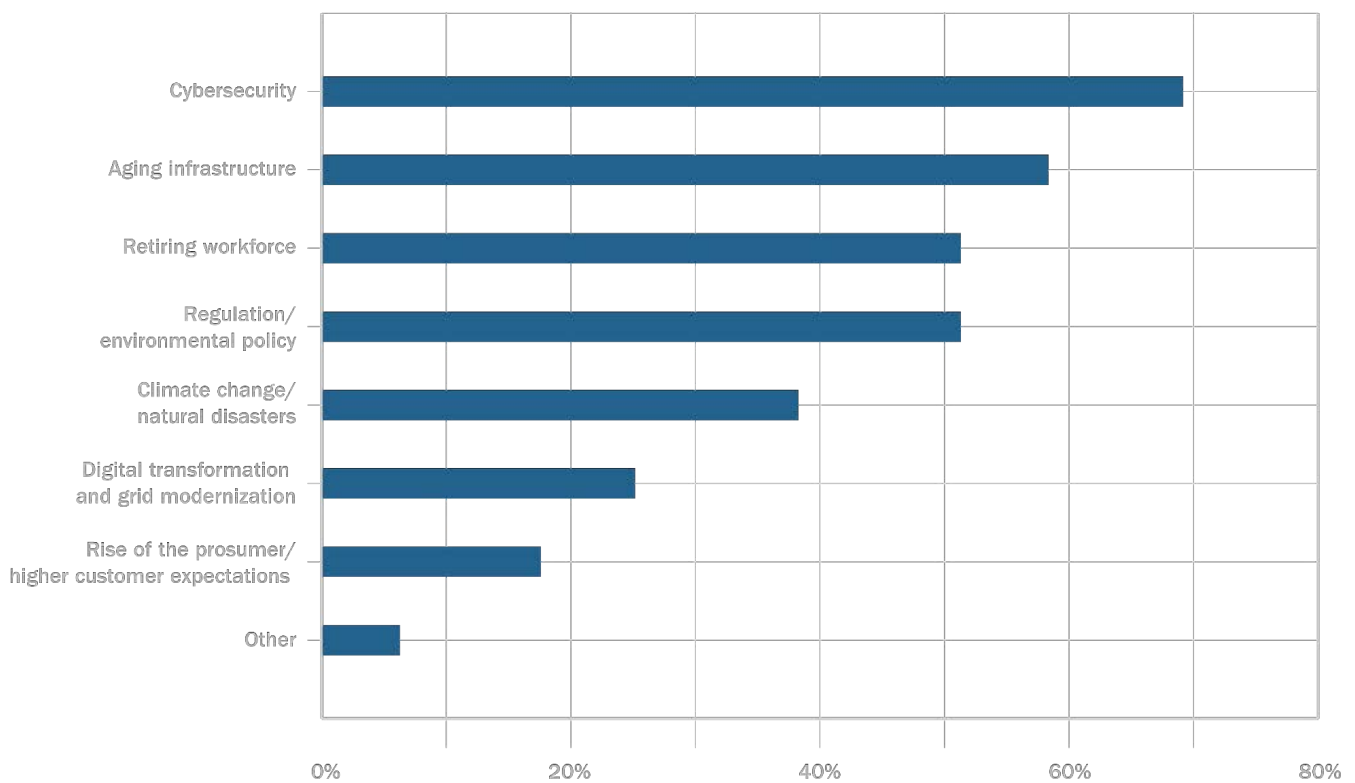* Source of graph with link

Figure 2: How often do you carry out emergency planning?
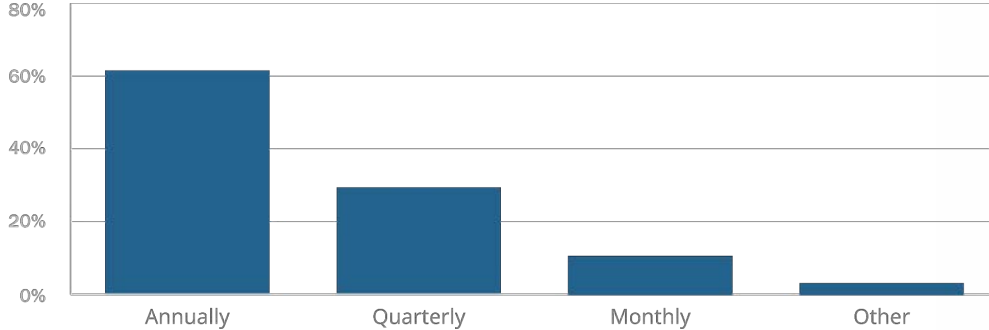
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An important aspect of emergency preparedness is frequent emergency planning. 61% of respondents said they conduct annual emergency planning. Whereas only 10% carry out monthly emergency planning. This is alarming because, in addition to natural threats, utilities now are increasingly facing technological and human-caused threats. **Physical attacks on the power grid have risen 71% in 2022 compared to 2021**, for example. Climate change and an evolving cyber landscape both increase the frequency and severity of natural and technological threats. Unsurprisingly, the top risk that utilities are concerned about is cybersecurity (69%), followed by aging infrastructure (58%), and then a retiring workforce and regulation/environmental policy, both at 52% (Figure 3).

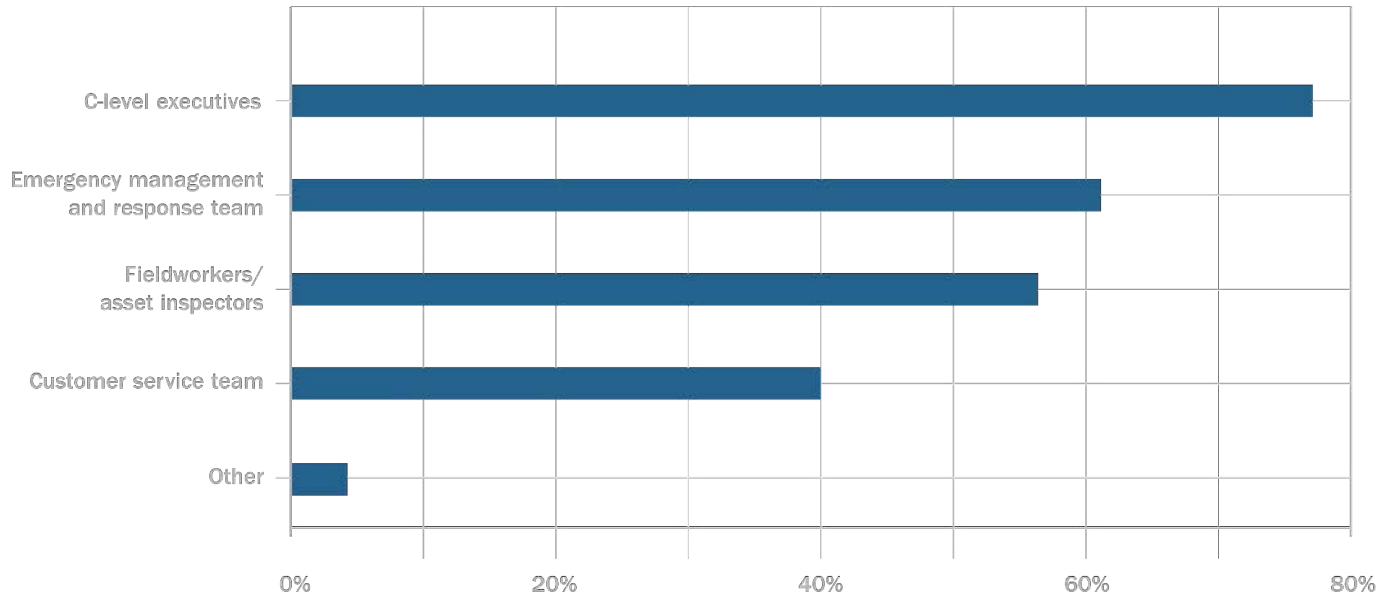**Figure 3: What types of risks are you most concerned about?**

* Source of graph with link

> "Climate change and an evolving cyber landscape both increase the frequency and severity of natural and technological threats."

STAKEHOLDERS AND DATA

**Figure 4: Who is involved in emergency planning at your organization?**

* Source of graph with link

When asked about the teams involved in the emergency planning, the responses appear to be organization-wide and primarily led by C-level executives (77%), and emergency planning and response teams (71%) respectively (Figure 4). Field Workers and customer service teams are involved to a lesser extent. Our perspective is that organizations that have cross-functional teams working on system and emergency planning are sharing more information across teams. Thus, free information flow increases resilience through the speed at which teams can respond to risks and emergencies. Part of resilience is how quickly a team can learn about, address, and bounce back (stronger) from risks.

**Figure 5: How do you gather data for
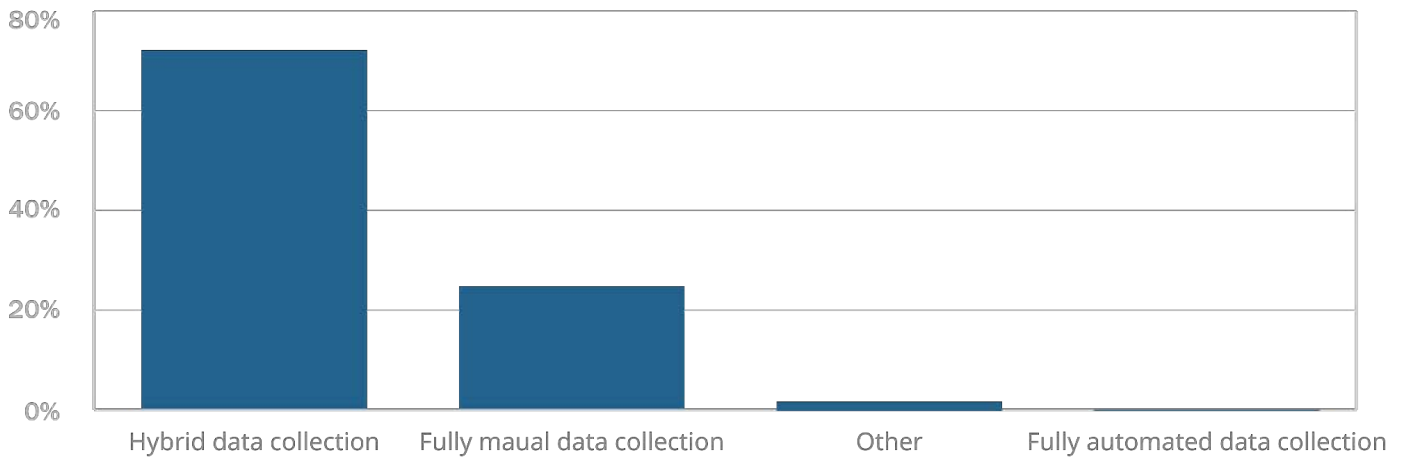emergency planning and remediation?**
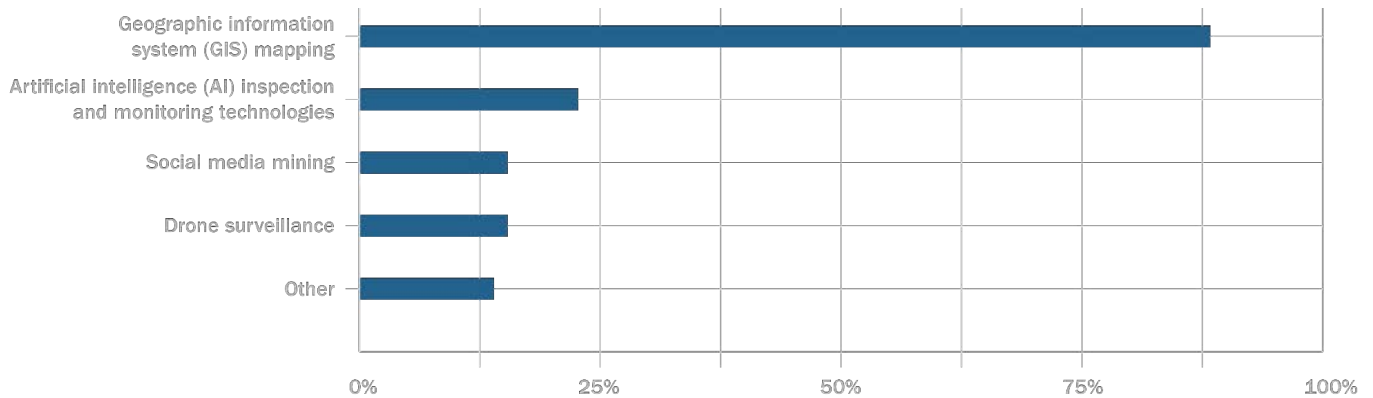
* Source of graph with link

> **GIS data is not and
> cannot be treated as
> the sole repository
> source of water systems
> information.**

The core element of emergency preparedness is accessible
and reliable data sources. When we asked utilities how they
gather their data, 88% of respondents said they gather their
emergency planning data through GIS mapping. Only 22% of
respondents said they gather their data via AI inspection and
monitoring technologies, and 16% use social media mining
and drone surveillance respectively. The 14% that answered
'other' comprise of responses that include physical data
collection, collaboration with county emergency management
teams, and internal expertise consulting.

These results show a significant gap in data collection sources. This is because GIS data is not
and cannot be treated as the sole repository source of water systems information. Tools that
pull the dispersed sources of water system information together into one place for analysis and
dissemination to stakeholders are the best approach to ensuring adaptive, frequent, and
consistent emergency planning for a water system. A critical factor in measuring the
preparedness of the stakeholders and respondents in this section of the survey would be their
ability to couple more than one source of data (i.e. GIS with AI, and other means) to feed a data
lake where information for emergency and planning will be examined.

**Figure 6: Do you manually or automatically collect data
for emergency planning and remediation?**

| | Hybrid data collection | Fully maual data collection | Other | Fully automated data collection |

73% of respondents said they collect their data in hybrid methods that combine both manual and automatic data collection. On the other hand, 25% said they conduct their data collection entirely manually, while no utility reported collecting their data fully automated. It is possible that we see utilities switching their data collection process to full automation as part of the digital transformation the industry is undergoing. This is potentially evident in the fact that 73% of respondents use hybrid data collection methods that combine manual and automated data collection. Indicating that utilities are indeed gradually making the shift to fully digitized and automated data collection processes.

EFFECTS & EFFECTIVENESS

27% reported their annual emergency planning costs to be more than $50,000. 24% reported the cost to be between $20,000 and $30,000, and 22% reported their annual emergency planning costs to be less than $10,000. Considering these numbers, the significance of the highest order in this section of the survey would be the mean annual cost of emergency planning for the entire water utility industry. Our survey may not be able to accurately determine this number without the scrutiny of the entire industries' financials and books. Although, it is apparent that there is an awareness of the cost that is associated with properly planning for an emergency, and most companies in our survey are willing to spend the money.

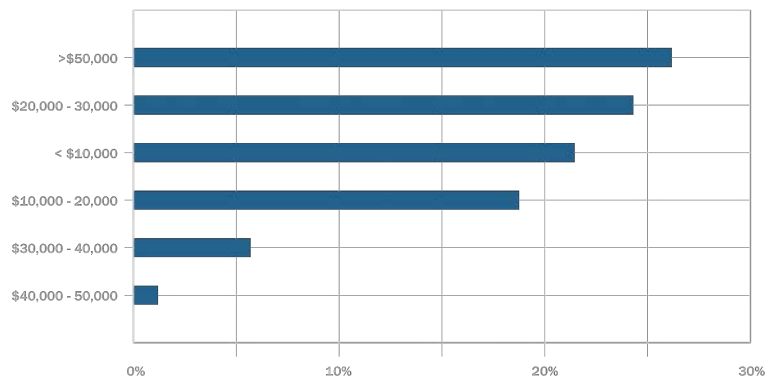**Figure 7: What is the annual cost of emergency planning at your organization?**
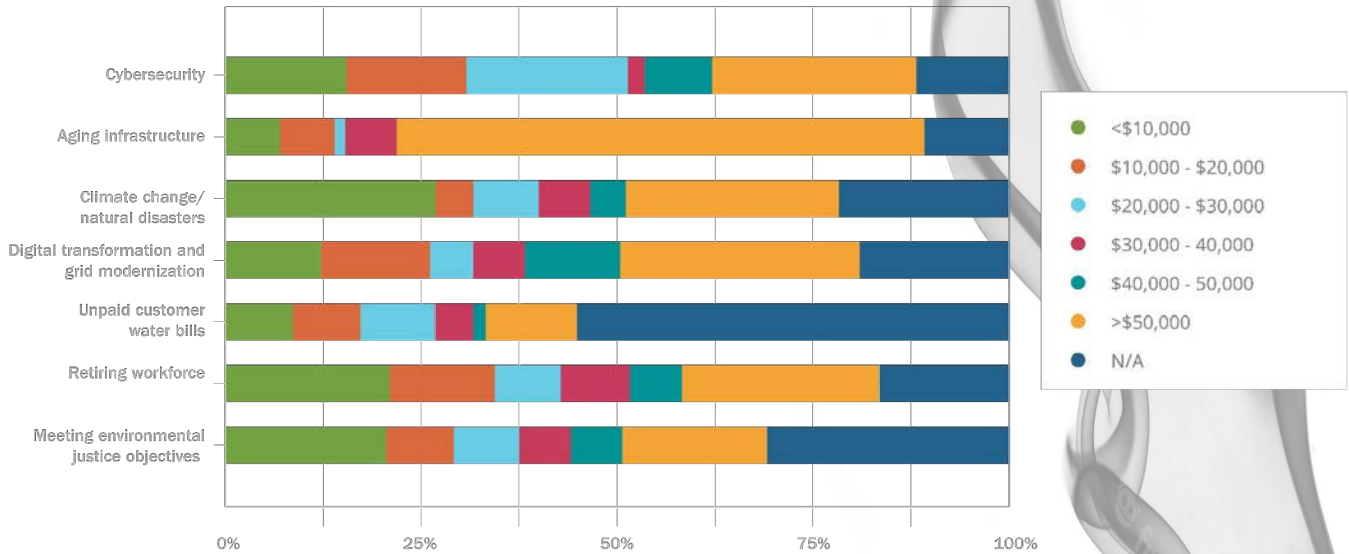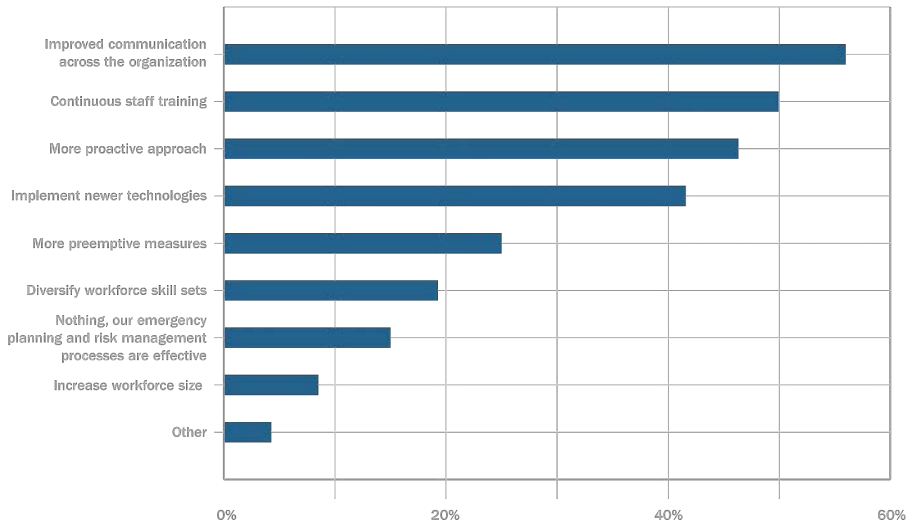
Figure 8: What's the annual cost of addressing each of the following risks/emergencies at your organization?

Legend:
- <$10,000
- $10,000 - $20,000
- $20,000 - $30,000
- $30,000 - 40,000
- $40,000 - 50,000
- >$50,000
- N/A

Categories (top to bottom):
- Cybersecurity
- Aging infrastructure
- Climate change/natural disasters
- Digital transformation and grid modernization
- Unpaid customer water bills
- Retiring workforce
- Meeting environmental justice objectives

* Source of graph with link

An aging infrastructure is one of, if not the top challenge currently facing utilities, as it contributes to a plethora of other risk factors like; service unreliability, increased risk of wildfires and other natural disasters, and fragility in the face of challenging climate conditions, to name a few. Addressing an aging infrastructure is undeniably an urgent risk as it is costly. 68% reported their annual cost of addressing aging infrastructure to be more than $50,000, making it the most expensive risk to address. Furthermore, 20% of our respondents reported meeting environmental justice objectives with more than $50,000. This positively indicates a shift in the legislation involving water utility. The ripple effect of this environmental injustice indicator is that its success in terms of the dollars paid for ERP will reflect on a number of other risks addressed in this section of the survey. If underrepresented communities can upgrade their infrastructure, then the newer technologies adapted will address climate change, fix aging tools and processes, and enact cybersecurity measures. Lest we forget, resiliency is the success factor.

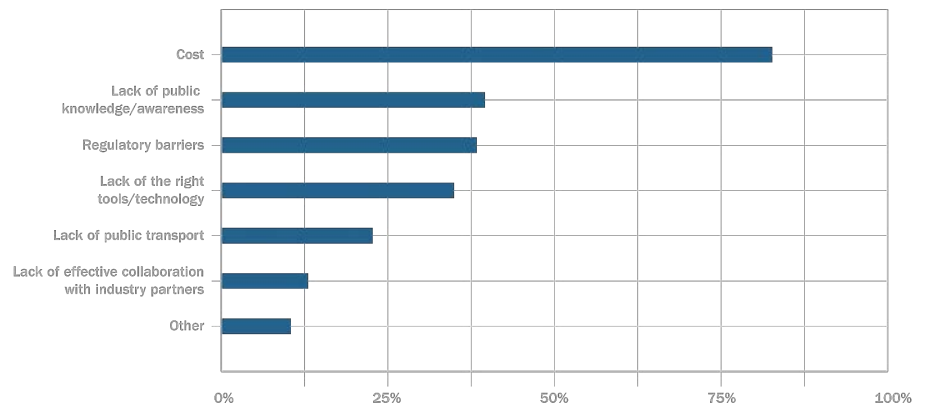**Figure 9: What do you think should change about emergency planning and risk management process?**

Consistent with the results from Figure 4., utilities recognize the lack of cross-organizational communication and the importance of a free flow of information to achieve resilience. The most important change that utilities would like to see with regards to emergency planning and risk management processes are improved communication across the organization (56%), continuous staff training (50%), and taking a more proactive approach (46%).

Achieving full and effective resilience is a goal all utilities strive for. The goal, however, is a challenging path to tread. Unsurprisingly, the overwhelming majority of respondents said that cost is the biggest constraint to realizing full and effective resilience. But beyond the cost constraints, there seem to be other issues facing utilities from reaching their resilience goals, which can

Figure 10: What do you think are the biggest constraints on effective resilience building?

be summed up in the lack of a robust comprehensive planning procedure. A resilient, robust, and comprehensive plan exposes many cost related factors in the risk management framework. Constraints that were uncovered in our survey that each carried their own respective percentages (regulatory barriers at 38%, lack of effective collaboration with industry partners at 13%) may need to be addressed for resiliency regardless of the costs associated with them. Key facets include training gaps, outdated technology solutions, support from communities and their leaders, etc.

SURVEY DEEPDIVE

To better get a view of who our respondents were in the survey, the diagram below relays the criteria in which they fall by utility type; Municipal (63.5%), investor-owned (7.7%), and co-operative (28.8%)
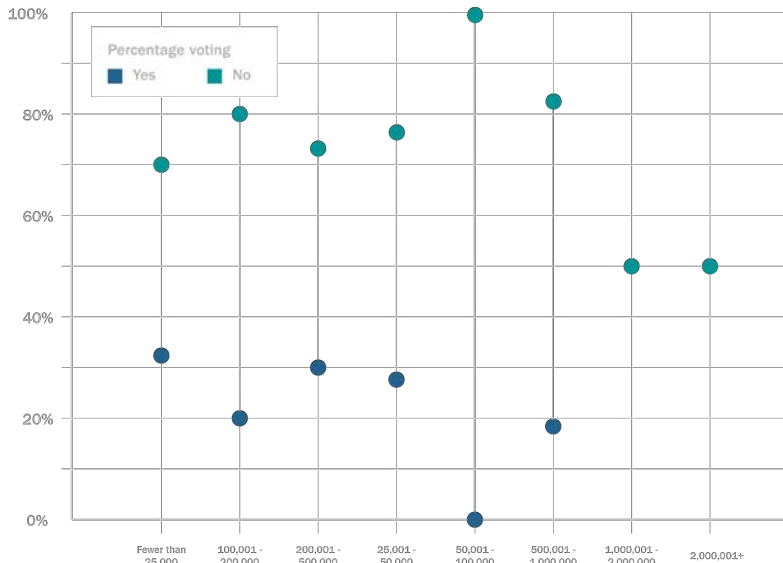
Figure 11: Breakdown of 52 Respondents by Utility Type
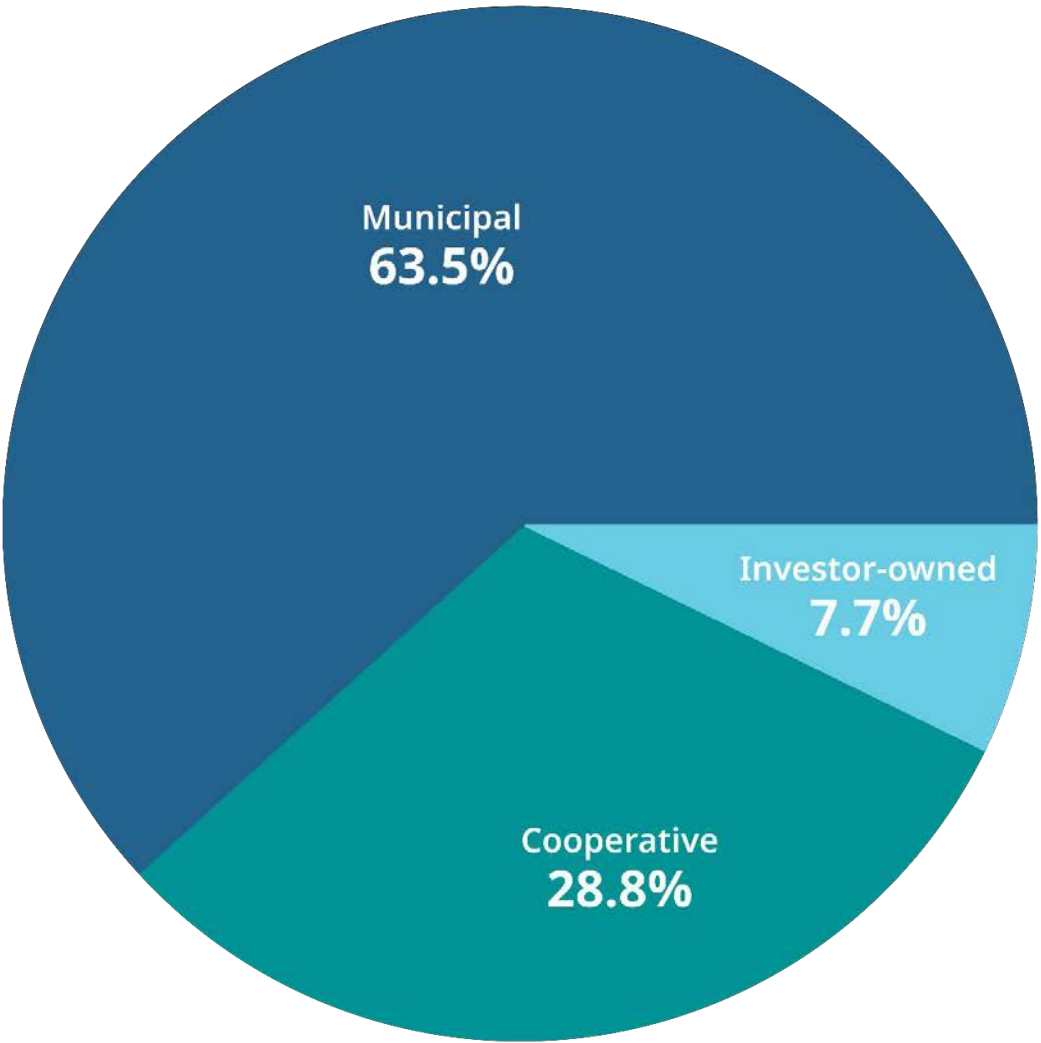

* Source of graph with link

Is digital transformation and grid modernization a primary concern for your utility?

Figure 12: Is digital transformation and grid modernization a primary concern for your utility?

For the percentage that voted 'Yes' on this question, we found the highest variance in votes of the utilities that manage 200,000 to 500,000 accounts. Here, the case may be that all or majority of the utilities that manage accounts of this size already have their risk processes managed and digitized by new and up to date technology. Hence the reason why approximately 100% voted 'No'. The more income that a utility has on its books is directly proportional to the size of the market it services. This will feed into the level of sophistication of their operations and the type of technology they use.

The large number of respondents that responded 'No' (>500,000 at over 80%, and >25,000 at 80%) may indicate the present trend of routine application of technology assets to better service customers.
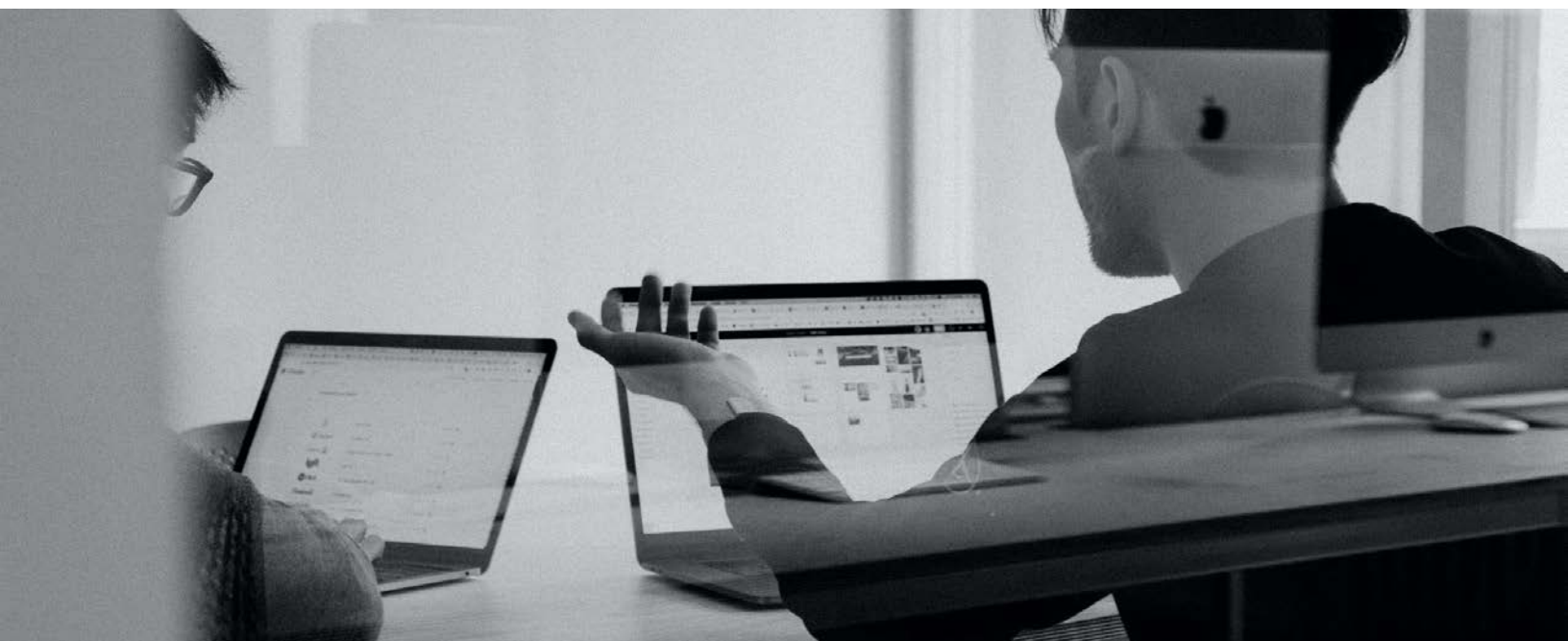
Is environmental policy and regulations a primary concern for your utility?

The involvement of corporate stakeholders (labor leaders, ward chairman, federal government operatives, climate change proponents) and individual members of the community alike who would like to see changes or improvements made to their utility is an important factor to consider. We recognize that everyone is involved, has an effect, and is affected by environmental policy in some way or another by just being a member of the community. Thus, our survey respondents reflect this perspective. Utilities that manage over 2 (two) million accounts responded with 'Yes' to policy and regulation on the environment as a primary concern.

Figure 13

Approximately 45% of utilities that represent between 50,000 and 100,000 accounts responded 'Yes' and approximately 52% responded 'No'. Following this unusual trend of utilities placing the environment on the back burner, approximately 75% (100,000 to 200,000 & 200,000 to 500,000 accounts), and 83% (500,000 to 1,000,000) also responded 'No'. Perhaps this indicates the slow and tedious machinations of formulating and passing legislation that is both conducive to business owners' current practices and favorable to bottom lines and balance sheets. On this subject, respondents generally tended to differ in the identification of their top risks.
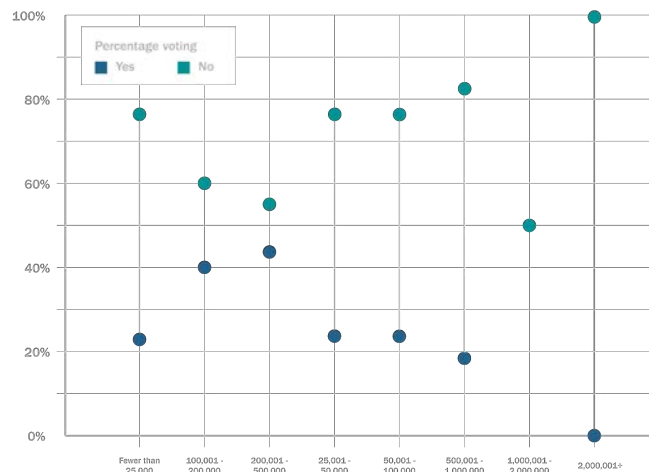
Is higher customer expectations and rise of the prosumer a primary concern for your utility?

Figure 14

The general consensus of respondents on this question was 'No'. We recognize that utility is basic, albeit modern supply systems could be the preference of almost all customers for the need to, for example, access clean and healthy water. This is a common expectation by 'prosumers' and will often mirror the amount, size, and quality of customers or accounts that utilities are able to attract.

What are the risks you are most concerned about?

CLIMATE CHANGE/NATURAL DISASTERS

The trend here is not clear cut. Respondents differed in their opinions with the majority of utilities in the 'fewer than 25,000' customers range opting for other risks to focus on regarding emergency planning procedures.

Respondents were few, however, and may have chosen either regulation/environmental policy or digital transformation and grid modernisation as greater concerns. This question instructed respondents to select their top three (3) concerns.

Figure 15: What are the risks you are most concerned about?
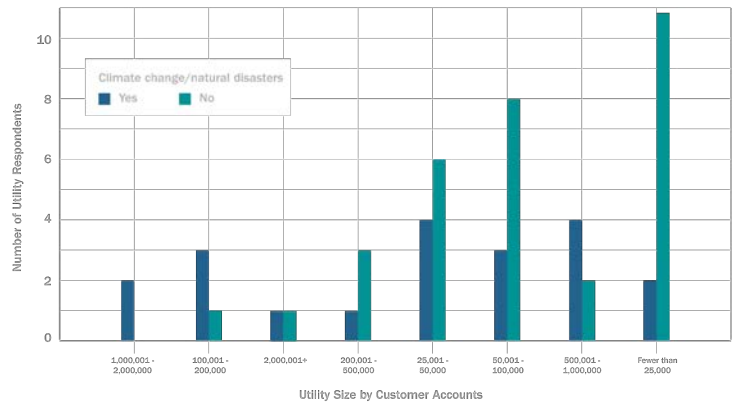

AGING INFRASTRUCTURE

Here, respondents were also asked to choose their top three (3) concerns. Utilities with the least number of accounts or customers in the 'fewer than 25,000' range substantially voted 'Yes'. Perhaps it is indicative of their low customer base, low churn rate, and their need to upgrade assets.

On the other hand, we suspect the more modern utilities are in the 50,000 to 100,000 range because the majority of these respondents voted 'No'.

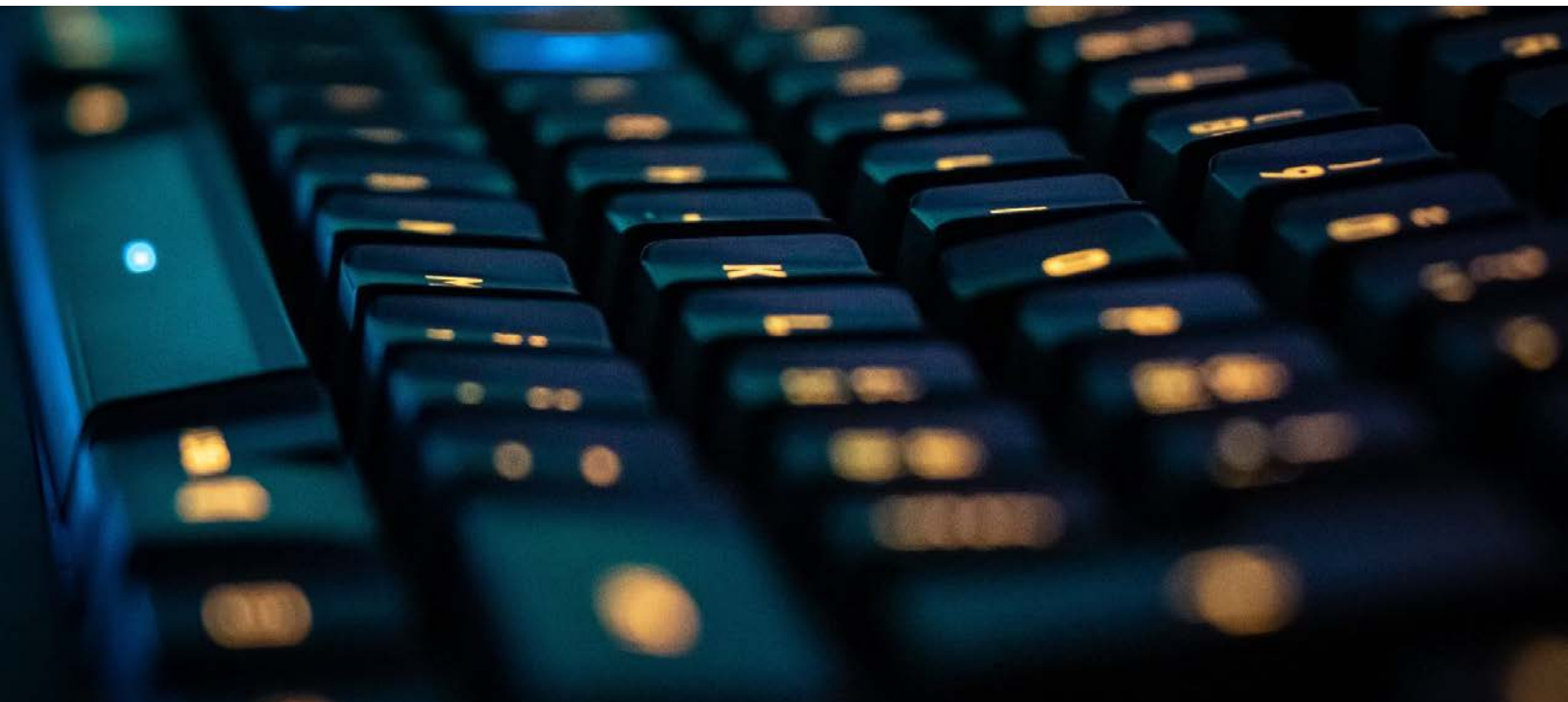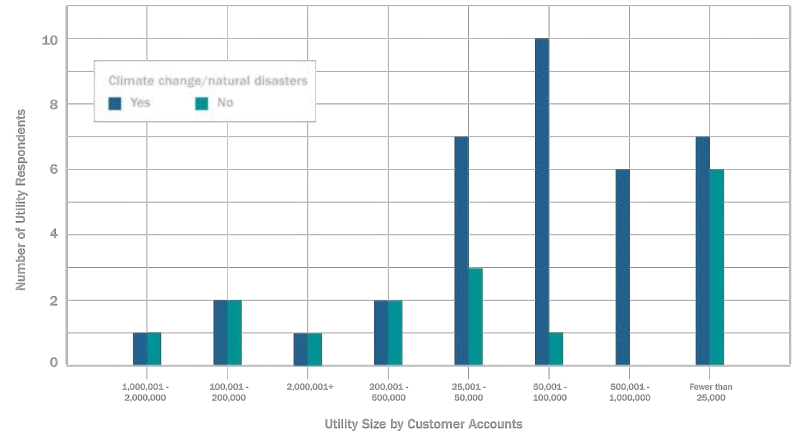**Figure 16: What are the risks you are most concerned about?**
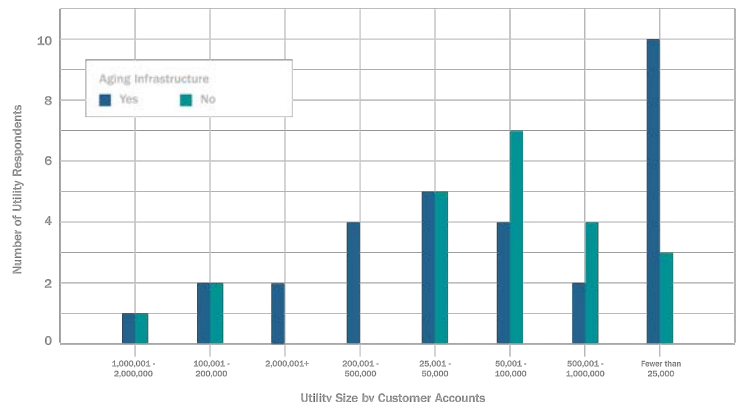
What are the risks you are most concerned about?

CYBERSECURITY

Practically all respondents voted 'Yes' to this risk as a serious concern in the development of emergency planning procedures.

> ❝ Building resilience to climate change and other stressors is critical for the long term sustainability of water and energy systems the resilience and building stressors in it.

Figure 17: What are the risks you are most concerned about?

Climate change/natural disasters
■ Yes   ■ No

Number of Utility Respondents

Utility Size by Customer Accounts

RECOMMENDATIONS

- Implement a shared repository and remove the silos of information to improve risk/emergency planning.
- Diversify sources of information/data emergency planning and risk management for higher accuracy and efficiency.
- Utilities would also benefit from more frequent and structured procedural emergency planning throughout the year for better resilience against increasingly frequent threats.

SUMMARY

Overall, our results show that most utilities have big gaps in their emergency management plans relating to their reliance on a single source of information (GIS) for their planning, a communicational disconnect across departments and personnel, and infrequent emergency planning. For a robust, comprehensive, and thus resilient emergency and risk management plan, these gaps need to be addressed.