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Climate Resilience Goes Digital

Using digital strategies to manage risk

Strategy | Digital | Technology | Operations

Introduction

Climate effects are being incorporated into strategic planning

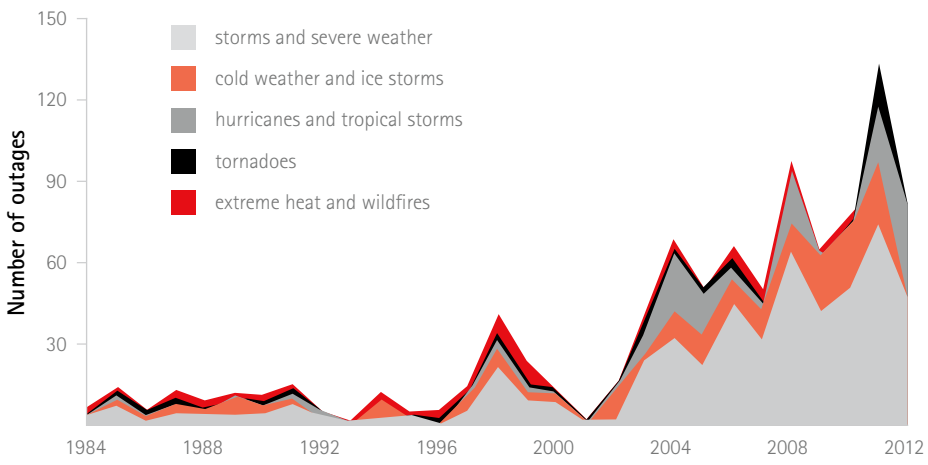
Changes to our climate have disrupted business, affecting efficiency, profitability and stability. Globally, extreme weather has resulted in US$175 billion in losses and damage annually over the past decade.[1] In 2012, for example, Superstorm Sandy resulted in an estimated US$25 billion in lost business activity—on top of extensive damage. Climate events causing organizational disruption through power outages have been on the rise over the past decade (see Figures 1 and 2). In addition, the United Nations Framework Convention on Climate Change (UNFCCC) has reaffirmed guidance that extreme weather events will continue to occur. Increasing climate effects have been accompanied by rising climate impacts and costs to organizations globally. Now, businesses, cities and government agencies are incorporating climate change into their strategic plans and long-term investment decisions – to reflect risks and costs, as well as new market opportunities. Organizational considerations include managing fluctuations in energy and resource access, coping with damage to infrastructure, and ensuring the wellbeing of employees, customers and communities.

Climate resilience is the ability to prepare for, mitigate and recover from the costs of climate impacts. It includes not only episodic weather events, but also long-term climate effects. The climate's impact on an organization has traditionally been seen as unmanageable because it is difficult to measure—hence the association with business continuity. However, with digital technology providing greater data visibility, businesses can now begin managing climate effects by linking them to measureable business. The advent of digital is transforming climate resilience from the ambiguous matter of business continuity to the measureable practice of risk management; this is enabling climate resilience to become a tangible part of an organization's strategic and operational plans.

Figure 1[2]

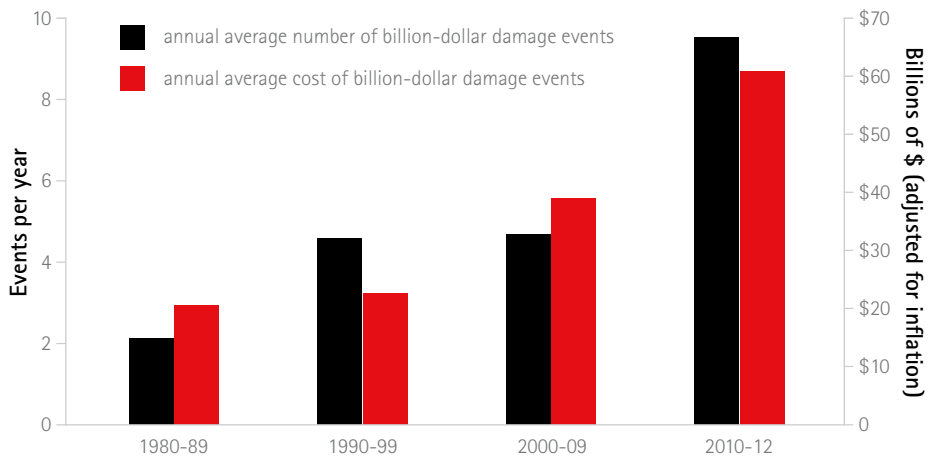
Extreme weather is causing more major power outages

(Major = at least 50,000 customers affected)



Source: Climate Central

Figure 2[3]



Climate Resilience as an Opportunity

While extreme weather events and long term climate effects may pose substantial organizational risks, others are viewing climate resilience as an opportunity for cost improvement and growth. Organizations can uncover operational efficiencies while searching for climate resilience enablers that drive reduced costs. Additionally, considering the evolution of climate effects moving from business continuity to risk management, organizations will require support to foster a more resilient organization. Support systems for climate resilience could spur new, and reignite existing, external growth opportunities. For example, financial service providers can help their clients to hedge the financial risks associated with climate effects and also investigate the opportunity to expand into reinsurance while technology companies will develop platforms that could digitally enable their clients' organizations leading to climate resilience.

Digital can play a transformational role in climate resilience

Digital is a game changer for organizations, giving them an opportunity to embrace climate risk management. Until recently, climate resilience strategy was infrastructure-centric. However, a comprehensive resilience strategy does not end with simply erecting barriers that keep high tide out and adapt to disasters. Rather, a robust, holistic and comprehensive climate resilience plan must combine built infrastructure, human capital, and information technology solutions that enable the organization and external stakeholders to resist and respond to severe weather events as efficiently as possible.

Today, more businesses and communities are interconnected and automated, all of which become potential points of failure. According to the Accenture Technology Vision 2014, the average cost of data center downtime by minute has risen by 41 percent since 2010. However, in a digital world, whether a system is hit by a storm or other natural calamity, the expectation is that it always works. Therefore, leaders must adopt a new mindset to ensure that systems are dynamic, accessible, and continuous—that is, designed for resilience after failure. The next step is for leadership to map out threat models specific to their businesses or communities and use business process economics to identify the most critical services and, thus, those most in need of resilience. This can help prioritize security investments to ensure "always on" digital infrastructure.

"Always on" infrastructure is especially important, as digital technologies often provide real-time data and information that help improve decision-making and execution during and after climate impacts. Digital can include technology related to Big Data analytics, cloud and mobility. Having a more resilient organization increasingly means having a robust digital strategy that addresses the three key components of resilience planning: resource access, infrastructure and people

However, when it comes to climate resilience, digital technology is rarely on the agenda for either city or business leaders. In this context, this paper describes how digital can bolster both city and organizational resilience, providing tangible examples—from monitoring and analyzing city data to providing new mobile tools that help proactively alert citizens and employees to potential risks. In doing so, it hopes to showcase how digital can be used to prepare for, and adapt to, climate change.

This is considered through three distinct areas, all of which are vital to organizations and communities:

Resource access (see page 4)

Infrastructure (see page 8)

People (see page 12).

Resource access

Extreme conditions can disrupt resource access

Resources are essential to business operations. Most organizations cannot function without access to water, energy or other resources. But climate impacts can impair resource access. Operational supply chains are often considered to be a manageable component of climate risk considering an organization's visibility into—and control over—where products are at any given time. But the resource supply chain is more difficult to measure, track and manage due to limited visibility into third-party resource management.

Temperature extremes are one climate threat that seriously impacts operations. For example, extremes in temperature can have a significant impact on the availability of basic resources in the affected regions. Extreme cold can lead to cracked water mains, which in turn leads to a shortage of clean water. At the other extreme, unusual heat can strain the electrical grid leading to brownouts or blackouts. The Risky Business Project, a collaborative effort between economists and climate scientists to understand the business impacts of climate effects, noted the risks of extreme heat and its impact on cooling demand leading to blackouts.[4, 5]

Resource disruptions carry a large cost

These types of resource disruptions often carry a substantial cost to both the power provider and the end-customer. For example, an electric utility cannot sell power to its customers during a blackout, leading to revenue loss that can only be made up through bill stabilization adjustments that result in additional charges to users, which are invested in fortifying the grid and preventing future power outages.[6] Similarly, nuclear power plants reduce power generation in times of extreme temperatures. In August 2011, Tennessee Valley Authority (TVA) had to cut power production at three nuclear plants as air at extreme heat raised the water temperature in local rivers used to cool the company's plants. In 2010 these production cuts cost TVA US$50 million in lost revenue.[7]

Extreme temperatures can also destabilize mining operations. In its submission to the 2013 Carbon Disclosure Project (CDP), Kinross Gold Corporation described the impact of extreme temperature on its mining operations, revealing the risk of groundwater contamination.

> "Potential thawing of the mine prior to or post-closure could result in the mine's production of acid that then leaks into the groundwater. To treat this, it might be necessary to flood and seal the mine... and monitor the waters. This would be instead of utilizing backfill (waste rock used to fill the voids), which is much cheaper. Sealing the mine would result in significant additional costs to plug the adit and install pumping and dewatering equipment. This and monitoring water conditions could cost well in excess of US$10 million over the mine rehabilitation period."
>
> Kinross Gold's Carbon Disclosure Project (CDP) Response

The problem

Behavioral management approaches are inadequate

In response to temperature extremes, tactical, non-strategic approaches are often taken to accommodate interruptions to resource access. One approach that is currently used is behavioral management, which entails incentivizing end-users to voluntarily adjust their standard practices to accommodate a resource interruption. How might this be applied to some of the examples in the previous section?

- A behavioral management solution to pipes freezing might be to shut off an organization's water or to have heat on constantly during a freezing event (even if there is no-one present).
- During extreme temperatures, businesses that participate in demand response programs are asked to shut down non-critical systems to reduce peak loads. The peak load reduction cuts the risk of brownouts or outages.
- A behavioral change at the Kinross Gold mine could be reduced mining, which would slow the thawing, hence reducing the potential contamination of groundwater and its usability or access.

The benefits of behavioral change approaches include low cost, relative ease of implementation (as no infrastructure is required), and agility. However, these approaches are often reactive, inadequate, and temporary. For example, voluntary participation in demand response programs does not always result in the levels of involvement required to counter the excess peak-load demand that comes from extreme heat events. Similarly, reduced mining to slow thawing also lowers the mines' profitability. And, behavioral management approaches to address extreme temperature swings that impact water availability increase costs. These arise from the need to keep heating on to reduce the chance of frozen pipes or the overall societal "cost burden" that results from temporarily cutting off access to water entirely to affected populations.

The digital solution

Using data increases visibility into threats

By digitally enabling an organization, extreme temperatures become a more visible, measurable and manageable threat. For resource access, this is enabled by advanced and real-time data capture and storage. Today, we have fairly accurate extended temperature forecasts. Using Big Data trending and monitoring, and integrating climate data into preparedness strategies, organizations can be forewarned of potential threats days or weeks in advance and respond to them before they occur.

In the case of advanced warning, certain digital software technologies such as General Electric Company's PowerOn ™ Precision also enable system scenario planning for the grid.[8] Models can be run with data forecasts to understand the extent of a weather threat on the grid. Similar models can be developed for scenarios like the Kinross Gold mine to understand the threshold of warming the mine can withstand, or similarly, the threshold at which a pipe would freeze.

During an event triggered by a climate effect, real-time digital data capture can also be a valuable asset. For example, having visibility into real-time energy use during an event can be essential to initiating demand response at the right time using behavioral means. There are also digitally-enabled technologies, such as ThinkEco, Inc.'s modlet, that can be automatically programmed to participate in demand response events so that no human intervention is required. This increases participation and removes the human error associated with behavioral management. Such technology has been used by Consolidated Edison, Inc. (ConEd), a New York City utility, to control window air conditioning loads in the summer months for its residential demand response program called CoolNYC.[9]

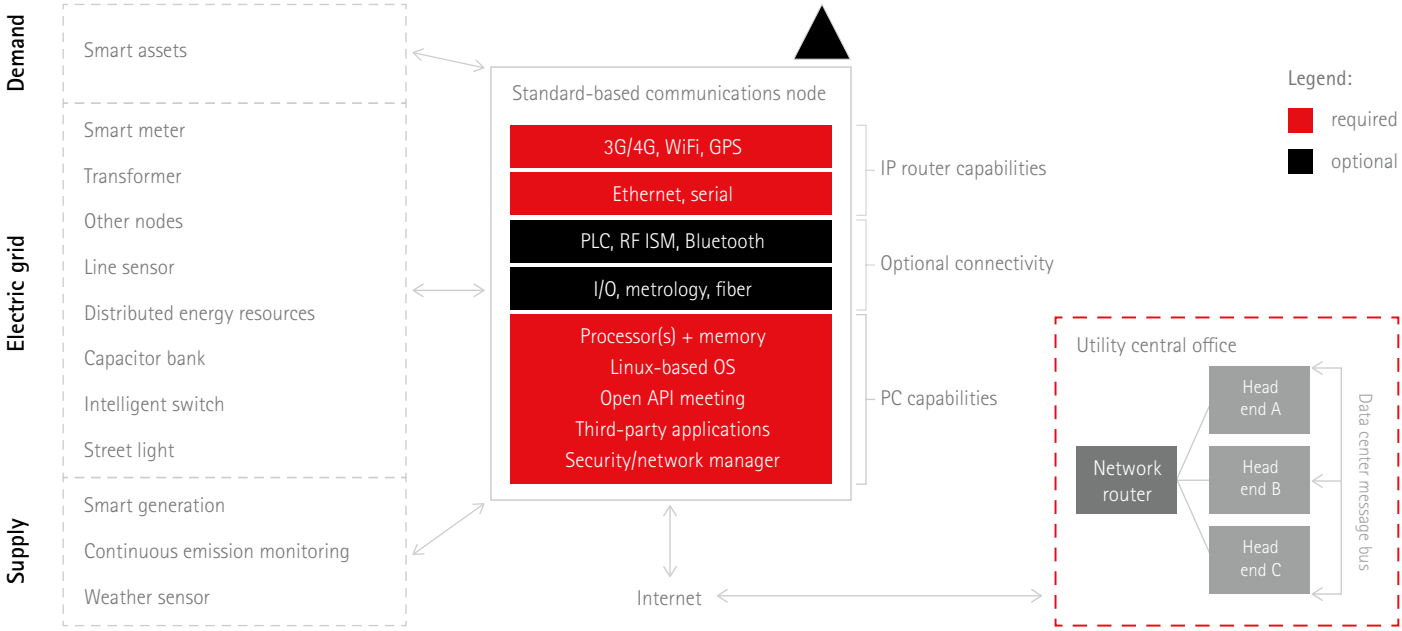
Issues can be identified and prioritized

If an electric grid or piping system is data enabled via advanced metering infrastructure, real-time data for energy and water management can be used to identify where issues are occurring that could result in reduced water flow or access, or energy outages. One of the benefits of a smart grid is complete visibility into issues or risks across the system, as demonstrated in Duke Energy Corporation's Distributed Intelligence Architecture (see Figure 3).[10]

But while digital technologies are evolving rapidly, organizations still struggle to access, share, and analyze much of the data they already have. According to the Accenture Technology Vision 2014, 85 percent of Fortune 500 (Time Inc.) organizations will be unable to adequately exploit Big Data. That's because data ecosystems are complex and littered with information silos, limiting the value that organizations can extract from their own data. In addition to the data that organizations already collect, new external data sources are available and able to be integrated into operations real-time, providing new opportunities for data insights. To truly unlock that value, companies must start treating data more as a supply chain, enabling it to flow easily, usefully and in real-time through the entire organization—and eventually throughout the company's ecosystem of partners, too.

This real-time visibility allows for prioritization of problems. If resource access in a particular region is more critical than in other affected areas, a recovery plan can be adapted accordingly—either proactively or during an event. Such data could also be used to create a business case for microgrid development or other resource infrastructure to hedge future risk. In the case of the Kinross Gold mine, real-time data visibility of mine thawing, as well as real-time monitoring of acid levels in groundwater, would help Kinross Gold determine when mine operations should be halted to mitigate the acid leak into the groundwater supply.

Figure 3



Duke Energy's vision for the utility "Internet of Things" platform. This architecture integrates data from multiple sources across a wide range of assets and enables distributed intelligence.

Broader benefits

Using real-time data can bring major efficiency gains

It might be difficult to justify real-time data visibility merely for the sake of climate resilience, but there are also many everyday uses for the performance visibility that digital technologies provide. Having a digitally-enabled grid or pipeline can help drive efficiency by showing where and when resources are being used—one of the benefits of a smart grid. It has been estimated, for example, that upgrading the US national power grid to a smart grid would generate savings of up to US$2 trillion in 2011-30 by matching supply and demand more efficiently.[11]

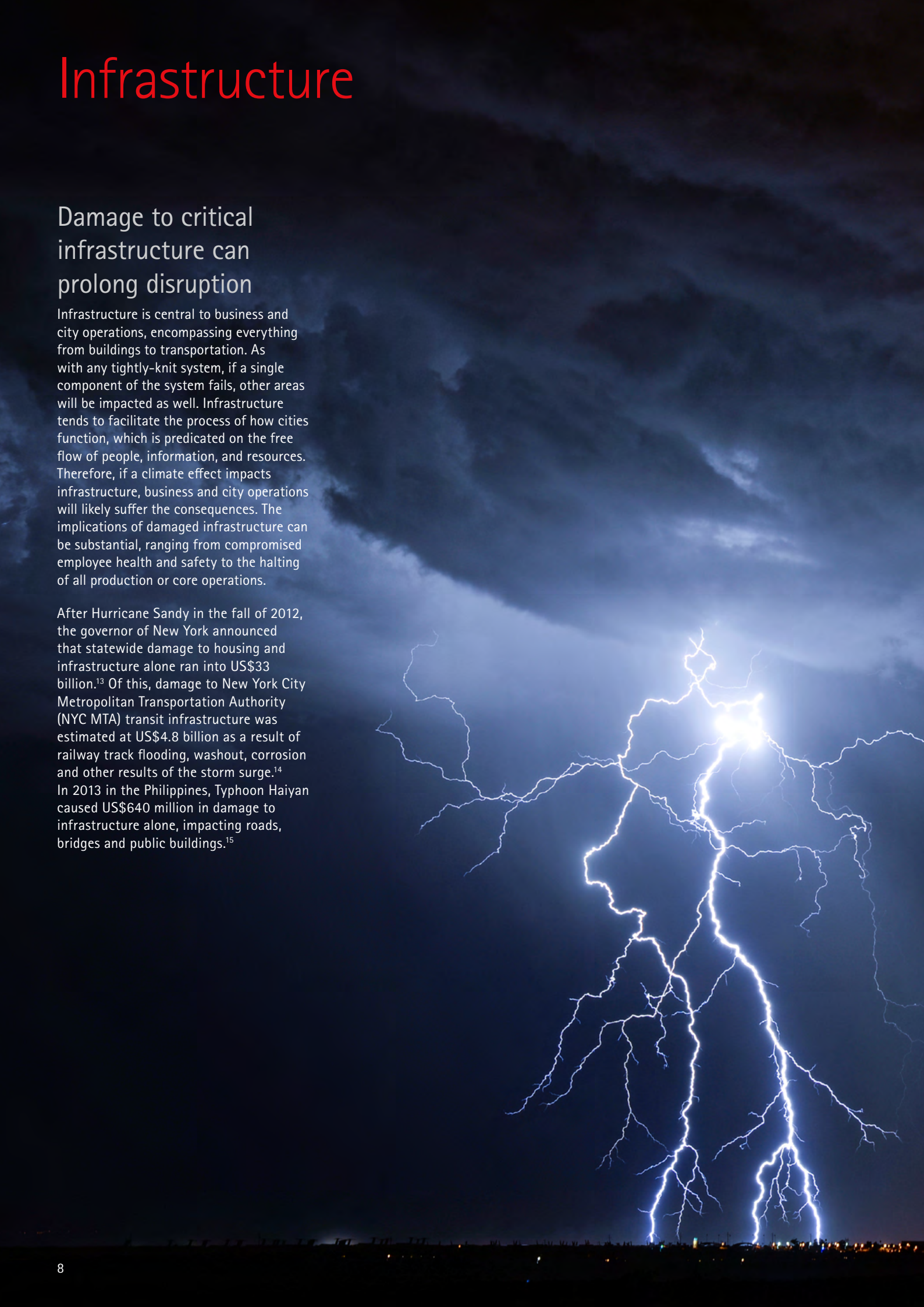
Daily issues such as outage management can be troubleshot and managed more effectively through real-time data visibility. In just one summer storm, the Electric Power Board of Chattanooga (EPB), a Tennessee utility that serves 170,000 customers, had a "55 percent reduction in duration of outages, and the expedited restoration (due to a smart grid) saved EPB Chattanooga $1.4 million."[12] Also, access to Big Data makes planning for future resource accessibility easier through scenario planning and modeling.

Infrastructure

Damage to critical infrastructure can prolong disruption

Infrastructure is central to business and city operations, encompassing everything from buildings to transportation. As with any tightly-knit system, if a single component of the system fails, other areas will be impacted as well. Infrastructure tends to facilitate the process of how cities function, which is predicated on the free flow of people, information, and resources. Therefore, if a climate effect impacts infrastructure, business and city operations will likely suffer the consequences. The implications of damaged infrastructure can be substantial, ranging from compromised employee health and safety to the halting of all production or core operations.

After Hurricane Sandy in the fall of 2012, the governor of New York announced that statewide damage to housing and infrastructure alone ran into US$33 billion.[13] Of this, damage to New York City Metropolitan Transportation Authority (NYC MTA) transit infrastructure was estimated at US$4.8 billion as a result of railway track flooding, washout, corrosion and other results of the storm surge.[14] In 2013 in the Philippines, Typhoon Haiyan caused US$640 million in damage to infrastructure alone, impacting roads, bridges and public buildings.[15]



The problem

Current proactive and reactive techniques are falling short

Current approaches to extreme weather events include anticipating upcoming events and responding to the event itself. One proactive approach is to shut down services across a system or halt a business function to minimize the impact on operations. For example, Schlumberger Limited saved a client US$500 million by shutting down operations of its electric submersible pumps during typhoon Chan Chu in the eastern South China Sea.[16] Reactive approaches include rebuilding structures after disasters, albeit in more "resilient" ways—for example, using flood barriers, pumps or weatherproof materials.

However, both of these approaches have limitations. Pre-emptive shutdowns result in lost revenue. During Hurricane Irene in 2011, NYC MTA conducted an unprecedented, system-wide shutdown of all transit. But the hurricane only affected isolated pockets of the city. As a result, MTA lost US$14 million in revenue from the shutdown, while the storm's impacts were less than anticipated.[17] Brick and mortar businesses also tend to shut down during storm periods, which impacts sales. During Typhoons Yolanda and Zoraida, local businesses in Bacolod City in the Philippines lost PHP500 million (US$11.3 million) in revenues.[18]

Rebuilding and fortifying infrastructure after it is destroyed can also present problems, especially if the rebuild is in the same location, which creates the risk of a repeat event. In the U.K., for example, thousands of new homes have been built on flood plains despite repeat flooding and only limited upgrading of defenses. Similarly in the U.S., Jersey Shore, a popular beach destination on the east coast which was destroyed by Hurricane Sandy, is being rebuilt as before, often failing to account for future storm surges.

The U.S. Federal Emergency Management Agency's (FEMA's) Hazard Mitigation Grant Program is helping to limit rebuilding on floodplains, particularly in New York and New Jersey, after Superstorm Sandy. These grants are used to buy out homes and property impacted by the storm to prevent disaster recurrence.[19] Potential issues with this solution include the resistance of homeowners to leave their prime real estate and the weakening of communities due to an exodus of homeowners from certain areas.

The digital solution

Digital allows more calibrated shutdowns

The physical world is coming online as objects, devices, and machines acquire more digital intelligence. What's emerging is more than just an "Internet of Things"; it's a new layer of connected intelligence that augments the actions of individuals, automates processes, and incorporates digitally empowered machines into our lives, increasing our insight into and control over the tangible world. These real-time connections to the physical world allow machines and employees to act and react faster—and more intelligently due to increased visibility and awareness. Moreover, the ability to immediately loop back insights into the decision process is supporting even more responsive action automation as can be seen in every-day devices such as the Nest Learning Thermostat produced by Google-owned Nest Labs, Inc.

This "digital-physical blur" allows decisions on shutdowns to become more strategic and driven by real-time requirements. If the NYC MTA had the ability to shut down critical systems just minutes prior to a climate impact, some of the US$14 million revenue loss from Hurricane Irene could have been averted.

How might this work? In the future, data-enabled tracks connected to other sensors would communicate with technology monitoring storm surges and real-time wind and weather patterns; upon a threat being detected, a shutdown and car stowage could be initiated. The data would be not only time-specific, but also location-specific. Using geographic information systems (GIS) and building information modeling, the location of anticipated climate impacts can be determined and suitable shutdowns initiated, rather than disrupting the entire system. GIS mapping and the algorithms to determine shutdown locations can be incorporated into an intelligent infrastructure program. Smart buildings and intelligent infrastructure, where equipment is data enabled and connected to a central source of control, can uncover issues that are only detectable by sensors.

For example, jointly with the Seattle 2030 District, Accenture is currently deploying smart buildings solutions for multiple properties in Seattle.[20] Building data is fed through Accenture's operations center where equipment faults are detected and prioritized. A future state of this deployment could include a centralized command center where city infrastructure data can be monitored and analyzed in real-time to derive insight into potentially hazardous climate and security conditions.

Such a command center could also leverage input from global weather data exchanges. One data hub is currently in the works as part of a collaborative effort involving UK's Meteorological Office, IBM Corporation, Imperial College Business School and the Grantham Institute for Climate Change. The data exchange will reside on an "open" online platform which will encourage the sharing of weather information and modeling strategies.[21] The Big Data nexus of weather information and real-time infrastructure events could be a major asset amidst a climate effect.

Remote working and e-commerce can keep business and government open

Apart from the clear productivity and environmental benefits that come with workforce mobility, using digital, cloud-based virtualization to enable remote work can also help keep businesses and government agencies open during climate events. When infrastructure in affected areas is taken offline for an extended period, major parts of a community's virtual workforce can continue without interruption. After the Telework Enhancement Act of 2010 was passed, the U.S. federal government reportedly saved US$30 million each day in productivity during storms by having a telecommuting workforce. A reported 93 percent of productivity was maintained during storms for U.S. federal workers.[22]

Digital technology can also assist decision-making on what infrastructure should be rebuilt and where it should be rebuilt. Investment and rebuilding decisions can be made using models that map the paths of past storm surges or floodplains to identify risk areas. An example of such a model includes FEMA's Region III Flood Insurance Rate Maps.[23] Historical data will enable strategic investment decisions. For example, GIS has been used in a number of cities to plot flood plains and watercourses to improve the planning of maintenance and installation of storm drains.[24]

Broader benefits

Intelligent infrastructure and e-commerce programs offer major paybacks

While it might not make commercial sense to install intelligent infrastructure and develop an e-commerce program just for climate resilience, they should be seen as investments with broader benefits. Smart Buildings can be used not only for strategic shutdowns to hedge climate impacts, but also to find faults in equipment as part of a real-time 24/7 continuous commissioning program. Such software monitoring solutions typically have a 24-month payback just from energy and maintenance savings, even apart from the substantial savings they would create during a climate event.[25]

Telecommuting and e-commerce, meanwhile, offer huge benefits beyond increased climate resilience. E-commerce continues to grow at an explosive rate. In the U.S., online retail spending grew by 14 percent in 2013, far outpacing total consumer retail spending, which grew in single digits.[26]

For telecommuting, research by Telework Research Network found that businesses that allow employees to work half of their time from home can save more than US$1 million annually per 100 employees, or US$10,000 per employee. It also improves employee satisfaction: the research found that 80 percent of workers would like to telecommute and 30 percent would even take a pay cut in order to do so.[27]

By incorporating a digital component to your organization's infrastructure climate resilience plan, not only can risks to business operations from climate impacts be reduced, but also cost savings can be realized year-round.

People

Ensuring the individual wellbeing of employees and consumers is a priority for organizations

Among the greatest risks for organizations during a climate event is employee and customer wellbeing. This is also one of the most difficult aspects to manage, because people tend to be dispersed. Historically, organizations have focused on the immediate and long-term health and safety of their employees, ranging from onsite operations to employees' home situations. However, increasingly they need to ensure the safety of employees and customers during climate events without having to shut down business operations. This is particularly true in professional services, hospitality and tourism where employees and consumers represent key aspects of continued operations.

Extreme weather creates large, unplanned costs and business risk

A climate impact that often heavily affects employees and customers is extreme weather, in particular precipitation. For professional services companies, when employees suffer, profits take a hit. In a 2013 Carbon Disclosure Project report, Stantec Inc., an architecture consulting and design company, explained its business risks due to extreme precipitation.

The hospitality and tourism industry frequently faces problems from extreme precipitation. Tourists are potentially at greatest risk during climate events due to their unfamiliarity with their surroundings. Tens of thousands of tourists (and employees) had to be airlifted out of Acapulco, Mexico, in a torrential downpour in 2013.[28] Similarly, a flood at Kota Tinggi, Malaysia, in December 2006 and January 2007 had a major impact on regional tourism—more than 100,000 people had to be evacuated and 18 people perished.[29]

"Increases to precipitation create uncertainty and challenges for travel both to and from places of employment and works sites. Extreme precipitation may affect client site operations. These could raise costs for employee travel, loss time, safety training and preparedness and inability to complete assignments per agreements with concurrent financial consequences. Recent events in 2012 have already demonstrated significant effects. Costs associated with this risk are uncertain but estimates of loss time from Superstorm Sandy alone to Stantec offices affected in the region were approximately US$350,000".

Stantec's 2013 Carbon Disclosure Project (CDP) Response

The problem

Information is too often ignored or people are not aware of how to act

Perhaps the most common way for organizations to help their employees and customers cope with climate events is through training and information. This can help convey general principles, but its limitations are considerable.

When climate impacts are not prevalent, employees and guests tend to ignore or disregard information.[30] Also, it is impossible to prepare people fully to cope with natural disasters or expect consistent action across a community.

The digital solution

Digital mobility technology reduces ambiguity and allows real-time responses

Using digital mobility technology, organizations can develop a comprehensive climate resilience strategy around the people they are responsible for. Mobility solutions can provide real-time guidance, tracking and alerts to employees and customers. Using mobility, organizations are able to convey specific instructions to all relevant individuals during climate impacts. They can create apps that enable employees or guests to "check in" and confirm their safety. In the event of a flash flood, for example, a hotel can send a text alert to all guests and request a response—the equivalent of doing a headcount check in the event of a hotel fire evacuation.

Professional services firms might be able to use mobility even more actively, if employees enable the company to increase transparency through their devices. In the event of climate impact, they can turn on global positioning system tracking for all traveling employees who might be at risk. An alert can be pushed to an employee giving a new route or the fastest way to safety. One example can be the future application of mobile device management solutions such as AirWatch®, which is already being used by several Fortune 500 companies, enabling organizations to provide oversight, while also allowing for appropriate privacy protections for employees.

Mobility data enables organizations to manage their risks in real-time in the case of a climate event and customization and streamlined communication can reduce the risk to employees and customers.

Broader benefits

Digital and mobility solutions have many wider uses into which climate resilience can be integrated

Mobility solutions have implications far beyond climate resilience. Increased communication with employees and customers is generally an asset. Starbucks Corporation is particularly successful when it comes to mobility customer engagement. Its mobile app allows customers pay by phone, automatically syncing purchases with Starbucks' already popular loyalty program. As of late 2013, over 11 percent of Starbucks' sales were processed via mobile payments and this number is expected to increase as the company rolls out skip-the-line ordering for mobile users.[31] This channel and the development of integrated solutions can also be used to communicate critical alerts to customers to reduce risk.

Companies have increased productivity by providing location-based services, client briefs, and cross-company communication for knowledge or information sharing in real-time to employees. In the future, mobility solutions will continue to evolve with the burgeoning "Internet of Things", as this can further data-enable organizations, providing unprecedented convenience and intelligence to users. It is these very types of digital applications that can also help insulate the same businesses from the operational disruptions that would otherwise result from climate effects.

Digital is also making it easier for organizations to build climate resilience by leveraging what Accenture calls the expanded workforce. Over the last decade, organizations have been using increasingly advanced tools and processes to boost collaboration among their employees. Videoconferencing, instant messaging, blogs, wikis, and activity streams have all become the norm as companies connect their employees across groups, skills, and geographic boundaries. Outside of the enterprise, this is even more pronounced: picture a workforce that extends beyond employees—one that consists of users connected to the Internet. Cloud, social, and collaboration technologies now allow organizations to tap into vast pools of resources across the world, especially in times of disruption. Channeling these efforts to drive business goals is a challenge, but the opportunity is enormous.

Conclusion

Increased climate effects on resource access, infrastructure and people are causing organization leaders to adapt the way investment decisions are made, such that they are driven by both operational value and climate risk considerations

Climate resilience strategies are needed to manage the risk associated with climate effects. In addition, climate resilience strategies are most operationally and cost effective if they are embedded into the organization's functions rather than existing as a stand-alone strategy. Digital technology helps enable a cross-functional organizational resilience strategy and can also provide a strong return on investment by helping an organization realize more value from their data.

The data visibility provided by digital improves operational effectiveness beyond resilience. Digital delivers the benefits of accessibility and transparency to an organization's functions in real-time, and allows strategic decision-making and operational fluidity during climate events. Comprehensive data visibility could lead to the development of a command center that aggregates the benefits of digital and is able to work across organizational silos to efficiently identify, prioritize, and manage risk across operations.

Additionally, deploying digital technologies opens up entirely new avenues for engaging with suppliers, customers and the rest of the community. Doing so provides new efficiencies and revenue streams that—irrespective of their longer-term climate resilience benefits—result in immediate cost savings and revenue growth. The same digital capabilities also deliver further measurable benefits by:

- notifying organizations of climate effects before they occur
- enabling organizations to withstand these events with reduced operational disruption while they happen
- facilitating organizations to rebound more quickly after they take place.

Thus digitally enabled organizations are becoming more climate resilient organizations.

Next Steps toward Climate Resilience

Public agencies and private businesses need to respond to the call for comprehensive approaches to incorporate climate resilience into their strategic priorities and operational plans. An initial step is to conduct a climate effect vulnerability assessment from a Resource Access, Infrastructure and People perspective. From there, an integrative digital and business strategy should be established that specifically identify opportunities to uncover operational efficiencies that will also lead to climate resilience. In the process of doing so, organizations should keep in mind that climate resilience is not only about managing risks, but also about capturing growth opportunities.

While all organizations must consider climate resilience strategies, some organizations will have more urgent resilience needs than others. Cities that face harsh climate effects such as chronic drought or storm surge must immediately begin a path towards developing a resilience strategy. This is also true of coastal businesses, frequently including hospitality services or resource extraction and refinement companies. Particularly for these entities, a thorough analysis of the organizational value chain is required where a resilience strategy can then be customized to each component of the value chain. To do this, frameworks such as Accenture's Organizational Resilience Architecture (ORA) can be leveraged, which helps develop an inclusive resilience program encompassing people, process and technology (see Figure 4).

Even if developing a comprehensive climate resilience strategy currently feels out of reach, executives and officials still must think about next steps required to manage climate risk and explore climate resilience opportunities. But what does it take to get started? The Climate Resilience & Digital Strategy Flow Chart (see Figure 5) can help your organization jump-start its climate resilience conversation.

Figure 4. Accenture's ORA Framework

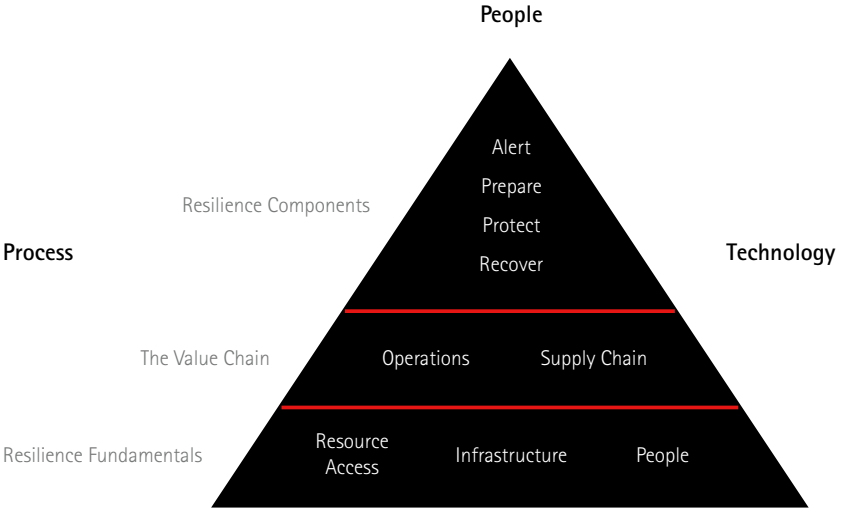
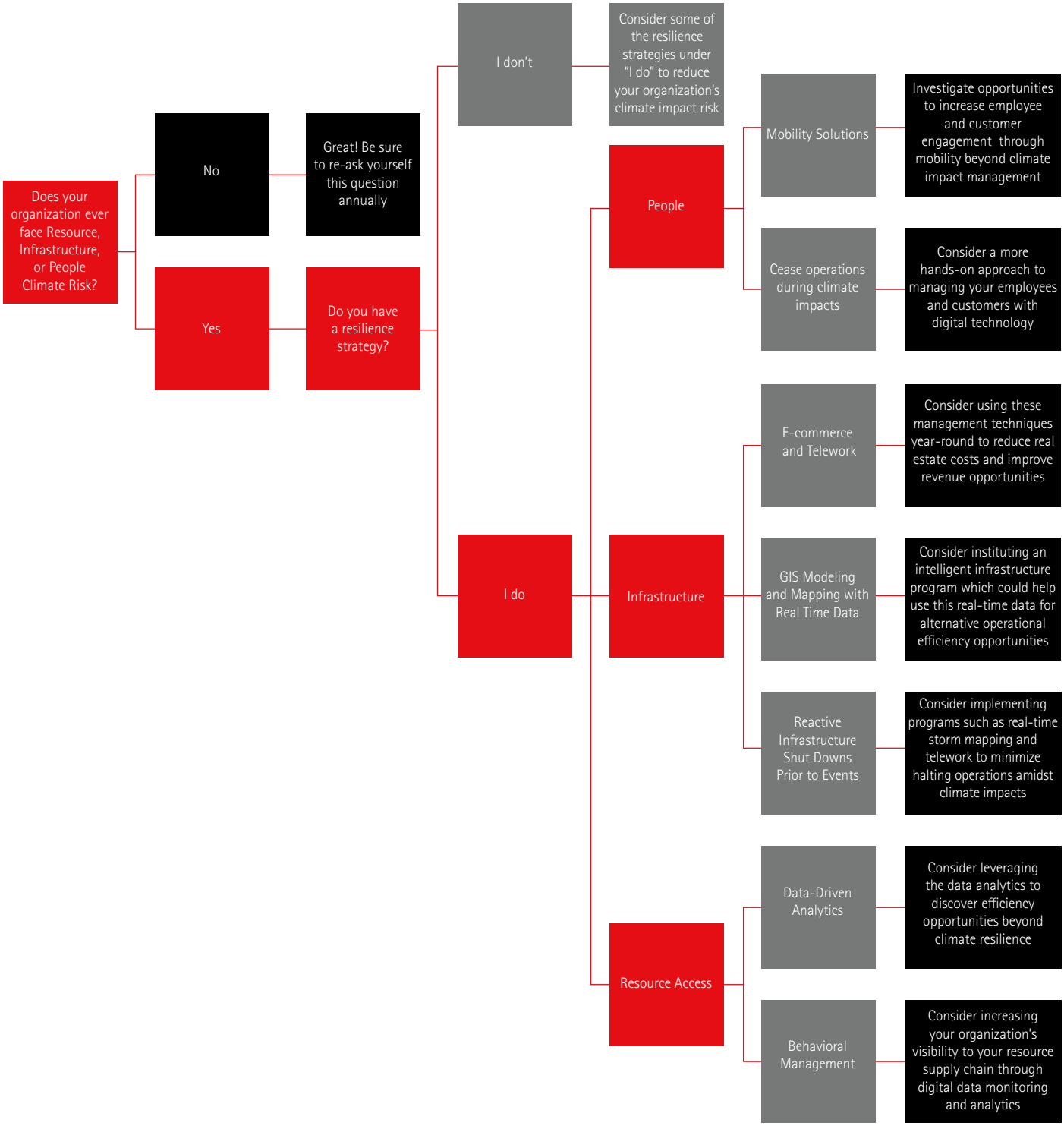


Figure 5. Climate Resilience and Digital Strategy Flow Chart



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