Hazard Identification and Risk Assessment (HIRA)

State of Ohio

2023 Edition

Ohio Emergency Management Agency
2855 West Dublin Granville Road
Columbus, Ohio 43235

Mission:
To coordinate activities to mitigate, prepare for, respond to, and recover from disasters.

Vision:
A safer future through effective partnerships committed to saving lives and reducing the impact of disasters.

Foreword

July 1st, 2023

The 2023 edition of the State of Ohio Hazard Identification and Risk Assessment (HIRA) provides current research and updates on natural, technological, and human-caused hazards to which the State of Ohio is most vulnerable. Knowledge of these hazards, their frequency, and the state's overall vulnerability to them allows state and local government officials and our partners to better assess their risks and plan and prepare for the consequences.

This revision is an update and expansion to the 2018 version of the HIRA. The HIRA has been reviewed in its entirety, with all information evaluated and updated as necessary. This document was prepared by the Planning Training and Exercise Branch at the Ohio Emergency Management Agency (Ohio EMA) with the assistance of all branches within the agency and other state and federal partners. The information contained in this HIRA is a compilation of research from local, state, and federal government sources as well as from public sources and interviews with government officials and subject matter experts.

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Executive Director
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Introduction

The intent of this document is to be a useful tool for local and state emergency management officials and partners to rate the risk, determine vulnerability, and predict the adverse impact of identified hazards in the state. The Hazard Identification and Risk Assessment (HIRA) does not provide policy or action-based recommendations to manage hazards. This document is one element of a comprehensive emergency management program that incorporates mitigation, preparedness, response, and recovery. The HIRA, the State of Ohio Emergency Operations Plan, as well as standard operating procedures, round-out a comprehensive program to manage hazards.

The HIRA, State of Ohio Hazard Mitigation Plan, and the Threat and Hazard Identification and Risk Assessment/Stakeholder Preparedness Review (THIRA/SPR) all involve the identification of hazards, but each document serves a different purpose. The HIRA identifies and ranks hazards to serve as a toolkit for partners to use in their planning efforts. The State of Ohio Hazard Mitigation Plan outlines potential actions partners may take to mitigate the risk and effects of hazards on the state, and there are specific hazards that are reflected in both the HIRA and the state's mitigation plan. The THIRA/SPR outlines impacts and establishes capability targets to aid communities in identifying capability gaps that should be addressed and potential funding sources for building and sustaining capabilities.[1] In the State of Ohio, the HIRA is published online and is openly available to the general public, while the THIRA/SPR is maintained internally due to containing sensitive information.

Emergency management in Ohio is governed by Ohio Revised Code (ORC) 5502. Section 5502.22 mandates that the state emergency management agency (EMA), a division of the Ohio Department of Public Safety, is the primary coordinating agency for statewide emergency readiness activities to meet the threats posed by various hazards.[2] In cooperation with other state departments and agencies, Ohio EMA has developed this analysis of the primary hazards that may threaten both lives and property.

'Hazards' in Chapter 5502.21 of the ORC are defined as: "… any actual or imminent threat to the survival or overall health, safety, or welfare of the civilian population that is caused by any natural, human-caused, or technological event."[3]

As defined by the ORC, "Hazard identification means an identification, historical analysis, inventory, or spatial distribution of risks that could affect a specific geographical area and that would cause a threat to the survival, health, safety, or welfare of the civilian population, the property of that population, or the environment."[4]

In updating the 2023 HIRA, hazards that were identified in the 2018 version were re-analyzed using the latest data, information, and discussions with subject matter experts. Knowledge gained through this process has allowed for the re-ranking and combining of specific hazards that will allow for a better understanding of the risks and vulnerabilities of hazards impacting the State of Ohio. New hazards have been included in this version of the HIRA that had not been previously identified based on the latest information and analysis of threats and hazards in an ever-evolving world. New hazard profiles are included as appendices for each of the 41 hazards identified in this version of the HIRA that provide detailed information as to the potential impacts and implications for each respective hazard to further assist partners in their planning efforts. While every effort was made to identify and rank hazards that pose a risk to the State of Ohio, we acknowledge that there are some hazards that are not germane to Ohio and/or not likely enough a scenario to warrant consideration in the state's HIRA.

State of Ohio Profile

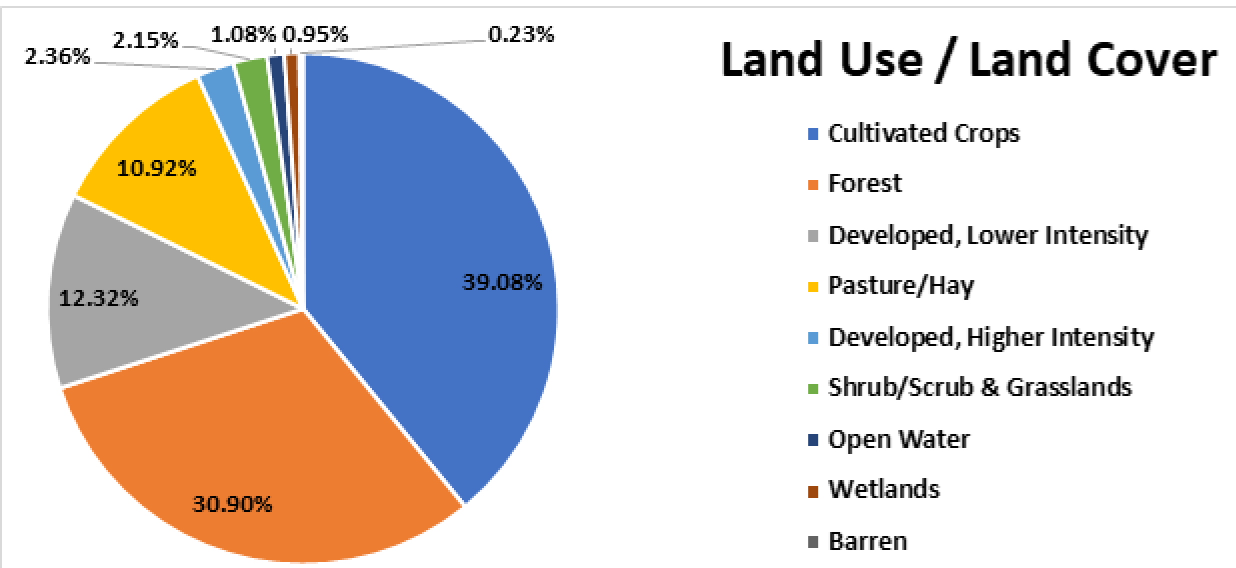
All geographical and political subdivisions of the state are vulnerable to some form of natural, technological, or human-caused hazard. The effects of these hazards, regardless of their type or size, will vary due to geography, climate, or land use. Examination of the state's characteristics provides a better understanding of these hazards and their associated risks.

Geography, Land Use, and Climate

With a total land area of 44,825 square miles, and an estimated population of 11,756,058 as of July 2022 (a gain of approximately 97,450 persons since the last risk assessment in 2018), nationally, Ohio ranks 34th in total area, and 7th in population.[5 6]

Topographically, the state presents a varied combination of landforms, which are diagonally divided across the state between the flat, glaciated, areas of the north-northwest, to the unglaciated highlands in the south and southeast. The steeply incised landforms in the south and east often contribute to flooding, mudslides, and other effects via rapid runoff from heavy rains and melt water. In the north and west, the level topography is subject to flooding when heavy snowstorms are followed by rapid melt water discharges.

The following graphic provides an overview of the land use and cover for the state:[7]



The state has a continental climate ranging through the year from cold, damp winters, to warm, humid summers with prevailing westerly wind patterns throughout the year. The average temperature in Ohio is 52.5 degrees Fahrenheit with an average monthly high of 86 degrees Fahrenheit (July) and average monthly low of 19 degrees Fahrenheit (January). The average annual rainfall is 40.16 inches.

Ohio's Economy

Ohio has a diversified economic portfolio, and ranks seventh in the nation in terms of economy.[8] Ohio's nearly $10 billion agricultural industry is dependent on the state having some of the most fertile and ideal farming conditions in the country.[9] The west and northwest sections of the state are characterized by glaciated plains, with large deposits (up to 400 feet-deep) of fertile soil and wide expanses of lands that were flattened by glacial retreat, which make these rich lands ideal for agricultural production with modern, heavy farm machinery.

Major service industries/trade, such as utilities, healthcare, finance/insurance, and business services contribute another $163 billion to the state's growing economy.

The State of Ohio is strategically located within the United States, allowing the state to have access to a significant proportion of the U.S. market within a reasonable distance. There is an estimated make-up of sixty percent of established manufacturing, fifty-five percent of established wholesale, and sixty percent of established retail within a 600-mile radius of Ohio.[10]

An extensive transportation network of roads, rail lines, waterways, and air travel support the state's economy. State, federal, and interstate highways form connecting links to, or around, major metropolitan areas. The state's large and medium-sized cities host commercial air traffic carriers. Ohio's railway infrastructure ranks fourth nationally in rail route mileage and eighth overall in carloads carried. Waterborne commerce (via barge or ship) contributes to local economies along the Ohio River and along the Lake Erie shore.

Cascading Impacts and Emerging Hazards

Individual hazards have the capability to impact numerous geographical areas, functions, and systems. Furthermore, there are emerging hazards that are not able to be accurately identified and defined as its own specific hazard, yet have cascading impacts that are imperative to conceptualize and understand to better prepare and plan for these potential impacts.

Identified emerging hazards include climate adaptation, artificial intelligence, unmanned aerial systems, and misinformation/disinformation. Shortage of critical materials is not a new hazard; however, real-world events that have transpired since the last publication of the state's HIRA does necessitate the need to describe its potential impacts.

Cascading impacts of the identified and ranked hazards in the HIRA are included in their respective hazard profile located in Appendix 3 of this document. Please reference the hazard profile of the respective hazard you would like to learn more about.

Climate Adaptation

Climate adaptation in and of itself cannot be easily defined as its own specific hazard. A changing climate has the potential of generating and increasing the risk of multiple natural hazards, and the numerous cascading impacts that this may create warrants an analysis.

The Federal Emergency Management Agency (FEMA) 2022 National Preparedness Report (NPR) specifically names climate adaptation (terminology used in the 2022 NPR is climate change) as being "…the most significant contributor to the change in risk for weather-related natural hazards…"[11] Changes in climate increases the risk of floods, high winds/windstorms, severe weather, drought, and wild fires.[12] The National Preparedness Report states that over the course of the last five years that weather phenomenon caused by changes in climate have cost the nation $600 billion in damages to the economy and physical structures, and that the impacts of increased duration and occurrence of climate adaptation-related events have placed immense strain on our emergency responders and delays in recovery efforts.[13]

Climate adaptation has had direct impacts on the State of Ohio and its weather patterns. Between 1895 – 2020, Ohio has seen a trend of increasing in temperature by 0.1 degrees Fahrenheit and 0.31 inches in precipitation. Of the top ten warmest and wettest years in the state, six of those years have taken place after the year 2005. The changes affect disaster events such as urban and rural flooding, drought, and extreme temperature. Floods can have adverse effects on our transportation infrastructure, agriculture, and water treatment facilities. Droughts may lead to the increase in risk and occurrences of fires. Changes in temperature, more specifically in terms of heat, can create "heat islands" within urban areas and decrease air quality that can cause negative health effects on humans.[14]

Human mental and behavioral health is also impacted by changes in climate. The cascading impacts and adverse effects caused by climate adaptation brings with it the increase in risk of straining social relationships, substance abuse as a means of coping, post-traumatic stress disorder (PTSD), and anxiety and depression.[15]

Based on climate trends, Ohio is likely to witness changes in its average temperature and precipitation. Winters and night-time temperatures may be warmer. By mid-century the state could be 3-5 degrees warmer than today, and 4-8 degrees warmer by the late-century. Changes in precipitation cycles may cause wetter cool seasons and drier summer months, which in effect has the potential of more severe drought events.[16]

Artificial Intelligence

The quickly evolving and advancing of technology over the past several decades has given rise to the use of artificial intelligence within society. Artificial intelligence is being used, or has the potential of being used, for numerous purposes to include decision making and problem solving, interpreting information, understanding and responding to written and verbal language, driving vehicles, and social media monitoring.[17] [18] Furthermore, this technology has been used across multiple disciplines to include agriculture, commerce/marketing, education, and healthcare.[19] A recent product of artificial intelligence that has gained popularity is that of ChatGPT, a chatbot that allows users to input questions and the artificial intelligence software answers the inputted questions.[20] [21]

While artificial intelligence has perceived benefits, there are potential adverse effects that may pose as a hazard to the state and its residents. Job losses due to artificial intelligence automation may correlate to higher levels of unemployment and a weakening economy in the state.[22] This may cascade into placing further socioeconomic burdens on society, increasing the risk of civil disobedience and criminal activity.[23] Safety and security of Ohioans may also be threatened, as there is a potential for artificial intelligence to be used for social surveillance, weapons automatization, and cyber intrusion into an individual's personal information online.[24] [25]

While modern artificial intelligence software is incapable of human-level thought processes at this time, as this form of technology continues to advance and its purposes and uses encompass more aspects of modern society, it is critical to understand, prepare, and plan for the potential impacts of this technology.

Unmanned Aerial Systems

Unmanned Aerial Systems (UAS) encompass the small, in-expensive recreational drones that members of the general public are able to purchase and use to that of the multi-million dollar unmanned aerial vehicles (UAVs) used by the nation's armed services to carry out military operations. While UAS does have its benefits (traffic monitoring, critical infrastructure inspections in hard-to-reach areas, search and rescue operations, etc.), these systems also pose risks that categorize UAS as an emerging hazard.

Just as easily as members of the general public can purchase drones for recreational purchases, so to can criminals and terrorist agents who want to use UAS with malicious intent. UAS may be weaponized with an explosive, chemical, biological, and/or radiological material and used against large gatherings of people at open-air venues such as concerts and sporting events or inflict harm on physical structures, to include critical infrastructure systems.[26] [27]

The devices can be used to deliver illegal substances (such as drugs) and weapons to areas that otherwise would be challenging or impossible to do without the use of UAS (i.e. prisons and across national borders).[28] Invasion of privacy is also a potential impact, as UAS may be utilized for surveillance, reconnaissance, and stalking.[29]

Disruption of life-safety operations is also a concern. In 2014, an event took place in Springfield, OH whereby a drone being operated by a hobbyist who was using a drone to photograph and record a traffic incident disrupted the ability of a medical helicopter to land and respond to the scene.[30]

Misinformation/Disinformation

Misinformation is defined as "incorrect or misleading information," whereas disinformation is defined as "false information deliberately and often covertly spread in order to influence public opinion or obscure the truth".[31] [32] Both misinformation and disinformation may cause cascading impacts based upon reactions to the information that are important to plan and prepare for.

With the increasing popularity of social media and video sharing websites, and the ease for which information can be posted and shared on a global scale, this creates a heightened risk of the spread of misinformation and disinformation.

The term often used to describe this type of information is "fake news," which can be described as fabricated or manipulated content that is shared to the general public.[33] [34] Information classified as "fake news" may be considered accurate and true by a significant subset of a population, creating a false reality that may cause harm to others and destabilize norms of society.[35] This may further affect the ability of government to carry out essential services due to a decrease in trust, public health, financial markets, elections, and critical infrastructure.[36] [37] The term "fake news" may also be used to classify content that is accurate, but due to the content being perceived as going against an individual's values or beliefs, it is considered to be fake information.

The challenges in accurately identifying misinformation/disinformation also raises concerns. The content may be sophisticated enough that it may be exceptionally difficult to discern the information as being inaccurate. Therefore, it is possible to unknowingly accept the information as being fact. Furthermore, the information may be presented in a way that aligns with an individual's values and beliefs, thereby causing people to accept the information without questioning the accuracy of the content.

In a recent Pew Research Center survey, seventy percent of the respondents in the countries that were surveyed stated that the "spread of false information online" was a "major threat", outranking other categories on the survey such as cyberattacks, the condition of the global economy, and the spreading of infectious diseases.[38] Narrowing the scope to just analyzing U.S. residents in the same survey, the "spread of false information online" is deemed as a "major threat" by seventy percent by those who were surveyed.[39] In a survey conducted by the Pew Research Center in 2016, the results showed that sixty-four percent of American adults believe that fake news articles create significant confusion, with twenty-three percent stating they had shared fabricated news stories themselves (whether intentionally or unintentionally).[40]

There are means to potentially address the impacts associated with misinformation/disinformation. Consumers of the information can verify the information by finding original sources and checking the authenticity of the author of the information.[41] However, this would require time and effort made by those consuming the information to conduct the research. Online transparency and accountability regulations may also help address the impacts of misinformation/disinformation, but at this time there are little to no regulations in place.[42]

Shortage of Critical Materials

Shortage of critical materials is not a new or emerging hazard, but the recent coronavirus pandemic (also known as COVID-19) demonstrated the fragility of the nation's supply chain and its impacts on critical materials throughout the supply chain process.

Shortages or disruptions of the supply chain and of critical materials can result in adverse impacts on our national security, which includes the economy, public health, and critical infrastructure.[43] Shortages cause increases in consumer products and basic necessities, which may increase the cost of living and disproportionately affect impoverished or vulnerable populations.[44] This may inevitably increase the risk of conflict between the general public and government, with the potential of increasing instances of civil disobedience and/or criminal activity.[45]

Impact on State Emergency Operations

Emergency managers have the task of coordinating mitigation, preparedness, response, and recovery efforts for the threats and hazards that Ohioans face. The State Emergency Operations Center (EOC) and the emergency management staff coordinating its operations require all available information, tools, and expertise in their efforts to reduce the impact of disasters and to ensure a rapid return to normal operations as soon as possible.

In this version of the HIRA, Ohio EMA analyzed the consequences of all hazards (natural, technological, and human-caused) for their effect on the state's emergency operations. The most likely hazards determined to affect state emergency operations are those which impact the community lifelines of energy, communications, transportation, and food, water, shelter.

Ohio EMA maintains and regularly updates all-hazards plans and the agency's continuity of operations plan (COOP) that provide operational procedures in the event of a disaster. Each respective all-hazard plan and the COOP assess the risk and vulnerability to the state's emergency management activities resulting from identified natural, technological, and human-caused hazards.

The State EOC has vulnerabilities attributed to its proximity to an active airport (The Ohio State

University Airport) to the south of the property and an active rail line to the east, which results in substantial risk for egress to/from the facility as well as the potential for hazardous materials accidents which would require evacuation and relocation. Furthermore, State Route 161 / West Dublin-Granville Rd. is the only public roadway connected to the street that the Ohio EMA/EOC facility is situated, thereby creating challenges associated with accessing the Ohio EMA/EOC facility should State Route 161 / West Dublin-Granville Rd. be closed or obstructed for any reason. These vulnerabilities and how to address them have been considered in the agency's COOP.

Risk Assessment: The Analysis and Scoring Process

Methodology

A hazard identification and risk assessment consist of an analysis of quantitative and qualitative information obtained throughout the hazard identification process.

The 2018 HIRA risk values, information obtained via conducting research into historical and statistical data, and/or internal discussions amongst members of Ohio EMA formed the baseline values of the identified hazards. Interviews were held with subject matter experts representing various disciplines at the local, state, and federal level to revise and confirm the baseline values to become the official risk values used in calculating the risk of the hazards.

Risk values are categized into three categories: threat and hazard profiles, vulnerability, and consequence analysis. Each category is broken down into their own set of factors that are defined and numerically coded to create the value. The following sections are broken down by category, with each section illustrating by means of a series of charts as to their set of factors, how each factor is defined, and how each factor is coded in order to create the numerical data necessary for the formula calculations (explained under the "Formulas and Value Calculations" section).

Factors for Threat and Hazard Profiles

Frequency. *A key factor in the risk of a particular hazard is the frequency with which it occurs. Some hazards have been relatively frequent in this state while others were only sporadic. For this hazard analysis, the frequency with which an event occurs is based on historical reports and query of subject matter experts from various state and local authorities as well as the number of Gubernatorial Declarations associated with the hazard agent. Using these criteria provides a wider variety of hazards than utilizing presidential declarations alone. State declaration records from Ohio's Secretary of State date back to 1991.*		
4	Highly Likely	Near 100% probability in next year. Many state declarations have occurred.
3	Likely	Between 10 and 100% probability in next year, or at least one chance in 10 years. Some state declarations have occurred.
2	Possible	Between 1 to 10% probability in the next year, or at least 1 in the next 100 years. Very few state declarations have occurred.
1	Unlikely	<1% probability in next 100 years. No state declarations are likely.

***Duration** may be defined as "time on the ground" or the time-period of response to a hazard or event. Transportation accidents may last a few hours whereas a tire fire may last a week and a flood several weeks. Duration, therefore, may not always be indicative of the degree of damage, but it remains an important planning factor.*

5	Excessive	More than 30 days
4	Long	7 to 30 days
3	Medium	1 to 7 days
2	Short	12 to 24 hours
1	Minimal	Less than half a day

***Speed of Onset** may affect all other factors due to lack of warning or time to prepare for impact. The lead-time required protecting lives and property varies greatly with each event. For instance, a slow-rising Ohio River flood may allow time to evacuate residents and begin flood fight measures, but flash floods can occur with little warning.*

4	Short-None	Minimal to no warning
3	Short	6 to 12 hours
2	Medium	12 to 24 hours
1	Extended	More than 24 hours

***Magnitude** is the geographic dispersion of the hazard. For instance, comparing the number of counties impacted by a flood on the Ohio River versus a transportation accident involving hazardous materials.*

4	Catastrophic	More than 50 counties impacted
3	Critical	25 to 50 counties impacted
2	Limited	10-25 counties impacted
1	Localized	Less than 10 counties impacted

Factors for Vulnerability

***Impact on Business** refers to enduring economic impact of the hazard on the community by an event.*

4	Complete shutdown of critical facilities for 30 days or more
3	Complete shutdown of critical facilities for at least two weeks
2	Complete shutdown of critical facilities for one week
1	Shutdown of critical facilities for less than 24 hours

Impact on Humans. *This factor relates to the number of lives potentially lost to a particular hazard.*		
4	High	Multiple deaths
3	Medium	Multiple severe injuries
2	Low	Some injuries
1	Minimum	Minor injuries

Impact on Property*. This factor relates to the amount of property potentially lost to a particular hazard agent. This factor can vary between jurisdictions based on economics, geographic amount owned, and demographics of the particular populations.*		
4	High	More than 50% of property severely damaged
3	Medium	More than 25% of property severely damaged
2	Low	More than 10% of property severely damaged
1	Minimum	Less than 10% of property severely damaged

Impact on Environment. *This factor considers the impacts from the hazard event to the air, water, land, and biota.*		
4	High	Catastrophic Impacts to the environment as a result of the event and/or cascading effects. Environmental impacts would have immediate and long term health effects to people. Significant resources required for remediation.
3	Medium	Localized and temporary Impacts to the environment as a result of the event and/or cascading effects. No immediate health threat to people and environmental remediation would restore the environment to acceptable limits.
2	Low	Impact to the environment would be minimal and only require a local response.
1	Minimum	Impact to the environment would not require remediation.

Factors for Consequence Analysis

Public. *This category considers the overall impact to the citizens of the State caused by the hazard. The short- and long-term impacts caused by the hazard were considered in addition to efforts at the State and local level to mitigate, prepare for, respond to and recover from the event. The ranking is a general reflection of the State's resilience to the hazard being evaluated.*		
3	High	Impacts to the public would likely exceed State resources and necessitate Federal assistance. Impacts would include multiple casualties.
2	Medium	Impacts to the public would likely not exceed State resources. Some casualties and injuries would occur.
1	Low	Impacts to the public would be managed at the local level.

First Responders. *This category considers the impact of the hazard event to police, fire, EMT, emergency management and other State and local officials that respond to the event. The threats to the health and safety of first responders posed by the hazard were considered in addition to staffing, training, and overall preparedness of first responders.*

3	High	Extreme threat posed to first responders, which would likely exceed local and State resources.
2	Medium	Significant threat posed to first responders, but would likely not exceed State and local resources.
1	Low	Threat posed by hazard would be managed at the local level.

Continuity of Operations. *This category considers the impact of the hazard event to State government's ability to continue or reestablish essential services.*

3	High	Impacts to essential functions as a result of the hazard event and/or cascading effects would be catastrophic. This failure would have an immediate cascading effect to public health and safety.
2	Medium	Impacts to essential functions as the result of the hazard event and/or cascading effects would be significant, but localized and temporary. This impact would create delayed response to public health and safety, but no immediate concerns.
1	Low	Impact to essential functions would be minimal and only require a local response.

Facilities/Infrastructure (i.e., Property). *This category considers the impacts of the hazard event to the built environment.*

3	High	The hazard event would result in catastrophic damages to the built environment. Damage to the built environment would have cascading and long-term effects. Impacts would strain Federal resources and require extensive long term recovery efforts.
2	Medium	The hazard event would result in significant damages to the built environment and likely require the need for Federal resources to effectively recover.
1	Low	Effects to the built environment would be limited and likely not exceed the response and recovery efforts at the State and local level.

Economy. *This category considers the impact to the State economy from the hazard event.*		
3	High	Cost to respond and recover from the event would quickly exceed the amount budgeted in the State Disaster Relief Fund requiring federal resources.
2	Medium	Cost to respond and recover from the event would likely not exceed the amount budgeted in the State Disaster Relief Fund.
1	Low	Cost to respond and recover from the event would likely not exceed local resources.

Environment (est. remediation). *This category considers the overall impact to the citizens of the State caused by the hazard. The short- and long-term impacts caused by the hazard were considered in addition to efforts at the State and local level to mitigate, prepare for, respond to and recover from the event. The ranking is a general reflection of the State's resilience to the hazard being evaluated.*		
3	High	Impacts to the environment as the result of the hazard event and/or cascading effects would be catastrophic. Environmental impacts would have immediate and long-term health effects to people. Significant resources would be required for environmental remediation.
2	Medium	Impacts to the environment as the result of the hazard event and/or cascading effects would be localized and temporary. There would be no immediate health threat to people and environmental remediation would restore the environment to acceptable limits.
1	Low	Impact to the environment would be minimal and only require a local response.

Public Confidence. *This category considers the impact a hazard event of each type could have on the public's confidence in the government and emergency management community.*		
3	High	Significant negative impact. Downturn in public trust for the government's ability to respond to or recover from disaster.
2	Medium	Some negative impact. Public trust is eroded but recoverable as the recovery ensues.
1	Low	Little or no impact on the public trust.

Formulas and Value Calculations

When determining the values based off the definitions and coding of the factors, it was often necessary for the subject matter experts to consider the average or most often occurrence of the hazard. It is important to note that outside variables and case-by-case situations may cause a hazard to not align with the risk values that were confirmed and decided upon for the calculations. Once the values were confirmed by subject matter experts for each identified hazard in the HIRA, the values were inputted into a series of formulas that created values for threat/hazard value, vulnerability rating, consequence value, and probability. Ultimately, through these calculations a total risk value was able to be determined and was used in the ranking of the hazards within the HIRA. The following are the formulas used in the HIRA:

Threat/Hazard Value (T) = (Duration + Speed of Onset + Frequency + Magnitude)/1.7

Where 1.7 is a normalizing factor to adjust the scores to the model used in the FEMA Critical Asset Risk Management MGT-315, October 2016

Vulnerability Score = (Business + Human + Property + Environment) x 2.2

Where 2.2 is a normalizing factor to adjust scores to the 35-point scale for vulnerability ratings in FEMA Critical Asset Risk Management MGT-315, October 2016.

Vulnerability Rating (V) – Compare the calculated vulnerability score to the table provided by FEMA (below) to determine the vulnerability rating, which is used for final calculation and plotting on the risk graph.

Vulnerability Score	*Rating*
0-2	*1*
3-5	*2*
6-8	*3*
9-11	*4*
12-14	*5*
15-17	*6*
18-20	*7*
21-23	*8*
24-26	*9*
27-29	*10*
30-32	*11*
33-35	*12*

Consequence Value (C) = sum of scores for each of the seven factors described in the Consequence Analysis section above divided by 2 to adjust scoring of six Ohio factors vs three factors used in *FEMA Critical Asset Risk Management MGT-315, October 2016*.

Hazard and vulnerability are used to calculate an overall Probability (P), which is then multiplied by Consequence to assign a Total Risk Value.

Probability (P) = T x V

Total Risk = P x C

Hazard Ranking and Total Risk Values

The following chart lists all 41 identified hazards, in categorical order, based upon the calculated total risk value.

RANK	HAZARD	TOTAL RISK VALUE
1	NUCLEAR FACILITY INCIDENT	951
2	TERRORISM, RADIOLOGICAL/NUCLEAR	883
3	TERRORISM, CHEMICAL	883
4	AGRICULTURAL INCIDENT	782
5	ANIMAL DISEASE	770
6	TERRORISM, BIOLOGICAL	726
7	ELECTRO MAGNETIC PULSE (EMP)	704
8	HAZARDOUS MATERIAL INCIDENT	667
9	PUBLIC HEALTH EMERGENCY	664
10	STRUCTURE COLLAPSE	585
11	FLOODING	562
12	SEVERE WINTER STORMS	529
13	LONG TERM POWER OUTAGE	520
14	SEVERE SUMMER STORMS	519
15	URBAN FIRE	495
16	CYBER INCIDENT	486
17	TORNADO	476
18	ELECTRICAL GRID FAILURE	469
19	DROUGHT	466
20	EARTHQUAKE	450

21	SOLAR FLARE	450
22	WATER SUPPLY FAILURE	440
23	MASS CASUALTY INCIDENT (MEDICAL)	433
24	FUEL SHORTAGE	408
25	DAM/LEVEE FAILURE	405
26	TEMPERATURE EXTREMES	395
27	NATURAL GAS FAILURE	388
28	MASS COMMUNICATIONS FAILURE	367
29	HIGH WINDS	362
30	INVASIVE SPECIES	334
31	RADIOLOGICAL INCIDENT (NON-TERRORISM, NON-NUCLEAR)	311
32	LANDSLIDE	296
33	LAND SUBSIDENCE	282
34	MASS CASUALTY INCIDENT (TRAUMA)	276
35	WILD FIRE	262
36	CIVIL DISTURBANCE	222
37	CRIMINAL ACTIVITY	214
38	TRANSPORTATION INCIDENT / ACCIDENT	176
39	TRANSPORTATION INFRASTRUCTURE SYSTEM FAILURE	155
40	COASTAL EROSION	113
41	SEICHE / COASTAL FLOODING	99

Hazard Grouping

Hazards identified within the HIRA fall within the hazard categories of natural, technological, and human-caused. The three categories are defined as follows[46]:

Natural: Result by acts of nature.

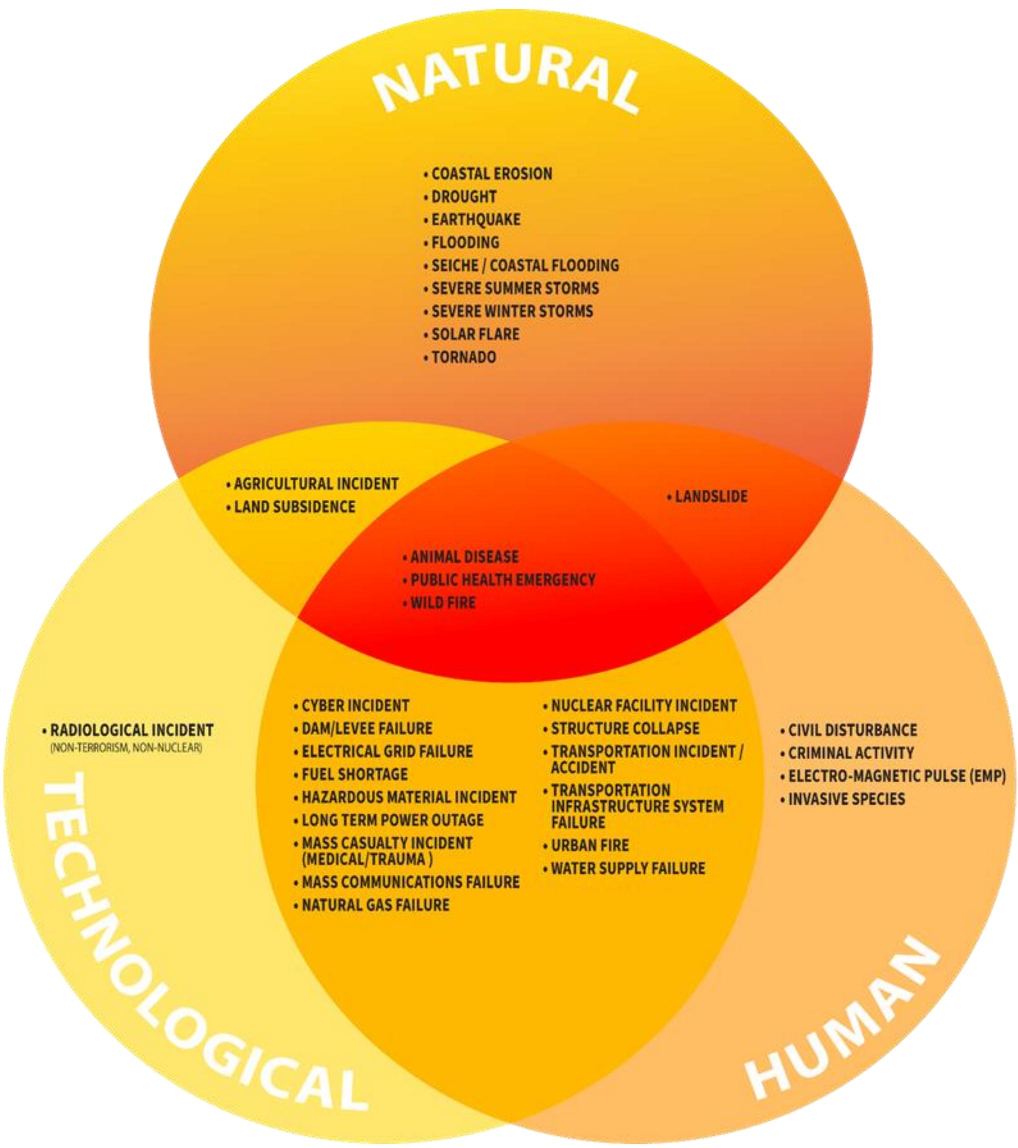
Technological: Result from accidents or system and structure failure.

Human-Caused: Result from intentional actions of an adversary.

While there are identified hazards that strictly only fall within one category, there are several identified hazards that fall under multiple categories. This is due to there being multiple causes and variables that can lead to the result of a single hazard.

Example: Cyber incident is grouped as falling within the technological and human-caused categories. An unintentional error in computer coding may result in the loss of access to a cyber program creating a technological cyber incident, just as a hacker may install ransomware in a cyber network creating a human-caused cyber incident.

Below is a venn diagram that illustrates how all 41 identified hazards in the HIRA are grouped based upon the three categories:



Method and Schedule for Review, Maintenance, and Revision

The HIRA is reviewed informally by the public via its availability on Ohio EMA's website and is distributed, upon request, to any interested party. Formally, the HIRA is reviewed by planning partners representing the whole community who are identified for their subject matter expertise and support of core capabilities for emergency management. Effective with this version, the HIRA is now included as Step 1 (Identification of Threats and Hazards) of the THIRA process.

As part of routine maintenance of this document, any reviews and changes must be verified to conform to the current, approved Emergency Management Accreditation Program (EMAP) standard, and primarily to sections 4.1.1 to 4.1.3.

The HIRA will be revised as needed to remain current or correct typographical errors. Formal publication and re-approval will be completed at least once every five years. Significant revisions will be recorded in the Record of Changes section of this document.

Record of Changes

Change Number	Description of Change	Date	Authorized by
001	Section added on Assessing Risk and Vulnerability to the Environment for Building Collapse and Terrorism...	July 2008	Ted Filer
002	Added Record of Changes	July 2008	Patrick Sheehan
003	HIRA Update Change from Human-Caused Hazard to Manmade / Adversarial	December 2011	Portia Pulsifer
004	HIRA Update • Formatting changes and updates • Update Data in Tables • Update Environmental Impacts Analysis Statements and Scoring • Update footnotes and references that have changed • Added consequence analysis	Spring / Summer 2013	Pulsifer, Sheehan, Dragani, Ferryman, Little, Merick
005	Reviewed and added analysis of risk and vulnerability State of Ohio Emergency Management Operations	Summer 2013	Sheehan

<table>
<tr><td>006</td><td>HIRA Update
Formatting changes and updates
Update data tables, analysis statements and scoring for consistency with FEMA Critical Asset Risk Management formula
Update footnotes and references that have changed
Incorporated consequence analysis as part of total risk valuation
Updated analysis of risk and vulnerability to State of Ohio Emergency Management Operations</td><td>December 2018</td><td>Susan Wyatt</td></tr>
<tr><td>007</td><td>Added Disease, Human supporting data collected according to the methodology to Figure 11 and ranked hazards table; updated document release to reflect December 2018,
version 1</td><td>February 2019</td><td>Susan Wyatt</td></tr>
<tr><td>008</td><td>Added specificity to the EMP scenario to indicate high-altitude nature of the attack and
the size of the impact zone.</td><td>June 2019</td><td>Susan Wyatt</td></tr>
<tr><td>009</td><td>Removed “disease - human”; incorporated into public health emergency</td><td>October 2020</td><td>Dan Baker</td></tr>
<tr><td>010</td><td>Updated Figure 1. Historical Events and Impacts to include events since last rendition of this document. See page 10</td><td>March 2021</td><td>Matt Jaksetic</td></tr>
<tr><td>011</td><td>HIRA Update
Formatting changes and updates
Updated references to information that have changed
Updated, removed, and created data tables charts, graphics, and visuals
Updated hazard grouping
Deleted the sections “General Overview of Hazards in Ohio” and “Annex 2 – Detailed Hazard Overview”.
Added “Factors for Vulnerability – Emergency Management Considerations”
Changed “Endnotes” section header to “References and Resources”
Updated “Impact on State Emergency Operations” Section
Updated formulas in methodology section
Updated “Presidential Major and Emergency Disaster Declarations in Ohio with Costs, by County” chart
Inclusion of hazard profiles as an annex</td><td>Winter 2022 – Spring 2023</td><td>Jordan Sanderson</td></tr>
</table>

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Appendix 1 – Historical Review of Disasters

For almost 200 years, the State of Ohio has recorded casualties (injuries and fatalities) associated with disasters varying in origins and effects. The more noteworthy of these, which resulted in loss of life or economic damages, are listed in the chart below.

Name of Disaster	Year	Hazard/Event Type	Location	Casualties
Cholera Epidemic	1849/50	Bio/Epidemiological	Statewide	5,000 +
Rail Bridge Collapse	1876	Transportation	Ashtabula	92
Collinwood School Fire	1908	Fire	Cleveland	17
Easter Flood	1913	Flood	S/SW Ohio	467
Influenza Epidemic	1918	Bio/Epidemiological	Statewide	Multiple Thousands
Sandusky/Lorain Tornado	1924	Tornadoes	Lorain and Sandusky	85
Cleveland Clinic Fire	1929	Fire	Cuyahoga	123
Millwood Mine Disaster	1930	Mine Fire – Collapse	Athens Co.	82
Penitentiary Fire - Columbus	1930	Prison Fire	Franklin Co.	322
Extreme Heat	1934	Heat Wave	Statewide	160
Winter Flood	1937	Flood	Statewide	250
Gas Explosion & Fire	1944	Technological + Fire	Cleveland	130
Blizzard	1950	Winter Storm	Statewide	Unknown
Penitentiary Fire - Columbus	1952	Prison Fire	Franklin Co.	0
Winter/Spring Floods	1959	Flood	Statewide	Unknown
Nursing Home Fire	1963	Fire	Marietta	95
Tornado	1965	Tornadoes	Toledo, Lima, Strongsville. Delaware, Mercer, Seneca, and Shelby counties	55
Lake Central/TWA Crashes	1967	Transportation	N&W Ohio	70 + (Combined)
Prison Riot - Columbus	1968	Other (Prison Riot)	Franklin Co.	5
Xenia Tornadoes	1974	Tornadoes	Greene Co.	30; 1150 injured
Blizzard	1978	Winter Storm	Statewide	51
Explosion/Fire - Miamisburg	1986	Technological + Fire	Butler Co.	0
Train wreck-HAZMAT Spill	1986	Transportation	Miamisburg	0
Flash Flood – Shadyside	1990	Flash Flood	Belmont Co.	26
Prison Riot – Lucasville	1993	Other (Prison Riot)	Scioto Co.	11

Name of Disaster	Year	Hazard/Event Type	Location	Casualties
Floods (from snow runoff)	1996	Flood	Statewide	0
Severe Storms/Floods	1997	Flood	Southern Ohio	5
Severe Storms/Floods	1998	Flash Flood	Central/east central & SE	12
Xenia Tornadoes	2000	Tornadoes	Greene Co.	1; 100 injured
Van Wert Tornado	2002	Tornadoes	Van Wert (1 of 83 tornadoes in 17 states)	5
Winter Storms	2004-05	Severe Winter Weather	Statewide	0
Severe Winter Weather	2005	Ice Storm	Statewide	0
Severe Storms	2007	Flooding	Statewide	0
Wind Storm	2008	High Wind Storm	Statewide	7
H1N1	2009/10	Pandemic	Statewide	119 (total influenz a deaths, including H1N1)
Severe Weather & Tornadoes	2010	Tornado	Wood, Fulton, Ottawa & Lucas counties	6
Severe Weather; Flooding	2011	Flooding	Ohio River	0
Winter Storm	2012	Blizzard	NW Ohio	0
Severe Weather (Derecho)	2012	High Wind	From NW Ohio to SE Ohio	1 (subsequent heatwave may have caused other deaths)
Hurricane Sandy	2012	Hurricane; High Wind	Northern Ohio	0
Train Derailment/Explosion	2012	Technological - HazMat	Franklin	
Severe Weather and Tornadoes	2012	Tornado; Severe Thunderstorms	Clermont, Hamilton, Highland, Pike, Adams, Lawrence, Athens	4
Cridersville Tornado	2013	High Wind, Flooding	Auglaize, Perry, Morrow	0

Name of Disaster	Year	Hazard/Event Type	Location	Casualties
Traffic Accidents (90 car pileup)	2013	Winter Storm	SW Ohio	1; 28 injured
Flooding	2014	Flooding	Summit, Clark, Highland	0
Toledo Water	2014	Harmful Algal Bloom	Lucas	0
Severe Weather	2014	Power Outage, Propane Shortage	Summit	0
Ebola Response	2014	Public Health Emergency	Summit	0
Severe Weather	2014	Tornado, High Wind	Mahoning, Highland	0
Winter Storm	2014	Winter Storm, Power Outage	Gallia, Darke, Warren, Highland	0
Akron Plane Crash	2015	Aircraft	Summit	9
Argo Shipwreck	2015	HazMat	Lake Erie	0
Kettering Tornado	2015	Tornado	Montgomery	0
Stark County Radium Response	2016	Radiological	Stark	0
Tornadoes	2016	Tornado	Statewide (24)	0
Tornadoes	2017	Tornado	Statewide (39)	0
Cincinnati Fifth Third Bank Shooting	2018	Active Aggressor	Hamilton	4 (incl. shooter)/2 injured
Flooding	2018	Flood	SE Ohio and Ohio River	1
Ross Correctional Facility Unknown Substance	2018	Public Health Emergency	Ross	0
Memorial Day Weather Event	2019	Tornado	West Central Ohio	~131 (1 death; 130 injuries)[47]
Dayton Oregon District	2019	Active Aggressor	Montgomery County	9 (incl. shooter) 17 injured
COVID-19 Pandemic	2020 – 2023	Pandemic	Statewide	42, 000 +[48]
High Path Avian Influenza (HPAI)	2022 – 2023	Disease, Animal	Statewide	0 Human ~4+ million poultry[49]

Source: *Ohio Almanac/Contributing agencies/Ohio EMA*

The above chart shows some of the historically serious events occurring since 1849 and mortality statistics, but not property damages or other costs.

Since 1964, many events have received a Declaration of Disaster by the President of the United States as shown in Appendix 2. The chart in Appendix 2 provides a breakdown as to the federally declared disasters between 1964-2023 in counties throughout the state, the type of federal assistance provided for each disaster, incident type, and funding provided.

These incidents have affected both people and property. Gubernatorial declarations have often been used for a number of other events, not qualifying for federal assistance via presidential declarations, as “Emergencies” or “Disasters.” This process serves to initiate coordinated state response efforts for areas requiring assistance beyond local capabilities.

Appendix 2 – Presidential Major and Emergency Disaster Declarations in Ohio with Costs, by County (1964-2023)

DISASTER DECLARATION NUMBER	DATE DECLARED	FEDERAL DISASTER PROGRAMS	INCIDENT TYPE	COUNTIES DECLARED	FUNDS PROVIDED
DR- 167	March 24, 1964	PA	Heavy rains and flooding	Adams, Athens, Auglaize Belmont, Brown, Butler, Carroll, Clermont, Clinton, Columbiana, Coshocton, Cuyahoga, Delaware, Fairfield, Franklin, Gallia, Geauga, Guernsey, Greene, Hamilton, Harrison, Hocking, Jackson, Jefferson, Lake, Lawrence, Licking, Medina, Meigs, Miami, Monroe, Morgan, Muskingum, Noble, Perry , Pickaway, Pike, Preble, Richland, Ross, Scioto, Summit, Trumbull, Tuscarawas, Vinton, Warren, Washington,	$571,482 (P)
DR- 191	April 14, 1965	PA	Tornadoes and high winds	Allen, Cuyahoga, Delaware, Hancock, Harrison, Highland, Lorain, Lucas, Medina, Mercer, Morrow, Pickaway, Seneca, Shelby, Van Wert	$275,248 (P)
DR- 238	May 4, 1968	PA	Tornadoes	Brown, Clermont, Gallia, Licking, Scioto	$270,000 (P)
DR- 243	June 5, 1968	PA	Heavy rains and flooding	Adams, Athens, Brown, Butler, Clermont, Clinton, Fairfield, Franklin, Fayette, Gallia, Greene, Guernsey, Hamilton, Hocking, Jackson, Lawrence, Licking, Meigs, Monroe, Montgomery, Morgan, Noble, Perry, Pickaway, Pike, Ross, Scioto, Vinton, Warren, Washington	$600,000 (P)
DR- 266	July 15, 1969	PA	Heavy storms and floods	Ashland, Ashtabula, Coshocton, Cuyahoga, Erie, Harrison, Holmes, Huron, Lake, Lorain, Lucas, Medina, Morgan, Muskingum, Ottawa, Richland, Sandusky, Seneca, Stark, Trumbull, Tuscarawas, Wayne, Wood	$1,000,000 (P)

DR- 345	July 19, 1972	PA	Storms and flooding	Ashtabula, Belmont, Cuyahoga, Jefferson, Lake, Lorain, Monroe	$1,328,098 (P)
DR- 362	November 24, 1972	PA	Storms and flooding	Erie, Lake, Lorain, Lucas, Ottawa	$615,863 (P)
DR- 377	April 27, 1973	PA	Storms and flooding	Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky	$1,417,975 (P)
DR- 390	June 4, 1973	PA	Mudslides	Hamilton, Washington	$1,434,684 (P)

DISASTER DECLARATION NUMBER	DATE DECLARED	FEDERAL DISASTER PROGRAMS	INCIDENT TYPE	COUNTIES DECLARED	FUNDS PROVIDED
DR- 421	April 4, 1974	PA/IFG	Tornadoes and high winds	Adams, Butler, Clark, Delaware, Fayette, Franklin, Greene, Hamilton, Madison, Paulding, Pickaway, Putnam, Summit, Warren,	$10,250,454 (P) $1,945,833 (I)
DR- 436	May 31, 1974	PA	Heavy rains and flooding	Lucas, Ottawa, Sandusky	$858,824 (P)
DR- 445	July 11, 1974	PA	Heavy rains and flooding	Warren	$507,364 (P)
DR- 480	September 11, 1975	PA	Floods	Belmont, Cuyahoga, Jefferson, Lake,	$3,320,493 (P)
DR- 3055-EM	January 26, 1978	PA	Severe blizzard conditions	All 88 counties	$3,546,669 (P)
DR- 630	August 23, 1980	PA/IFG	Heavy rains and flooding	Belmont, Columbiana, Guernsey, Jefferson, Monroe, Muskingum, Noble	$1,653,327 (P) $669,820 (I)
DR- 642	June 16, 1981	PA/IFG	Tornado, high winds and flooding	Hancock, Morrow, Putnam, Wyandot (IA) Morrow (PA)	$346,950 (P) $47,382 (SCB)** $515,593 (I)
DR- 653	March 26, 1982	PA/IFG	Flood	Defiance, Fulton, Henry, City of Toledo (Lucas), Paulding, Wood County (IA) Defiance, Paulding, Village of Grand Rapids (Wood only) (PA)	$157,390 (P) $268,187 (I)
DR- 738	June 3, 1985	PA/IFG	Tornadoes	Ashtabula, Columbiana, Coshocton, Licking, Portage, Trumbull (IA) Trumbull (PA)	$1,556,950 (P) $419,751 (SCB)** $424,893 (I)
DR-796	1987	IFG	Floods	Crawford, Marion, Morrow, Richland	$1,066,258 (I) $266,564 (SCB)**
DR- 831	June 10, 1989	IFG	Severe storms and flooding	Butler, Coshocton, Cuyahoga, Franklin, Geauga, Greene, Lake, Licking, Lorain, Mercer, Montgomery, Preble, Warren	$2,363,868 (I) $590,967 (SCB)**

DISASTER DECLARATION NUMBER	DATE DECLARED	FEDERAL DISASTER PROGRAMS	INCIDENT TYPE	COUNTIES DECLARED	FUNDS PROVIDED
DR- 870	June 6, 1990	PA/IFG/HMGP *	Severe storm, tornadoes, and flooding	Athens, Belmont, Butler, Columbiana, Fairfield, Hamilton, Harrison, Hocking, Jackson, Jefferson, Lawrence, Licking, Monroe, Muskingum, Perry, Pike, Richland, Vinton (PA/IA) Clermont, Franklin, Mahoning, Morrow, Madison, Ross, Trumbull (IA only)	$10,847,075 (P) $4,331,497 (I) $3,849,783 (SCB)** $630,000 (M) $630,000 (S)
DR- 951	August 4, 1992 (IA) August 14, 1992 (PA/HMGP)	PA/IFG/HMGP *	Severe storms, tornadoes, flooding	Cuyahoga, Franklin, Logan, Mahoning, Medina, Mercer, Ross, Shelby, Summit, Trumbull, Van Wert (PA/IA) Auglaize, Belmont, Columbiana, Erie, Fairfield, Fulton, Geauga, Jefferson, Lorain, Lucas, Ottawa, Portage, Wood (PA only)	$8,308,334 (P) $2,081,117 (I) $2,474,083 (SCB)** $250,000 (M) $350,000 (CDBG)+
DR-1065	August 25, 1995	IFG/HMGP	Severe storms and flooding	Champaign, Erie, Logan, Lorain, Licking, Marion, Mercer, Miami, Scioto, Shelby, Washington	$3,493,319 (I) $81,731 (SCB)** $721,500 (M)
DR-1097	January 27, 1996	PA/IFG/ HMGP	Ohio River flooding	Adams, Belmont, Columbiana, Gallia, Jefferson, Lawrence, Meigs, Monroe, Scioto, Washington (PA/IA) Brown, Clermont, Hamilton (IA)	$4,335,000 (P) $1,822,056 (I) $1,617,991 (SCB)** $1,721,655 (M)
DR-1122	June 24, 1996	PA/HMGP	Severe storms and flooding	Adams, Belmont, Brown, Butler, Clermont, Gallia, Hamilton, Hocking, Jefferson, Lawrence, Meigs, Monroe, Paulding, Scioto, Vinton, Williams	$10,811,838 (P) $2,702,960 (S) $1,137,951 (M)
DR-1164	March 4, 1997	IA/PA/HMGP	Flash flooding on inland rivers/streams and Ohio River flooding	Adams, Athens, Brown, Clermont, Gallia, Hamilton, Highland, Hocking, Jackson, Lawrence, Meigs, Monroe, Pike, Ross, Scioto, Vinton, Washington (IA/PA/HMGP) and Morgan (PA/HMGP)	$29,666,825 (P) $22,196,350 (I) $9,821,524 (M) $9,821,524 (S) $9,740,294 (NRCS)*+

DR-1227	June 30, 1998	IA/PA/MIT	Flash flooding, flooding, high winds and tornadoes.	Athens, Belmont, Coshocton, Guernsey, Harrison, Jackson, Jefferson, Knox, Meigs, Monroe, Morgan, Morrow, Muskingum, Noble, Ottawa, Perry, Pickaway, Richland, Tuscarawas, Washington; (IA only) Franklin, Sandusky (PA only) Holmes	$21,803,771 (P) $14,312,348 (I) $9,000,000 (M) $9,000,000 (S) $10,410,817 (NRCS)*+
DR-1321	March 7, 2000	IA/MIT	Flash flooding, flooding	Adams, Gallia, Jackson, Lawrence, Meigs, Pike and Scioto	$1,914,189 (I) $297,310 (M) $297,310 (S)
DR-1339	August 25, 2000	IA/MIT	Flooding	Lucas	$7,898,840 (I) $1,132,279 (M) $1,132,279 (S)
DR-1343	September 26, 2000	IA/PA/MIT	High winds and tornadoes	Greene	$189,051 (I) $3,430,810 (P) $558,025 (M) $558,025 (S)
DR-1390	August 8, 2001	PA/MIT	Flooding	Brown, Butler, Clermont and Hamilton	$ 7,712,456 (P) $ 876,439 (M) $ 876,439 (S)
DR-1444	November 18, 2002	IA/MIT	Tornados, Severe Storms	Ashland, Auglaize, Coshocton, Cuyahoga, Franklin, Hancock, Henry, Huron, Lorain, Medina, Ottawa, Paulding, Putnam, Sandusky, Seneca, Summit, Union, Van Wert, Wayne and Wood	$ 11,668,849 (I) $ 139,068 (M) – $ 48,409 (S) $ 2,297,222 (SDRP)
DR-1453*	March 24, 2003	IA/PA/MIT	Ice/Snow Storm	Adams, Gallia, Jackson, Lawrence, Meigs, Pike and Scioto (IA/PA); Athens, Belmont, Darke, Delaware, Fayette, Franklin, Greene, Guernsey, Harrison, Hocking, Licking, Madison, Miami, Monroe, Morgan, Montgomery, Muskingum, Noble, Perry, Preble, Ross , Union, Vinton and Washington (PA)	$ 16,689,841 (I) $ 39,621,605 (P) * $ 2,415,899 (M) $ 2,415,899 (S) -
DR-1478*	July 15, 2003	IA/MIT	Severe Storms, flooding	Auglaize, Columbiana, Crawford, Darke, Logan, Mahoning, Mercer, Pike, Shelby and Van Wert (IA/MIT); Adams, Auglaize, Darke, Logan, Mercer, Pike, Shelby and Van Wert (SDRP)	$ 6,451,793 (I) $ 145,762 (M)* $ 13,721 (S) $ 2,976,949 (SDRP)

DR-1484*	August 1, 2003	IA/PA/MIT	Severe storms, tornadoes and flooding	Carroll, Columbiana, Cuyahoga, Franklin, Jefferson, Mahoning, Medina, Portage, Richland, Stark, Summit and Trumbull (IA/MIT); Adams, Columbiana, Carroll, Jefferson, Mahoning, Medina, Monroe, Portage, Stark, Summit, Trumbull and Vinton (PA)	$ 135,723,395 (I) $ 13,160,834 (P)* $ 6,016,488 (M) $ 162,790 (S) -
EM-3187*	August 23, 2003	PA Only	Power Outage	Ashland, Ashtabula, Cuyahoga, Erie, Geauga, Huron, Knox, Lake, Lorain, Lucas, Portage, Summit and Trumbull	$ 2,067,222 (P)*
DR-1507*	January 26, 2004	IA/PA/MIT	Landslide, severe storms and landslides	Belmont, Jefferson, Morgan, Ross, Tuscarawas and Washington (IA/PA/MIT); Franklin, Licking (IA/MIT); Athens, Guernsey, Harrison, Monroe, Noble and Perry (PA/MIT)	$ 3,408,934 (I) $ 14,811,923(P*) $ 875,265 (M)* $ 164,804 (S) -
DR-1519*	June 3, 2004	IA/PA/MIT	Severe storms and flooding	Athens, Carroll, Columbiana, Cuyahoga, Delaware, Guernsey, Harrison, Hocking, Holmes, Medina, Noble, Perry, Portage, Summit and Tuscarawas (IA/PA/MIT); Crawford, Geauga, Licking, Logan, Lorain, Mahoning, Richland and Stark (IA/MIT) and Knox and Jefferson (PA/MIT)	$ 30,238,921 (I)* $ 14,060,750 (P) * $ 2,305,560 (M) $ 748,426 (S) -
DR-1556*	September 19, 2004	IA/PA/Mit	Severe storms and flooding	Athens, Belmont, Carroll, Columbiana, Gallia, Guernsey, Harrison, Jefferson, Meigs, Monroe, Morgan, Muskingum, Noble, Perry, Tuscarawas, Vinton and Washington (IA/PA/MIT); Lawrence, Mahoning, Stark and Trumbull (IA/MIT)	$ 47,455,690 (I) $ 35,597,480 (P)* $ 3,948,349 (M)* $ 2,300,000 (S)
EM-3198*	January 11, 2005	PA Only	Snow Removal and Response	Butler, Champaign, Clark, Crawford, Darke, Delaware, Erie, Franklin, Greene, Hamilton, Hardin, Huron, Logan, Madison, Marion, Miami, Montgomery, Morrow, Preble, Richland, Sandusky, Seneca, Shelby, Union, Warren and Wyandot	$ 11,116,398 (P)*

DR-1580*	February 15, 2005	IA/PA/MIT	Severe winter storms, ice and mudslides	Clark, Sandusky, Warren and Miami (IA/MIT); Ashland, Auglaize, Athens, Belmont, Coshocton, Crawford, Delaware, Fairfield, Franklin, Guernsey, Henry, Hocking, Holmes, Huron, Jefferson, Licking, Logan, Morgan, Muskingum, Pickaway, Pike, Richland, Ross, Scioto, Stark, Tuscarawas, Washington and Wyandot (IA/PA/MIT); Adams, Allen, Brown, Carroll, Champaign, Clermont, Columbiana, Darke, Fayette, Hancock, Hardin, Harrison, Highland, Knox, Lorain, Marion, Medina, Meigs, Mercer, Monroe, Montgomery, Morrow, Noble, Paulding, Perry, Putnam, Seneca, Shelby, Union, Van Wert and Wayne (PA/MIT)	$ 13,823,757 (I)* $123,935,836 (P)* $7,534,746 (M)* $1,500,000 (S) -
EM-3250	September 13, 2005	PA	Hurricane Katrina Emergency Shelter Operations	All 88 Counties were included in the federal declaration	$2,499,103 (P)*
DR-1651*	July 2, 2006	IA/MIT	Severe storms and flooding	Cuyahoga, Erie, Huron, Lucas, Sandusky and Stark	$25,001,761 (I)* $1,798,019 (M) $593,090 (S)
DR-1656*	August 1, 2006	IA/PA/MIT	Severe storms and flooding	Ashtabula, Geauga and Lake	$25,895,531 (I)* $9,282,843 (P)* $3,411,736 (M) $1,137,245 (S)
DR-1720	August 28, 2007	IA/PA/MIT	Severe storms and flooding	Allen, Crawford, Hancock, Hardin, Putnam, Richland, Wyandot (IA/PA/MIT); Seneca (IA/MIT)	$45,452,363 (I) $12,688,139 (P) $6,630,799 (M) $1,984,493 (S)
EM-3286	April 24, 2008	PA	Snow	Ashtabula, Brown, Clermont, Clinton, Crawford, Delaware, Fairfield, Franklin, Geauga, Greene, Hardin, Huron, Lake, Morrow, Richland, Union and Wyandot	$9,481,809 (P) est.

DR-1805	October 24, 2008	PA/MIT	Wind Event	Ashland, Brown, Butler, Carroll, Champaign, Clark, Clermont, Clinton, Coshocton, Delaware, Fairfield, Franklin, Greene, Guernsey, Hamilton, Harrison, Highland, Hocking, Holmes, Knox, Licking, Madison, Miami, Montgomery, Morrow, Perry, Pickaway, Preble, Shelby, Summit, Tuscarawas, Union, and Warren	$47,968,724 (P) $6,507,249 (M)
DR-4002	July 13, 2011	PA/MIT	Severe storms, landslides	Adams, Athens, Belmont, Brown, Clermont, Gallia, Guernsey, Hamilton, Hocking, Jackson, Jefferson, Lawrence, Meigs, Monroe, Morgan, Noble, Pike, Ross, Scioto, Vinton, Washington	$45.8 Million (P) $5,046,137 (M)
EM-3346	June 30, 2012	PA (for Direct Assistance only)	Severe storms, straight-line winds (derecho)	All 88 counties	PA was for Direct Assistance only, no financial assistance
DR-4077	August 20, 2012	PA/MIT		Adams, Allen, Athens, Auglaize, Belmont, Champaign, Clark, Coshocton, Fairfield, Franklin, Gallia, Guernsey, Hancock, Hardin, Harrison, Highland, Hocking, Jackson, Knox, Lawrence, Licking, Logan, Meigs, Miami, Monroe, Morgan, Morrow, Muskingum, Noble, Paulding, Perry, Pickaway, Pike, Putnam, Shelby, Van Wert, Vinton, Washington, Wyandot	Initial Estimates of: $22,018,335 (P) $3.4 Million (M) est.
DR-4098	January 3, 2013	PA/MIT	Severe storms, flooding	Ashtabula, Cuyahoga	Initial Estimates of: $23,355,813 (P) $2.7 Million (M) est.
DR-4360	April 17, 2018	PA/MIT	Severe storms, flooding, landslides	Adams, Athens, Belmont, Brown, Columbiana, Coshocton, Gallia, Hamilton, Harrison, Jackson, Jefferson, Lawrence, Meigs, Monroe, Morgan, Muskingum, Noble, Perry, Pike, Scioto, Vinton, Washington	Initial Estimates of: $120 Million (P) est. $9.75 Million (M) est.

DR-4424	April 8, 2019	PA/MIT	Severe storms, flooding, landslides	Adams, Athens, Belmont, Brown, Gallia, Guernsey, Hocking, Jackson, Jefferson, Lawrence, Meigs, Monroe, Morgan, Muskingum, Noble, Perry, Pike, Ross, Scioto, Vinton, Washington	Initial estimates of: $80 Million (P) est. $12.2 Million (M) est.
DR-4447	June 18, 2019	IA/PA/MIT	Severe storms, tornados, straight-line winds, flooding, landslides	Greene, Mercer, Montgomery (IA/PA/MIT); Auglaize, Darke, Hocking, Mahoning, Miami, Muskingum, Perry, Pickaway (IA/MIT); Columbiana (PA/MIT)	Initial estimates of: $27 Million (I) $17.8 Million (P) est. $4.1 Million (M) est.
DR-4507	March 31, 2020	PA (IA - FEMA Crisis Counsel Program)	COVID-19	All 88 counties	Initial estimates of: $220 Million (P) est.

(M) – Hazard Mitigation Grant
(S) – State Match to Federal Hazard Mitigation funds
(P) – Public Assistance
(I) Individual Assistance includes FEMA Disaster Housing, SBA loans for homes, personal property and businesses and FEMA/State Other Needs Assistance grants for families and individuals
(NRCS)*+ - Natural Resources Conservation Service
* Indicates the disaster is not officially closed.

HMGP first available with disaster declared after 1987.
(SCB)** - State Controlling Board funds
(SDRP)**State Disaster Relief Program
(CDBG)+ - Community Block Grant funds provided by the Ohio Department of Development

EM 3187 is an Emergency Declaration for Public Assistance

Appendix 3 – Hazard Profiles

The hazard profiles provide supplemental information on each of the 41 identified hazards. These brief, but detailed profiles are meant to assist in further understanding each respective identified hazard and be used as planning aids when developing hazard plans.

Each hazard profile is broken down into six sub-sections. The six sub-sections, and a brief description of the type of content contained in the sub-sections, are the following:

Hazard Profile - Brief description and overview of what the hazard is / how it is defined within the HIRA.

Historical Data - Historical information on the hazard. This may include any data/statistics about the hazard and/or information about a real-world event that dealt with the named hazard. Every attempt was made to have the data and information be Ohio-centric.

Sample Planning Scenario - A hypothetical situation (usually draws on real-world events) to assist partners and stakeholders with placing the hazard in context and how they may respond to and address the impacts of the named hazard.

Potential Cascading Impacts - List of the potential cascading impacts caused by a hazard event.

Community Lifeline Implications - Provides a visual as to the potential community lifelines that may be impacted should a hazard event occur for that specific hazard.

References - Reference as to where the information was gathered from so that those utilizing the hazard profiles know where the information is coming from, and if it's open source they are able to go to the original content.

The hazard profiles are in the same order in which they are ranked within the HIRA (please reference the "Hazard Ranking and Total Risk Values" section for a chart that lists the hazards in order by their rank).

OHIO EMERGENCY MANAGEMENT AGENCY

Nuclear Facility Incident

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

A nuclear facility incident is any event by which an emergency situation at a nuclear facility causes an activation (either partial or full) of the state's emergency operations center (EOC).

Per the State of Ohio Radiological Emergency Preparedness (REP) Plan, the emergency classification system utilized includes the levels of unusual event, alert, site area emergency (SAE), and general emergency (GE). If viewed in a strict order of succession, starting at the alert level there would typically be a partial activation of the state EOC, with a typical full activation of the state EOC being at the SAE and GE levels. Depending on the case-by-case details of events and situations, there may not be a linear progression of emergency classification system levels (i.e. a GE may be issued without first issuing an unusual event, alert, and SAE); furthermore, it is important to note that state EOC actions may not be performed in any particular order.

For more information as to the emergency classification system and the state EOC's activities for each level, please reference the State of Ohio REP Plan published on the Ohio EMA website.

Historical Data

On March 28th, 1979, there was a nuclear facility incident at Three Mile Island located near Middletown, PA. What is still the most significant accident in the history of U.S. commercial nuclear power plants, the Unit 2 reactor suffered a partial meltdown following the failure of one of the pumps used to send water to the steam generators in order remove heat from the reactor core.[1][2] A series of cascading events and factors following the failure of the pump ultimately led to the accident.[3][4] While government studies did not find any direct adverse health effects nor environmental impacts as a result of the incident, the accident did lead to increases in public fear and distrust of nuclear power as a whole as well as changes to the nation's nuclear power plant regulations.[5][6]

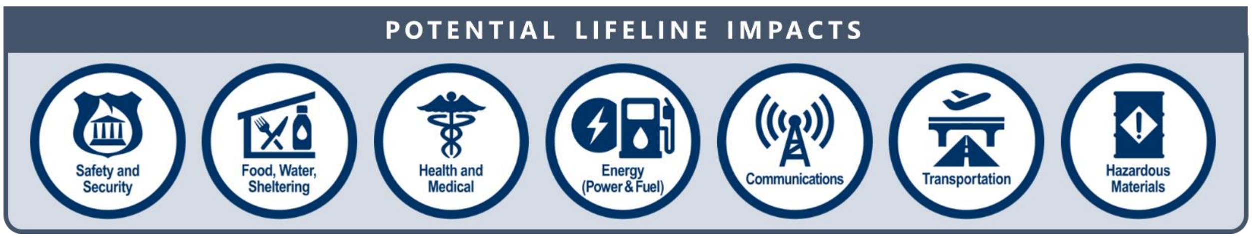
Sample Planning Scenario

A nuclear power plant facility suffers a catastrophic equipment failure, creating conditions of an imminent meltdown. Due to the situation and rapidly deteriorating conditions, a GE is issued. This activates numerous emergency nuclear facility plans, and the state EOC is fully activated. Mass evacuation orders are issued to everyone residing/located within the 50-mile Emergency Planning Zone (EPZ). First responders are dispatched to assist with evacuation efforts. Multiple transportation accidents are simultaneously being reported as people try to evacuate from the area, creating significant demands on first responders and also creating numerous blocked roadways. Multiple shelters are stood up, and decontamination efforts are underway.

Potential Cascading Impacts

Radioactive material release
Agricultural & environmental loss
Fear / panic
Medical service disruption
Operational and service disruption
Evacuation
Traffic disruption
Contamination
Illness / death
Displaced persons

Community Lifeline Implications



References

[1] "Backgrounder on the Three Mile Island Accident." United States Nuclear Regulatory Commission. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html
[2] Cusick, Marie. "40 Years After A Partial Nuclear Meltdown, A New Push To Keep Three Mile Island Open." NPR. March 28, 2019. https://www.npr.org/2019/03/28/707000226/40-years-after-a-partial-nuclear-meltdown-a-new-push-to-keep-three-mile-island-o
[3] "Backgrounder on the Three Mile Island Accident." United States Nuclear Regulatory Commission. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html
[4] Cusick, Marie. "40 Years After A Partial Nuclear Meltdown, A New Push To Keep Three Mile Island Open." NPR. March 28, 2019. https://www.npr.org/2019/03/28/707000226/40-years-after-a-partial-nuclear-meltdown-a-new-push-to-keep-three-mile-island-o
[5] "Backgrounder on the Three Mile Island Accident." United States Nuclear Regulatory Commission. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html
[6] "5 Facts to Know About Three Mile Island." U.S. Department of Energy – Office of Nuclear Energy. May 4, 2022. https://www.energy.gov/ne/articles/5-facts-know-about-three-mile-island

OHIO EMERGENCY MANAGEMENT AGENCY

Terrorism, Radiological/Nuclear

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

Terrorism, radiological / nuclear is the intentional release of radiological or nuclear material with the intention of killing or causing physical harm to humans and animals, and /or adverse effects on the environment, in order to instill panic or fear and / or for political motives.

Historical Data

No historical data is available on this hazard.

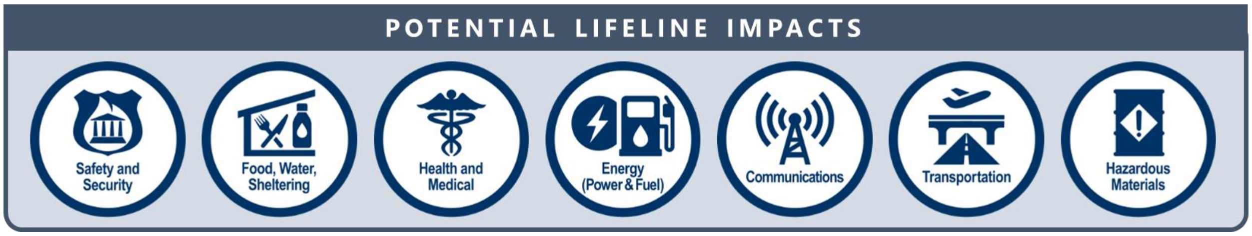
Sample Planning Scenario

A terrorist organization sets off a nuclear device downtown of a major metropolitan area in the state. The device releases radioactive material in the air and over a significant geographical area. Numerous physical structures are destroyed, and countless individuals within the affected area are killed and /or have life threatening injuries. Due to the high levels of radiation, first responders are unable to get in close proximity to "ground zero". Furthermore, resources are quickly diminished, and federal resources are in the process of being mobilized to assist in the response. Mass evacuation and decontamination efforts are commenced. Hospitals throughout the region are quickly overwhelmed with the surge of patients with physical injuries as a result of the blast and those who are experiencing radiation poisoning.

Potential Cascading Impacts

Radioactive material release
Agricultural & environmental loss
Fear / panic
Medical service disruption
Operational and service disruption
First responder demands
Evacuation
Traffic disruption
Contamination
Illness / death
Displaced persons

Community Lifeline Implications



OHIO EMERGENCY MANAGEMENT AGENCY

Terrorism, Chemical

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

Terrorism, chemical is the intentional use of chemical agents in order to physically injure or kill humans and animals and /or have an adverse effect on the environment for the purpose of generating panic and fear. Chemical agents may be released as a vapor/aerosol, liquid, and / or a solid.[1]

Historical Data

No historical data is available on this hazard.

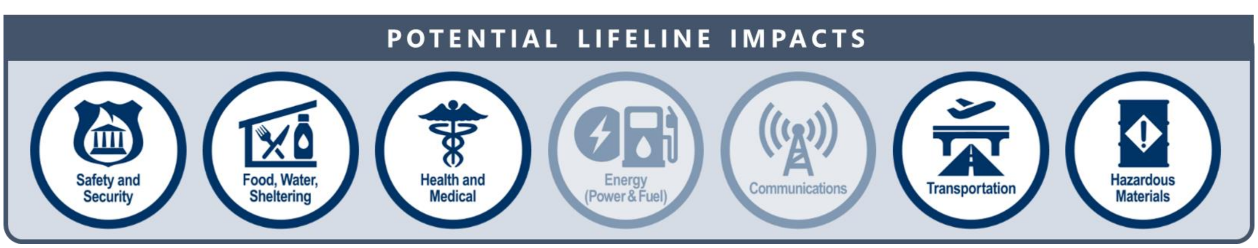
Sample Planning Scenario

Individuals aligned with a domestic terrorist organization release nerve agents at several transportation hubs (bus stations, airports, etc.) throughout the state. Hundreds of individuals become incapacitated, and first responders throughout the state begin evacuating areas affected by the nerve agents. Even with personal protective equipment (PPE), first responder safety is a concern. Dozens of individuals are transported to area hospitals for treatment.

Potential Cascading Impacts

First responder demands
Medical service demands
Fear / panic
Toxic airborne gases
Injury / death
Food / water contamination
Agricultural / environmental loss

Community Lifeline Implications



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[1] "Understanding the Bioterrorism Terminology." UPMC. https://www.upmc.com/services/poison-center/biological-chemical-terrorism/terminology#:~:text=Chemical%20terrorism%20agents%20are%20poisonous,to%20people%20and%20the%20environment

OHIO EMERGENCY MANAGEMENT AGENCY

Agricultural Incident

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

Agricultural incident is defined as being any incident that adversely impacts crops and livestock (non-disease event) in the state. A specific example that is common to take place in Ohio is that of drought. Acts of biological/chemical terrorism / criminal intent also does not fall under the category of an agricultural incident.

Historical Data

Agricultural products sold in the state in 2017 was over $9 billion in market value. Ohio has a reported 77,805 farms and 13,965,295 acres in farmland.[1]

The Ohio Department of Agriculture's website provides information on any agricultural incidents that may be impacting the state. Please visit https://agri.ohio.gov/ for more information.

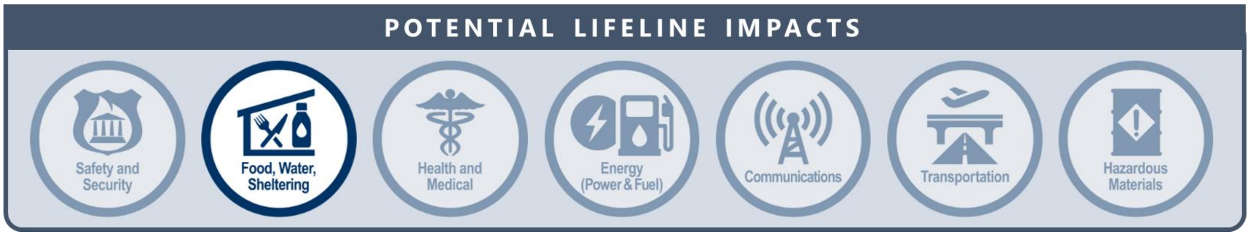
Sample Planning Scenario

Multiple months of less-than-seasonal precipitation has led to exceptional agricultural drought that impacts the entire state, leading to a category D4 condition per Ohio's emergency operations plan - drought incident specific annex. The extremely dry conditions cause brush fires to generate in fields and in some areas "dustbowl" like conditions reminiscent of what took place in the United States in the 1930s. Large swaths of agricultural crops die off, creating an impact on food supply and the state's economy. Furthermore, the loss of vegetation adversely impacts livestock whom are no longer able to graze in open fields.

Potential Cascading Impacts

Environmental loss
Dried vegetation
Wildfire
Crop damage / loss
Food chain / production disruption
Economic loss

Community Lifeline Implications



References

[1] "Tab A-1-1: Ohio State Profile". FEMA Region 5 All-Hazards Plan. Pg. 10. PDF

OHIO EMERGENCY MANAGEMENT AGENCY

Animal Disease

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

Animal disease is defined as any biological contagion that infects and / or has a high probability of infecting a large population of domestic and wild animals, to include livestock, and has an adverse effect on their health. Diseases can be those spread animal-to-animal and /or animal-to- human.

Historical Data

Beginning in September 2022, confirmed cases of High Path Avian Influenza (HPAI), a highly infectious disease that affects birds/poultry, were reported in the state. Cases would end up being reported at multiple locations in multiple counties, with an estimated total of poultry affected by the HPAI outbreak being close to 3.75 million (as of January 2023). The response to the HPAI outbreak was the decontamination and depopulation of all poultry infected by the contagion.[1]

The Ohio Department of Agriculture's Division of Animal Health is responsible for protecting and promoting the health of the state's livestock.[2] For more information and resources that the Division provides on animal diseases, please visit https://agri.ohio.gov/divisions/animal-health .

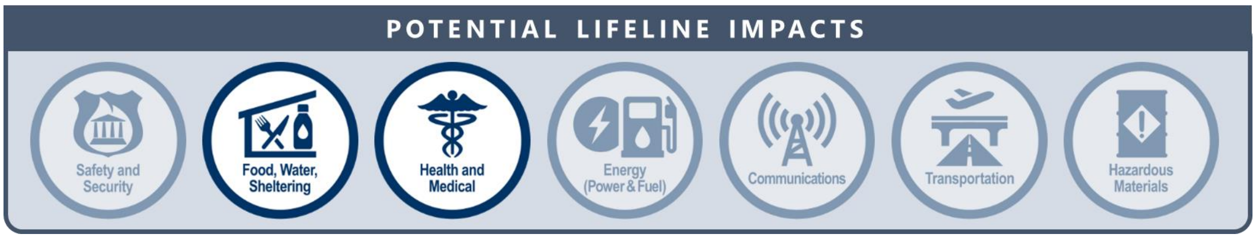
Sample Planning Scenario

A presumptive case of HPAI is reported in a county in northwest Ohio. While in the process of responding to the facility and testing the possibly infected poultry, three more cases are reported. One case is in the adjacent county, while another is in southeast Ohio. Within a span of three weeks, multiple cases have been reported across seven counties in the state. For every case reported, response personnel are required to put on personal protective equipment (PPE), use testing kits, send samples to a lab for testing, and if a positive test is confirmed, the bird/poultry facilities must undergo depopulation and decontamination of their entire livestock.

Potential Cascading Impacts

Illness
Spread of disease
Loss of livestock
Food chain / production disruption
Death

Community Lifeline Implications



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[1] "HPAI: Biosecurity, Reporting, Resources". Ohio Department of Agriculture. https://agri.ohio.gov/divisions/animal-health/resources/02.25.2022hpaiupdate
[2] "Welcome to the Division of Animal Health". Ohio Department of Agriculture. https://agri.ohio.gov/divisions/animal-health

OHIO EMERGENCY MANAGEMENT AGENCY

Terrorism, Biological

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

Terrorism, biological is any intentional release of biological agents to cause illness or death in humans and animals, and /or adverse effects on the environment. These agents may include bacteria, fungi, toxins, or viruses.[1 2]

Historical Data

In 2001, anthrax-laced letters/mail were delivered to news media offices and the U.S Congress.[3]

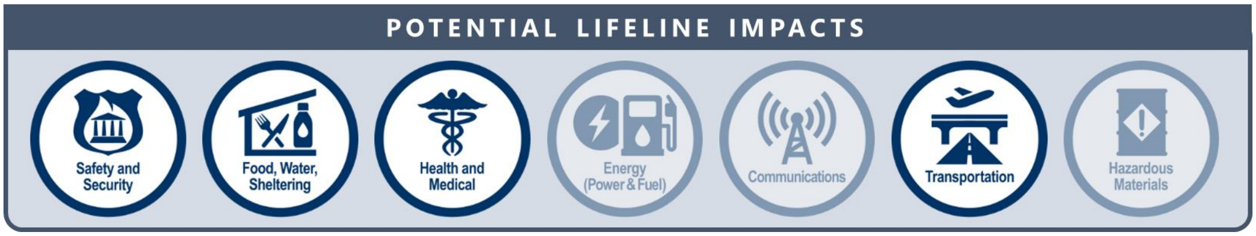
Sample Planning Scenario

A commercial airliner carrying passengers is forced to make an emergency landing at an international airport in the state. Prior to landing, the flight crew had to assist multiple passengers with sudden medical problems that weren't present when they boarded the aircraft. First responders arrive at the scene and realize more passengers are showing signs of illness. The passengers are quarantined at a local hospital where it is determined all occupants on the aircraft were exposed to anthrax. Law enforcement begin a traceback investigation, and is found that the anthrax was intentionally released due to political motives that ultimately forces the closure of several major airports throughout the United States.

Potential Cascading Impacts

Biological spread / exposure
Medical service demands / disruptions
First responder demands
Operational and service disruptions
Fear / panic
Illness / death
Evacuation
Transportation disruption
Quarantine / isolation
Economic loss

Community Lifeline Implications



References

[1] Information provided by law enforcement partners.
[2] Williams, Mollie, Lisa Armstrong, and Daniel C. Sizemore. “Biologic, Chemical, and Radiation Terrorism Review”. National Library of Medicine – National Center for Biotechnology Information. August 22, 2022. https://www.ncbi.nlm.nih.gov/books/NBK493217/
[3] Information provided by law enforcement partners.

OHIO EMERGENCY MANAGEMENT AGENCY

Electro-Magnetic Pulse (EMP)

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

An electro-magnetic pulse (EMP) is a short burst of electro-magnetic energy causing a disturbance.[1]

When an EMP is detonated, the pulse of energy produced has the potential to damage or destroy any and all electronic devices (to include power systems) over a significant geographical area.[2]

Historical Data

In 1962, an atmospheric test of a nuclear weapon took place over Johnston Island (small island in the Pacific Ocean). The EMP generated by the explosion affected Hawaii, which was 800 miles away from the detonation. Streetlights, electronic fuses, and phone services either failed or were disrupted as a result of the EMP wave.[3]

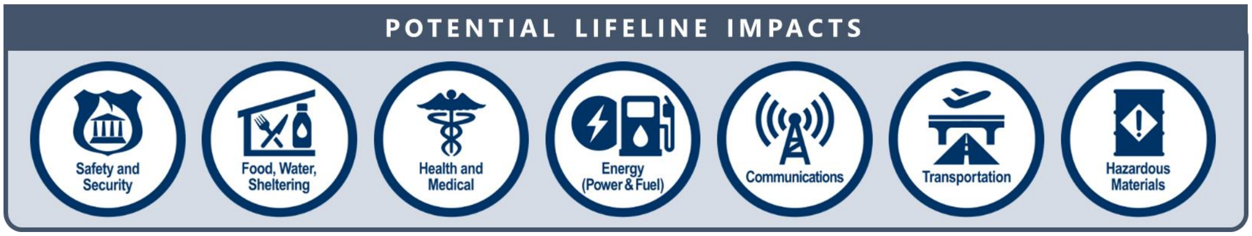
Sample Planning Scenario

A state actor detonates an EMP device over Washington D.C., with the energy burst reaching significant portions of the eastern half of the State of Ohio. All electric devices located within the affected geographical area, to include power and communication systems, are disrupted and /or fail. The state emergency operations center (EOC) is activated, but due to the state EOC being located within the affected zone, Ohio EMA implements its continuity of operations plan (COOP). Resources, to include personnel and equipment, in the western portion of the state not affected by the EMP begin to mobilize in order to assist those who were affected, and operational and tactical plans are discussed and implemented in response to the incident. Panic and fear begin to consume those in the affected area of the state, and first responders attempt to provide emergency assistance without the means of transportation and communication.

Potential Cascading Impacts

Operational and service disruption
Communication systems disruption / damage
First responder demands / disruption
Injury / death
Government / business essential functions disruption
Economic loss
Energy systems disruption / damage
Supply chain disruption
Transportation disruption
Panic / fear

Community Lifeline Implications



References

[1] Information provided by law enforcement partners

[2] "Electromagnetic Pulse (EMP)". Washington State Department of Health – Division of Environmental Health – Office of Radiation Protection. September 2003. PDF.

[3] "Electromagnetic Pulse (EMP)". Washington State Department of Health – Division of Environmental Health – Office of Radiation Protection. September 2003. PDF.

OHIO EMERGENCY MANAGEMENT AGENCY

Hazardous Material Incident

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

A hazardous material incident is defined as any occurrence, event, or disaster by which a material that is identified as being hazardous by a regulatory and/or governmental entity is released in such a manner that adversely affects the health and safety of the environment, animals, and humans.

Historical Data

Hazardous material incidents have a high frequency of occurring throughout the state.

One example is that of an incident taking place in February 2020 in Cleveland, OH. Two workers at a chemical transportation company were in the process of cleaning a tanker truck, where they both became overwhelmed by hazardous chemical fumes and later died as a result of their injuries.[1]

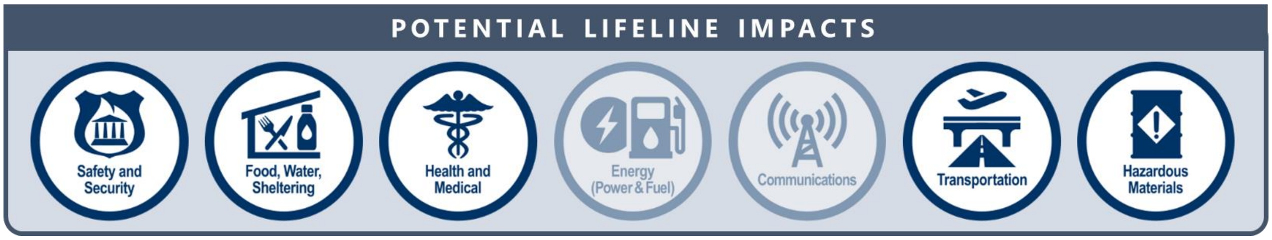
Sample Planning Scenario

A tanker truck hauling a hazardous material is traveling on a major highway in the state and becomes involved in a transportation accident, causing the hazardous material stored in the tank to tip over and spill onto the highway. The hazardous material is highly flammable, and shortly ignites. The flames pose a significant danger to individuals who are stopped on the highway as a result of the accident, and who have no means of easily escaping the rapidly spreading flames. Toxic fumes are being carried by the wind in the direction of a sports stadium, in which a major sporting event is simultaneously taking place. First responders are dispatched to both the scene of the accident to put out the fire and rescue those stranded on the highway, and to the sports stadium to begin evacuating the stadium due to the toxic fumes.

Potential Cascading Impacts

Agricultural / environmental loss
Property damage
Food / water contamination
Transportation disruption
Illness / injury / death
Toxic airborne gases
First responder demands
Medical service demands

Community Lifeline Implications



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OHIO EMERGENCY MANAGEMENT AGENCY

Public Health Emergency

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

A public health emergency describes any health-related incident whereby a local, state, or federal public health emergency / state of emergency is declared.

Emergency declarations may be made when there is the occurrence or imminent threat of an illness / health condition caused by an infectious agent, biological toxin, and / or a threat that poses significant risk to humans that may cause a large number of fatalities or permanent / long-term disability.

Historical Data

The coronavirus that was first detected in 2019 (COVID-19) had significant impacts across the world. In Ohio, the governor declared a state of emergency in March 2020. Shortly after the declaration, schools suspended classes or closed, businesses and restaurants closed, and residents were told to stay home. The COVID-19 pandemic resulted in over 3.4 million total cases in the state, with an estimated 42,000 Ohio residents dying as a result of the virus (as of April 13, 2023).[1][2][3]

The first wave of the opioid epidemic occurred in the 1990s, and was declared a public health emergency in 2017. The public health emergency was most recently renewed in 2023. The primary cause of the declaration and renewals are the increased opioid-related deaths and the opioid use disorder. The number of drug overdose deaths increased by almost 30% from 2019 to 2020 and has quintupled since 1999.[4]

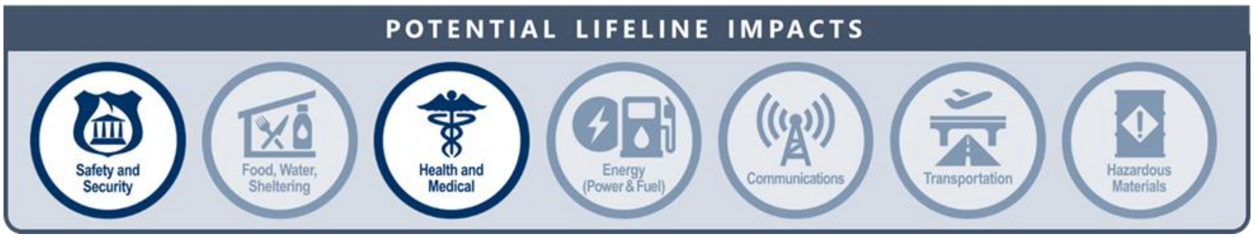
Sample Planning Scenario

An unknown pathogen begins to make people ill. People begin reporting to hospitals with symptoms, with numbers increasing at an alarming rate. Hospitals and public health systems rapidly become overrun and are unable to keep up with the demand for personnel and equipment necessary to treat the patients. A state of emergency is declared, and all non-essential services and businesses are shut down. The public is told to stay home. First responders must contend with an increasing demand on their services while also protecting their own personal health. There is significant economic loss, and small business owners are unsure if they will be able to re-open their business following the public health emergency. Thousands of people are instantly without a job, and fear and anxiety significantly increases.

Potential Cascading Impacts

Medical service demands
Panic / fear
Injury / death
Supply chain disruption
Pollution
Adverse psychological effects
Isolation / quarantine
Service disruption
Economic loss
First responder health & safety

Community Lifeline Implications



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[2] "COVID-19 pandemic in Ohio." Health Policy Institute of Ohio. https://www.healthpolicyohio.org/coronavirus-covid-19-in-ohio/
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[4] Information provided by public health partners.

OHIO EMERGENCY MANAGEMENT AGENCY

Structure Collapse

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

Structure collapse is the destruction of a physical structure (does not include transportation related structures, such as bridges). The collapse can be caused accidently (technological) or deliberately with malicious intent (human-caused).

*Note: does not include the planned detonation/tear-down of a structure

Historical Data

On December 23rd, 2021, an underground parking garage adjacent to an apartment building in Cleveland, OH, collapsed as a result of construction work being done on the support beams. The collapse resulted in dozens of damaged vehicles, but no reported injuries or fatalities.[1 2]

During the early morning hours of June 24th, 2021, a portion of Champlain Towers, a condominium located in Surfside, FL, collapsed. The cause of the collapse is reported as being from construction flaws and corrosion. The collapse resulted in 98 fatalities and an extensive search and rescue operation.[3 4]

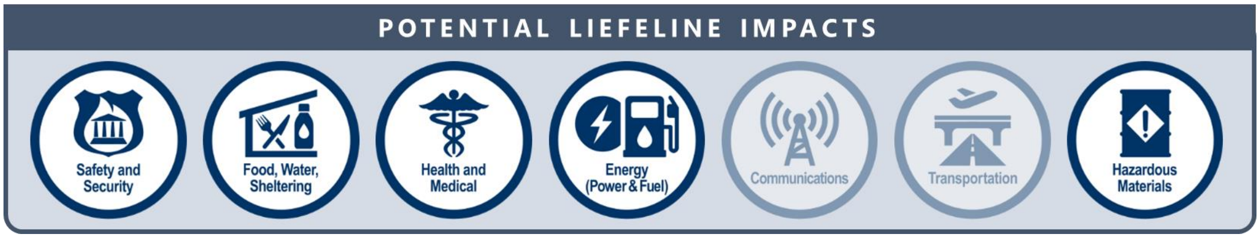
Sample Planning Scenario

An apartment building in an urban area collapses. The collapse takes place during the late-night hours while most residents of the building are asleep. Half the building collapses; trapping, injuring, and killing dozens of individuals. Those residents who were in the part of the building that did not collapse are trapped as significant portions of the emergency stairwell had collapsed as well. First responders reach the scene and assess the situation. Search and rescue operations commence for those trapped under the debris and rubble. Meanwhile, those who managed to escape are in need of first aid and shelter.

Potential Cascading Impacts

Evacuation
Displaced & trapped persons
Injury / death
Service disruption
Search and Rescue demands
Damaged water / electrical lines
Fire
Spread of hazardous materials

Community Lifeline Implications



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[3] "Investigations into 2021 Surfside, Florida, condo collapse far from over." CBS News. November 12, 2022. https://www.cbsnews.com/news/surfside-florida-condo-collapse-investigation-60-minutes-2022-11-13/

[4] Schuppe, Jon. "Surfside collapse exposes an overlooked threat: Saltwater rising from underground." NBC News. February 17, 2022. https://www.nbcnews.com/news/us-news/surfside-condo-collapse-salt-groundwater-rcna16473

OHIO EMERGENCY MANAGEMENT AGENCY

Flooding

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

Floods occur when water ways overflow their banks and spill onto the adjoining land surface (i.e. floodplain). Numerous factors can cause or exacerbate flooding in the state to include, but are not limited to, heavy and prolonged periods of precipitation, soil saturation, snow melt, and inadequate drainage systems. Every year, floods cause damage to private and public property and infrastructure. Flooding is the most frequently occurring natural disaster in Ohio and the United States.[1]

Historical Data

Historically, significant floods in Ohio occurred in 1913, 1937, 1959, and 1969. Flooding that occurred during these years caused hundreds of deaths, tens of thousands of damaged or destroyed structures (to include residential facilities), and hundreds of millions of dollars in damages.

One of the more notable flooding events to take place in the state was in Shadyside on June 14th, 1990. An estimated 3-4 inches of rain fell in a little over an hour near Pipe Creek and Wegee Creek, with total estimates being at 5.5 inches in just three hours. Flooding began at 9:30 PM and was over in 30 minutes, causing a wall of water six feet high (20 feet in some areas) to move through the valley at seven to ten miles-per-hour. Approximately 80 homes were destroyed, 250 were damaged, and killed 26 people.[2]

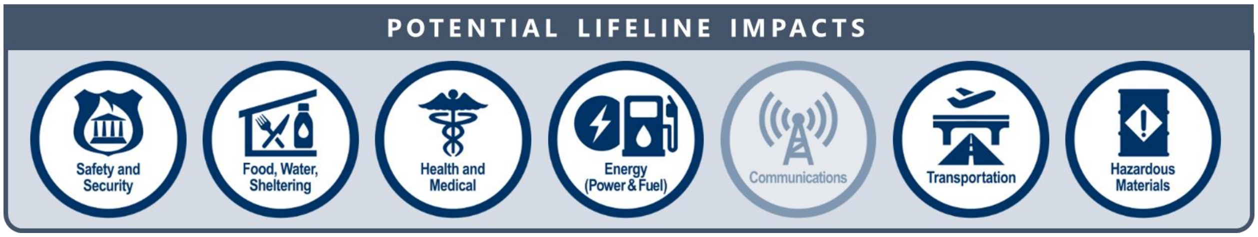
Sample Planning Scenario

Three to four inches of rain fall in a little over one hour causing a flash flood in southeastern Ohio. Saturated soil from previous rains and narrow, steep-sided valleys causes the water to rise quickly in nearby water ways. Flooding begins to occur in floodplains, damaging and destroying several structures and injuring individuals who were unable to escape the flooding conditions.

Potential Cascading Impacts

Evacuation
Erosion
Debris spread
Dam / levee failure
Stranded / trapped persons
Road and property damage

Community Lifeline Implications



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[1] "2.2 Flood." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-12

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OHIO EMERGENCY MANAGEMENT AGENCY

Severe Winter Storms

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

Severe winter weather affects all parts of Ohio. A winter storm occurs when precipitation (snow or sleet) forms at cold temperatures or when the ground temperature is cold enough where ice forms (freezing rain). Accumulations of snow, ice, and sleet often make conditions hazardous to motorists and pedestrians.

Northeast Ohio experiences lake-effect snow, by which weather systems absorb moisture from Lake Erie and may cause heavy snowfalls in communities and geological areas close to the lake.[1]

Historical Data

Ohio experienced 341 severe winter storms between January 1, 2019 and December 31, 2022.[2]

The Great Blizzard of 1978 (January of that year) was one of the deadliest winter storms to hit the state with 51 fatalities, and closed homes and businesses for an entire week. Wind gusts of 70 mph caused blowing and drifting snow that covered vehicles and houses, blocked roadways and railways, and closed airports.[3]

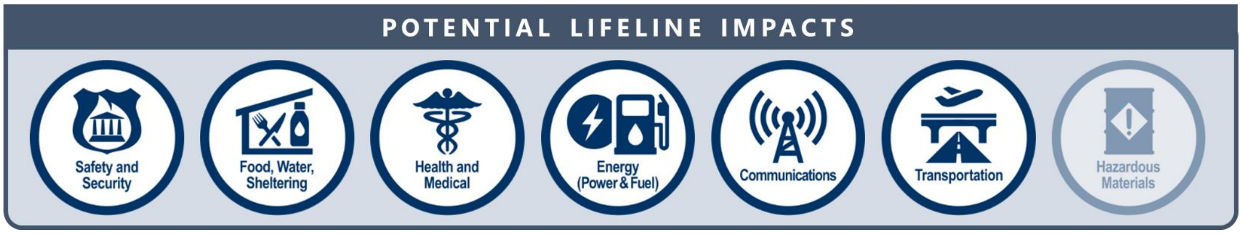
Sample Planning Scenario

A February storm produces heavy snowfall across the majority of the state with freezing rain and ice along the Ohio River and lake-effect snow in northeast Ohio. The storm causes widespread power outages, road closures, business, and school closures. Households are isolated and people are without heat and communication systems have been damaged. First responders are severely delayed or unable to reach individuals in need of emergency services due to the snow-covered roadways.

Potential Cascading Impacts

Roof failure / collapse
Broken water lines
Power disruption
Disruption of transportation systems
Workforce reduction
Delayed emergency response

Community Lifeline Implications



References

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[2] "Storm Events Database." NOAA National Centers for Environmental Information. https://www.ncdc.noaa.gov/stormevents/
[3] "2.4 Winter Storm." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-69

Long Term Power Outage

Hazard Profile

Long term power outage is the loss of electric power generation output and/or distribution of power that adversely impacts the output of electric power across all sectors and general public for a period of 72 hours or more.

Historical Data

While there is no historical data available for the State of Ohio regarding long term power outages, data from recent world events is available.

In September 2017, Hurricane Maria made landfall in Puerto Rico. The category 4 hurricane impacted the entire island nation, causing close to 3,000 deaths and destroying much of the country's infrastructure, to include its power generation. Power was not restored to all electric customers until after 328 days (about 11 months) after Hurricane Maria impacted the country. Billions of dollars in federal funding were allocated to rebuild Puerto Rico's power grid, but the grid remained fragile years after Hurricane Maria, with the residents of Puerto Rico facing intermittent power outages.[1 2]

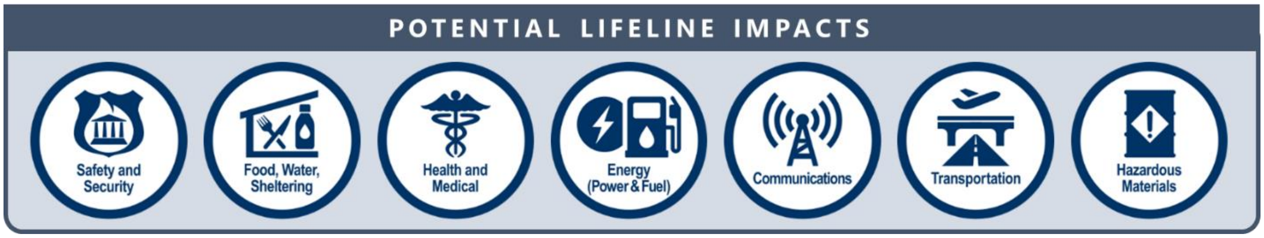
Sample Planning Scenario

Temperatures throughout the state are in the high 90s. A severe summer storm system moves throughout the state, to include a derecho. The combination of high temperatures and the extreme weather phenomenon causes widespread damage to electrical power stations, utility poles, and transmission lines. Due to the extent of the damage being state-wide, the overtaxed personnel and resources necessary to restore power creates a situation whereby a majority of electric customers throughout the state will not have their power restored until well after 72 hours following the weather event. People are without air conditioning in the summer heat. The debris left behind by the storms have left several roads to be impassable, causing people to be unable to travel to seek shelter and food. The blocked roadways also impact emergency responders who are attempting to respond to calls for help. Multiple hospitals are without power and are facing backup generator failure, thus creating a situation of patients not being able to receive lifesaving and life sustaining medical care for a prolonged period of time.

Potential Cascading Impacts

Loss of heat / cooling
Operational and service disruptions
Infrastructure disruptions / failure
Emergency / medical service disruption & increase demand
Communications disruption
Traffic disruption
Injury / death

Community Lifeline Implications



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[2] "Major Hurricane Maria – September 20, 2017." National Weather Service. https://www.weather.gov/sju/maria2017

Severe Summer Storms

Hazard Profile

Severe summer storms typically precede an approaching cold air mass, with the key components for the formation of severe storms being low- and high-pressure zones, and a jet stream to carry the pressures zones across the continent. The interaction and significant differences between the pressure zones create storms.[1]

Historical Data

According to the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information – Storm Events Database, between the dates of January 1, 2018 through December 31, 2022, there were over 3,400 identified thunderstorm wind events in the state, causing property and crop damage with estimated costs over $17 million dollars.[2]

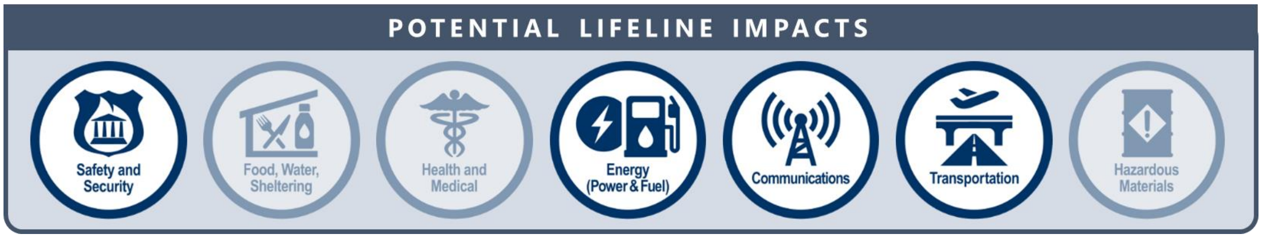
Sample Planning Scenario

The local National Weather Service office is forecasting heavy rains today that will continue for the next three days in the northwest region of the state. High winds have been blowing over the past two days causing many fallen trees in the streets resulting in traffic congestion and lack of vehicle access to some areas. Local officials predict flash floods and local flooding. Many communities in the northwest portion of the state have lost power with unknown time estimates for restoration of service.

Potential Cascading Impacts

Hail
Flooding
Power disruption
Property / structural damage
Spread of debris
Erosion

Community Lifeline Implications



References

[1] "2.12 Severe Summer Storms." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-182

[2] "Storm Events Database." NOAA National Centers for Environmental Information. https://www.ncdc.noaa.gov/stormevents/

Urban Fire

Hazard Profile

Urban fires are those that take place within an urban area that cannot be easily contained and results in the damage and destruction of multiple structures due to the fire's spread.

Historical Data

There is no historical data available on urban fire events that have taken place in the State of Ohio.

The "Great Chicago Fire," which began on October 8th, 1871, started out as a barn fire in Chicago, IL. The fire quickly spread into the city center, where it burned down a 4 by 1 mile area of the city. In all, 17,500 structures were burned down, 90,000 residents of Chicago (which was equal to one third of the city's population at that time) became homeless, and it is estimated that 300 people died as a result of the fire. Rain that moved into the area more than a day later is what ultimately put out the fire.[1]

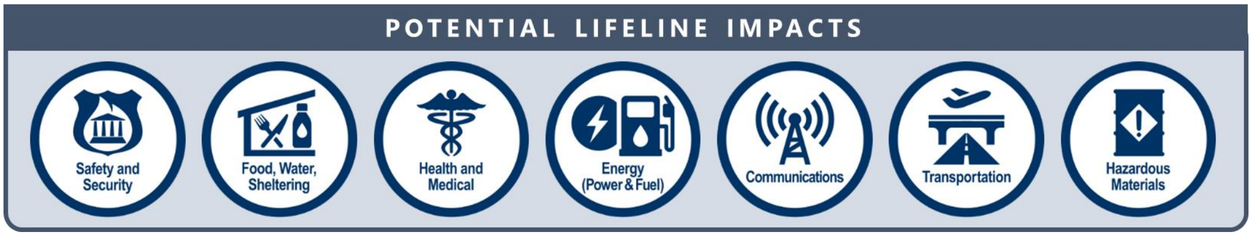
Sample Planning Scenario

A fire breaks out at an industrial facility in an urban area in the state. Due to the chemicals stored at the facility which acts as fuel to the fire, the fire quickly gains in intensity and begins to spread to adjacent structures. Due to the intense heat of the fire and its rapidly increasing spread to nearby structures, fire fighters are unable to stop and contain it. After several hours, the fire begins to lose its intensity and the fire is able to be contained and eventually put out. In all, several residential and business facilities are severely damaged or destroyed, with multiple injuries and possible fatalities. Nearby hospitals become inundated with the sudden increase in people arriving to the hospital for respiratory issues / smoke inhalation.

Potential Cascading Impacts

Smoke / toxic gases
Impeded emergency response
Property / structural damage
Injury / death
Trapped & displaced persons
Reduced visibility

Community Lifeline Implications



References

[1] "The Chicago Fire of 1871 and the 'Great Rebuilding'". National Geographic. https://education.nationalgeographic.org/resource/chicago-fire-1871-and-great-rebuilding/

Cyber Incident

Hazard Profile

Cyber incidents can be described as any incident, whether it be technological or human-caused, that adversely impacts the ability to access software, files, and /or any other information stored or saved on an electronic device.

The theft of private, financial, or other sensitive data and cyber-attacks that damage computer systems are capable of causing lasting harm to anyone engaged in personal or commercial online transactions. Such risks are increasingly faced by businesses, consumers, and all other users of the internet.[1]

Historical Data

On December 18th, 2022, Dynamic Networks (an information technology (IT) company) was hacked into. The City of Johnstown, OH is one of Dynamic Networks' clients for its IT systems, and was directly impacted as a result. The city's police department was unable to access all of its electronic data following the incident.[2]

On January 31st, 2017, Licking County was affected by a cyber-attack that included a ransomware demand. The county did not pay the ransom, but the cyber incident forced the county government to shut down all of their computer and phone systems. The incident also cost the county government $50,000 due to a combination of overtime and insurance payments.[3]

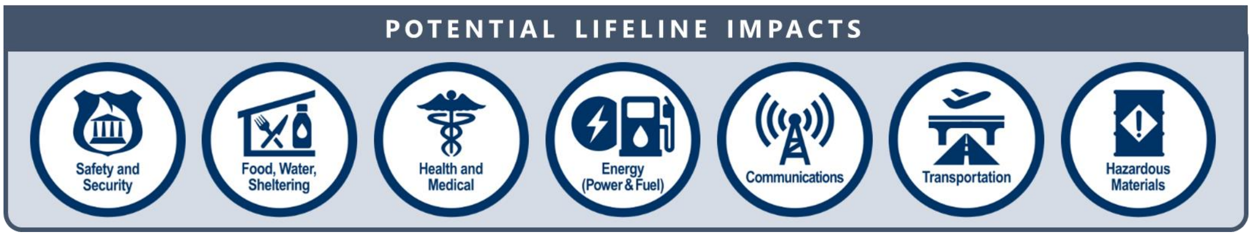
Sample Planning Scenario

A human-caused cyber incident adversely impacts a chemical facility in the state, causing the loss of operational control. A ransomware demand is made in order to restore operational control of the facility, and law enforcement is notified of the situation. As an effect of the incident, the volatile hazardous liquids stored at the facility begin to experience a rapid increase in temperature due to the loss of being able to monitor and control the cooling system. The situation creates the potential risk of an explosion that could severely injure or kill hundreds of people within the vicinity of the facility. First responders are notified of the situation, and evacuation efforts begin.

Potential Cascading Impacts

Operation and service disruption
Economic loss
Supply chain disruption
First responder disruption
Transportation disruption
Critical infrastructure disruption / damage
Panic
Communication disruption
Medical service disruption

Community Lifeline Implications



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[1] Information provided by law enforcement partners.
[2] Mallett, Kent. "City of Johnstown computer system hacked; policy department most affected." Newark Advocate. January 8, 2023. https://www.newarkadvocate.com/story/news/2023/01/08/johnstown-computer-system-hacked-police-department-most-affected/69782802007/
[3] Mallett, Kent. "City of Johnstown computer system hacked; policy department most affected." Newark Advocate. January 8, 2023. https://www.newarkadvocate.com/story/news/2023/01/08/johnstown-computer-system-hacked-police-department-most-affected/69782802007/

Tornado

Hazard Profile

According to the National Atmospheric Association (NOAA), a tornado is a "narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground." Tornados have the capability to damage/destroy homes, businesses, and natural landscapes, and can generate wind speeds of over 200 mph.

Tornados are measured using the Enhanced Fujita (F) scale, which uses the original F-scale of 1 – 5 but also classifies tornados using damage indicators that takes into account the strengths and weaknesses of construction types used on impacted facilities when measuring the strength of the tornado.[1]

Historical Data

Ohio ranks within the top twenty states in terms of fatalities/injuries and costs incurred due to tornado events, with the frequency of tornadic activity varying across the state.[2]

The Memorial Day 2019 tornado event saw a total of 19 confirmed tornados in southwest Ohio, with the tornados touching down in the late night/early morning hours between the 27th and 28th of May. One of the more notable of these tornados was the one that went through the Trotwood/Dayton area, which was confirmed as a EF-4 tornado. The tornado caused significant damage and destruction to homes, apartment complexes, and businesses in the region.[3]

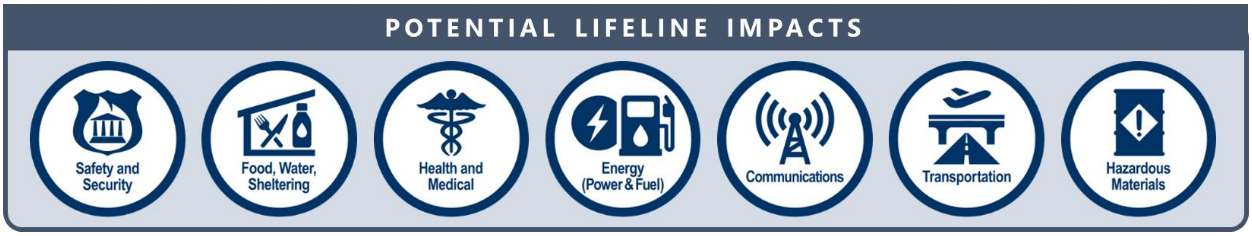
Sample Planning Scenario

In the early morning hours while most residents were still asleep, an EF-3 tornado moves across a rural community. Due to the time of day, a majority of the residents did not hear the outside tornado warnings sounding off. Dozens of residents have been reported missing, injured, or dead. Power is out and the sewer system is unable to keep up with the amount of rain that has fallen with the storm system. Debris is blocking the roadways within and into the affected community, making it difficult for first responders to respond to any calls for assistance.

Potential Cascading Impacts

Wind damage
Power disruption
Search and rescue
Property / structural damage
Debris

Community Lifeline Implications



References

[1] "2.3 Tornado." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-43, 44.
[2] "2.3 Tornado." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-43, 44.
[3] "Tornado Outbreak – May 27-28, 2019." National Weather Service. https://www.weather.gov/iln/20190527

Electrical Grid Failure

Hazard Profile

Electrical grid failure refers to any disruption of electrical energy/power output due to the tampering or destruction of equipment that make up the components of the electrical grid. These components include, but are not limited to, sub-stations, transformers, and power transmission lines.

Historical Data

On August 14th – 15th, 2003, a power blackout affected nearly 50 million people in the northeastern United States and southern Canada, to include the State of Ohio.[1] What would become the largest power outage in U.S. history started when a brush fire outside of Columbus, OH damaged a transmission line. Other transmission lines in the area began to fail, and as more lines overloaded and disconnected from the electrical grid, it led to the cascading effect of causing blackouts in several states and Canada.[2]

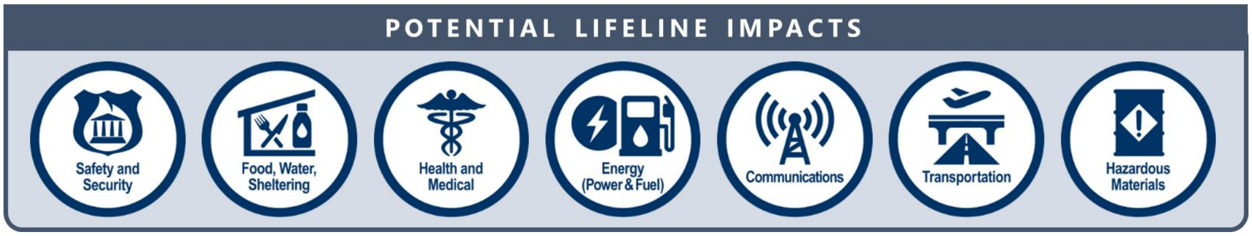
Sample Planning Scenario

A large metropolitan area in the state is experiencing a heat wave that is currently in its fourth day and is forecasted to last at least another three days. With a heat index of nearly 100 degrees Fahrenheit, residents within the city are utilizing their AC units on their highest setting in order to stay cool. The significant electrical demand caused by the AC units, and an aging electrical system, causes the transmission lines and local transformers to become overloaded, thus creating a failure of the electrical grid. The failure cascades to affect the electrical grid that supplies nearly half of the metropolitan area's power. Significant personnel and resources are necessary to restore power, with an estimated time of restoration time being 48 hours. Meanwhile, residents are without power and unable to stay cool in the heat wave. Some residents have functional needs in which prolonged exposure to excessive heat may become life threatening.

Potential Cascading Impacts

Loss of heat / cooling
Operational and service disruptions
Infrastructure disruptions / failure
Emergency / medical service disruption & increase demand
Communications disruption
Traffic disruption
Injury

Community Lifeline Implications



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[1] "August 2003 Blackout." U.S. Department of Energy – Office of Electricity. https://www.energy.gov/oe/august-2003-blackout

[2] "Public Roads – September/October 2004." U.S Department of Transportation – Federal Highway Administration. https://highways.dot.gov/public-roads/septemberoctober-2004/learning-2003-blackout

Drought

Hazard Profile

Within the State of Ohio, the potential for drought to occur is equal in all sections of the state and occurs when there is a deficiency of precipitation over an extended period of time. However, the effects of drought vary from farming difficulties to water consumption in different parts of Ohio.[1]

Historical Data

The U.S. Drought Monitor started in 2000. Since the year 2000, the longest duration of drought in the state lasted for 44 weeks, spanning from July 2002 – May 2003. In terms of drought intensity, the most intense period occurred during the first week of September 2007, whereby D3 drought conditions affected 11.45% of Ohio land. Historical and current drought conditions in Ohio can be found by going to Drought.gov.[2]

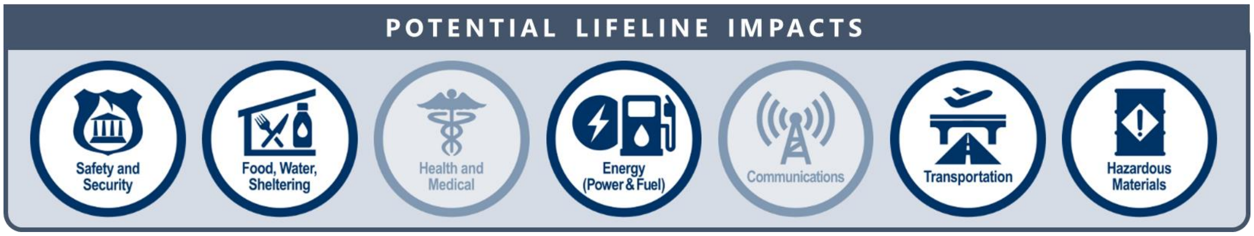
Sample Planning Scenario

Higher than normal temperatures and dry vegetation for two straight weeks create extreme drought conditions in multiple southern Ohio counties. Crops are adversely affected, as well as lawns, gardens, and other landscapes. Many municipalities mandate water-use restrictions as water supplies approach critically low levels.

Potential Cascading Impacts

Dried vegetation – plant water stress
Decrease in water resources
Wildfire
Crop damage
Decrease in water recycling and reuse
Disruption of public water services

Community Lifeline Implications



References

[1] "2.11 Drought." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-168

[2] "Drought in Ohio from 2000 – Present." National Integrated Drought Information System. https://www.drought.gov/states/ohio#historical-conditions

Earthquake

Hazard Profile

Although most earthquakes are unnoticeable in Ohio, there have been numerous quakes with a magnitude of 2.0 or higher over the last several years. Earthquakes in the state are primarily geologically located in the northeast and far west-central portion, and historically have not exceeded 5.4 in magnitude.

An earthquake results from a release of energy from the Earth creating seismic waves. Earthquakes are caused mostly by tectonic plate movement known as geologic faults, but also by volcanic activity and landslides.[1]

Historical Data

In terms of magnitude, of the top ten earthquakes that have occurred in Ohio, five have occurred in Shelby County, two in Ashtabula County, and one occurrence in the counties of Auglaize, Coshocton, Allen, and Lake. Shelby County is considered to be one of the most geologically active areas in the state for seismic activity, and has experienced more than 39 earthquakes averaging a magnitude of 2.8. The most damaging earthquake to occur in the state had a recorded magnitude of 5.4.[2]

Ohio EMA maintains a "Earthquakes in Ohio" GIS dashboard of earthquakes that have occurred in the state. The dashboard can be found by going to Ohio EMA's website at ema.ohio.gov.

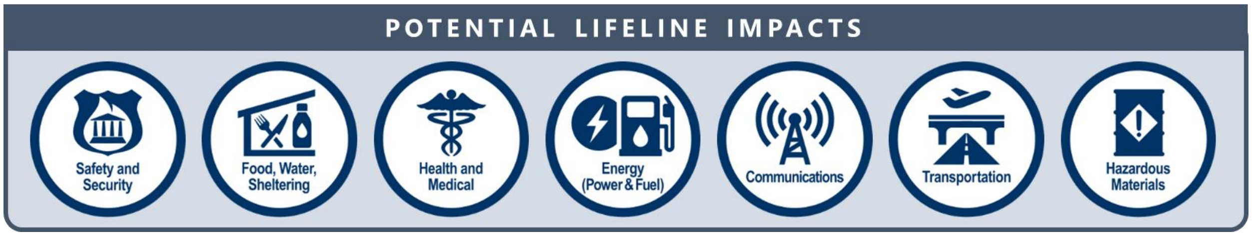
Sample Planning Scenario

A 5.4 magnitude earthquake occurs at 5:00 PM on a weekday near the border of two counties in northern Ohio. Several communities are heavily impacted. Damage to buildings varies depending on the quality of building construction. Some older buildings near the epicenter are destroyed and many other older buildings sustained damage. Several transportation accidents are reported in the area.

Potential Cascading Impacts

Landslide
Broken pipelines
Service disruption
Impeded emergency response
Search & rescue
Property / structure damage

Community Lifeline Implications



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[1] "2.9 Earthquake." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-141,143
[2] "2.9 Earthquake." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-145,146

Solar Flare

Hazard Profile

A solar flare is electromagnetic radiation that erupts from the sun (usually in active regions associated with sunspots) and interacts with the Earth's atmosphere.[1]

Historical Data

On March 10th, 1989, a large solar flare was detected that was heading straight towards Earth. The event immediately caused short-wave radio interference, and on March 13th caused an electrical blackout throughout Quebec, Canada. The blackout lasted for twelve hours, impacting millions of people in the province that closed down schools, businesses, airports, and public transportation. The U.S. was also impacted, with over 200 power grids losing megawattage as a result of the effects of the solar flare, but no reported blackouts.[2]

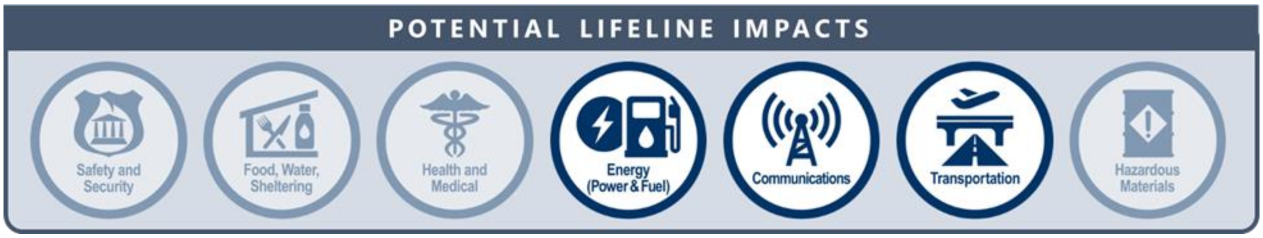
Sample Planning Scenario

A large solar flare hits the Earth, with a direct impact on the mid-western, eastern United States (to include Ohio). The significant amount of electrical currents caused by the solar flare event adversely impacts the communication and power systems utilized by the state. A majority of the state suffers a blackout, causing millions to lose power. Due to disruptions in communication systems, there are difficulties in communicating emergency information to the public. Furthermore, there are disruptions in people trying to dial 911, and emergency responders are having difficulty in communicating with each other.

Potential Cascading Impacts

Communications disruption
Transportation disruption
Energy disruption (power)

Community Lifeline Implications



References

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Water Supply Failure

Hazard Profile

Water supply failure is any disruption to water systems used in the collection, transportation, and distribution of water that adversely affects any living or non-living entities or structures that utilize water.

Historical Data

At 5:30am on February 16th, 2017, the City of Athens, Ohio suffered a significant water outage due to a water main rupture. The outage affected an estimated 75% of the city's residents, to include patients at O'Bleness hospital. Two water trailers were dispatched to the City of Athens for use by the residents. Repairs and re-pressurization of the water system was completed the evening of the 16th, but the boil advisory was not lifted until February 18th.[1]

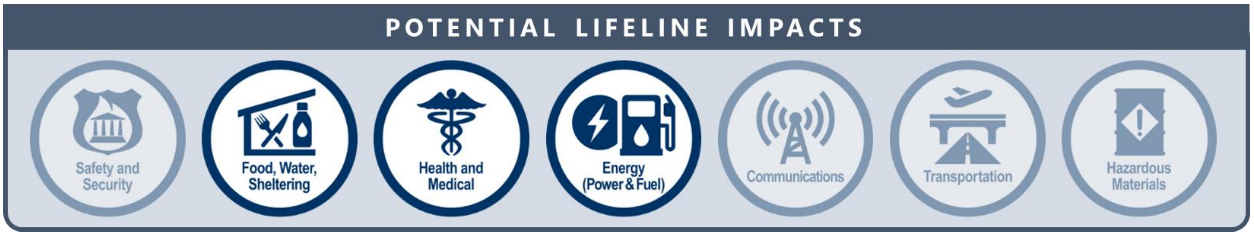
Sample Planning Scenario

A critical water main for a major metropolitan area in the state breaks, creating an outage that affects nearly 95% of the residents in the city. The outage forces residents to be unable to access water for drinking and hygiene purposes, and forces businesses and schools in the city to close. During the response to the water main break, a fire breaks out at a high-rise apartment complex. Due to the water supply failure impacting the city, fire hydrants surrounding the apartment complex are unable to be used to extinguish the fire. The water supply failure event also takes place in the middle of a heat wave, whereby the heat index in the city is over 100 degrees Fahrenheit.

Potential Cascading Impacts

Disruption of public water services
Infrastructure failure
Environmental loss
Power disruption
Crop damage / destruction
Illness and disease
Death

Community Lifeline Implications



Resources

[1] City of Athens Water Outage – After Action Summary Memorandum. Ohio Emergency Management Agency. February 27, 2017. PDF.

Mass Casualty - Medical Incident

Hazard Profile

A mass casualty – medical incident involves a significantly large number of casualties as a consequence of an event that does, or has the strong potential to, overwhelm the health care demands of a specific area/community.

A mass casualty – medical incident may vary in its intensity based upon the geographical area (i.e. rural vs. urban) the event takes place, and is dependent upon the preparedness and size of the health care facility(ies) involved in the response to the incident.

Historical Data

In August 2022, at least 14 people in the state had fallen ill due to an outbreak of E. coli (CDC believes this number may be higher and went unreported). No deaths were reported from the outbreak, but at least nine people were hospitalized. E. coli can vary person-to-person and often includes severe stomach cramps, diarrhea, vomiting, and a fever. Symptoms typically begin within three-to-four days after the bacteria is ingested, and some people may have an increased risk of infection. Those who have an increased risk of infection include adults who are 65 years old or older, children younger than 5 years of age, individuals with weakened immune systems, pregnant women, and people who travel to certain countries.[1]

In the winter of 2022/2023, Ohio faced a "tripledemic" that resulted from the overlapping of flu, Respiratory Syncytial Virus (RSV), and COVID-19 outbreaks that were infecting children. The surge of all three illnesses at one time resulted in surges in the pediatric hospitals and medical providers throughout the state. Furthermore, there was an increased risk of picking up multiple infections at once or within a short time of one another. With the increase in pediatric patients falling ill, there was also a supply chain shortage of critical medication.[2]

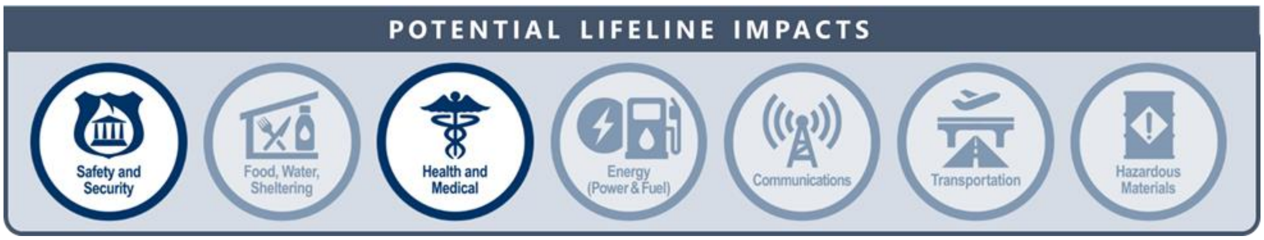
Sample Planning Scenario

A county fair is taking place in a rural part of state, whereby thousands are attending. A few days after the start of the festivities, hundreds of people begin to exhibit signs and symptoms of food borne illness that could be traced back to the food being served at the fair. There is only one hospital in the county, and dozens begin to arrive at the hospital within a short period of time, all exhibiting symptoms of food borne illness. The hospital quickly becomes overrun and places a temporary hold on elective procedures/surgeries in order to focus and preserve personnel and medical supplies in treating the patients who have a food borne illness. Necessary medical supplies are beginning to become extremely low, with multiple doctors and nurses beginning to show signs of fatigue.

Potential Cascading Impacts

Medical service demands & disruption
Panic / fear
Illness / death
First responder health & safety
Mortuary service demands
Adverse psychological effects
Isolation / quarantine
Medical supply shortages

Community Lifeline Implications



References

[1] Information provided by public health partners.
[2] Information provided by public health partners.

Fuel Shortage

Hazard Profile

Fuel shortage is defined as any disruption to the creation, output, and/or distribution of fuel for a prolong period of time that adversely affects the operations of daily life, to include the execution of essential public and private services.

*Note: this does not include natural gas

Historical Data

While there is no historical data in the State of Ohio regarding fuel shortages, there have been recent fuel shortage events that have taken place in other parts of the United States.

On September 9th, 2016, a gas leak was detected from a gas line operated by Colonial Pipeline, forcing a shutdown of the line. The affected gas line ran from Houston, TX up to the state of New Jersey, and provided fuel for an estimated 50 million people along the East Coast. Alabama, Georgia, Tennessee, and the Carolinas were severely affected by the incident, with multiple of these states declaring a state of emergency which caused gasoline prices to surge. Panic buying led to long lines and gas shortages at gas stations.[1] [2] [3]

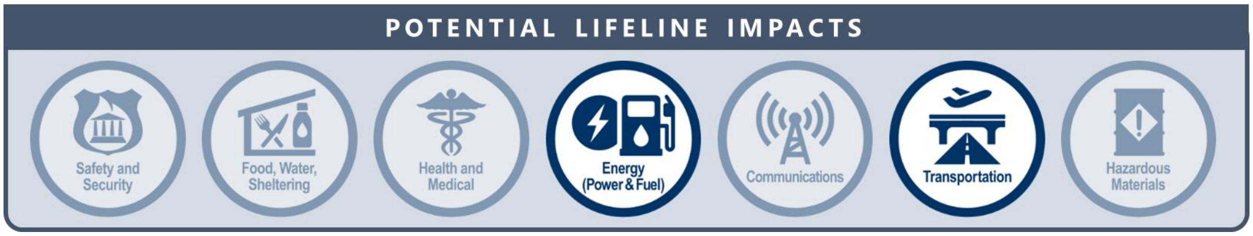
Sample Planning Scenario

Social media posts begin spreading disinformation of an impending shutdown of a gas line will cause gasoline prices to surge and fuel shortages at gas stations. While the information is not true, this generates fear among the public, who begin to rush to gas stations to fuel their vehicles, thus creating long lines and an actual gasoline fuel shortage.

Potential Cascading Impacts

Operation and service disruption
Decrease in fuel supply
Panic / fear
Transportation disruptions
Emergency response disruptions

Community Lifeline Implications



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[1] Graham, David A. "There's Nothing Left in the Tank in the Southeast." The Atlantic. September 20, 2016. https://www.theatlantic.com/news/archive/2016/09/southeastern-gas-shortage/500873/

[2] Riley, Charles. "East Coast faces gas shortages, price hikes after pipeline leak." CNN. September 16, 2016. https://money.cnn.com/2016/09/16/investing/gasoline-prices-shortage-pipeline-leak/

[3] Schmitt, Brad and Melanie Balakit. "Worries lead to long gas lines in Nashville – again." The Tennessean. September 17, 2016. https://www.tennessean.com/story/money/2016/09/17/panic-leads-long-gas-lines-nashville-again/90575330/

Dam / Levee Failure

Hazard Profile

Dam failure is defined as an uncontrolled release of impounded water, while a levee failure occurs when a portion of the levee breaks away allowing water to flood the landward side of the levee structure. Dams in Ohio have been divided into four classes; I, II, III, IV, based upon a downstream threat potential.[1]

The Ohio Department of Natural Resources has identified most dams in the state and categorized each by their impact to residents in the event of failure.

Historical Data

Based on available data, Ohio has recorded minimal property damage as a result of a dam failure and no documentation of instances by which a levee failure resulted in structure or property damage in the state. However, this observation may be due to an issue of incomplete historical data and records not being kept on these instances.[2]

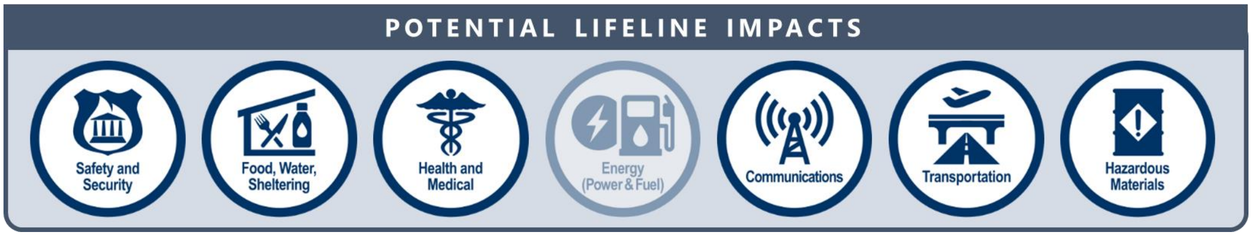
Sample Planning Scenario

Near record spring precipitation, compounded by a series of spring storms, lead to a Class I dam failure upstream of a highly populated area in central Ohio. The inundation area downstream of the dam contains business, residential, commercial, and other uses. There are hundreds of casualties, and property and infrastructure damage totals in the hundreds of millions of dollars. Bridges, culverts, and other stream crossings are destroyed 20 miles downstream of the dam. The event causes significant environmental contamination downstream of the dam and habitat degradation in the reservoir and surrounding park.

Potential Cascading Impacts

Flooding
Search & rescue
Evacuation
Property / structural damage

Community Lifeline Implications



References

[1] "2.6 Dam/Levee Failure." State of Ohio Hazard Mitigation Plan 2019. Pg. 1-91,92,93

[2] "2.6 Dam/Levee Failure." State of Ohio Hazard Mitigation Plan 2019. Pg. 1-98,99

Temperature Extremes

Hazard Profile

Temperature extremes includes any event by which the temperatures are considered to be significantly higher or lower (hotter or colder) than what is considered to be "normal" based on the time of year/season.

While no defined temperature range is used to define a temperature extreme, an indicator that can be used is for extreme heat it is those conditions that are considered to be a "heat wave," while for extreme cold it is those conditions that are considered to be a "polar vortex".

Historical Data

On December 23rd, 2022, a major winter storm impacted the State of Ohio. One of the conditions of this storm was the extreme cold, where temperatures in much of the state were zero or sub-zero, with wind chills being as low as -35 degrees Fahrenheit.[1]

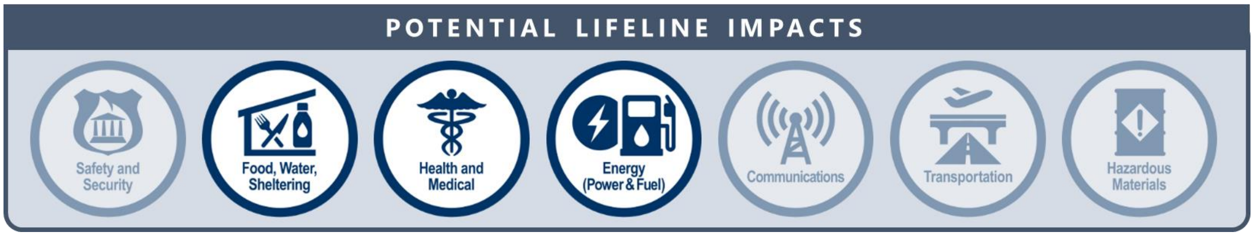
Sample Planning Scenario

A heat wave is impacting significant portions of the state during the month of May. Temperatures are measuring 100 degrees Fahrenheit, with a heat index of 110 degrees Fahrenheit. Several schools that do not have AC units in their buildings close, and there are multiple reports of heat stroke from those who are unable to find shelter from the extreme heat. Cooling centers are stood up, and organizations have begun handing out bottled water to anyone in need. The weather conditions are also fueling forecasted severe storms, where it is reported Ohio is in a moderate to high risk of severe storms that can generate tornados, strong wind, and hail.

Potential Cascading Impacts

Power disruption
Illness / death
Equipment failure / malfunction
Operational and service disruption
Shelter demands
Medical service demands

Community Lifeline Implications



References

[1] "A Major Winter Storm System Impacted The Region In The Days Leading Up to Christmas 2022, Resulting In Blizzard Conditions Across Northeast Ohio." National Weather Service. https://www.weather.gov/cle/event_Christmas_Blizzard_2022

Natural Gas Failure

Hazard Profile

Natural gas failure is defined as any disruption to the creation, output, and/or distribution of natural gas for a prolong period of time that adversely affects the operations of daily life, to include the execution of essential public and private sector services.

*Note: this does not include fuel

Historical Data

In January 2014 (likely beginning in late 2013) a combination of events, to include record-breaking cold temperatures and propane used to dry out corn harvests that caused low inventories of stored propane, led to a propane shortage in multiple states that affected millions of Americans.[1,2] In Ohio, specifically, the propane shortage was the worst in 25 years, causing propane price hikes and caused the rationing and delivery restrictions of propane for homeowners.[3] Propane costs for residential use reached its peak in February 2014 with propane costing $3.73 per gallon, a 31 percent increase from the same time period in 2013.[4] On Saturday, January 18th, 2014, Ohio Governor John Kasich issued a state of emergency declaration to create conditions necessary for the speeding-up of shipments and deliveries in an attempt to ease the burdens on Ohioans who use propane in their homes.[5,6,7]

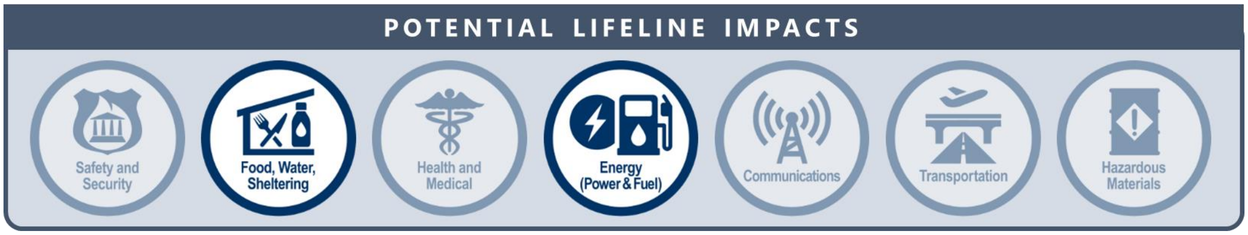
Sample Planning Scenario

A major natural gas line in northwest Ohio burst in the middle of January, forcing a shutdown of the natural gas line. Repairs to the natural gas line are estimated to take at least a week. The shutdown has caused hundreds of homes and businesses to be unable to use natural gas to heat their homes and stoves for cooking. Heating centers and shelters are opened in the region to allow those affected to stay warm.

Potential Cascading Impacts

Loss of heat
Panic / fear
Loss of electricity

Community Lifeline Implications



References

[1] Zawadzki, Sabina and Edward McAllister. "U.S. propane shortage hits millions during brutal freeze." Reuters. January 24, 2014. https://www.reuters.com/article/us-energy-propane-shortage/u-s-propane-shortage-hits-millions-during-brutal-freeze-idUSBREA0N0AB20140124

[2] "The Cause Of The 2014 Propane Shortage And What It Means For You." GASTEC: Propane-Sales & Services. February 12, 2014. https://www.gasteconline.com/cause-2014-propane-shortage-means-2/

[3] Larsen, Dave. "Propane shortage was the worst in past 25 years." Dayton Daily News. April 7, 2014. https://www.daytondailynews.com/news/propane-shortage-was-the-worst-past-years/lf4hge4KWzqXOmZImmxYXO/

[4] Larsen, Dave. "Propane shortage was the worst in past 25 years." Dayton Daily News. April 7, 2014. https://www.daytondailynews.com/news/propane-shortage-was-the-worst-past-years/lf4hge4KWzqXOmZImmxYXO/

[5] Anderson, Kristin. "Ohio propane shortage raises concerns." WKYC Studios. January 20, 2014. https://www.wkyc.com/article/news/local/ohio/ohio-propane-shortage-raises-concerns/95-241866479

[6] Gearino, Dan. "Propane users in Ohio face shortage as cold returns." The Columbus Dispatch. January 19, 2014. https://www.dispatch.com/story/news/environment/2014/01/20/propane-users-in-ohio-face/23773584007/

[7] Tweh, Bowdeya. "State declaration aims to ease propane gas shortage." Cincinnati.com | The Enquirer. January 18, 2014. https://www.cincinnati.com/story/news/2014/01/18/state-declaration-aims-to-ease-propane-gas-shortage/4642109/

OHIO EMERGENCY MANAGEMENT AGENCY

Mass Communications Failure

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Profile

Mass communications failure encompasses the failure of any communications system that significantly impacts the daily activities or operations of government, businesses, organizations, and society as a whole.

*Note: does not include temporary interruptions of communication systems, such as internet connectivity issues of a small sub-set of a population

Historical Data

No historical data is available on this hazard.

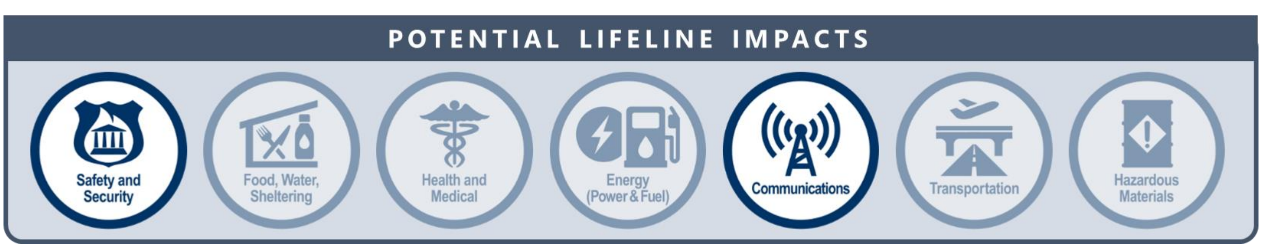
Sample Planning Scenario

An error in the communications system of cellular towers in central Ohio causes the communications towers to become inoperable. This impacts the ability of thousands of individuals, businesses, and organizations that utilize mobile devices in making phone calls, to include emergency calls. Cellular on wheels (COWs) are dispatched to the impacted area, but due to the limited number of COWs available to be used and the geographic region impacted there are still countless individuals and businesses who are unable to communicate.

Potential Cascading Impacts

Operation and service disruption
Supply chain disruption
Emergency response disruption
Alarm systems disruption
Economic loss
Civil unrest

Community Lifeline Implications



High Winds

Hazard Profile

High winds are described as any wind event (excluding tornados) that causes severe or extensive damage to the natural environment and/or physical infrastructure.

An example of what may fall within this hazard is a derecho event.

Historical Data

On June 29th, 2012, virtually the entire state of Ohio was impacted by a derecho event. Wind speeds of over 60 to 80 mph damaged or destroyed trees, power lines, homes, and businesses. Over a million residents in the state lost power as a result of the event, and for many it took over a week before their power was restored. There were reports of injuries due to downed trees and wind-blown debris.[1 2]

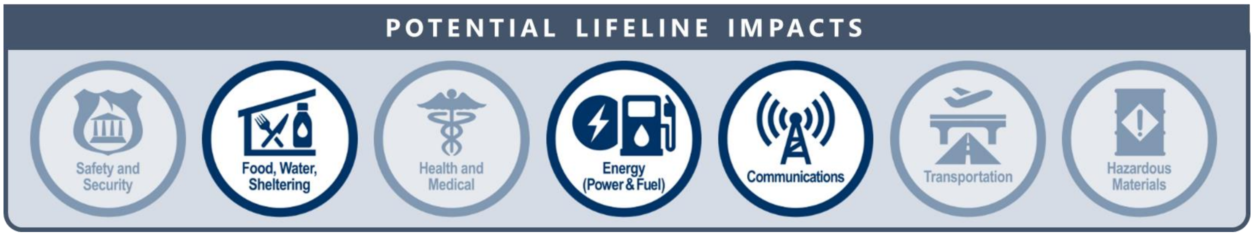
Sample Planning Scenario

A derecho enters the state from the southwest, heading northeast. Wind speeds of over 70 mph are recorded in multiple counties that cause extensive damage to the roofs and sidings of homes and barns, trees are uprooted with some falling onto homes and businesses, and power utility poles are blown over that cause power outages to hundreds of thousands of people. Communication towers are also damaged, which impacts the ability of those who may need emergency assistance to dial 911. Due to the extent of the damage and having impacted multiple counties, resource scarcity in response to the incident becomes an issue.

Potential Cascading Impacts

Emergency services demands
Property / structural damage
Loss of power / communications
Environmental damage
Injury

Community Lifeline Implications



References

[1] "Derecho Event of June 29th, 2012." National Weather Service. https://www.weather.gov/rlx/SVR062912
[2] "The Ohio Valley / Mid-Atlantic Derecho of June 2012." National Oceanic and Atmospheric Administration. https://www.spc.noaa.gov/misc/AbtDerechos/casepages/jun292012page.htm

Invasive Species

Hazard Profile

An invasive species is defined as any living organism that is not native to an ecosystem and causes an adverse effect on the environment, economy, and public health. Furthermore, invasive species are capable of reproducing quickly and rapidly increasing their potential to cause harm.[1]

Historical Data

Of the approximately 2,300 species of plants known to grow in the wild in Ohio, about 78% are native and the other 22% of species (more than 500 in total) are invasive.[2]

An invasive animal species that directly impacts the State of Ohio is that of feral swine. Feral swine are a combination of Eurasian wild boar and domestic swine, and cause damage to natural resources and agricultural crops and property. Feral swine may also carry diseases that impact native wildlife, domestic animals (pets), and humans.[3]

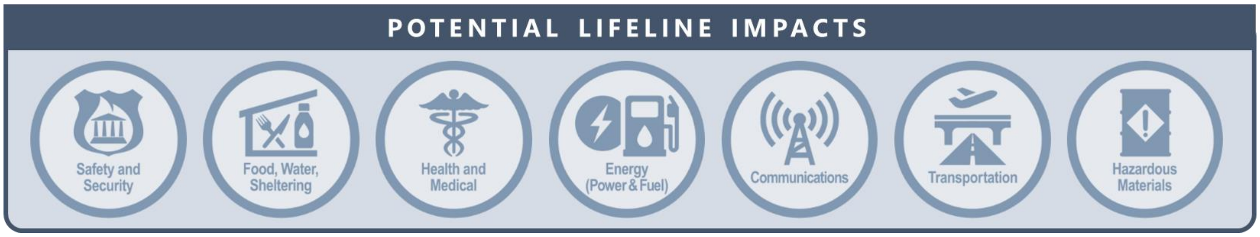
Sample Planning Scenario

An invasive insect from another country is accidently introduced into the environment in the State of Ohio due to being inside containers involved in the state's trade and commerce. The insect feeds on the agricultural crops in the state, and having no known predators, quickly reproduces. The significant increase in the population of the invasive species directly correlates to the significant rise in agriculture crop damage, adversely impacting the state's agriculture economy and food resources.

Potential Cascading Impacts

Agricultural property / crop damage
Economic loss
Environmental loss
Illness / disease

Community Lifeline Implications



Overall impacts to the community lifelines will be minimal depending on the area affected by an invasive species.

References

[1] "Invasive Species." The National Wildlife Federation. https://www.nwf.org/Educational-Resources/Wildlife-Guide/Threats-to-Wildlife/Invasive-Species

[2] "Invasive Plants." Ohio Department of Natural Resources. https://ohiodnr.gov/discover-and-learn/plants-trees/invasive-plants

[3] "Invasive Species: Feral Swine in Ohio." Ohio Department of Natural Resources. https://ohiodnr.gov/discover-and-learn/safety-conservation/wildlife-management/invasive-species/feral-swine

Radiological Incident (non-terrorism; non-nuclear)

Hazard Profile

A radiological incident is classified as any event by which there is a release of radiological material that is non-nuclear nor released as an act of terrorism.

Orphan sources, which are small volumes of radioactive material that are uncontrolled or improperly controlled or dispositioned, are illustrative of what may cause a radiological incident to occur.[1]

Historical Data

On May 15th, 1929, an exposed light bulb ignited nitro-cellulose x-ray film on fire in the main Cleveland Clinic facility. The resulting fire caused 123 deaths, with the cause of death of the majority of the victims being the inhaling of radioactive material of the burning x-ray film.[2]

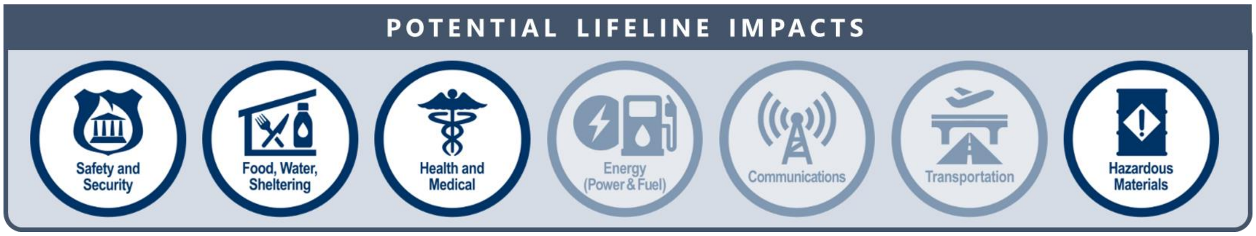
Sample Planning Scenario

A hospital in the state recently closed, with several pieces of medical equipment still being located inside of the abandoned facility. People break into the abandoned hospital in the hopes of stealing some of the left behind items and equipment to sell as scrap metal. Medical equipment that utilizes radioactive material in their operations are stolen, with the radioactive material contained inside the equipment improperly handled. Several individuals begin to show signs of radiation poisoning at varying degrees. Some seek medical attention, while others do not due to being unaware as to the cause of their ailments. Over the course of several days and weeks, people begin to die or have permanent injuries as a result of the improper handling of radioactive material.

Potential Cascading Impacts

Spread of radioactive debris
Environmental damage / loss
Medical service demands
Injury / death
Panic / fear

Community Lifeline Implications



References

[1] "Orphan Sources." United States Nuclear Regulatory Commission. https://www.nrc.gov/materials/miau/miau-reg-initiatives/orphan.html

[2] "Cleveland Clinic Fire." Ohio History Connection. https://ohiohistorycentral.org/w/Cleveland_Clinic_Fire

Landslide

Hazard Profile

A landslide occurs when there is downward movement of land material (soil and rock) on a slope. In Ohio, there are three main types of landslides that occur: rotational slump, earthflow, and rockfall. Factors in Ohio that may impact slope stability and contribute to landslides include: groundwater pressure, soil structure, stream erosion, saturation (snow melt, heavy rains), and earthquakes.[1]

While landslides are virtually non-existent throughout much of the state due to the lack of geological slopes, there are areas of the state, mainly the southern and eastern portions, that do have the geological conditions necessary for landslides to occur.[2]

Historical Data

According to reports, the Cincinnati metropolitan area has one of the highest per capita costs of landslide damage of any metropolitan area in the United States with the city spending half a million dollars annually on emergency repairs caused by landslides.[3]

There has only been one recorded fatality in the state due to a landslide. On December 24th, 1986, the driver of a vehicle traveling on U.S. Route 52 in Lawrence County was killed by falling rock.[4]

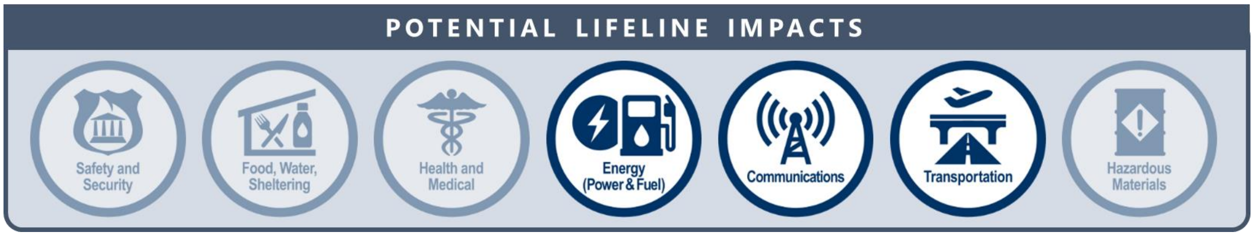
Sample Planning Scenario

Above normal rainfall amounts were recorded in Hamilton County throughout the month of April. Soil moisture as a result of the significant rainfall causes the shale landscape to lose strength and generates landslides on high-grade slopes. The landslides cause damage to roadways and bridges in the area, along with homes that were situated at the base of the affected slopes.

Potential Cascading Impacts

Altered landscape
Property / structure damage
Disruption of infrastructure operations
Environmental loss
Road damage
Debris spread

Community Lifeline Implications



References

[1] "2.5 Landslide." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-79,80

[2] "Landslides." Ohio Department of Natural Resources. https://ohiodnr.gov/discover-and-learn/safety-conservation/geologic-hazards/landslides

[3] "2.5 Landslide." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-83

[4] "Landslides in Ohio." GeoFacts No. 8. Ohio Department of Natural Resources. https://ohiodnr.gov/discover-and-learn/safety-conservation/geologic-hazards/landslides

Land Subsidence

Hazard Profile

Subsidence is the downward shift of the land surface relative to a geological benchmark of the surrounding terrain. While there are several causes for this, in the State of Ohio it is primarily due to abandoned underground mines and karst.

Abandoned underground mines located in the state create open voids under the surface, and factors such as depth of the mine, geological material that makes up both the abandoned mine and land surface, and the mining techniques that were used, may cause the mine to collapse, thus generating a land subsidence.

Karst encompasses terrain such as sinkholes and caves that form natural voids underground that are vulnerable to collapse. When it comes to Ohio, sinkholes are the most prevalent when it comes to karst-induced land subsidence. There are thousands of sinkholes located throughout the state.[1]

Historical Data

According to the Ohio Department of Natural Resources there are 3,606 abandoned underground mines (that are known of), and over thirty active underground mines. Coal mines can range in depth from less than 100 feet from the surface all the way to over 1,000 feet.

Karst terrain encompasses a vast portion of the western third of the state due to glaciers that were moving in the region tens of thousands of years ago. The counties with the most probable karst areas are Brown, Adams, Highland, Seneca, Huron, Erie, Sandusky, and Ottawa.[2]

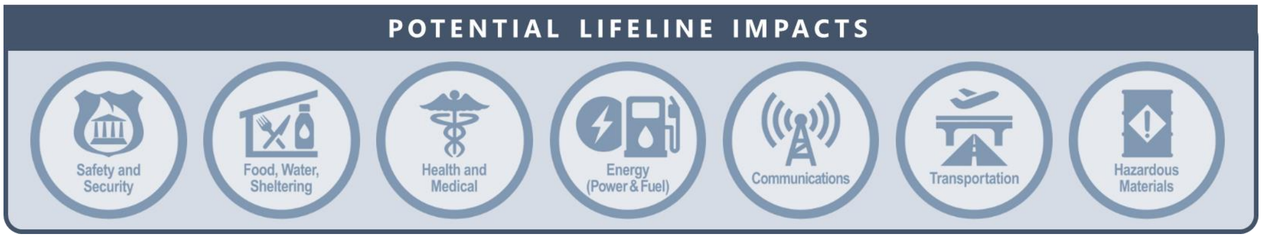
Sample Planning Scenario

Due to years of erosion and landscape changes, the ground above an abandoned underground mine in southeast Ohio collapses. The collapse causes the roadway that was sitting upon the ground to crumble into the newly created sinkhole. First responders respond to the scene whereby the roadway is closed and motorists are diverted to alternate routes.

Potential Cascading Impacts

Altered landscape
Property / structure damage
Disruption in infrastructure operations
Injury
Roadway damage

Community Lifeline Implications



Overall impacts to the community lifelines will be minimal depending on the area affected by land subsidence and manmade structures in that area.

References

[1] "2.14 Land Subsidence." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-201
[2] "2.14 Land Subsidence." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-201, 203

Mass Casualty - Trauma Incident

Hazard Profile

A mass casualty – trauma incident involves a sufficiently large number of individuals with severe physical injuries as a consequence of an event that does, or has the strong potential to, overwhelm the health care demands of a specific area/community.

A mass casualty – trauma incident may vary in its intensity based upon the geographical area (i.e. rural vs. urban) the event takes place, and is dependent upon the preparedness and size of the health care facility(ies) involved in the response to the incident.

Historical Data

On December 23rd, 2022, a severe winter weather event caused several vehicles to lose control due to low visibility and icy road conditions. The incident resulted in a 51-vehicle accident on the Ohio Turnpike, resulting in 4 deaths and 73 injuries. The immediate response took several hours to respond to as the pile-up blocked the eastbound lanes of the Turnpike, and took over 24 hours to clear and reopen the turnpike.[1]

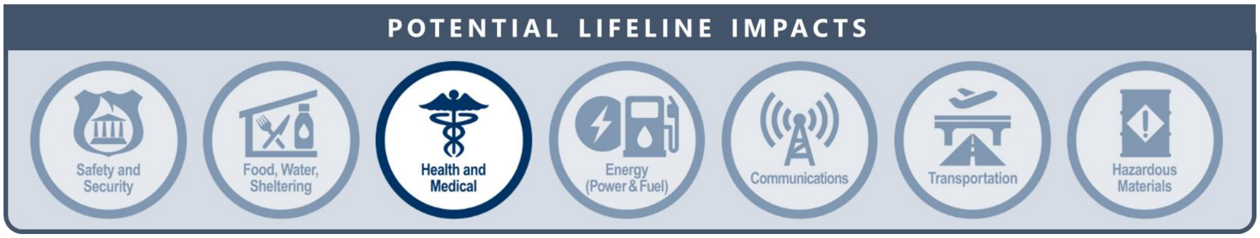
Sample Planning Scenario

During a sold-out college football game, an announcement is made over the public announcement system of a possible active shooter in the area. Immediately after the announcement is made, panic ensues amongst the attendees. Hundreds of people begin to attempt to evacuate the stadium in a disorderly fashion through narrow corridors and stairwells. People are shoved and tripped onto the ground, where they are unable to get back up while people run on top of them. Several people are killed or severely injured as a result of being trampled.

Potential Cascading Impacts

Medical service demands & disruption
Panic / fear
Injury
Mortuary service demands
Adverse psychological effects
Medical supply shortages

Community Lifeline Implications



References

[1] Information provided by public health partners.

Wildfire

Hazard Profile

A wildfire is any uncontrolled fire with extensive size and speed in a combustible vegetative area. In Ohio, wildfire season typically starts in the spring before vegetation has "greened-up", and in the fall due to a buildup of dead foliage on the ground. The danger of wildfires is that they are unpredictable, especially when weather conditions are warm, dry, and windy and the topography of the area is uneven.[1]

The Ohio Department of Natural Resources - Division of Forestry has a "Fire Management Program" webpage, whereby information such as open burning regulations, online wildfire reporting, and wildfire prevention can be found. The link to the webpage is https://ohiodnr.gov/discover-and-learn/safety-conservation/about-ODNR/forestry/fire-management-program .

Historical Data

There is an annual average of 800 wildfires that burn 4,000 to 5,000 acres of forest and grassland within the Ohio Department of Natural Resources (ODNR), Division of Forestry's forest fire protection district. The forest fire protection district corresponds mostly to the state's unglaciated hill country (southern and eastern Ohio), and also encompasses a section of northwest Ohio.[2]

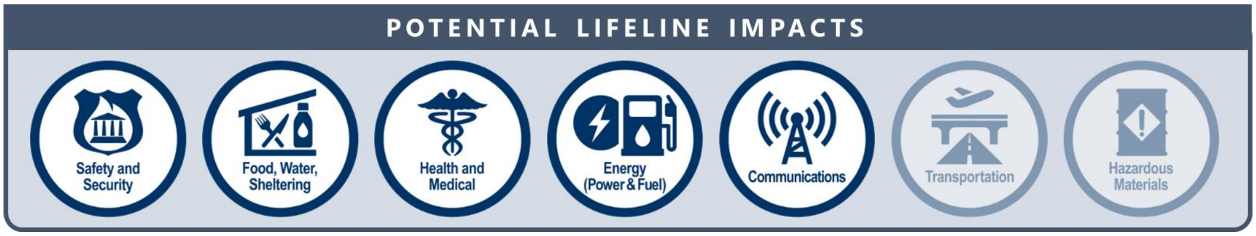
Sample Planning Scenario

At a campsite in southeast Ohio during the autumn months, a campfire that was not properly extinguished catches the surrounding forested area on fire. Lower-than-average precipitation, drought conditions, and the collection of dead leaves allows for the fire to consume over 500 acres of land in a short period of time. The fire moves through private and state-managed lands, resulting in local fire departments and ODNR fire personnel to respond to the scene of the wild fire. One firefighter suffers severe dehydration, and another firefighter suffers a shoulder injury as a result of a heavy tree branch falling on them. In total, hundreds of acres of forested land, several residential and commercial facilities, and public and private parks are damaged or destroyed.

Potential Cascading Impacts

Smoke
Structure damage
Evacuation
Crop damage
Infrastructure damage

Community Lifeline Implications



References

[1] "2.7 Wildfire." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-114
[2] "2.7 Wildfire." State of Ohio Hazard Mitigation Plan 2019. Pg. 2-114

Civil Disturbance

Hazard Profile

A civil disturbance is any event in which acts of violence and / or disregard for established laws, codes, and statutes are carried out by a mass group of individuals. Examples of what would classify as a civil disturbance incident are riots, public nuisances, and illegal demonstrations.

*Note: Civil disturbance does not include public demonstrations / protests that are carried out in-line with established laws, codes, and statues, to include the First Amendment of the United States Constitution.

Historical Data

Starting in May 2020, civil disturbance activities commenced in Columbus, OH as an extension of civil unrest events taking place nationwide. The activities were centered primarily in downtown Columbus (to include Capitol Square), the Short North, and the South Side. Dozens of businesses, residential complexes, and government facilities were vandalized and looted. The civil unrest was met with a significant police presence in attempting to restore public order.[1]

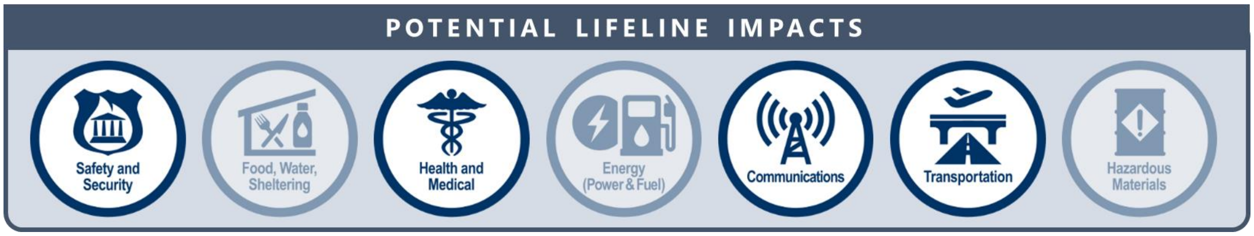
Sample Planning Scenario

A large demonstration is being held in a major metropolitan area in the state, whereby over a thousand individuals are present for the protest. What began as a lawful protest quickly becomes a civil disturbance event, as some of the individuals present begin vandalizing buildings and property. Law enforcement respond to the scene of the protest in riot gear, and cordon off the area in an attempt to limit the spread of the illegal activities and protect the general public. The city government issues an evening curfew as a means to curtail the civil unrest, but this only escalates tensions further.

Potential Cascading Impacts

First responder demands
Injury
Fear / panic
Property damage
Social media response
Medical service demands
Communications / transportation disruption
Increases in public distrust of government

Community Lifeline Implications



References

[1] Information provided by law enforcement partners.

Criminal Activity

Hazard Profile

Criminal activity is any criminal act that violates local, state, or federal law. Criminal offenses can range from shoplifting to murder.

For the purposes of the HIRA, the scope of criminal activity will be focused on crimes that effect multiple victims and / or threaten to impact multiple victims.[1]

Historical Data

An active shooter event occurred on August 4th, 2019 in the Oregon District located within Dayton, OH. The shooter, Connor Betts, fired over 41 times near the entrance of Ned Peppers Bar, killing nine people and wounding 27 others. Betts was fatally shot by responding police officers 32 seconds after the first shots were fired.[2 3 4]

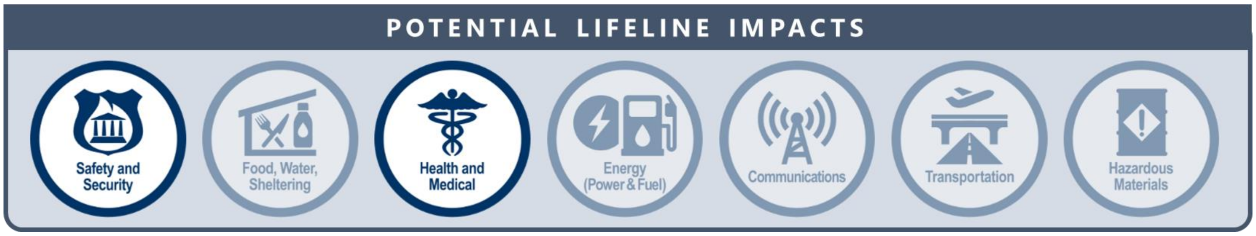
Sample Planning Scenario

A dispatch center begins receiving multiple emergency calls reporting an active shooter at a large, popular mall located within a major metropolitan area in the state. Dispatchers filter numerous calls, some reporting multiple shooters, some reporting a single shooter. Police officers from multiple law enforcement agencies respond and begin entering the mall to eliminate the threat and protect the public. A single gunman is located on the second floor of the mall and is neutralized. Law enforcement personnel begin to secure the rest of the mall for possible additional threats as well as evacuating multiple wounded.

Potential Cascading Impacts

First responder demands
Injury / death
Property / structure damage
Service disruptions
Medical service demands
Panic

Community Lifeline Implications



References

[1] Information provided by law enforcement partners.
[2] Sewell, Dan and John Seewer. "Police Divided on Whether Dayton Gunman Targeted Sister." NBC. August 13, 2019. https://www.nbcbayarea.com/news/national-international/dayton-gunman-deadly-mass-shooting/150723/
[3] "Police: Dayton gunman fired at least 41 shots in 30 seconds, killing 9." WLWT5. August 6, 2019. https://www.wlwt.com/article/police-dayton-gunman-fired-at-least-41-shots-in-30-seconds-killing-9/28599430
[4] Morse, Caroline. "Dayton police stopped Oregon District shooting in 32 seconds." WDTN-2News. August 3, 2022. https://www.wdtn.com/news/oregon-district-shooting/dayton-police-stopped-oregon-district-shooting-in-32-seconds/

Transportation Incident / Accident

Hazard Profile

A transportation incident / accident involves any mode of transportation, which includes, but is not limited to, motor vehicles, rail, aircraft, and boats/ships, that is involved in an accident due to a natural, technological, or human-caused event.

Events classified as a transportation incident / accident do not have to cause casualties/fatalities, only so long as the mode of transportation is damaged or destroyed as a result of the incident.

Historical Data

Transportation incidents / accidents are a common occurrence in the State of Ohio.

A notable historical event was the November 10th, 2015 plan crash that took place in Akron, OH. A corporate jet was on approach into Akron Fulton International Airport, where it lost control and crashed into power lines and an apartment building. All nine passengers and crew of the aircraft were killed in the crash, but due to none of the tenants of the apartment being in the building at the time of the crash there were no injuries or fatalities from those who may have been in the building. Due to the destruction of the apartment building, the tenants lost all of their personal belongings.[1]

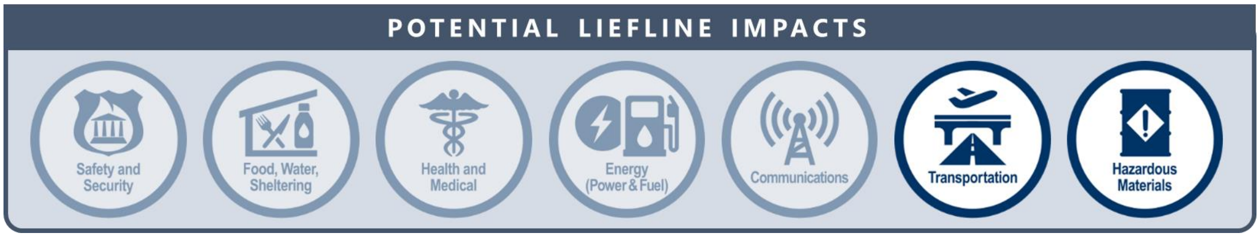
Sample Planning Scenario

A severe winter storm impacts the state. There are white-out conditions and ice-covered roadways on a major highway. The conditions cause a 30-vehicle pile-up, causing an extensive traffic jam on the highway and the closure of the roadway. First responders are having difficulty in reaching the accident scene due to the weather conditions and the traffic jam. There are individuals who were involved in the multi-vehicle incident who are injured and are being subjected to the extreme cold and heavy snowfall. Vehicles who are stuck on the roadway begin to run out of fuel, thus causing people to be unable to stay warm in their vehicle.

Potential Cascading Impacts

Traffic disruption
Impeded emergency response
Stranded persons / vehicles
Injury / death

Community Lifeline Implications



References

[1] Botelho, Greg and Steve Almasy. "Akron plane crash: Shock, horror after plane slams into apartment building." CNN. November 12, 2015. https://www.cnn.com/2015/11/11/us/akron-ohio-plane-crash/index.html

Transportation Infrastructure System Failure

Hazard Profile

Transportation infrastructure systems are defined as those by which modes of transportation utilize, which includes, but not limited to, roadways, airstrips, and waterways. Failure of bridges located throughout the state would also fall under this hazard.

Historical Data

At appropriately 5pm on December 15th, 1967, the Silver Bridge collapsed into the Ohio River, causing 31 vehicles to fall into the river and killing 46 people. The 2,200-foot bridge connected Gallipolis, OH to Point Pleasant, WV, and when it opened in 1928 it was the first bridge to utilize an eyebar-link suspension system.[1 2]

The design of the bridge utilized a single chain on each side of the bridge's span, as opposed to multiple for redundancy. Following the collapse, it was found that there was a stress fracture in one of the links that cascaded into the entire failure of the bridge.[3]

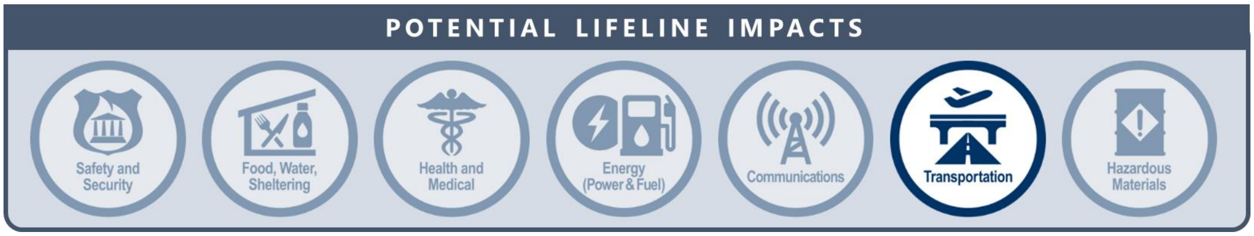
Sample Planning Scenario

A decades-old roadway bridge near an urban area encounters a structure failure and collapses. Multiple vehicles were on the bridge at the time of the collapse and fall nearly 50 feet into the river below. First responders are dispatched to the scene, whereby the roadway on either side of where the bridge was located is closed off and traffic is diverted away from the area. Search and rescue teams attempt to reach those individuals trapped in their vehicles in the river. Multiple injuries and fatalities are reported.

Potential Cascading Impacts

Infrastructure operation disruption
Traffic disruption
Supply chain disruption
Economic loss
Vehicle accidents
Injury / death

Community Lifeline Implications



References

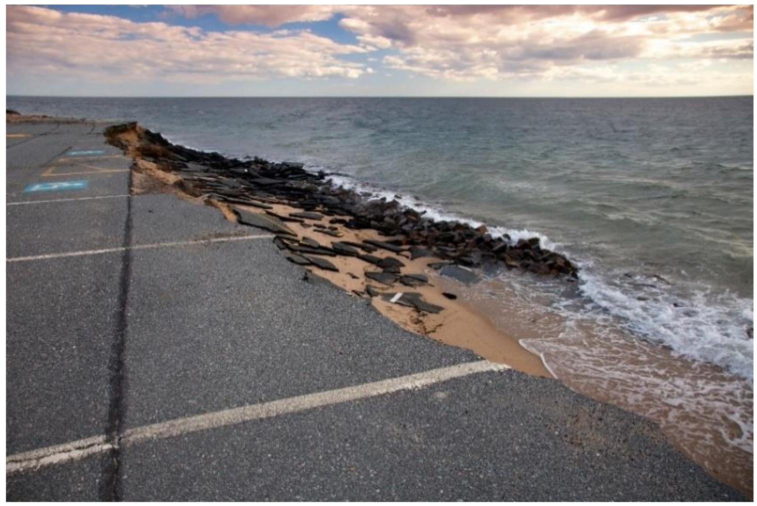
[1] "WVDOT marks 55th anniversary of the Silver Bridge collapse, remembers those who lost their lives." West Virginia Department of Transportation. December 15, 2022. https://transportation.wv.gov/communications/PressRelease/Pages/WVDOT_marks_55th_anniversary_of_the_Silver_Bridge_collapse_remembers_those_who_lost_their_lives.aspx#:~:text=Fifty%2Dfive%20years%20ago%20today,hour%20traffic%2C%20killing%2046%20people.

[2] "The Silver Bridge Collapses Killing 46: December 15, 1967." West Virginia Public Broadcasting. December 15, 2020. https://wvpublic.org/the-silver-bridge-collapses-killing-46-december-15-1967/

[3] "WVDOT marks 55th anniversary of the Silver Bridge collapse, remembers those who lost their lives." West Virginia Department of Transportation. December 15, 2022. https://transportation.wv.gov/communications/PressRelease/Pages/WVDOT_marks_55th_anniversary_of_the_Silver_Bridge_collapse_remembers_those_who_lost_their_lives.aspx#:~:text=Fifty%2Dfive%20years%20ago%20today,hour%20traffic%2C%20killing%2046%20people

Coastal Erosion

Hazard Profile



Coastal regions are continually being reshaped due to waves, ice, and gravity continually reshaping the land-water interface. The erosion of the shore is a natural process, and the rate by which erosion takes place is influenced by multiple factors to included, but not limited to, geological material, fluctuations in the water level, duration of storms and precipitation, the orientation of the shoreline, and mitigative protective measures implemented.

When it comes to the State of Ohio, the land surrounding Lake Erie is affected by coastal erosion. Erosion that takes place is site-specific depending on local conditions and weather patterns and are impacted by different processes and rates.

While the process of coastal erosion cannot be stopped entirely, mitigative efforts can be implemented to alleviate the rate and impacts of erosion.[1]

Historical Data

No historical information is available for his hazard.

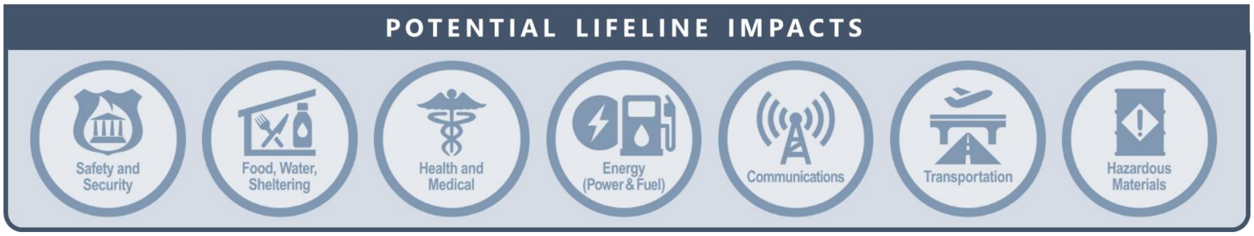
Sample Planning Scenario

Erosion has gradually taken place along the Lake Erie shoreline near a historical building located on a bluff. Over time, the bluff is gradually washed away as a result of heavy rain events, lake water level fluctuations, and storm waves. The historical building is at risk of falling into Lake Erie if protective measures aren't taken.

Potential Cascading Impacts

Change in landscape
Road damage
Property / structural damage
Environmental loss

Community Lifeline Implications



Overall impacts to the community lifelines will be minimal depending on the area affected by coastal erosion and manmade structures in that area.

References

[1] "Lake Erie Erosion." Ohio Department of Natural Resources. https://ohiodnr.gov/discover-and-learn/land-water/lake-erie-watershed/le-coastal-erosion

Seiche/Coastal Flooding

Hazard Profile

Seiches are standing waves in a body of water that may result in coastal flooding. In the State of Ohio, the most common cause of a seiche is a strong and constant wind blowing over a water's surface that forces the water to accumulate at the down-wind shore. When the wind diminishes, the water level will begin to return to its original equilibrium across the entire body of water. Often referred to as the "bathtub effect", seiches cause the water levels to rise and fall along the shorelines until equilibrium is restored.

Areas surrounding Lake Erie are highly susceptible to seiche / coastal flooding, with the counties that sit along the lake (Lucas, Ottawa, Sandusky, Erie, Lorain, Cuyahoga, Lake, and Ashtabula) being impacted the most from this hazard.[1]

Historical Data

On December 23rd, 2022 a severe winter storm impacted the State of Ohio. Sustained winds of over 50 knots occurred over the surface of Lake Erie, creating historic low water levels on the western portion of the lake (i.e. Toledo) while the eastern side of the lake (i.e. Buffalo, NY) encountered damaging coastal flooding and large waves. Based on data from the National Weather Service, the water level in Toledo was as low as 7 to 8 feet below that of the low water datum (over one foot below the previous record), and the water level in Buffalo, NY was as high as 10 to 11 feet above the low water datum.[2]

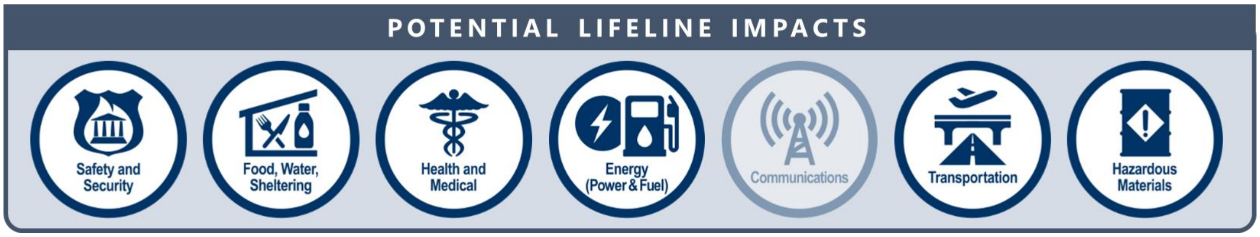
Sample Planning Scenario

A severe summer storm impacts northern portions of Ohio, bringing with it high wind conditions. Strong and consistent winds over a period of several hours over Lake Erie causes the development of a seiche. Water is pulled from the western portion of the lake towards it eastern portion, causing significant and damaging coastal flooding along the shoreline in the eastern portions of the lake.

Potential Cascading Impacts

Change in landscape
Road damage
Property / structural damage
Environmental loss

Community Lifeline Implications



References

[1] "2.8 Storm Surge / Seiche / Coastal Flooding". State of Ohio Mitigation Plan 2019. Pg. 2-131, 132

[2] "A Major Winter Storm System Impacted the Region in the Days Leading Up to Christmas 2022, Resulting in Blizzard Conditions Across Northeast Ohio." National Weather Service. https://www.weather.gov/cle/event_Christmas_Blizzard_2022