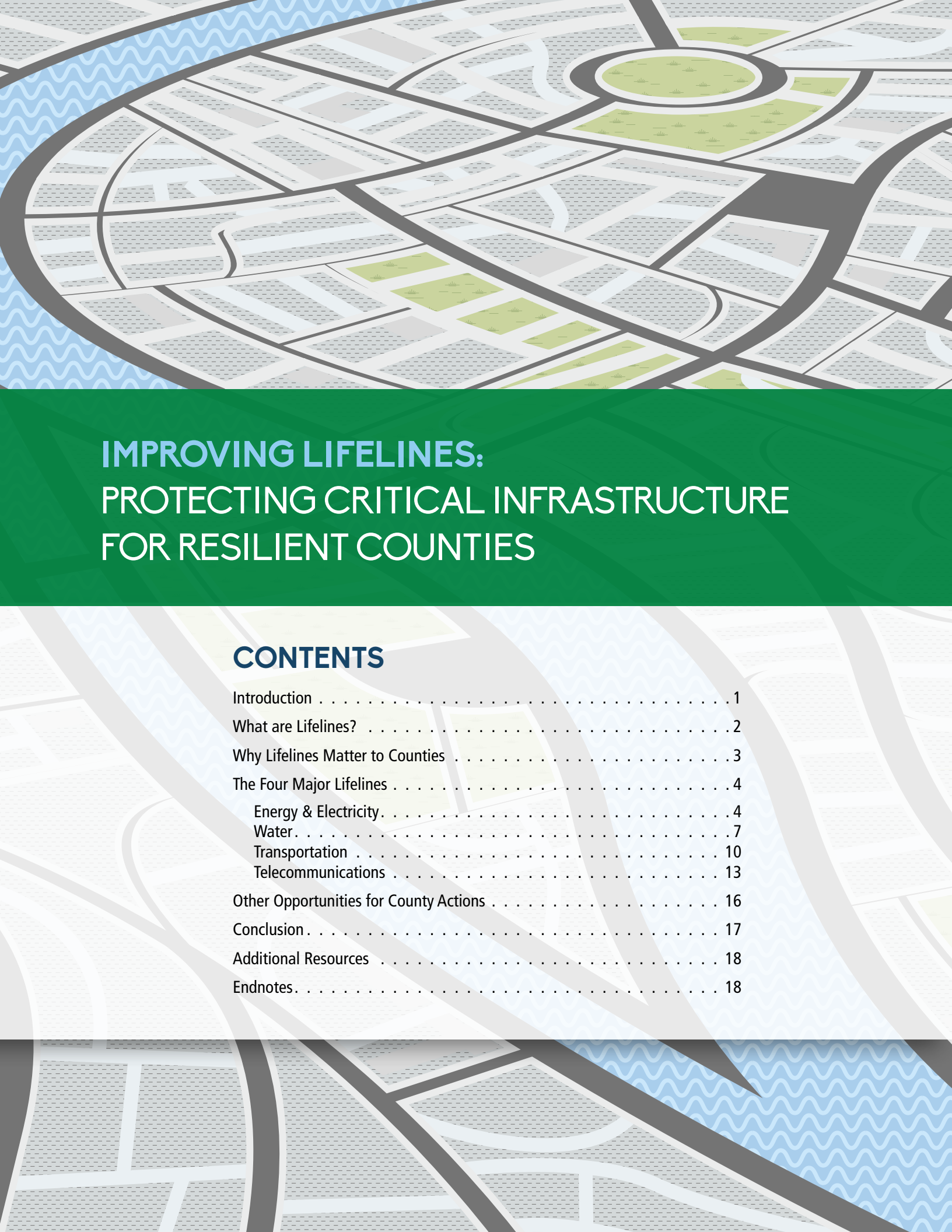




NATIONAL ASSOCIATION OF COUNTIES

IMPROVING LIFELINES:
PROTECTING CRITICAL
INFRASTRUCTURE
FOR RESILIENT COUNTIES





IMPROVING LIFELINES: PROTECTING CRITICAL INFRASTRUCTURE FOR RESILIENT COUNTIES

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COUNTIES NEED TO BE ABLE TO PREPARE FOR, RESPOND TO AND RECOVER FROM DISASTERS IN A TIMELY FASHION, AND AS PART OF THIS PREPARATION, THEY NEED TO ENSURE THAT CRITICAL INFRASTRUCTURE, SUCH AS ENERGY, WATER, COMMUNICATIONS AND TRANSPORTATION, REMAIN OPERATIONAL, OR THAT SERVICE CAN BE QUICKLY RETURNED TO NORMAL FOLLOWING A DISASTER.

INTRODUCTION

There are a myriad of high-impact disruptions that counties across the country face each and every day. Ranging from natural disasters to structural failures to economic downturns, these events can impact natural environments and cause damage to homes or businesses. While the scope and size of disasters may vary, one commonality they all share is that they are expensive.

On average, natural and man-made disasters cause an estimated \$57 billion in damages and related costs each year.¹ Large events can cost even more — Hurricane Katrina, for example, cost upwards of an estimated \$100 billion.² Damages to homes, businesses, roads, water infrastructure and energy plants, among others, can be extremely costly to counties, and the recovery efforts can last from days to even years.

Not only do extreme events like hurricanes, floods, tornados and fires threaten the financial health of counties all across the country, they threaten critical infrastructure known as lifelines, which are necessary for counties to function and provide vital services to the public. It is imperative for counties to understand the risks that weather-related events or economic downturns pose to their lifelines. Counties need to be able to prepare for, respond to and recover from disasters in a timely fashion, and as part of this preparation, they need to ensure that critical infrastructure, such as energy, water, communications and transportation, remain operational, or that service can be quickly returned to normal following a disaster.

This issue brief will serve as a guide for county leaders to help them understand the vulnerabilities of and threats to critical infrastructure in their county. By having a better understanding of the interconnectedness of lifelines, and how damages to one sector can cascade and affect others, county leaders will be better prepared to address vulnerabilities in their county and protect their lifelines. Case studies throughout will highlight the replicable work that large and small, urban and rural counties across the country are undertaking to ensure that their lifelines are ready for unforeseen events.

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This issue brief includes case studies on the following counties:

- Electricity & Energy: Carroll County, Md. (page 6)
- Water: St. Clair County, Mich. (page 9)
- Transportation: Hillsborough County, Fla. (page 11)
- Telecommunications: Arlington County, Va. (page 15)

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WHAT ARE LIFELINES?

Counties provide the public with a number of programs and services; critical to these services are infrastructure systems that are vital for counties to operate. These lifelines, as they are known, are essential systems that serve residents and businesses throughout the county, often extending into the greater region. Without these lifelines, counties would not be able to ensure the public's health and safety, as well as economic security. It is important to distinguish lifelines from what are known as "life support" systems, which include emergency services and public health.³

Lifelines have a set of defining characteristics that separate them from other sectors and services provided. In general, there are four main factors that define lifelines:

- They provide necessary services and goods that support nearly every home, business and county agency,
- Lifelines deliver services that are commonplace in everyday life, but disruption of the service has the potential to develop life-threatening situations,
- They involve complex physical and electronic networks that are interconnected within and across multiple sectors, and
- A disruption of one lifeline has the potential to effect or disrupt other lifelines in a cascading effect.⁴

Each county has distinctive characteristics, be they geography and terrain, demographics or economic drivers. As such, the needs of a small rural county are going to be different than those of a larger urban county. Counties will invariably define lifelines differently from one another, but there are four main lifeline categories that apply to virtually every county across the nation:

- Energy, such as oil, natural gas and electricity,
- Water, including potable water and wastewater systems,
- Transportation, including roads, bridges, rail, airports and ports, and
- Communications, including telephone, satellite and Internet infrastructure.⁵

In addition to these four main categories, counties may consider other areas to be important lifelines, depending on the county's size, population and location. For example, San Francisco County classifies more than 12 different lifelines that it monitors.⁶

Flooding can damage county roads, hindering emergency response crews' ability to assist those in need, and disrupting normal business operations.



WHY LIFELINES MATTER TO COUNTIES

Counties are tasked with protecting the public's health, safety and welfare, and threats to lifelines could limit counties' ability to carry out this basic task. There are a number of important aspects about lifelines that demand special attention.

INTERDEPENDENCIES

Lifelines do not operate in a silo; rather, they are highly interconnected and dependent on one another, and it is this interconnectedness that necessitates counties to work to address the security and reliability of its various lifelines. For example, a storm could knock a tree over and onto power lines, which then causes a failure at a local substation, leading to a widespread power outage. Not only would this disrupt power to homes and offices, it could cut off power to a county's emergency communications network.⁷ Damages to a water main could impact the public's supply of potable water, or interrupt HVAC operations at critical county buildings.

To complicate matters, much of the physical materials that make up lifelines, including water pipes, electrical wiring, telecommunications fiber and natural gas pipes, are buried underground. This can make it hard for counties and other key players such as energy providers to know the exact location of an issue such as a burst pipe or cut cable, or to know the condition of the materials as they age. In addition, much of the material is often buried in close proximity, which can put multiple systems at risk. For example, if a water main breaks underground, the leak can damage electrical or telecommunications cables that are buried nearby.⁸

COUNTIES ARE TASKED WITH PROTECTING THE PUBLIC'S HEALTH, SAFETY AND WELFARE, AND THREATS TO LIFELINES COULD LIMIT COUNTIES' ABILITY TO CARRY OUT THIS BASIC TASK.

ECONOMIC RECOVERY

When disruptions to lifelines occur, counties can face significant threats to economic activity and recovery. A county's ability to recover and bounce back from a disaster or other major event is dependent on the ability for lifelines to be up and running shortly after a disaster.⁹ For counties that are highly dependent on tourism, ensuring the resilience of roads, airports, bridges, railways and ports is key to ensuring that economic activity remains active during, or quickly returns after a major event.

For example, a shop that retains or quickly regains power may continue providing goods and services with little disruption to their normal operation. However, if an earthquake or flooding damages local roads, customers or delivery services may not be able to make it to the store. Manufacturers that export their goods may not be able to distribute products following damages to ports or freight rail lines. Loss of power at an airport or flooding on the runway can disrupt tourist-dependent communities and businesses such as hotels, shops and restaurants if visitors are unable to fly in.

EMERGENCY PREPAREDNESS

By addressing lifeline resiliency, counties can be better prepared to respond to emergency situations and ensure public safety. Good emergency planning requires extensive emergency response exercises and drills.¹⁰ By running through a variety of scenarios, counties can understand where exactly their vulnerabilities lie, and create plans for how to address them. These exercises will also familiarize county leaders, emergency managers and lifeline operators with a wide range of potential disasters and responses, and can better prepare them to adapt to changing circumstances during an event.



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THE FOUR MAJOR LIFELINES

As mentioned earlier, though counties may define what constitutes a lifeline differently than one another based on their size, location or needs, there are four main categories of infrastructure lifelines that are applicable to nearly every county in the country: energy, water, transportation and communications. Damages to one or all of these lifelines from a high-impact event can seriously hinder a county's ability to ensure the public's health, safety and welfare, and are therefore the most important for counties to focus on protecting.

**THERE ARE FOUR
MAIN CATEGORIES
OF INFRASTRUCTURE
LIFELINES THAT ARE
APPLICABLE TO NEARLY
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IN THE COUNTRY:
ENERGY, WATER,
TRANSPORTATION AND
COMMUNICATIONS.**

ENERGY & ELECTRICITY

Energy and electricity facilities, as well as transmission and distribution lines, are among the most critical of lifelines. Disruption of power service can be more than just an inconvenience of the lights going out after a storm. A severe power outage may mean that people cannot heat or cool their homes; water and wastewater treatment facilities' electric pumps would not be able to provide potable water or treat sewage and storm runoff; traffic and rail crossing signals will cease to function; and emergency call centers would not be able to process 911 calls or provide communication to emergency dispatchers and first responders.¹¹ Loss of power also threatens the livelihood of local and regional economies. Power outages cause an estimated loss of \$18–33 billion per year due to lost inventory, wages, production delays and damaged equipment.¹²

TRANSMISSION AND DISTRIBUTION

At the heart of the issue that counties face is the fact that the energy infrastructure across the country is aging and unable to keep up with the current demand of electricity. The demand for electricity has risen more than 25

percent since 1990, yet the methods for electrical generation, transmission and distribution remain relatively unchanged over the last 75 years.¹³ Little has been done over the years to improve the reliability, efficiency and security of energy distribution, which leaves counties and the public at risk for severe power outages.

The majority of electricity in the U.S. is generated at a power station and then sent to a transmission substation along high-voltage lines. From the substation, electricity is sent to a distribution station where it is then delivered to customers on demand. The transmission and distribution wires are strung along electrical poles and subject to the elements.

Hurricanes, wind storms, ice storms and other major weather events can damage lines, which can lead to widespread power outages and impact homes, businesses, emergency communications, water treatment plants and other critical facilities. Given the one-way nature of electrical distribution from distribution centers to customers, utilities are often unaware when a power failure occurs until customers report it, and it can take a considerable amount of time to determine the location of the problem and fix it. As the demand for energy increases and new lines and equipment are added, existing electrical poles can become overloaded, increasing their vulnerability to wind and ice storms.¹⁴



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NATURAL GAS INFRASTRUCTURE

Counties need to be prepared to address vulnerabilities to natural gas infrastructure, including 1.5 million miles of pipeline, storage facilities and port and rail stations.¹⁵ Across the U.S., natural gas is used to heat and power 65 million homes, five million businesses and nearly 200,000 factories.¹⁶ As new methods to detect and extract natural gas become available, counties are also using natural gas as a major source of county revenue—Garfield County, Colo., for example, generates 70 percent of its revenue from natural gas production.¹⁷ A disruption to production and distribution facilities not only has the ability to disrupt power and heating for homes, business and critical facilities, it can also greatly impact significant sources of revenue and jobs for counties.

Natural gas infrastructure is particularly vulnerable to threats from earthquakes, which can cause damage to buried pipes that have corroded over time. Seismic activity can also weaken or damage welded joints, which can lead to leaks. A leak in a natural gas line can disrupt service to customers, or worse, lead to fires if the leak occurs where gas is able to build up under high pressure.

EMERGENCY BACKUP POWER

Counties should be prepared with backup sources of power should a disruption to the electrical grid or natural gas pipeline occur. An extended loss of power for critical facilities such as jails, traffic signal control centers, hospitals, fire stations and police stations can threaten a county's ability to provide help during emergency events and ensure public safety. Backup power can ensure that lights remain on, fire detection services are functional, public safety communication channels are open and HVAC systems remain running.¹⁸

OPPORTUNITIES FOR COUNTIES

■ **Smart Grids:** Though the majority of counties do not own and operate their own utilities, counties can work with local utilities to begin upgrading their energy infrastructure with new smart grid technologies. Smart grids are composed of interconnected components that monitor energy use in real time and relay that information to utilities. This technology allows for two-way communications between a utility and its customer, which can allow for utilities to quickly know when and where there is a power failure, address the issue and return power service to residential customers and critical facilities.

A number of counties are already exploring the opportunities to use smart grid technologies. Alameda County, Calif. for example, built a micro-grid (a localized smart grid) at their Santa Rita Jail in 2012. The system is set up so that if power along the regular grid is disrupted, the facility will automatically disconnect from the regular utility grid and operate independently, using power generated and stored on-site from solar panels, wind turbines and a combined heat and power plant.¹⁹ With this system, the county is prepared to handle an unforeseen loss of power, and ensure the safety of both jail staff and inmates alike.

Solar panels help provide the Santa Rita jail with renewable energy it can store ahead of any power outages.

Source: Alameda County, Calif.



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■ **Emergency Backup Power:** Backup power can be provided from a variety of sources. Gasoline-powered generators are among the most commonly used and accessible. These can vary in size from small, portable generators to permanently installed generators with large fuel capacities that can power systems that require significant amounts of energy.²⁰ Renewable energy sources can also provide emergency backup power. Solar panels and wind turbines connected to a battery system can store electricity for use should power be disrupted.

■ **Updated Building Codes:** Through building codes, counties can require safety measures such as automatic shutoff valves for gas lines where they enter critical facilities, including power plants, water treatment facilities and ports. Automatic shutoff valves minimize the risk for a gas leak in a damaged building which can increase the risk of fire. Replacing older steel piping with plastic and steel pipes can minimize the risk of pipeline damage.²¹

■ CASE STUDY

CARROLL COUNTY EMERGENCY POWER

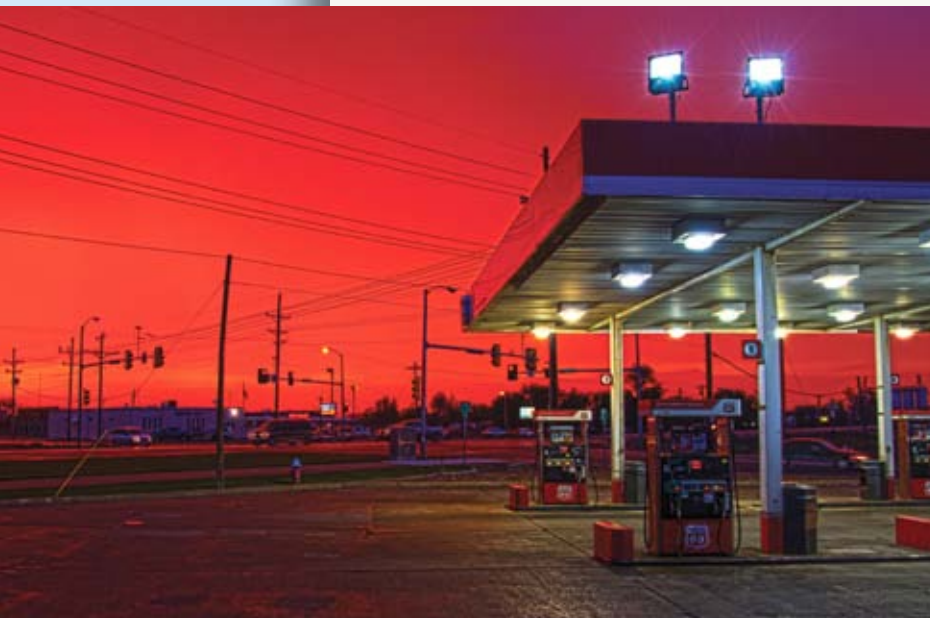
Extended power outages can threaten the public's safety, limiting their ability to heat or cool their homes and store and cook food. Gasoline generators are a common and reliable source of backup power, but most people don't store extra gasoline in case of an emergency. What would happen if, during an

emergency event, fuel service stations lost power and gasoline pumps failed?

Recognizing the threat posed by a lack of power at local service stations during a power outage or emergency, Carroll County, Md., with a population of 167,134, launched its County Service Station Energy Resiliency Grant Program.²² Through the grant program, fuel stations can apply for grants of up to \$22,000 which can help offset the costs for purchasing and installing portable and fixed generators, as well as backup battery units.²³ By reducing the financial burden on local fuel stations, Carroll County is ensuring that local fuel stations are more resilient and prepared for disaster events.

In 2013, the county's Board of Commissioners allocated \$225,000 to prepare the county for unforeseen natural and manmade disasters. \$110,000 of that has been allocated to the grant program to provide funds for at least five different fuel stations throughout the county. Eligible stations must have a fuel storage capacity of at least 10,000 gallons and have a minimum of 75,000 gallons in sales each year, ensuring that the station is equipped to handle an influx of customers.

The idea for the grant program came about when the Board of Commissioners was reviewing Carroll County's emergency plans. Board members realized that local fuel stations didn't have the capacity to pump fuel during an emergency, and saw the need to invest in the county's emergency infrastructure. When the station upgrades are complete, residents will be able to secure fuel needed to temporarily power their homes, or even fuel their cars should the county issue an evacuation order.



Fuel stations throughout Carroll County, Md. are being upgraded to store more fuel and handle an influx of customers during emergency events.

Flickr user Kansas Poetry

WATER

The ability of a county to provide reliable water service is key to maintaining public health and a functioning economy. Water and wastewater treatment facilities and infrastructure play a major role in everyone's daily lives. The average American family uses 300 gallons of water per day for drinking, cooking, showers, watering lawns and washing clothes and dishes, among other uses.²⁴ Water is also necessary for HVAC systems for hospitals, fire-fighting purposes, landscaping in county parks, manufacturing purposes, irrigation and farming and countless other purposes.²⁵ It is often only after an emergency and disruption in service that people recognize how much water is taken for granted.

WATER INFRASTRUCTURE

Water treatment plants and associated infrastructure supply homes and commercial and industrial customers with potable water. The majority of the water people drink and use comes from two main sources: groundwater, which is collected from wells that are connected to underground aquifers, and surface water, including rivers and lakes.²⁶ Transmission pipelines carry water from the source to treatment facilities; following treatment, water is carried through smaller distribution pipelines where it is then directed to individual customers. Throughout the process, water travels along the pipelines via a series of pumping stations. These pumping stations consist of pumps and motors that mechanically control the flow of water.

One of the biggest threats to water supply that counties face is aging infrastructure. It is not uncommon for buried pipes and components to be nearly 100 years old. Aging pipelines can corrode over time and collapse on themselves. Stress from seismic activities over the years can damage joints connecting pipes and cause slow-building leaks; major earthquakes can lead to massive breaks in the pipeline and cause significant damage to infrastructure.

Water treatment facilities are critical for providing clean drinking water during normal circumstances as well as during times of emergency.

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The infrastructure is also vulnerable to problems caused by other lifelines. Water pipelines are often buried near natural gas lines, and are at risk for damage should a gas leak lead to a fire. A loss of power can cause pump stations to fail since they need a constant supply of electricity to function. Flooding and damages to roads and bridges can affect repair crews' ability to get to areas where the infrastructure is damaged, further delaying normal water service. Pipelines may run along roads and bridges, which if damaged in a storm, can cause breaks and leaks. Flooding can also damage water treatment facilities, forcing a facility shutdown and threatening potable water supply.

WASTEWATER INFRASTRUCTURE

Wastewater infrastructure collects and processes domestic and industrial waste.²⁷ Whereas water systems distribute water from a treatment center to individual customers, wastewater systems collect used water and waste from residential and industrial areas and send them through pipelines to a wastewater treatment facility. There, through a series of filtration processes, water is separated from solid wastes and treated. It can then be used in a variety of agricultural and industrial processes, or discharged into bodies of water.

Wastewater infrastructure faces a number of the same threats that water systems face. Aging infrastructure, as well as breaks and leaks caused by earthquakes, are the biggest threats to wastewater infrastructure. Systems that are designed as combined storm and sewer are particularly vulnerable to major storms. These systems collect stormwater runoff in addition to waste. During heavy rainstorms, high levels of stormwater runoff can overwhelm the capacity of the treatment plant, and untreated waste can flow directly into the bodies of water into which treated water is normally discharged. The potential exposure to untreated sewage and waste can pose a threat to public health and safety.

OPPORTUNITIES FOR COUNTIES

Replacing existing and aging water infrastructure with newer materials is one way that counties can make their water infrastructure more resilient. Yet this can be costly, and take years to complete. There are, however, a number of other opportunities and actions counties can take to prepare for the loss of water and wastewater treatment service to improve their resiliency.

■ **Backup water supply:** In the event of a loss of potable water, a backup water supply can provide drinking water until regular service is restored. Buried water storage tanks have been used to provide a clean drinking supply following events like floods and earthquakes.²⁸ Backup power from generators at pump stations can allow pumps to continue normal operation if the grid is damaged.

■ **Temporary water and sanitation supplies:** Counties can work with local utilities and public health groups to determine plans for temporary water supplies and sanitary services.²⁹ Local water utilities can work with emergency management teams and personnel to determine key distribution points for drinking water and water for firefighting purposes. Public health agencies and community groups can help identify prior to an emergency where temporary sanitation services like portable toilets and showers can be set up throughout the community.

■ **Educating the public:** Education and outreach are key to ensuring community resiliency. By creating and maintaining disaster response plans which establish community-set goals for water needs and priorities ahead of an emergency situation, county officials and staff, residents and businesses can be prepared and know how to react.

■ CASE STUDY

CLEAN WATER FOR ST. CLAIR COUNTY

While most people have encountered a power outage at some point, it's unlikely they've experienced a water shortage. Perhaps some are prepared with enough water to last them a day or two, but what would happen if the shortage continued? How and where would people obtain clean water?

That is what St. Clair County, Mich. was concerned about in 2012. The county has a population of

163,040, and is located in eastern Michigan between Lake Huron and Lake St. Clair, separated from Canada by the St. Clair River.³⁰ Following a 2011 algae bloom in Lake Erie, during which residents in nearby Ohio were unable to use the water—boiling it made it even worse—the county realized that it needed to assess its emergency plans should there be a water shortage.

The next year, the county's Homeland Security-Emergency Management office, in collaboration with the U.S. Environmental Protection Agency, held the St. Clair County Community Water Resiliency Roundtable.³¹ This day-long event brought together members from city, county, state and federal agencies, as well as local utilities and other stakeholders, to explore the interdependencies between water and other lifelines; develop an understanding of the true impact a loss of water would have on the community; and create action plans for response and recovery.

Since the roundtable, St. Clair County has implemented a number of plans to better withstand an emergency event that impacts the county's water supply. The county has contingency plans to bring in outside water for drinking and cooking, filling tanker trucks from the county's unaffected municipalities. If needed, the county can request additional water from other counties throughout the state. They have created a fire-strike team to bring in outside water to fight fires during a disruption.

In fall 2014, St. Clair County also plans to implement a new mass-notification system. The system will identify water distribution facilities that are experiencing abnormal functions and notify residents and businesses in the immediate area to begin conserving water. Through the use of social media, the county hopes to get the vital information to the public as soon as possible.

Though the county is taking great steps in collaboratively working to ensure potable water in the event of a disaster, Jeff Friedland, Director of Emergency Management, still wants to do more to reach out to the public and make sure citizens are aware of the issue. Concerned that most people are more worried about a power outage than loss of water, he notes, "People need to wake up and realize the criticality of water."



The Blue Water Bridge connects St. Clair County, Mich. and Canada, and crosses over the St. Clair River, the primary source of drinking water for St. Clair County

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TRANSPORTATION

Counties heavily invest in the nation's transportation infrastructure. Counties build and maintain 45 percent of public roads, 230,690 bridges and are involved in one-third of transit and airport systems across the U.S.³² Maintaining this infrastructure is not only important for enabling people to move about during their daily lives, but also allows for efficient shipment of goods and supplies, creates access for tourists who contribute to the local economy, enables emergency personnel to reach those in need and provides evacuation routes in emergencies.

Developing and maintaining resilient transportation infrastructure is imperative for counties to keep the public safe and the economy functioning. Nearly \$101 billion is lost each year from time and fuel costs associated with traffic congestion.³³ Long-term disrupted access could have further significant impacts, from lost trade and manufacturing sales due to disrupted freight rail service, to lost wages because workers cannot access places of employment. Damages to major roads from floods and earthquakes can delay or even prohibit emergency first responders

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ROADS AND BRIDGES

Roads and bridges are the backbone of the country's transportation system. Nearly three trillion miles were traveled on the nation's four million miles of public roads in 2011.³⁴ Like other infrastructure systems, though, many of the roads are aging and in states of much needed repair. About a third of the roads are classified as being in mediocre or poor conditions, and one in nine bridges is structurally deficient.³⁵

Aside from aging, roads and bridges are prone to issues related to flooding. While the road surfaces and bridge structures are generally able to withstand major storms, heavy rains, flood waters and mudslides can take a toll on their foundations, causing roads to buckle, crack or even wash away.

Passenger rail ridership doubled between 2000 and 2012. Increased opportunities for rail travel can lessen the toll that driving takes on county roads across the country.

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CASE STUDY

HILLSBOROUGH COUNTY LOCAL MITIGATION

The last time Hillsborough County, Fla. was hit by a direct hurricane was 1921. Since then, the county, which has 1.2 million residents, is located on Florida's Gulf Coast and is home to Tampa, has dealt with numerous tropical storms, as well as felt the impact from other hurricanes, but the county has been lucky to not receive a direct hit in 93 years.³⁸ That does not mean that county officials are not concerned about the long-lasting effects the county could face if they are hit. Flooding from previous tropical storms has demonstrated the need for improving transportation resiliency—in 2012, Tropical Storm Debby dumped 20 inches of rain on the county and caused major flooding that disrupted access between downtown Tampa, Tampa General Hospital and MacDill Air Force Base.³⁹ A Category 3 storm has the potential to cause a storm surge inland up to 21 feet deep; on top of that, Tampa Bay's tides may increase some 14 inches by 2040 from sea level rise.⁴⁰

With an understanding that the county is vulnerable to major storms and sea level rise, Hillsborough County began efforts to bolster its transportation infrastructure resiliency. In 2013, the Hillsborough County Metropolitan Planning Organization, in collaboration with the County Planning Commission, Hillsborough County, the Tampa Bay Regional Planning Council and the University of South Florida received a \$132,000 grant from the Federal Highway Administration as part of a program to better understand and assess transportation infrastructure resiliency.

By collecting data and using potential extreme weather modeling, the county's Local Mitigation Strategy Working Group identified critical infrastructure at high risk and created specific strategies to mitigate and adapt to threats from sea level rise, storm surges and inland flooding. Strategies that the study recommends include improving the



Given its location along the Gulf of Mexico, and facing threats from hurricanes and sea level rise, Hillsborough County, Fla. has been proactively working to make its transportation infrastructure more resilient.

strength of road and bridge bases to protect against erosion; raising low-lying roads to minimize the risk of flood exposure; increasing stormwater capacity systems to drain water faster; channeling floodwater adjacent to or under roadways to avoid flooding; and improving the quality of roads parallel to major corridors to increase redundancy.⁴¹ The study also found that investing \$37 million in improved storm water drainage capacity could reduce the county's economic loss during a major event by 46 percent, and increase the transportation system's recovery time by two weeks.⁴²

The full report is expected to be completed in late fall 2014. The strategies identified in it will help inform what work needs to be addressed and funded in the Plan Hillsborough 2040, a long-range planning document.

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RAIL AND AIR SERVICE

Both passenger and freight rail service have seen growth in recent years. Between 2000 and 2012, Amtrak ridership doubled to 31.2 million passengers per year; freight rail transports nearly half of all shipments within the U.S. and a third of the nation's exports.³⁶ Air infrastructure is also critical to the economy. Each year, more than \$500 billion in cargo is transported, an amount expected to triple by 2040.³⁷ Disruptions can be costly, though. Airport congestion and delays cost nearly \$22 billion in 2012, a cost that is expected to rise to \$63 billion by 2040.

Rail and air infrastructure are vulnerable to power outages, both short term and extended. Rail switch facilities rely on a constant source of power to coordinate the movement of freight and rail trains, which often share the same tracks. Rail crossing guards are also dependent on electricity to close gates as trains approach road crossings. Airports rely on power to operate control towers and radar functions. A power outage that disrupts communication capabilities can threaten airport security and safety if the control tower and pilots cannot communicate with one another.

Flooding is also a threat to rail and air infrastructure. Flooded tracks and tunnels can shut down rail service. Flooded runways not only prohibit planes from taking off and landing, but can also lead to soil erosion that can cause runways to collapse.

OPPORTUNITY FOR COUNTIES

■ **Increasing redundancy:** During a high-impact event, major roads and bridges may become damaged, or can experience significant backups caused by bottlenecks during evacuations. Ensuring that secondary roads are maintained and available for use can build redundancy into the emergency transportation system, providing alternative options for transit.

■ **Multi-modal transit:** Heavily used roads and bridges are more susceptible to damage from hurricanes, earthquakes, floods and other weather-related events, and need to be repaired more often from use. By providing alternative transit options through improved bike and pedestrian infrastructure and increased public transit options, counties can lower the wear and tear that takes a toll on road surfaces.

■ **Improving stormwater capacity:** As noted earlier, lifelines work in tandem with one another; improvements in one improves the resiliency of others. By improving stormwater systems' ability to handle floods and heavy rains, these systems can drain water faster and minimize the threat that flooding poses to roads, bridges, rail and air infrastructure.



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TELECOMMUNICATIONS

Telecommunications systems are an integral part of nearly everyone's lives. Businesses rely on email to send important documents and online banking systems to conduct financial transactions; people use text messages and social media to talk and stay in touch with one another; and emergency personnel depend on reliable connections to handle 911 calls, contact first responders and communicate emergency and safety information with the public.⁴³

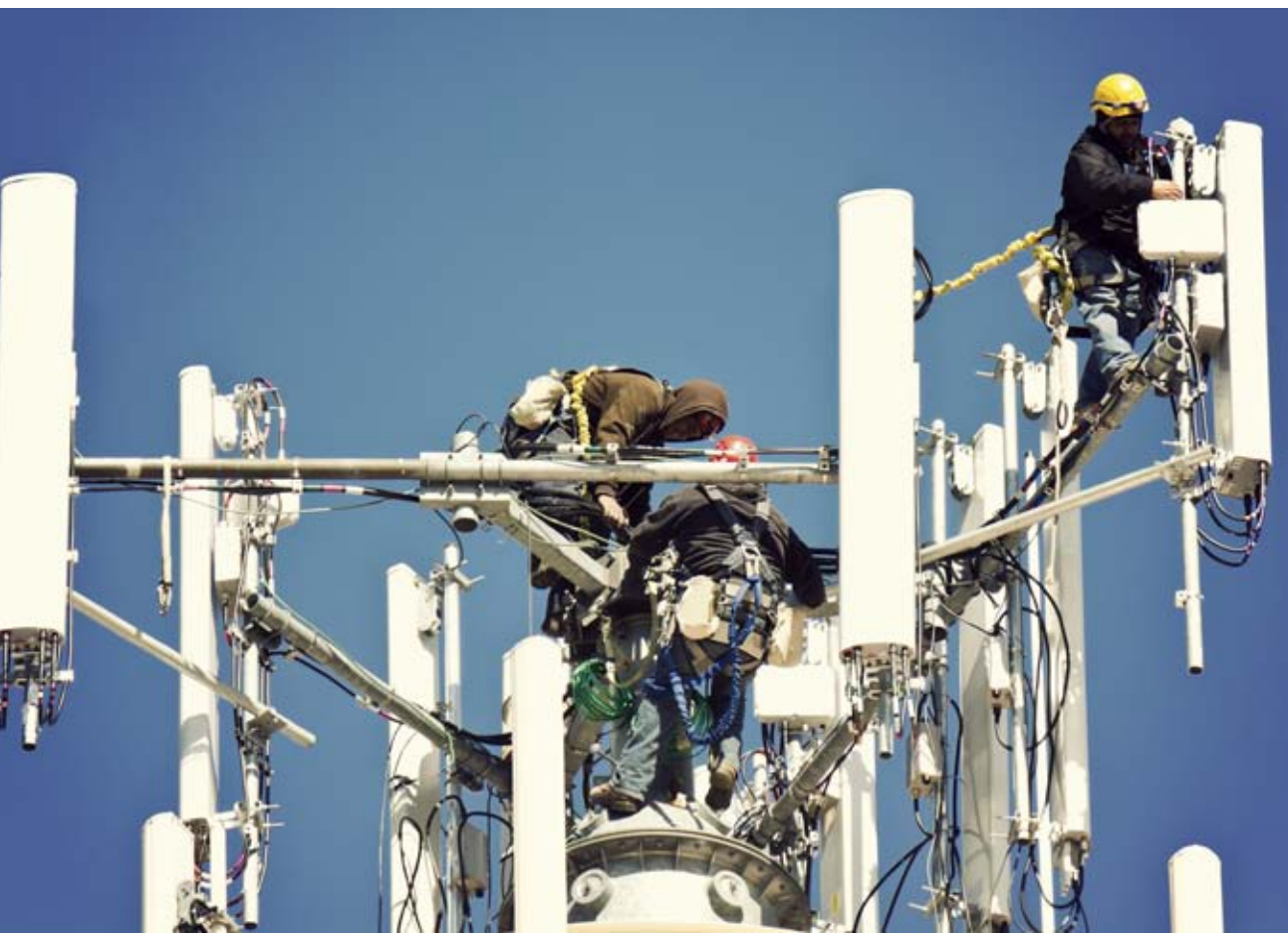
Disruptions to telecommunication systems can more than inconvenience two friends trying to connect with one another—they can greatly interfere with businesses' ability to conduct normal business and impact the local and national economy. During times of emergencies, individuals may not be able to communicate with 911 centers, which then may not be able to communicate to emergency responders including police, fire departments and EMTs.

WIRING

Copper wire has been the choice of many telecommunications utilities, but now the infrastructure is outdated. It was not designed to handle the large amount of data needed for high-speed Internet and other electronic methods of communications we rely on today. The wiring is also prone to failure caused by flooding and erosion, which can limit emergency communications during a disaster event.

**EMERGENCY
PERSONNEL DEPEND ON
RELIABLE CONNECTIONS
TO HANDLE 911
CALLS, CONTACT
FIRST RESPONDERS
AND COMMUNICATE
EMERGENCY AND
SAFETY INFORMATION
WITH THE PUBLIC.**

A resilient telecommunications network can help counties keep communication channels open during emergencies.



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OPPORTUNITIES FOR COUNTIES

■ **Fiber Optic Cables:** Counties can work with their local utilities to upgrade their telecommunications infrastructure with fiber optic cables. These cables are becoming the choice material for new telecommunication installations as they are less prone to damage from flooding compared to copper wires, and can send significant amounts of data and handle high traffic volumes.⁴⁴

■ **Backup Communications System:** Despite the decline in use of landline phones in favor of cell phones, email and VoIP for daily communications, it is recommended that counties keep a landline system as a backup system should a major event disrupt the power supply.⁴⁵ Unlike fiber optic-based systems, traditional landlines are generally not reliant upon the normal power supply, minimizing the risk of interdependency and remaining usable for emergency communications in the event of power loss.

■ **Underground Wires:** Moving electrical and telecommunication wires underground can also decrease the risk to these vital lifelines. Above ground wires are at risk to damage from wind storms, ice buildup on the lines and fallen trees. Emergency repair crews can be put at risk if they are working to assess a power failure during heavy storms or extreme heat or cold. Damages to roads from flooding or earthquakes such as mud and downed trees and other debris can also limit crews' access to fix a problem. While moving the lines underground can help counties address these issues, it is important to note that the installation and maintenance costs of burying wires is more expensive than that of overhead wires, and it can also be more difficult to identify and locate disruption sites.⁴⁶

■ **Redundant Systems:** Counties can also create redundancy in their emergency communications infrastructure to ensure that during emergency events, the infrastructure can handle an increased volume of calls or withstand power outages. One way to do this is to have multiple call and dispatch centers throughout the county, rather than in one centralized location. Each call center can operate as the primary dispatch facility and act as a backup should there be any disruption to phone or power lines.

When Hurricane Sandy hit the U.S. in 2012, counties in New York, New Jersey and eastern Pennsylvania were among the hardest hit. The storm caused flooding that damaged thousands of homes, cancelled nearly 20,000 flights, and shut down freight and passenger rail service; nearly six million customers were without power once the storm passed.⁴⁷ A storm of this magnitude had the potential to completely overwhelm or shut down emergency communications services that connect 911 centers, fire and police stations, EMS and first responders. Luckily for Pike County, Pa., their 911 dispatch center was prepared to handle such an event. Just 18 days before Hurricane Sandy struck, Pike County's 911 center moved into a new state-of-the-art facility in Lords Valley that was connected via fiber optics to the older center in Milford.⁴⁸ During the hurricane, the 911 center answered 1,268 calls between October 29 and October 31—about the same number of calls the county would have expected during an entire month.⁴⁹ The fiber optic cables avoided any damages from wind or downed trees, and enabled the county to create redundancy in its 911 centers.

■ CASE STUDY

CONNECTARLINGTON

Arlington County, Va.'s current communications network dates back to the 1980s. The county's recent population growth, coupled with an increased demand for faster and more data-intensive connectivity, has placed an increased demand on the communications network beyond what the current setup is capable of providing. Recognizing the need to upgrade its current infrastructure, the county board approved in 2011 the ConnectArlington program.

The project will replace the current 52 miles of copper wiring with a new fiber optic system. Expected to be completed in 2016, there will be some 60 miles of fiber optics that will connect more than 90 county and school facilities, as well as over 300 traffic signals. The project is estimated to cost about \$50 million when completed, and is funded through federal and state grants, as well as public bonds.

ConnectArlington will significantly improve communication reliability between county agencies, as well as improve emergency response capabilities. The county previously relied on radio communications via towers and microwave for its 911 operations.⁵⁰ Overgrown trees and major storms had the potential to disrupt the signals and service, but the new fiber optic cables have resolved that issue.

At just under 26 square miles, the county is one of the smallest self-governing counties in the country. The new ConnectArlington program will greatly improve the speed at which emergency responders can get to an emergency through the county's dense urban corridors. The new network will allow for real-time traffic monitoring, so if an ambulance is responding to an emergency, dispatchers and drivers can know which roads to avoid for the safest and fastest travel. Also, the county's emergency vehicle preemption system will enable the county

to turn lights green for emergency vehicles at more than 31 major intersections.⁵¹

Arlington County is also allowing private organizations to connect to the new fiber optic network's unused capacity, known as "dark fiber."⁵² Starting in 2015, private organizations will be able to work with a third-party vendor to take advantage of the new network's high-speed capacity and security—issues important to businesses like federal contractors. The county expects this access to the new infrastructure to draw new jobs and increase county revenue.



Arlington County, Va. is upgrading its telecommunications infrastructure, using fiber optic cables to improve emergency communications and attract new businesses.

"Arlington County has a history of long-term planning, then following through with the strategic investments to make it happen. ConnectArlington is an innovative project that will help distinguish Arlington in the competitive market and surely provide a healthy return on the investment."

— Hon. Jay Fissette
Arlington County Board Chair, Arlington County, Va.

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OTHER OPPORTUNITIES FOR COUNTY ACTIONS

In addition to addressing resiliency improvements to the four major lifeline sections, there are a number of actions that counties can take to make sure they are ready for major disruptive events.

EDUCATION AND AWARENESS

A truly resilient community is one where members of the public are educated about the risks and hazards their community faces, and what to do in the event of a major event. Communities that are better prepared to deal with events like flooding, wildfires or earthquakes will have a better chance at a quicker recovery.

When counties understand the risks specific to their county and lifelines, they can work with schools, religious groups, community organizations and volunteer groups to develop programming that can help communicate to the public how they can be prepared for unexpected events and emergencies.

FUNDING AND TECHNICAL ASSISTANCE

Federal funding and technical assistance opportunities exist for counties to upgrade their infrastructure to make them more resilient. The U.S. Environmental Protection Agency (EPA) has a technical assistance program to help local communities address technical and regulatory barriers for developing sustainable infrastructure. In 2014, 14 communities received \$860,000 in assistance for a variety of projects related to resiliency and sustainable infrastructure, including Ada County, Idaho, which is exploring ways to develop storm water mitigation strategies.⁵³ In 2013, the EPA assisted Pima County, Ariz.'s Regional Flood Control District to complete a guidance manual that addresses the siting, design, construction and maintenance of green infrastructure in a desert environment.⁵⁴ More information on the EPA's program can be found at http://water.epa.gov/infrastructure/greeninfrastructure/gi_support.cfm.



PLANNING PROCESSES

Opportunities exist for counties to develop resiliency standards and goals through a variety of planning processes. San Francisco County, for example, created in 2009 its Lifelines Council, which explores the interconnectedness and interdependencies of lifelines in order to improve development and restoration plans, disperse information about recovery plans and projects and create processes for restoring lifelines after a major disaster.⁵⁵ On the council are more than 30 members from the public and private sector, from county agencies like the Department of Emergency Management and the Department of Public Works, to communication companies like AT&T and Verizon, to transportation agencies like Amtrak, the Port of San Francisco and the San Francisco International Airport. This effort has helped the county improve collaboration for lifeline and disaster planning and restoration, providing the county with a framework for a five-year implementation plan.⁵⁶

Counties can also incorporate lifeline resiliency in their general plans. By including lifelines and critical facilities, counties can make sure that new growth and development does not negatively impact lifeline resiliency, but rather bolsters it. Riverside County, Calif., is one example of a county that addresses critical facilities and lifelines in its general plan. The county recognizes that critical facilities such as hospitals, fire and police stations, emergency operation and communication centers and dams may not be able to properly function if service from lifelines is disrupted, and therefore is using its general plan to protect these facilities.⁵⁷ As part of the general plan, new lifeline utilities must be designed to withstand earthquakes.

CONCLUSION

Aging infrastructure and increased storm frequency and intensity pose a number of threats to counties all across the U.S. In order for counties to protect public health and safety, and avoid disruptions to economic activity, they need to address their lifelines' resiliency. It is important for county leaders to understand how each lifeline impacts one another. By addressing vulnerabilities before any unforeseen events occur, counties can be more resilient, and better prepared to respond to and recover from major events.



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ADDITIONAL RESOURCES

ARLINGTON COUNTY, VA.

- Arlington County: www.arlingtonva.us
- ConnectArlington: <http://departments.arlingtonva.us/dts/connectarlington>

CARROLL COUNTY, MD.

- Carroll County: www.carr.org
- Service Station Energy Resiliency Grant Program: <http://ccgovernment.carr.org/ccg/emermang/EnergyRes.aspx>

CITY AND COUNTY OF SAN FRANCISCO

- San Francisco County: <http://www.sfgsa.org>
- Lifelines Council: www.sfgsa.org/index.aspx?page=4964

HILLSBOROUGH COUNTY, FLA.

- Hillsborough County: www.hillsboroughcounty.org
- Plan Hillsborough: www.planhillsborough.org

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

- National Institute of Standards and Technology: www.nist.gov
- Community Disaster Resilience: www.nist.gov/el/building_materials/resilience
- Disaster Resilience Framework: www.nist.gov/el/building_materials/resilience/framework.cfm

SPUR

- SPUR: www.spur.org
- Lifelines: www.spur.org/publications/spur-report/2009-02-01/lifelines

ST. CLAIR COUNTY, MICH.

- St. Clair County: www.stclaircounty.org
- Office of Emergency Management: www.stclaircounty.org/Main/contact.aspx?id=emerg_mngmt

U.S. ENVIRONMENTAL PROTECTION AGENCY

- U.S. Environmental Protection Agency: www.epa.gov
- Green Infrastructure Technical Assistance: http://water.epa.gov/infrastructure/greeninfrastructure/gi_support.cfm



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ENDNOTES

- 1 "Community Disaster Resilience." National Institute of Standards and Technology, http://www.nist.gov/el/building_materials/resilience/
- 2 Ibid.
- 3 "Strengthening Regional Resilience." National Infrastructure Advisory Council, <http://www.dhs.gov/sites/default/files/publications/Strength-reg-resi-final-report-recomendations.pdf>
- 4 Ibid.
- 5 Ibid.
- 6 "Lifelines Interdependency Study." The City and County of San Francisco, <http://www.sfgsa.org/modules/show-document.aspx?documentid=12025>
- 7 R.A. Haugerud, D.B. Ballantyne, C.S. Weaver, K.L. Meagher and E.A. Barnett, "Lifelines and Earthquake Hazards in the Greater Seattle Area." U.S. Geological Survey, <http://geomaps.wr.usgs.gov/pacnw/lifeline/>
- 8 T.D. O'Rourke, "Engineering for the Threat of Natural Disasters." National Academy of Engineering, Spring 2007. <https://www.nae.edu/Publications/Bridge/EngineeringfortheThreatofNaturalDisasters/CriticalInfrastructureInterdependenciesandResilience.aspx>
- 9 Christopher Barkley, "Lifelines: Upgrading Infrastructure to Enhance San Francisco's Earthquake Resilience." San Francisco Urban Planning + Urban Research Association, 17 Sep 2008. http://www.spur.org/sites/default/files/publications_pdfs/SPUR_Lifelines.pdf
- 10 T.D. O'Rourke, "Engineering for the Threat of Natural Disasters." National Academy of Engineering, Spring 2007. <https://www.nae.edu/Publications/Bridge/EngineeringfortheThreatofNaturalDisasters/CriticalInfrastructureInterdependenciesandResilience.aspx>
- 11 "County of Maui Multi-Hazard Mitigation Plan 2010." County of Maui, http://www.co.maui.hi.us/documents/10/Maui%20Multi-Hazard%20Mitigation%20Plan%20Vol.1%20-%20May%202020_1.PDF
- 12 "Resiliency of Stationary Fuel Cells and the Natural Gas Grid." Whole Building Design Guide, <http://www.wbdg.org/resources/resiliencyfuelcells.php>
- 13 "Disaster Resilience Framework: Energy Sector." National Institute of Standards and Technology, http://www.nist.gov/el/building_materials/resilience/upload/Chapter7_Energy_v0-1A.pdf
- 14 Ibid.
- 15 Ibid.
- 16 Ibid.
- 17 Interview with Drew Gorgey, September 18, 2014.
- 18 "Disaster Resilience Framework: Energy Sector." National Institute of Standards and Technology, http://www.nist.gov/el/building_materials/resilience/upload/Chapter7_Energy_v0-1A.pdf
- 19 "Project Overview." Alameda County. <http://www.acgov.org/pdf/SRJSmartGridOverview.pdf>
- 20 "Disaster Resilience Framework: Energy Sector." National Institute of Standards and Technology, http://www.nist.gov/el/building_materials/resilience/upload/Chapter7_Energy_v0-1A.pdf
- 21 Ibid.
- 22 "Carroll County, Maryland." United States Census Bureau, <http://quickfacts.census.gov/qfd/states/24/24013.html>
- 23 "Carroll County Service Station Energy Resiliency Grant Program." Carroll County, <http://ccgovernent.carr.org/ccg/emermang/docs/EnResGrantProgram.pdf>
- 24 "Water Use Today." United States Environmental Protection Agency, http://www.epa.gov/watersense/our_water/water_use_today.html
- 25 "Overview." United States Environmental Protection Agency, <http://www.epa.gov/watersense/commercial/types.html>
- 26 "Water and Wastewater Sector." National Institute of Standards and Technology, http://www.nist.gov/el/building_materials/resilience/upload/Chapter_9_Water_and_Wastewater_Sector_v0-1A.pdf
- 27 Ibid.
- 28 "Water and Wastewater Sector." National Institute of Standards and Technology, http://www.nist.gov/el/building_materials/resilience/upload/Chapter_9_Water_and_Wastewater_Sector_v0-1A.pdf
- 29 Ibid.



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Protecting Critical
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- 30 "St. Clair County, Michigan." United States Census Bureau, <http://quickfacts.census.gov/qfd/states/26/26147.html>
- 31 "St. Clair County Water Resiliency Roundtable Meeting Summary." United States Environmental Protection Agency, <http://water.epa.gov/infrastructure/watersecurity/communities/upload/epa817s13001.pdf>
- 32 Emilia Istrate, Anya Nowakowski and Kavita Mak, "The Road Ahead: County Transportation Funding and Financing," The National Association of Counties, 02 Feb 2014. <http://www.naco.org/research/Pages/county-transportation.aspx>
- 33 "Transportation Sector." National Institute of Standards and Technology, http://www.nist.gov/el/building_materials/resilience/upload/Chapter-6-Transportation_Sector_v0-1A.pdf
- 34 Ibid.
- 35 Ibid.
- 36 Ibid.
- 37 Ibid.
- 38 "Hillsborough County." United States Census Bureau, <http://quickfacts.census.gov/qfd/states/12/12057.html>
- 39 "Making Our Transportation System More Resilient." Plan Hillsborough, <http://www.planhillsborough.org/making-our-transportation-system-more-resilient/>
- 40 "Building Transportation Resiliency." <http://www.planhillsborough.org/building-transportation-resiliency/>
- 41 "Hillsborough County MPO Adaptation Pilot." Plan Hillsborough, http://www.planhillsborough.org/wp-content/uploads/2013/10/2040-Hillsborough-County-Vulnerability-Assessment_LMS-mtg4_FINAL.pdf
- 42 "Building Transportation Resiliency." <http://www.planhillsborough.org/building-transportation-resiliency/>
- 43 "Communications Sector." National Institute of Standards and Technology, http://www.nist.gov/el/building_materials/resilience/upload/Chapter-8-Communications_v0-1A.pdf
- 44 Ibid.
- 45 Ibid.
- 46 Ibid.
- 47 Ben Mutzabaugh. "Sandy: Flight Cancellations Top 20,000, but State to Ease." USA Today, 1 Nov 2012. <http://www.usatoday.com/story/todayinthesky/2012/11/01/airline-cancellation-tally/1673823/>
- 48 Peter Becker. "Pike Assesses Storm." The News Eagle, 05 Nov 2012. <http://www.neagle.com/article/20121105/NEWS/121109898?template=printart>
- 49 Ibid.
- 50 Katie Pyzyk. "Fiber Optic Lines to Improve County Operations." Arlington News, 1 Jun 2012. <http://www.arlnow.com/2012/06/01/fiber-optic-lines-to-improve-county-operations/>
- 51 "Arlington County Board Moves to Improve Emergency Response Time, Critical Communications." Arlington County, <http://news.arlingtonva.us/releases/arlington-county-board-moves-to-191708>
- 52 Ethan Rothstein. "Arlington Expanding Fiber Network to Businesses." Arlington News, 2 Apr 2014. <http://www.arlnow.com/2014/04/02/arlington-expanding-fiber-network-to-businesses/>
- 53 "What is EPA Doing to Support Green Infrastructure?" United States Environmental Protection Agency, http://water.epa.gov/infrastructure/greeninfrastructure/gi_support.cfm
- 54 Ibid.
- 55 "Lifelines Council." City & County of San Francisco, <http://www.sfgsa.org/index.aspx?page=4964>
- 56 "Lifelines Interdependency Report." City and County of San Francisco, <http://www.sfgsa.org/modules/showdocument.aspx?documentid=12025>
- 57 "Riverside County General Plan." Riverside County Planning Department, http://planning.rctlma.org/Portals/0/genplan/content/gp/chapter06.html#TOC4_15



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ABOUT THE NATIONAL ASSOCIATION OF COUNTIES

The National Association of Counties (NACo) is the only national organization that represents county governments in the United States. Founded in 1935, NACo provides essential services to the nation's 3,069 counties. NACo advances issues with a unified voice before the federal government, improves the public's understanding of county government, assists counties in finding and sharing innovative solutions through education and research and provides value-added services to save counties and taxpayers money. For more information about NACo, visit www.NACo.org.

ABOUT THE RESILIENT COUNTIES INITIATIVE

NACo's Resilient Counties initiative serves as a catalyst between local governments and the private sector to strengthen the resilience of the nation's 3,069 counties, and create solutions for sustainable places.

In order to remain healthy, vibrant, safe and economically competitive, America's counties must be able to anticipate and adapt to all types of change. Through the Resilient Counties initiative, NACo works with counties and their stakeholders to bolster their ability to thrive amid changing physical, environmental, social and economic conditions.

Hurricanes, wildfires, economic collapse, and other disasters can be natural or man-made, acute or long-term, foreseeable or unpredictable. Preparation for and recovery from such events requires both long-term planning and immediate action. NACo works to strengthen county resiliency by building leadership capacity to identify and manage risk, and allow counties to become more flexible and responsive. Through the use of sustainable practices and infrastructure, counties will be better prepared to address these issues in a manner that can minimize the impact on local residents and businesses, while helping counties save money.

Through the initiative, NACo:

- Develops strategies to foster economic growth and competitiveness,
- Educates counties on techniques for implementing resiliency and sustainability strategies,
- Provides tools for counties to educate their communities on resiliency initiatives,
- Identifies ways to leverage changing conditions and take advantage of new technologies and innovation, and
- Facilitates an open exchange with the private sector.

For more information, visit www.naco.org/resilientcounties.

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For more copies of this report, please contact: Rob Pressly, NACo Program Manager, rpressly@naco.org, 202.942.4224

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