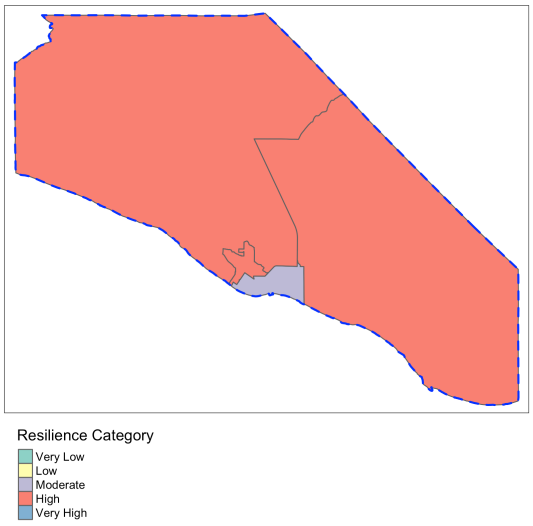
County-Level Risk Assessment: Massac

Census Tracts within Massac



Basic Statistics

Table 1: Basic Statistics (County level)

Information	Value
Population	14041 persons
Area sq. miles	237.6 sqm
Gross Density(persons/sq mil)	59 p/sqm
Avg HH Size	2.44 persons
Median HH Income	51195 USD

Count of Tracts in each Category

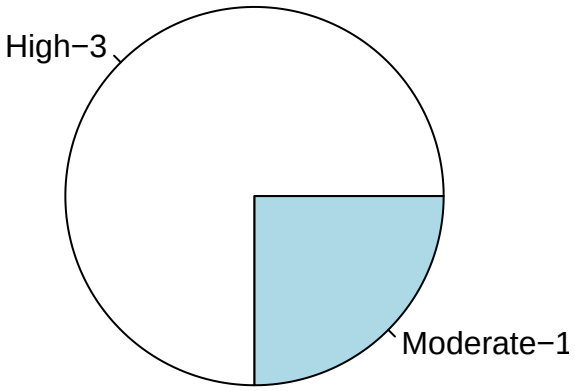
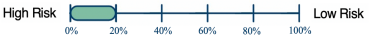
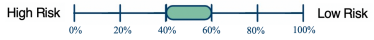


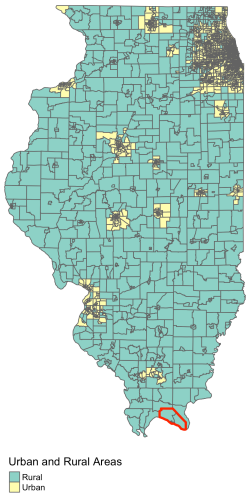
Table 2: Percentage of Census Tracts under each Resilience Category(County level)

Very High	High	Moderate	Low	Very Low
0	75	25	0	0

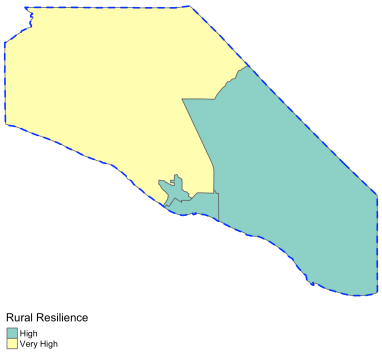
Indicator Group Rankings

Indicator Group	High Risk Areas	Low Risk Areas
Community 	Young percent, Old percent, Elderly growth percent, Percent AssistanceNeed, Physically Unhealthy Days, COVID-19 death rate, Percent Food Insecure, Percent rural	Females Percent, FemaleHeaded HHs Percent, Educated percent, PrimeWorkingAge percent, Food Environment Index, Percent Exercise Access, Percent Vaccinated, Social Association Rate
Economy 	UnstableEmployment Percent, LowIncome Percent, Arts LQ, Percent Children in Poverty, Gender Pay Gap, Percent income required for childcare expenses, CommuteTime, Recreation related business rate	poverty, Unemployment percent, Service LQ, Sales LQ, construction LQ, Retail LQ, Transport LQ, Info LQ, Management, Others, Walkability Score, Civic related business rate, Education related business rate, Healthcare related business rate
Housing 	OldHomes, Vacancy, MobileHomes, Overcrowding, Percent HousingProblems	Homewownership, NewHomes, Cost IncomeRatio, Segregation Index
Environment 	Avg temp, Max temp, Min temp, Precipitation, std sandandgravel prim pop ln, Radon.x	NO21, O3, PCT IRRIGATED ACRES ln, pct manure acres ln, pct harvested acres ln, fungicide ln, herbicide ln, insecticide ln, std coal prim pop ln, std metal prim pop ln, std nonmetal prim pop ln, Per TotPopSS.x, D303 Percent ln, CaAve ln, Kave ln, NO3Ave.x, SO4Ave ln, W HG ln, W NO3 ln, W NO2 ln
Infrastructure 	Percent PoorCondition Bridges, Percent commuters by transit	Percent BroadbandAccess, Percent MediumFairCondition Bridges

Census Tracts within Massac

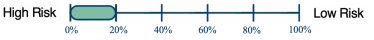
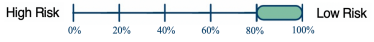


Rural Resilience within Massac

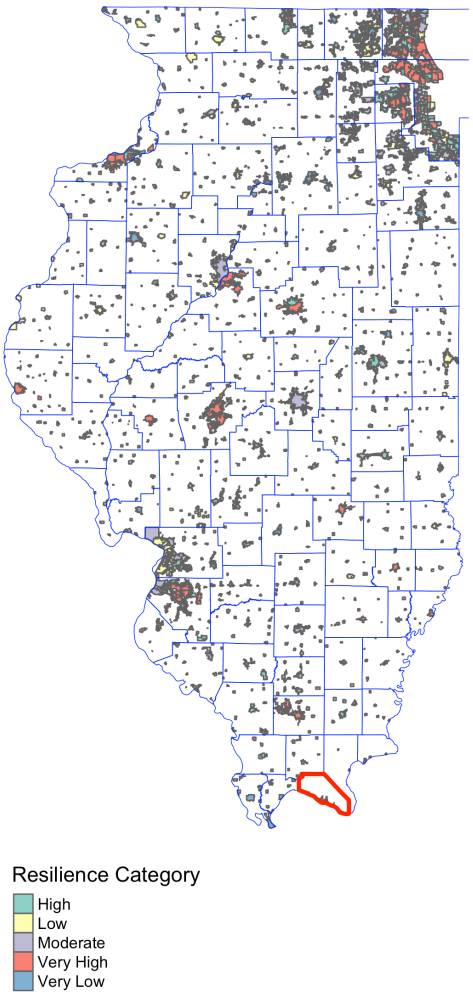


Settlement Types

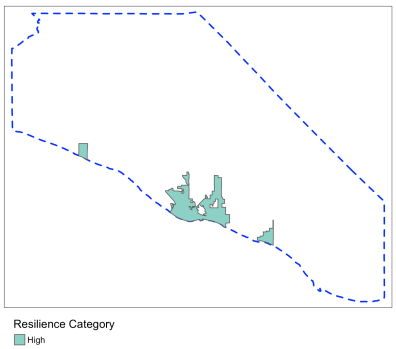
Rural Indicator Rankings

Indicator Group	High Risk Areas	Low Risk Areas
Community 	Young percent, NotMarried Percent, Avg HHsize, Percent AssistanceNeed, Physically Unhealthy Days, COVID-19 death rate, Percent Food Insecure, Percent rural	Females Percent, Educated percent, PrimeWorkingAge percent, Food Environment Index, Percent Exercise Access, MentalHealth Provider Rate, Percent Vaccinated, Social Association Rate
Economy 	UnstableEmployment Percent, LowIncome Percent, PT LQ, Arts LQ, GINI Index, Percent Children in Poverty, Gender Pay Gap, Percent income required for childcare expenses, CommuteTime, Recreation related business rate	poverty, WorkNearby percent, MBS LQ, Service, construction LQ, Transport LQ, Walkability Score, Civic related business rate, Education related business rate, Healthcare related business rate
Housing 	Total, OldHomes, Units SingleFamily, MobileHomes, Percent HousingProblems	Homewownership, NewHomes, Segregation Index
Environment 	Precipitation, std sandandgravel prim pop ln, Radon.x	Avg Temp, Max Temp, Min Temp, PCT IRRIGATED ACRES ln, pct manure acres ln, pct harvested acres ln, fungicide ln, herbicide ln, insecticide ln, Per TotPopSS.x, D303 Percent ln, CaAve ln, Kave ln, NO3Ave.x, SO4Ave ln, W NO3 ln, W NO2 ln
Infrastructure 	Percent PoorCondition Bridges, Percent commuters by transit	Percent BroadbandAccess, Percent MediumFairCondition Bridges

State-Level Places Map



Places Map within Massac County, IL



Count of Places in each Category

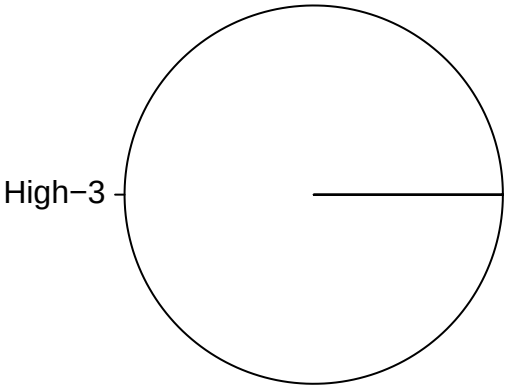
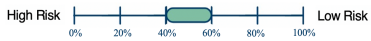


Table 5: Percentage of Census Tracts under each Resilience Category(County level)

Very High	High	Moderate	Low	Very Low
0 %	100 %	0 %	0 %	0 %

Places Indicator Rankings

Indicator Group	High Risk Areas	Low Risk Areas
Community 	Young percent, Old percent, NotMarried Percent, Physically Unhealthy Days, COVID-19 death rate, Percent Food Insecure, Percent rural	Females Percent, Educated percent, PrimeWorkingAge percent, Food Environment Index, Percent Exercise Access, MentalHealth Provider Rate, Percent Vaccinated, Social Association Rate
Economy 	LowIncome Percent, PT LQ, Arts LQ, GINI Index, Percent Children in Poverty, Gender Pay Gap, Percent income required for childcare expenses, CommuteTime, Vice related business rate, Recreation related business rate	MHHI, poverty, Service LQ, Sales LQ, construction LQ, Transport LQ, Management, Others, Walkability Score, Civic related business rate, Education related business rate, Healthcare related business rate
Housing 	OldHomes, Rented, Vacancy, Units SingleFamily, MobileHomes, Percent HousingProblems	Homewownership, NewHomes, Renter MHHI, Segregation Index
Environment 	Precipitation, std sandandgravel prim pop ln, Radon.x	Avg Temp, Max Temp, Min Temp, PCT IRRIGATED ACRES ln, pct manure acres ln, pct harvested acres ln, fungicide ln, herbicide ln, insecticide ln, Per TotPopSS.x, D303 Percent ln, CaAve ln, Kave ln, NO3Ave.x, SO4Ave ln, W NO3 ln, W NO2 ln
Infrastructure 	Percent PoorCondition Bridges, Percent commuters by transit	Percent BroadbandAccess, Percent MediumFairCondition Bridges

Relevant Resources

The following represent key areas of concern (in order of importance) at the county level:
- **Infrastructure**
- **Housing**

The resources below have been extracted from the Disaster Planning Library to facilitate planning for high-risk areas observed through the assessment. Please go through the following tools as a starting point for your planning process and feel free to search the Disaster Planning Library for further information, if required. The resources here are included to facilitate the process of hazard mitigation planning, through the Planning for a Purpose Model of Illinois Extension (see Toolkit).

Infrastructure

Green Infrastructure

- **Green Infrastructure: Smart Conservation For The 21st Century**
  Organization : Renewable Resources Journal
  Year : 2002
  Document_type : General Resource/ Foundational Research, Planning Tool
  Disasters : Flood, Man-Made Disasters
  Abstract : "Green infrastructure" is a term becoming more commonly used among natural resource professionals. While it means different things to different people, depending on the context in which it is used, for the purposes of this article, green infrastructure is an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations. Green infrastructure is the ecological framework needed for environmental, social and economic sustainability- our nation's natural life support system. Planning utilizing green infrastructure differs from conventional open space planning because it looks at conservation values in concert with land development, growth management and built infrastructure planning. This article introduces green infrastructure as a strategic approach to land conservation that addresses the ecological and social impacts of sprawl and the accelerated consumption and fragmentation of open land. It describes the concept and value of green infrastructure and presents seven principles for successful green infrastructure initiatives.
  Plan_Components : Planning Processes

- **Mitigation Assistance: Building Resilient Infrastructure And Communities**
  Organization : FEMA
  Year : 2022
  Document_type : Policy
  Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Man-Made Disasters, Biological Disasters, Soil Erosion/Landslides
  Abstract : The purpose of this policy is to establish the framework and requirements for BRIC while allowing flexibility to promote continuous program improvement through priorities and criteria set forth in the annual Notice of Funding Opportunity (NOFO). The BRIC program is designed to promote a national culture of preparedness and public safety through encouraging investments to protect the nation's communities and infrastructure and through strengthening national mitigation capabilities to foster resilience.
  Plan_Components : Strategies, Funding Mechanisms

- **What Is Green Infrastructure?**
  Organization : EPA
  Year : 2022
  Document_type : Web-based Resource, Manual for an Local Organization

Disasters : Flood, Drought, Extreme Weather
Abstract : Description of green infrastructure with examples of different types of green infrastructure.
Plan_Components : Strategies

- **Green Infrastructure Modeling Tools**
  Organization : EPA
  Year : 2022
  Document_type : General Resource/ Foundational Research, Web-based Resource, Planning Tool
  Disasters : Flood, Extreme Weather
  Abstract : Modeling tools support planning and design decisions on a range of scales from setting a green infrastructure target for an entire watershed to designing a green infrastructure practice for a particular site.
  Plan_Components : Strategies, Tools, Green Infrastructure

- **Overcoming Barriers To Green Infrastructure**
  Organization : EPA
  Year : 2022
  Document_type : General Resource/ Foundational Research, Web-based Resource
  Disasters : Flood, Drought
  Abstract : Communities across the country are experiencing the benefits of green infrastructure. They have adopted performance standards or incentives promoting green infrastructure while others have built demonstration projects. Here we identify some of the barriers to adopting green infrastructure approaches and suggest strategies to overcome them.
  Plan_Components : Strategies, Green Infrastructure

- **Operation And Maintenance Of Green Infrastructure Receiving Runoff From Roads And Parking Lots**
  Organization : EPA
  Year : 2016
  Document_type : General Resource/ Foundational Research, Manual for an Local Organization
  Disasters : Flood
  Abstract : Operation and maintenance is a challenge that when not addressed properly can lead to failure of green infrastructure and high costs associated with restoration. This memorandum addresses common operation and maintenance questions and provides recommendations for evaluating the need and providing maintenance for green infrastructure, specifically bioretention and bioswales, that serves highly impervious roadways and parking lots.
  Plan_Components : Strategies, Tools, Green Infrastructure

- **Green Infrastructure Funding Opportunities**
  Organization : EPA
  Year : 2022
  Document_type : Web-based Resource, Funding Opportunities
  Disasters : Flood, Extreme Weather, Soil Erosion/Landslides
  Abstract : Federal funding sources and funding resources from the EPA for green infrastructure
  Plan_Components : Funding Mechanisms, Tools

- **Green Infrastructure Grant Opportunities**
  Organization : Illinois EPA
  Year : 2021
  Document_type : Web-based Resource, Funding Opportunities
  Disasters : Flood, Drought, Soil Erosion/Landslides
  Abstract : The new Green Infrastructure Grant Opportunities (GIGO) Program funds projects to construct green infrastructure best management practices (BMPs) that prevent, eliminate, or reduce water quality impairments by decreasing stormwater runoff into Illinois' rivers, streams, and lakes.

Projects that implement treatment trains (multiple BMPs in a series) and/or multiple BMPs within the same watershed may be more effective and efficient than a single large green infrastructure BMP.
Plan_Components : Funding Mechanisms, Green Infrastructure

- **Managing Wet Weather With Green Infrastructure Municipal Handbook Funding Options**
  Organization : EPA
  Year : 2008
  Document_type : Manual for an Local Organization, Funding Opportunities
  Disasters : Flood
  Abstract : The Municipal Handbook is a series of documents
  to help local officials implement green infrastructure in their communities. This chapter identifies and discusses the two most common funding options communities are using for green stormwater infrastructure – stormwater fees and loan programs.
  Plan_Components : Strategies, Funding Mechanisms, Case Studies, Green Infrastructure

- **Managing Wet Weather With Green Infrastructure Municipal Handbook Green Infrastructure Retrofit Policies**
  Organization : EPA
  Year : 2008
  Document_type : Planning Tool, Manual for an Local Organization, Policy
  Disasters : Flood
  Abstract : The Municipal Handbook is a series of documents to help local officials implement green infrastructure in their communities. This chapter is about creating policies for green infrastructure.
  Plan_Components : Strategies, Planning Processes, Tools, Green Infrastructure

- **Managing Wet Weather With Green Infrastructure Municipal Handbook Green Streets**
  Organization : EPA
  Year : 2008
  Document_type : Planning Tool, Manual for an Local Organization, Policy
  Disasters : Flood
  Abstract : The Municipal Handbook is a series of documents
  to help local officials implement green infrastructure in their communities. This chapter looks at green streets.
  Plan_Components : Strategies, Green Infrastructure

- **Managing Wet Weather With Green Infrastructure Municipal Handbook Rainwater Harvesting Policies**
  Organization : EPA
  Year : 2008
  Document_type : Planning Tool, Manual for an Local Organization, Example Ordinances and Codes
  Disasters : Flood, Drought
  Abstract : The Municipal Handbook is a series of documents
  to help local officials implement green infrastructure in their communities. This chapter looks at rainwater harvesting
  Plan_Components : Strategies, Case Studies, Tools, Green Infrastructure

- **Managing Wet Weather With Green Infrastructure Municipal Handbook Incentive Mechanisms**
  Organization : EPA
  Year : 2009
  Document_type : Planning Tool, Manual for an Local Organization, Example Ordinances and Codes, Funding Opportunities
  Disasters : Flood

Abstract : The Municipal Handbook is a series of documents
to help local officials implement green infrastructure in their communities.
This chapter looks at incentive mechanisms
Plan_Components : Funding Mechanisms, Case Studies, Green Infrastructure

- **Green Infrastructure Modeling Toolkit**
  Organization : EPA
  Year : 2022
  Document_type : Web-based Resource
  Disasters : Flood, Drought
  Abstract : EPA has developed innovative models, tools, and technologies for communities to manage water runoff in urban and other environments. The resources in this toolkit incorporate green or a combination of green and gray infrastructure practices to help communities manage their water resources in a more sustainable way, increasing resilience to future changes.
  Plan_Components : Tools, Green Infrastructure

- **Green Infrastructure Methods**
  Organization : EPA
  Document_type : General Resource/ Foundational Research, Funding Opportunities
  Disasters : Flood, Drought
  Abstract : FEMA is encouraging communities to incorporate methods to mitigate the impacts of climate change into eligible Hazard Mitigation Assistance (HMA) funded risk reduction activities by providing guidance on mitigating flood and drought conditions.
  Plan_Components : Strategies, Funding Mechanisms, Tools, Green Infrastructure

- **Equity Guide For Green Stormwater Infrastructure Practitioners**
  Organization : Greenprint Partners
  Year : 2022
  Document_type : General Resource/ Foundational Research, Planning Tool, Manual for an Local Organization, Policy
  Disasters : Flood, Drought
  Abstract : The Equity Guide for Green Stormwater Infrastructure Practitioners is a resource developed by and for green infrastructure program managers representing local public sector stormwater management organizations across the United States and Canada. It offers an action and evaluation roadmap that defines: our industry's shared long-term equity goals, best practices that will move the needle, and sample metrics that help us track progress toward those goals over time. It also offers a variety of tools to support practitioners in customizing community- informed equity work plans and evaluation plans to local
  contexts
  Plan_Components : Surveys/Assessments, Strategies, Planning Processes, Tools, Green Infrastructure, Information

- **Cape Cod Green Infrastructure Guide**
  Organization : Tufts University
  Year : 2015
  Document_type : General Resource/ Foundational Research, Web-based Resource
  Disasters : Flood
  Abstract : In 2015, this Green Infrastructure Guide was developed by Tufts University graduate students in the Water: Systems, Science & Society program to provide accessible opportunities for stakeholders and the public to learn about green technologies and the unique benefits they offer.
  Plan_Components : Green Infrastructure, Information

- **Professional Practice Green Infrastructure: Constructed Wetlands**
  Organization : American Society of Landscape Architects

Document_type : General Resource/ Foundational Research, Web-based Resource
Disasters : Flood
Abstract : Constructed wetlands mimic the functions of natural wetlands to capture stormwater, reduce nutrient loads, and create diverse wildlife habitat. They are often created in engineered growth media in trenches, small islands, and pools. They are designed to contain water at all times – either standing water on the surface or water saturated just below the soil surface.
Plan_Components : Tools, Green Infrastructure, Information

- **Minnesota Green Stormwater Infrastructure Guide**
Organization : MN Department of Natural Resources, NOAA
Year : 2022
Document_type : General Resource/ Foundational Research, Planning Tool, Manual for an Local Organization
Disasters : Flood, Drought, Extreme Weather
Abstract : The purpose of this guide is to help homeowners and small business owners who are not subject to stormwater permits identify ways to improve and protect their property and the area's water quality through installation and management of green stormwater practices. The designs of these practices can be customized to fit specific needs and site-specific constraints.
Plan_Components : Strategies, Planning Processes, Tools, Green Infrastructure, Information

- **The Green Infrastructure Guide Planning For A Healthy Urban And Community Forest**
Organization : The Regional Planning Partnership
Year : 2001
Document_type : General Resource/ Foundational Research, Planning Tool, Manual for an Local Organization
Disasters : Flood, Drought, Biological Disasters, Soil Erosion/Landslides
Abstract : This handbook builds the case for the value of green infrastructure and provides suggestions about how to integrate green infrastructure planning with planning for development.
Plan_Components : Planning Processes, Tools, Green Infrastructure, Information

- **Approved Green Infrastructure Master Plan**
Organization : Prince George's County Planning Department
Year : 2002
Document_type : Specific Plan, Policy
Disasters : Flood, Drought, Man-Made Disasters
Abstract : This document contains text and maps of the Approved Countywide Green Infrastructure Plan for Prince George's County, Maryland. Green infrastructure is defined as an interconnected network of waterways, wetlands, woodlands, wildlife habitats, and other natural areas of countywide significance. The plan identifies a contiguous network of environmentally sensitive areas throughout the county and sets forth a goal, objectives, policies, and strategies to preserve, protect, and enhance these elements by the year 2025. The plan supports the desired development pattern in the General Plan. This is the first comprehensive functional master plan ever developed for environmental ecosystems in Prince George's County.
Plan_Components : Planning Processes, Green Infrastructure

- **Kane County 2040 Green Infrastructure Plan**
Organization : Kane County Board, Quality of Kane, Greening Infrastructure, IDNR
Year : 2012
Document_type : Specific Plan
Disasters : Flood, Soil Erosion/Landslides
Abstract : The ultimate goal of the Kane County 2040 Green Infrastructure Plan is to lay the groundwork for green infrastructure planning and projects at the regional, community, neighborhood and site levels addressing current issues of water resource management, biodiversity, conservation, water supply, public health,

climate change and economic development.
Plan_Components : Surveys/Assessments, Planning Processes, Funding Mechanisms, Green Infrastructure, Information

- **Green Infrastructure Partnership Opportunity Program**
Organization : Metropolitan Water Reclamation District of Greater Chicago
Year : 2022
Document_type : Specific Plan, Funding Opportunities
Disasters : Flood, Extreme Weather
Abstract : MWRD encourages and supports implementing green infrastructure (GI), which includes a range of engineered installations that store, infiltrate, and/or evaporate stormwater, thereby mimicking the natural water cycle. The MWRD recognizes that GI practices can be effective in reducing wet-weather flows to combined sewer systems, reducing combined sewer overflows to local waterways, and reducing runoff volumes and improving water quality in separate sewer service areas. The MWRD also recognizes the vital role of local government in addressing flooding concerns through the innovative use of GI.
Plan_Components : Planning Processes, Funding Mechanisms, Tools, Green Infrastructure

Housing

Buildings and Codes

- **Partial Implementation Of The Federal Flood Risk Management Standard For Hazard Mitigation Assistance Programs (Interim)**
Organization : FEMA
Year : 2021
Document_type : Planning Tool, Policy
Disasters : Flood
Abstract : In its Hazard Mitigation Assistance (HMA) programs, the Federal Emergency Management Agency (FEMA) utilizes the American Society of Civil Engineers (ASCE) 24-14,3 or latest
edition, to establish minimum design and construction requirements for structure elevation, dry floodproofing, and mitigation reconstruction.4 Under this interim policy, the FFRMS FVA will be utilized to determine the minimum flood protection elevation for certain project types. This interim policy applies to all HMA programs: the Hazard Mitigation Grant Program (HMGP), HMGP Post Fire, Building Resilient Infrastructure and Communities (BRIC), and Flood Mitigation Assistance (FMA).
Plan_Components : Strategies, Planning Processes

- **Building Codes Toolkit**
Organization : FEMA
Year : 2021
Document_type : Manual for an Local Organization
Disasters : Tornado, Flood, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides
Abstract : The new FEMA Building Science Branch Building Codes Toolkit offers basic guidance and tools to help building owners and occupants learn about building codes and the process of making a building stronger against natural hazards.
Plan_Components : Strategies, Planning Processes, Funding Mechanisms

- **Building Code And Floodplain Management Administration And Enforcement**
Organization : FEMA
Year : 2018
Document_type : Policy
Disasters : Tornado, Flood, Extreme Weather, Earthquakes, Wildfires, Man-Made Disasters, Soil

Erosion/Landslides
Abstract : The Disaster Recovery Reform Act of 2018 (DRRA), amended Sections 402 and 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), and authorized FEMA to "provide assistance to state and local governments for building code and floodplain administration and enforcement, including inspections for substantial damage compliance"1 and "base and overtime wages for extra hires to facilitate the implementation and enforcement of adopted building codes for a period of not more than 180 days after the major disaster is declared."
Plan_Components : Strategies, Funding Mechanisms

- **Building Codes Save: A Nationwide Study**
Organization : FEMA
Year : 2020
Document_type : General Resource/ Foundational Research
Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides
Abstract : The findings of the MAT investigations, the magnitude of recent hazard events,
and the escalating cost of natural disasters together revealed a compelling need to quantify the value of building codes in reducing damage from natural disasters nationwide.
Plan_Components : Surveys/Assessments

- **Protecting Communities And Saving Money**
Organization : FEMA
Year : 2020
Document_type : General Resource/ Foundational Research
Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides
Abstract : One of the most cost-effective ways to safeguard our communities against natural disasters is to adopt and follow hazard-resistant building codes. Not only are casualties reduced, but the cost of building damage is also reduced during a natural disaster. Building codes also help communities get back on their feet faster by minimizing indirect costs such as business interruptions and lost income. A new FEMA study has made the impact of building codes on sustainability clear. The cost of not adopting building codes is too high.
Plan_Components : Surveys/Assessments, Strategies, Planning Processes, Funding Mechanisms, Case Studies

- **Resilience Toolkit**
Organization : ICC (International Code Council)
Year : 2022
Document_type : Web-based Resource
Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides
Abstract : Over the past twenty years communities worldwide have experienced disaster events that have significantly impacted their society, economy, and culture. As populations grow, urban areas expand, and interconnectedness increases, the potential for a disaster event to have deeper and further-reaching consequences also increases. As a result, there is a need to implement measures that increase resilience across the social, organizational, and infrastructural aspects of communities - community resilience.
Plan_Components : Strategies, Planning Processes

- **Resilience Strategies For Wildfire**
Organization : Center for Climate and Energy Solutions
Year : 2018
Document_type : Planning Tool, Example Ordinances and Codes
Disasters : Wildfires

Abstract : The risk of wildfire is expected to grow across the United States due to reduced precipitation in some regions, and higher temperatures caused by climate change. Wildfire has far-reaching impacts that can ripple through communities, regions, watersheds, and ecosystems. This paper overviews a number of adaptation strategies for areas with a projected increase in wildfire conditions. For each strategy, it will discuss design and operation costs, and primary and co-benefits. The paper includes a community case
study of Austin, Texas, which has used a number of these strategies, and a list of publications and interactive tools to help communities become more resilient to wildfire
Plan_Components : Strategies, Planning Processes, Case Studies, Tools, Information

- **Tornado Risks And Hazards In The Midwest United States**
  Organization : FEMA
  Year : 2007
  Document_type : General Resource/ Foundational Research, Planning Tool
  Disasters : Tornado
  Abstract : The purpose of this Tornado Recovery Advisory (RA) is to summarize facts about the Midwest tornado hazard, specifically the area served by FEMA Region VII. Region VII includes Iowa, Kansas, Missouri, and Nebraska. The general population, specifically homeowners and renters, policy makers, local officials, builders, and building officials know and understand
  that tornado occurrence in the Midwest is not a rare event. In fact, more than half of the 20 states with the highest frequency of tornado occurrence on record, and 4 of the top 5 (Texas, Oklahoma, Kansas, and Nebraska) are located in the Midwest
  Plan_Components : Surveys/Assessments, Strategies, Tools, Information

- **Tornado Protection Selecting Refuge Areas In Buildings**
  Organization : FEMA
  Year : 2009
  Document_type : Manual for an Local Organization
  Disasters : Tornado
  Abstract : The guidance presented in this booklet is intended primarily to help
  building administrators, architects, and engineers select the best available
  refuge areas in existing schools. Building administrators, architects, and
  engineers are encouraged to apply this guidance so that the number of
  injuries and deaths will be minimized if a tornado strikes an occupied
  school
  Plan_Components : Strategies, Planning Processes, Case Studies, Tools, Information

- **Sustainable Land Development Code City Of Greensburg, Kansas**
  Organization : GREENSBURG PLANNING COMMISSION
  Year : 2011
  Document_type : Example Ordinances and Codes
  Disasters : Tornado, Flood, Soil Erosion/Landslides, Agricultural Disasters
  Abstract : City code for Greensburg, Kansas. The small rural town is a unique example in which the entire town was destroyed by a tornado. This gave leeway for a complete reimagination of the town and code, building a sustainable and resilient community from the ground up.
  Plan_Components : Strategies, Tools, Green Infrastructure, Information

- **Code Of Ordinances Village Of Thomasboro, Illinois**
  Organization : Order of the Board of Trustees, Village of Thomasboro
  Document_type : Example Ordinances and Codes
  Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Man-Made Disasters
  Abstract : Code of Ordinances for a small rural town in Illinois.
  Plan_Components : Strategies, Funding Mechanisms, Information

- **State Of Illinois Illinois Department Of Natural Resources Model Stormwater Management Ordinance**
  Organization : Illinois Department of Natural Resources
  Year : 2015
  Document_type : Planning Tool, Manual for an Local Organization, Policy
  Disasters : Flood, Drought, Extreme Weather, Soil Erosion/Landslides
  Abstract : In June 2015, the Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR) issued a report for the Urban Flooding Awareness Act. The report recognizes that combating the damages of urban flooding requires a coordinated approach from state and local governments. A critical component in that effort is for local governmental entities to adopt sound, comprehensive stormwater management ordinances that incorporate best practices. To that end, IDNR/OWR and the Illinois State Water Survey (ISWS) developed this Model Stormwater Management Ordinance as a
  resource for counties and municipalities to use when drafting or revising their own stormwater ordinances. While local development, review, and approval processes are unique, IDNR/OWR provides this document as a template containing the minimum requirements for an effective ordinance and suggestions for more advanced stormwater protection
  Plan_Components : Tools, Green Infrastructure, Information

Floods and Disaster Mitigation

- **Partial Implementation Of The Federal Flood Risk Management Standard For Hazard Mitigation Assistance Programs (Interim)**
  Organization : FEMA
  Year : 2021
  Document_type : Planning Tool, Policy
  Disasters : Flood
  Abstract : In its Hazard Mitigation Assistance (HMA) programs, the Federal Emergency Management Agency (FEMA) utilizes the American Society of Civil Engineers (ASCE) 24-14,3 or latest
  edition, to establish minimum design and construction requirements for structure elevation, dry floodproofing, and mitigation reconstruction.4 Under this interim policy, the FFRMS FVA will be utilized to determine the minimum flood protection elevation for certain project types. This interim policy applies to all HMA programs: the Hazard Mitigation Grant Program (HMGP), HMGP Post Fire, Building Resilient Infrastructure and Communities (BRIC), and Flood Mitigation Assistance (FMA).
  Plan_Components : Strategies, Planning Processes

- **Building Codes Toolkit**
  Organization : FEMA
  Year : 2021
  Document_type : Manual for an Local Organization
  Disasters : Tornado, Flood, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides
  Abstract : The new FEMA Building Science Branch Building Codes Toolkit offers basic guidance and tools to help building owners and occupants learn about building codes and the process of making a building stronger against natural hazards.
  Plan_Components : Strategies, Planning Processes, Funding Mechanisms

- **Building Code And Floodplain Management Administration And Enforcement**
  Organization : FEMA
  Year : 2018
  Document_type : Policy
  Disasters : Tornado, Flood, Extreme Weather, Earthquakes, Wildfires, Man-Made Disasters, Soil Erosion/Landslides

Abstract : The Disaster Recovery Reform Act of 2018 (DRRA), amended Sections 402 and 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), and authorized FEMA to "provide assistance to state and local governments for building code and floodplain administration and enforcement, including inspections for substantial damage compliance"1 and "base and overtime wages for extra hires to facilitate the implementation and enforcement of adopted building codes for a period of not more than 180 days after the major disaster is declared."
Plan_Components : Strategies, Funding Mechanisms

- **Building Codes Save: A Nationwide Study**
  Organization : FEMA
  Year : 2020
  Document_type : General Resource/ Foundational Research
  Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides
  Abstract : The findings of the MAT investigations, the magnitude of recent hazard events,
  and the escalating cost of natural disasters together revealed a compelling need to quantify the value of building codes in reducing damage from natural disasters nationwide.
  Plan_Components : Surveys/Assessments

- **Protecting Communities And Saving Money**
  Organization : FEMA
  Year : 2020
  Document_type : General Resource/ Foundational Research
  Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides
  Abstract : One of the most cost-effective ways to safeguard our communities against natural disasters is to adopt and follow hazard-resistant building codes. Not only are casualties reduced, but the cost of building damage is also reduced during a natural disaster. Building codes also help communities get back on their feet faster by minimizing indirect costs such as business interruptions and lost income. A new FEMA study has made the impact of building codes on sustainability clear. The cost of not adopting building codes is too high.
  Plan_Components : Surveys/Assessments, Strategies, Planning Processes, Funding Mechanisms, Case Studies

- **Resilience Toolkit**
  Organization : ICC (International Code Council)
  Year : 2022
  Document_type : Web-based Resource
  Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides
  Abstract : Over the past twenty years communities worldwide have experienced disaster events that have significantly impacted their society, economy, and culture. As populations grow, urban areas expand, and interconnectedness increases, the potential for a disaster event to have deeper and further-reaching consequences also increases. As a result, there is a need to implement measures that increase resilience across the social, organizational, and infrastructural aspects of communities - community resilience.
  Plan_Components : Strategies, Planning Processes

- **Resilience Strategies For Wildfire**
  Organization : Center for Climate and Energy Solutions
  Year : 2018
  Document_type : Planning Tool, Example Ordinances and Codes
  Disasters : Wildfires
  Abstract : The risk of wildfire is expected to grow across the United States due to reduced precipitation

in some regions, and higher temperatures caused by climate change. Wildfire has far-reaching impacts that can ripple through communities, regions, watersheds, and ecosystems. This paper overviews a number of adaptation strategies for areas with a projected increase in wildfire conditions. For each strategy, it will discuss design and operation costs, and primary and co-benefits. The paper includes a community case
study of Austin, Texas, which has used a number of these strategies, and a list of publications and interactive tools to help communities become more resilient to wildfire
Plan_Components : Strategies, Planning Processes, Case Studies, Tools, Information

- **Tornado Risks And Hazards In The Midwest United States**
  Organization : FEMA
  Year : 2007
  Document_type : General Resource/ Foundational Research, Planning Tool
  Disasters : Tornado
  Abstract : The purpose of this Tornado Recovery Advisory (RA) is to summarize facts about the Midwest tornado hazard, specifically the area served by FEMA Region VII. Region VII includes Iowa, Kansas, Missouri, and Nebraska. The general population, specifically homeowners and renters, policy makers, local officials, builders, and building officials know and understand
  that tornado occurrence in the Midwest is not a rare event. In fact, more than half of the 20 states with the highest frequency of tornado occurrence on record, and 4 of the top 5 (Texas, Oklahoma, Kansas, and Nebraska) are located in the Midwest
  Plan_Components : Surveys/Assessments, Strategies, Tools, Information

- **Tornado Protection Selecting Refuge Areas In Buildings**
  Organization : FEMA
  Year : 2009
  Document_type : Manual for an Local Organization
  Disasters : Tornado
  Abstract : The guidance presented in this booklet is intended primarily to help
  building administrators, architects, and engineers select the best available
  refuge areas in existing schools. Building administrators, architects, and
  engineers are encouraged to apply this guidance so that the number of
  injuries and deaths will be minimized if a tornado strikes an occupied
  school
  Plan_Components : Strategies, Planning Processes, Case Studies, Tools, Information

- **Sustainable Land Development Code City Of Greensburg, Kansas**
  Organization : GREENSBURG PLANNING COMMISSION
  Year : 2011
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- **State Of Illinois Illinois Department Of Natural Resources Model Stormwater Manage-**

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Organization : Illinois Department of Natural Resources
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Document_type : Planning Tool, Manual for an Local Organization, Policy
Disasters : Flood, Drought, Extreme Weather, Soil Erosion/Landslides
Abstract : In June 2015, the Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR) issued a report for the Urban Flooding Awareness Act. The report recognizes that combating the damages of urban flooding requires a coordinated approach from state and local governments. A critical component in that effort is for local governmental entities to adopt sound, comprehensive stormwater management ordinances that incorporate best practices. To that end, IDNR/OWR and the Illinois State Water Survey (ISWS) developed this Model Stormwater Management Ordinance as a
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Plan_Components : Tools, Green Infrastructure, Information

Appendix A

Interpretation of High Risk and Low Risk Areas at County Level

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Agri	Percentage Employed in Agricultural Occupations	A lower percentage of workers in the agricultural sector indicates a greater economic diversity, lower dependence on weather conditions, higher resilience and lower risk	Agricultural sector is most directly affected by natural disasters and extreme weather events such that their productivity goes down drastically. Therefore a predominantly agrarian economy represents lower economic resilience and greater disaster risk	Very Low
Agri LQ	Location Quotient of Agricultural Occupations	A lower LQ for the Agricultural Sector indicates a low risk	A higher LQ for Agricultural Businesses indicates a higher risk	Moderate
Agro Percent	Percentage Employment in Agriculture and related Sectors	A lower percentage of workers in the agricultural sector indicates a greater economic diversity, lower dependence on weather conditions, higher resilience and lower risk	Agricultural sector is most directly affected by natural disasters and extreme weather events such that their productivity goes down drastically. Therefore a predominantly agrarian economy represents lower economic resilience and greater disaster risk	Moderate
Airports	Non-Commercial -Civil Public Use Airports and Seaplane base	A higher value is associated is low risk	It indicates access to communication and transportation infrastructure which is essential in times of disasters. A lower value is associated with high risk	Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
ALLNPDESperKMln	All NPDES permits per 1000 km of stream, as permits per 1000km stream length, log transformed	A Lower value is associated with low risk	It indicates pollution of water resources. A higher value is associated with high risk	High
Arts	Percentage Employed in Arts Occupations	A lower employment in the arts sector could indicate higher resilience to economic shocks and higher incomes and is therefore associated with lower risk	Although a higher proportionof artists could signal a greater economic diversity, arts occupations are highly susceptible to natural disasters. Therefore a greater employment in arts industries could signal a higher disaster risk.	Moderate
Arts LQ	Location Quotient of Arts Occupations	A low LQ in the arts sector is associated with low risk	A high LQ in the arts sector is associated with higher risk	Very High
Avg HHsize	Average Household Size	A smaller average household size indicates a greater proportion ofhousehold resources available to every individual in the household and is therefore a lower risk	Household sizes relate with the distribution of resources among individuals with the household. A greater average household size indicates a lesser proprotion of resources available to individuals and is therefore interpreted as a high risk	High
Avg temp	Average Temperature	A lower average temperature is associated with lower risk	A higher average temperate is associated with a higher risk	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Bridges	Number of Bridges	A higher value is associated is low risk	It indicates access to transportation infrastructure which is essential in times of disasters. A lower value is associated with high riskA lower value is associated with high risk	Very High
Business establishments	Number of business establishments	A higher value is associated is low risk	It represents access to resources , and economic vilatity. A lower value is associated with high risk	Very High
CaAve ln	Calcium (Ca) precipitation weighted mean in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Very Low
Civic related business rate	Rate of civic-related business per county	A higher value is associated is low risk	Civic-related businesses indicate a strong, built-environment and development industry. A lower value is associated with high risk	Very Low
CO8	Concentration of Pollutant	A lower concentration indicates less pollution and is associated with lower risk	A higher concentration indicates more pollution and is associated with higher risk	Low
Commuters withinCounty	Number of resident workers who commute within county	A higher value is associated is low risk	A lower commute time is assocatied with a health local economy. A lower value is associated with high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
CommuteTime	Time it takes from home to go to work in minutes	A Lower value is associated with low risk	Time spent in commute is associated with lack of productivity and extra expenses. A lower commute time is assocatied with a health local economy. A higher value is associated with high risk	Low
construction	Percentage Employed in Construction Occupations	Construction and allied industries represent possibilities for robust economic growth and government investment. A greater employment in the construction industry also signals potential for development of local infrastrcuture. A higher employment in this sector is therefore a low risk	Lower employment in the construction sector indicates lower investment in built environment and infrastructure and high disaster risks	Very High
construction LQ	Location Quotient of Construction Occupations	A higher LQ for the construction industry indicates a low disaster risk	A lower LQ for the construction industry indictes a high disaster risk	Moderate
Cost IncomeRatio	Ratio of Housing Cost to Household Income	A lower cost to income ratio indicates that households are successfully able to meet their financial demands and are more resilient to disasters. It is therefore a low risk.	A higher cost to income ratio indicates that households are unable to meet their financial needs and are more likely to suffer adversely during disasters. It is therefore associated with high risk.	Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
COVID-19 death rate	All deaths occurring between January 1, 2020 and December 31, 2020 due to COVID-19, per 100,000 population (age-adjusted).	A Lower value is associated with low risk	A greater number of deaths owing to Covid-19 indicates pre-existing health conditions and comorbidities within the community. A higher value is associated with high risk	Moderate
D303 Percent ln	% of stream length impaired in county, log-transfored	A Lower value is associated with low risk	It indicates pollution of water resources. A higher value is associated with high risk	Very Low
Disabled Percent	Percentage of Disabled Persons	A lower percentage of disabled individuals in the community indicates a lower risk owing to reduced requirements for preparation, disaster and accessibility planning	A higher percentage of disabled individuals is associated with a high risk. They are disproportionately affected owing to inaccessible evacuation, response and recovery efforts and could often be left behind.	Moderate
Docks	Total Docks	A higher value is associated is low risk	It indicates access to transportation infrastructure which is essential in times of disasters. A lower value is associated with high risk	Low
Edu	Percentage Employed in Education-related Occupations	A higher employment in the education sector signals a more skilled economy, which is typically more resilient to natural disasters. It is therefore a low risk	A lower employment in the education sector signals a less resilient, less skilled economy, and is therefore associated with high risk	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Edu LQ	Location Quotient of Education-related Occupations	A high LQ in the education sector signals a higher economic resilience and low risk	A lower LQ in education sector signals a lower economic resilience and high risk	Very High
Educated percent	Percentage of Educated Persons	A greater person of educated individuals is interpreted as low disaster risk	Lack of education is associated with social marginalization, lack of preparation and disaster planning. Therefore a lower percentage of educated individuals is interpreted as high risk.	High
Education related business rate	Rate of education-related business per county	A higher value is associated is low risk	Education-related businesses enable a community to obtain access to education and child development resources. A lower value is associated with high risk	Low
Elderly growth percent	Growth Percent of Elderly Population	A lower percentage of older adults represents a lower disaster risk.	Older adults are more vulnerable to dosaster risks owing to functional problems, health and medication concerns. A greater percentage of older adults represents a higher risk.	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
FemaleHeaded HHs Percent	Percentage of Households with Female Householder	A lower percentage of female headed households indicates a lower disaster risk, a more stable family and household structure, greater social integration and family support, and higher socio-economic status at the community level	A higher percentage of female headed households could indicate a higher disaster risk owing to greater chances of poverty, and particular risk from housing shocks and stresses, hunger and food insecurity owing to gender discrimination	Moderate
FemaleLaborforce percent	Percentage of Labor Force constituted by Women	A higher particpation of females in the workforce indicates increased incomes, and lowers or leads to sharing of unpaid care-work with other members of the family, leading to a more economically resilient community. Thus a higher female workforce particpation indicates a low disaster risk	A lower particpation of women in the labour force is associated with lower household incomes and poverty. Therefore a lower female workforce particpation means a higher disaster risk owing to lower economic support.	Moderate
Females Percent	Percentage of Females	A good percentage of women represent a stable sex ratio for the area and is therefore a positive indicator	A low percentage of women could indicate an unstable sex ratio, thereby showing that there are fewer opportunities for women in the area. This could have negative consequences during a disaster	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Finance	Percentage Employed in Finance Occupations	Finance, realestate, etc. jobs are positively correlated with high incomes, job security and high economic resilience during disasters. Therefore a greater employment ins uch industries poses a low risk and indicates a diverse economic base. A higher employment in such industries is associated with a low risk	A lower employment in finance, real estate etc. signals lower incomes and less resilient jobs. Therefore, a lower employment in this sector is associated with high risk	Very High
Finance LQ	Location Quotient of Finance Occupations	A high LQ in finance, real estate, etc. signals a low risk	A low LQ in finance, real estate, etc. signals a high risk	Very High
Food Environment Index	Index of factors that contribute to a healthy food environment, from 0 (worst) to 10 (best).	A higher value is associated is low risk	A poor food environment reduces the physical and mental vitality of a community. A lower value is associated with high risk.	High
Freight railroad miles	Route miles of freight railroad	A higher value is associated is low risk	It indicates access to transportation infrastructure which is essential in times of disasters. A lower value is associated with high risk	High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
fungicide ln	Fungicides applied in pounds, log-transformed	A Lower value is associated with low risk	It indicates soil quality and environmental pollution. During disasters, pollutants from the soil can contaminate the environment. A higher value is associated with high risk	Very Low
Gender Pay Gap	A ratio of women's median earnings to men's median earnings for all full-time, year-round workers, presented as "cents on the dollar."	A Lower value is associated with low risk	Gender inequality determines a society's ability to develop economically and equitably. A higher value is associated with high risk	Low
GINI Index	GINI Index for Inequality Determination	A lower GINI Index depicts lesser inequality in the industry and is associated with low risk	A higher inequality represents differential distribution of resources, greater poverty and lack of accessibility. A higher GINI Index is associated with high risk.	Very Low
GroupQuarters	Percentage of GroupQuarters as part of Total Housing Stock	A lower concentration of group quarter residents is a low risk owing to greater access to recovery resources and social support	Group quarters consist of unrelated persons sharing a living space, either in institutionalized or non-institutionalized settings. Thus they lack the social support of a family and a high percentage of group quarter population is associated with high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Healthcare related business rate	Rate of healthcare-related businesses per county	A higher value is associated is low risk	Availability of health care businesses indicate access to medical resources during disasters. A lower value is associated with high risk	Moderate
HelperPool	Percentage of Helpers in a time of crisis	A higher proportion of helpers indicates a lower risk, since a greater number of persons will be available for disaster recovery and mitigation efforts.	A goood number of participants in the helper pool could indicate greater support and emergency management in the community. A lower percentage of helpers represents a high risk.	Very High
herbicide ln	Herbicides applied in pounds, log-transformed	A Lower value is associated with low risk	It indicates soil quality and environmental pollution. During disasters, pollutants from the soil can contaminate the environment. A higher value is associated with high risk	Very Low
Homewownership	Perecentage Homewowners	A higher percentage of homeownership is associated with greater income and family stability and greater access to relief during a disaster. It is therefore a low risk	A lower percentage of homeownership signals lower incomes and support during disasters. It is therefore a higher risk.	High
Inadequate Facilities	Percentage of households with inadequate infrastructure within their housing unit	A Lower value is associated with low risk	Inadequate infrastructure within the household lowers quality of life and residents' health. A higher value is associated with high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Info	Percentage Employed in Information-based Occupations	Information industries are positively associated with mitigation planning and have the ability to shift to remote working during a disaster. Therefore, such a higher employment in such industries poses a low risk	A lower employment in infirmation industries signals a less diverse economic base and a higher susceptibility to natural disasters. It is therefore associated with higher disaster risks	High
Info LQ	Location Quotient of Information-based Occupations	A lower LQ in the information sector signals a low risk	A lower LQ in information sector signals a high risk	Moderate
insecticide ln	Insecticide applied in pounds, log-transformed	A Lower value is associated with low risk	It indicates soil quality and environmental pollution. During disasters, pollutants from the soil can contaminate the environment. A higher value is associated with high risk	Very Low
Kave ln	Potassium (K) precipitation weighted mean in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
LargeFam Percent	Percentage of Large Families as part of all Families	In case of smaller family sizes, a greater investment of the family's resources is possible leading to greater achievements. Therefore a smaller proportion of big families is a reduced social vulnerability during disasters	In case of large families, the same limited resources are shared by a large group of individuals owing to less investment per person. This can result in differential academic achievements and occupational performance. Thus prevalence of a bigger family size would indicate a higher disaster risk.	High
LowIncome Percent	Percentage Low Income Population	A lower proportion of low income families indicates a greater access to resources for preparation and recovery from disasters and is hence a low disaster risk	A higher proportion of low income households lack of adequate access to resources to prepare for and recover from disasters, contingency funds, personal vehicles and abilities to arrange for alternate housing arrangements during disasters. It is therefore a high risk.	Very High
Management	Percentage Employed in Management Occupations	Management, Business and Science jobs are invariably correlated with greater incomes, social mobility and lower dependence on place-based work. Therefore they are more resilient during disasters and higher employment in these sector represent lower risks	A lower proportion of employees in Management, Business and Science professions indicates lower incomes and a low skill economy and is therefore indicative of higher disaster risks	Moderate

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Management LQ	Location Quotient of Management Occupations	A higher LQ in management, business, or science indicates a low risk	A lower LQ in Management, business or science indicates a high risk	Low
Manufacturing	Percentage Employed in Manufacturing Occupations	A lower concentration of manufacturing industries/employment indicates lower chances of disruption during disasters. It is therefore an area of low risk	Manufacturing industries are directly affected by natural disasters. Extreme events cause great damage to the manufacturing units and their associated supply chains. A higher concentration of Manufacturing Industries is associated with high risk	Very Low
Manufacturing LQ	Location Quotient of Manufacturing Occupations	A lower LQ for manufacturing industries indicates a low risk	A higher LQ for manufacturing industries indicates a high risk	Very Low
Marinas	Total Marinas	A higher value is associated is low risk	It indicates access to transportation infrastructure which is essential in times of disasters. A lower value is associated with high risk	NA
Max temp	Maximum Temperature	A lower maximum temperature is associated with lower risk	A higher maximum temperature is associated with a higher risk	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
MBS	Percentage Employed in Management, Business and Science Occupations	Management, Business and Science jobs are invariably correlated with greater incomes, social mobility and lower dependence on place-based work. Therefore they are more resilient during disasters and higher employment in these sector represent lower risks	A lower proportion of employees in Management, Business and Science professions indicates lower incomes and a low skill economy and is therefore indicative of higher disaster risks	Very High
MBS LQ	Location Quaotient of Managemnt, Business and Science Occupations	A high Location Quotient for Management, Business and Science professions indicates a more specialized, high income economy. It is indicative of low disaster risk	A low LQ for Management, Business and Science professions indicates a less specialized economy and is therefore indicative of lower economic diversity, lower incomes and high risk	Very High
MedianHomeValue	Median Home Value	A higher home value indicates higher incomes, higher accessibility to funds during disaster and is therefore associated with low risk	A lower home value indicates lower incomes and is therefore associated with high risk	High
MentalHealth Provider Rate	Ratio of population to mental health providers.	A higher value is associated is low risk	A lower proportion of physicians indicates that community members may not have access to mental health resources during disasters. A lower value is associated with high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
MHHI	Median Household Income	A higher income indicates greater avaiability of resources to cope with disasters as well as to prevent them. Therefore it is a low risk	Low income HHs tend to locate or concentrate in areas prone to natural disasters sich as floodplains, because the land is cheaper. Moreover they face resource deficiencies when a disaster strikes. A lower Median Household Income is associated with a higher disaster risk.	High
Min temp	Minimum Temperature	A higher minimum temperature is associated with lower risk	A lower minimum temperature is associated with a higher risk	Very High
MobileHomes	Percentage of Mobile Homes as part of Total Housing Stock	A lower proportion of mobile homes indicates greater structural resilience of the housing sector and more stable economy	A greater proportion of mobile homes is associated with greater risk owing to structural problems and lower incomes.	Very High
NewHomes	Percentage of New Homes as part of Total Housing Stock	A higher proprotion of new homes indicates a greater structural resilience to natural disasters and is associated with a low risk	A lower porportion of new homes indicates the possibility of greater structural damage during disasters. It is therefore associated with a high risk	Low
NO21	Concentration of Pollutant	A lower concentration indicates less pollution and is associated with lower risk	A higher concentration indicates more pollution and is associated with higher risk	Very Low
NO2AM	Concentration of Pollutant	A lower concentration indicates less pollution and is associated with lower risk	A higher concentration indicates more pollution and is associated with higher risk	Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
NO3Ave.x	Nitrate (NO3) precipitation weighted mean in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Very Low
NonWhite Percent	Percentage of Non-White Popula-tion**Minority Populations, add Hispanic Population	A lower population of ethnic minorities might indicate a less diverse population. However, in case of disaster vulnerability, a lower population of racial minorities has been represented as a lower vulnerability, owing to its correlations with poverty and health care outcomes.	Race and ethnicity are highly correlated with poverty and thus often with health outcomes. Owing to historical, systemic and structural barriers, racial minorities are often more susceptible to disasters and often lack the support mechanisms required to cope. As a result, a higher population of racial or ethnic minorities might (in conjunction with income, poverty, employment, education and other indicators) represent a greater vulnerability.	High
NotMarried Percent	Percentage of Unmarried Persons	A lower percentage of unmarried individuals could indicate a lower vulnerability to disasters owing to the availability of social support that comes with having a family	A higher percentage of unmarried individuals could indicate lack of family and social support.	Low
O3	Concentration of Pollutant	A lower concentration indicates less pollution and is associated with lower risk	A higher concentration indicates more pollution and is associated with higher risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Old percent	Percentage of Elders**	A lower percentage population of elders indicates a lower vulnerability.	A higher percentage of elder population indicates a greater vulnerability, owing to physical infirmities, functional limitations and care needs.	High
OldHomes	Percentage of Old Homes as part of Total Housing Stock	A lower proportion of old homes signals new construction that is more structurally resilient to natural disasters. It is therefore associated with low disaster risk	A higher proportion of houses that are built more than 30 years ago signals an old housing stock in need of repair and reconstruction. It is therefore associated with high disaster risk.	Low
Other county workers	Number of workers from other counties who commute to work in the county	A Lower value is associated with low risk	Asmaller commute time is assocatied with a health local economy. A higher value is associated with high risk	Low
Others	Percentage Employed in Other Occupations	Employment across other sectors represents diversification of the economic base and is therefore positively correlated with economic resilience. It is therefore a low risk	A lower employment in other sectors represents a less diverse and creative economy. It is therefore associated with high risks	Very Low
Others LQ	Location Quotient of Other Occupations	A higher LQ in other industries is associated with low risk	A lower LQ in other industries is associated with high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Overcrowding	Percentage of Overcrowded Homes as part of Total Housing Stock	A lower proportion of vercrowded units signals higher incomes and well-maintained, structurally sound housing units which are resilient to disasters. It is therefore associated with low risk	In an overcrowded housing unit, available resources are distributed among a higher than average number of individuals which could lead to familial, socio-economic and structural inadequacies over a period of time. It is therefore associated with high risk.	Very High
Passenger railroad miles	Route miles of passenger railroad and rail transit	A higher value is associated is low risk	It indicates access to transportation infrastructure which is essential in times of disasters. A lower value is associated with high risk	Moderate
Pb3	Concentration of Pollutant	A lower concentration indicates less pollution and is associated with lower risk	A higher concentration indicates more pollution and is associated with higher risk	Low
pct au ln	Animal Units, animal units per county acres , log-transformed	A Lower value is associated with low risk	It indicates soil quality and environmental pollution. During disasters, pollutants from the soil can contaminate the environment. A higher value is associated with high risk	Moderate

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
pct disease acres ln	Chemicals used to control Diseases in crops and orchards, acres applied per county acres , log-transformed	A Lower value is associated with low risk	It indicates soil quality and environmental pollution. During disasters, pollutants from the soil can contaminate the environment. A higher value is associated with high risk	Moderate
pct harvested acres ln	Harvested acres, acres harvested per county acres , log-transformed	A Lower value is associated with low risk	It indicates soil quality and environmental pollution. During disasters, pollutants from the soil can contaminate the environment. A higher value is associated with high risk	Very Low
PCT IRRIGATED ACRES ln	Irrigated acres, acres irrigated per county acres, log-transformed	A higher value is associated is low risk	A lower value is associated with high risk, since poor irrigation can lead to agricultural failure	Very Low
pct manure acres ln	Manure, acres applied per county acres , log-transformed	A Lower value is associated with low risk	It indicates soil quality and environmental pollution. During disasters, pollutants from the soil can contaminate the environment. A higher value is associated with high risk	Very Low
Per PSWithSW.x	Percent of Public Supply Population which is on Surface Water	A Lower value is associated with high risk	It indicates access to water resources. A higher value is associated with low risk	Moderate

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Per TotPopSS.x	Percent of Population on Self Supply	A Lower value is associated with high risk	It indicates access to water resources. A higher value is associated with low risk	Very Low
Percent Medium-FairCondition Bridges	% of Medium to Fair Condition Bridges	A higher value is associated is low risk	It indicates access to transportation infrastructure which is essential in times of disasters. A lower value is associated with high risk	Moderate
Percent AssistanceNeed	Percentage of Population with Assisstance Need	A lower percentage of people withfood assistance indicates higher incomes and economic resilience, and is therefore a low risk area	A high proportion of persons with assistance needs indicates poverty and lack of socio-economic resilience. Therefore it is interpreted as a high risk.	Very High
Percent BachelorsDegree	Percentage of Population with Bachelors' Degree	A greater proportion of persons with bachelors' degree indicates a greater likelihood of being employed by a variety of employers, along with a higher concentration of high skilled high income positions. Therefore it is interpreted as a lowrisk	A lower porportion of persons with a bachelor's degree indicates a lower number of persons with skills for career advancement. It indicates lack of skilled labour in the workforce and tehrefore lower incomes and social mobility. Therefore it is interpreted as a high risk factor	Very High
Percent Children in Poverty	Percentage of people under age 18 in poverty.	A Lower value is associated with low risk	Children living in poverty indicate inadquate resources available for growth, education and development. A higher value is associated with high risk	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Percent Commuters	Percentage of Population who Commute to work regularly	A lower percentage of commuters indicates that most workers live near where they work and can continue their jobs irrespective of transportation network disruptions. Therefore it is an area of low risk	Natural disasters invariably affect transportation routes and make it difficult for persons requiring commutes to their workplace to continue their employment. Therefore a greater proportion of commuters indicates a disaster risk	Very Low
Percent commuters by transit	Percent of resident workers who commute by transit	A Lower value is associated with low risk	A lower commute time is assocatied with a health local economy. A higher value is associated with high risk	High
Percent Disconnected Youth	Percentage of teens and young adults ages 16-19 who are neither working nor in school.	A Lower value is associated with low risk	Teens and young adults need to either be in school, or part of the workforce, to be able to cultivate a healthy, self-sufficient lifestyle, involved hopeful and forward looking endeavours. Disconnected youth have been positively associated with poverty, unempoyment and crime. A higher value is associated with high risk	Very Low
Percent Exercise Access	Percentage of population with adequate access to locations for physical activity.	A higher value is associated is low risk	Lower physical exercise increases health risks with age. A lower value is associated with high risk	Moderate

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Percent Food Insecure	Percentage of population who lack adequate access to food.	A Lower value is associated with low risk	Access to food indicates community health. A higher value is associated with high risk	Very High
Percent HousingProblems	Percentage of households with at least 1 of 4 housing problems: overcrowding, high housing costs, lack of kitchen facilities, or lack of plumbing facilities.	A Lower value is associated with low risk	Unavailability of housing infrastructure adversely affects residents' health.A higher value is associated with high risk	High
Percent income required for childcare expenses	Childcare costs for a household with two children as a percent of median household income	A Lower value is associated with low risk	A high burden of childcare costs indicates that a family may not be able to provide for its other necessary expenditures. A higher value is associated with high risk	Very High
Percent LanguageBarrier	Percentage of Population facing Language Barrier	A lower proportion of persons with language problems indicates greater accessibility to disaster relief efforts and is therefore an area of lowe risk	A higher proportion of persons with language barriers could indicate a higher percentage of people suffering due to communication problems, interpretation of instructions and emergency rescue operations. Therefore it is interpreted as a high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Percent Limited Access to Healthy Foods	Percentage of population who are low-income and do not live close to a grocery store.	A Lower value is associated with low risk	Persons who are low income lack access to healthy food, especially if they live away from grocery stores and lack transportation. A higher value is associated with high risk	Low
Percent NoHealthIns	Percentage of Population without Health Insurance	Greater health insurance coverage is correlated with better health conditions and higher economic productivity. Therefore a higher number of persons with health insurance is a low risk	Lack of health insurance coverage has negative impacts on health as patients are less likely to receive preventive health care, or affordable medical care during a disaster. A greater proportion of persons without health insurance indicates a higher disaster risk.	Very High
Percent PoorCondition Bridges	% of Poor Condition Bridges	A Lower value is associated with low risk	It indicates access to quality transportation infrastructure which is essential in times of disasters. A higher value is associated with high risk	Moderate
Percent rural	Percentage of population living in rural areas	A Lower value is associated with low risk	Rural areas often lack access to resources and are geogrpahically isolated. A higher value is associated with high risk	High
Percent Section8	Rate of low-rent + section-eight units in county	A Lower value is associated with low risk	Greater proportion of low income housing indicates poverty and declining housing quality. A higher value is associated with high risk	High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Percent Vaccinated	Percentage of Households vaccinated against Covid-19 and other diseases	A higher value is associated is low risk	A high proportion of vaccination indicates that the community is safe against the Covid-19 pandemic. A lower value is associated with high risk	Low
Percent work at home	Resident workers who work at home	A higher value is associated is low risk	A lower commute time is assocatied with a health local economy. A lower value is associated with high risk	Very High
Physically Unhealthy Days	Average number of physically unhealthy days per year for the population	A Lower value is associated with low risk	A higher value is associated with high risk because people are more prone to being affected by disaster risks	Very High
PM10	Concentration of Pollutant	A lower concentration indicates less pollution and is associated with lower risk	A higher concentration indicates more pollution and is associated with higher risk	Low
PM2.5	Concentration of Pollutant	A lower concentration indicates less pollution and is associated with lower risk	A higher concentration indicates more pollution and is associated with higher risk	Low
PM2Point5	Concentration of Pollutant	A lower concentration indicates less pollution and is associated with lower risk	A higher concentration indicates more pollution and is associated with higher risk	Low
Population	Total Population	A small number of people will be affected by a disaster	A large number of persons will be affected by the disaster	Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
poverty	Percentage Below Poverty Line	A lower poverty indicates less exposure to disaster risks and greater accessibility to exigency funds. It is therefore a low risk	Poverty can be both a cause and consequence of disaster risk. A greater poverty is associated with a higher risk	Very Low
Precipitation	Precipitation	A lower precipitation is associated with a lower risk	A higher precipitation is associated with higher risk	Very High
PrimaryCare Physicians Rate	Ratio of population to primary care physicians.	A higher value is associated is low risk	A lower proportion of physicians indicates that community members may not have access to medical help during disasters and have to rely on external support. A lower value is associated with high risk	Very High
PrimeWorkingAge percent	Percentage of population in Prime Working Age	A greater number of persons of working age indicates a greater labour pool available for the local economy. Therefore a higher ratio indicates a lower risk.	A lower number of persons of working age represents a greater number of dependents on the existing workfore and is hence a high risk.	High
PT	Percentage Employed in Production and Transportation Occupations	A lower concentration of production and transportation industries indicates a lower dependence of the economic base on land, location and natural resources. It is therefore more economically resilient and a low risk	Both production and transportation industries are dependent on avaibality of local natural resources and are therefore more susceptible to natural disasters. A higher employment in such industries signals greater disater risk.	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
PT LQ	Location Quotient of Production and Transportation Occupations	A lower concentration of the production and transportation idnustry indicates a low risk	A higher LQ for the Production and Transportation Industry indicates a high risk	Very Low
Radon.x	Radon zone, ordinal value	A Lower value is associated with low risk	It indicates environmental quality and stability. A higher value is associated with high risk	Very High
Recent Immigrants Percent	Percentage of Recent Immigrant Individuals	A lower percentage of immigrants represents a lower disaster risk owing to more equitable access to local and regional resources within the community and lack of communication barriers	A higher percentage of immigrants represents a greater disaster risk owing to their immigration status, lack of English proficiency and lack of direct access to resources in comparison with native citizens	High
Recreation related business rate	Rate of recreation-related businesses per county	A lower value is associated with low risk	Greater proportion of recreation-related business indicate hightened economic instability during disasters. A higher value is associated with high risk	Very Low
Rental CostBurden below20000	Housing Cost Burden on renters whose incomes are below 20,000 USD	A lower proportion of cost-burdened low income households indicates greater economic resilience among low-income renters. This is an asset during natural disasters and is a low risk area	A higher proportion of low income rental households who are housing cost burdened signals a higher concentration of highly vulnerable households in the community. This is an area of high risk, structurally, financially and socially	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Rental Overcrowding	Percentage of Rental Units that are Overcrowded	A lower proportion of overcrowded rental units indicates a more affordable rental housing stock, and a more resilient rental population. It is a low risk	A higher proportion of rental units which are overcrowded signals lower incomes, structural and maintenance issues associated with the rental housing stock. It indicates that the rental stock is inadequate and unaffordable and is therefore associated with high risk	High
Rented	Percentage Renters	A lower proportion of renters signals greater homeownership, higher incomes and access to resources. This is therefore an area of low risk	Renters are associated with higher vulnerability during disasters owing to lower incomes, and lesser accessibility to disaster relief. A high proportion of renters is therefore associated with a higher risk	Low
Renter MHHI	Monthly Household Income of Renters	A higher income indicates greater capacity to cope with disasters. It is therefore associated with low risk.	A lower income indicates a lower capacity to cope with disasters and is associated with high risk	Very High
Renters Cost IncomeRatio	Ratio of Renter Housing Cost to Household Income	A lower cost to income ratio for renters indicates that rental households are successfully able to meet their financial demands and are more resilient to disasters. It is therefore a low risk.	A higher cost to income ratio for renters indicates that rental households are unable to meet their financial needs and are more likely to suffer adversely during disasters. It is therefore associated with high risk.	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Resident Workers	Number of resident workers	A higher value is associated is low risk	Greater number of workers represent greater economic participation. A lower value is associated with high risk	Very High
Retail	Percentage Employed in Retail Occupations	Although prone to natural disasters, retail industries generally show a higher resilience to natural disasters than wholesale industries. This is because they are less likely to be low mitigators and often associated with having a plan unlike wholesale industries. Thus a higher employment in retail industries is associated with low risk.	A lower employment in retail industries signals lower economic resilience and is associated with higher risk	High
Retail LQ	Location Quotient of Retail Occupations	A higher LQ in retail industries is associated with low risk	A lower LQ in retail industries is associated with high risk	Low
Sales	Percentage Employed in Sales Occupations	Employment in sales is associated with higher pay greater skills and organizational support. It signals greater economic resilience and low risk	A lower employment in sales industries could indicate a less entrepreneurial economy, lower resilience and therefore higher disaster risk	High
Sales LQ	Location Quotient of Service Occupations	A higher LQ for the service sector indicates a low risk	A lower LQ for sales industries is associated with high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Segregation Index	Index of dissimilarity where higher values indicate greater residential segregation between non-white and white county residents.	A Lower value is associated with low risk	Dissimilarity or segregation indicates social inequality and differential access to resources. A higher value is associated with high risk	High
Service	Percentage Employed in Service	Service sector is a huge contributor to the economic productivity and bolsters the primary and secondary economic sectors as well and provides a huge source of employment. A higher employment in the service sector signals greater economic resilience and lower risk.	A lower proportion of workers in the service sector indicates a less developed and resilient economy with greater dependence on place-based work. It is therefore an area of high risk.	High
Service LQ	Location Quotient of Service Occupations	A higher LQ for the service sector indicates a high risk	A lower LQ for the service sector indicates a lower resilience and higher risk	Very Low
SingleParent Percent	Percentage of Single Parent Households	A lower proportion of single parent households indicates a lower disaster vulnerability, owing to lesser probability of financial, academic and behavioural problems which have been correlated with single parent households.	Children living in single-parent households have greater risks to their physical and social health and wellbeing compared with other family structures such as two parent or grandparent headed households. Thus, a greater proprotion of single parent households represents a higher disaster risk	Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Skilled Percent	Percentage of Skilled Persons	A higher number of skilled individuals represents a lower disaster risk	Lack of occupational skill is associated with lower incomes and employment benefits and therefore less resources for disaster recovery. Therefore, a lower percentage of skilled workers indicates a greater disaster risk.	Very High
SO4Ave ln	Sulfate (SO4) precipitation weighted mean in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Very Low
Social Association Rate	Number of membership associations per 10,000 population.	A higher value is associated is low risk	A high rate of social associations indicates healthy relationships and community life. A lower value is associated with high risk	Low
std coal prim pop ln	Primarily coal mines, mines per county population, as proportion	A Lower value is associated with low risk	It indicates mining activities and environmental stability. A higher value is associated with high risk	Very Low
std metal prim pop ln	Primarily metal mines, mines per county population, as proportion	A Lower value is associated with low risk	It indicates mining activities and environmental stability. A higher value is associated with high risk	Very Low
std nonmetal prim pop ln	Primarily nonmetal mines, mines per county population, as proportion	A Lower value is associated with low risk	It indicates mining activities and environmental stability. A higher value is associated with high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
std sandandgravel prim pop ln	Primarily sand and gravel mines, mines per county population, as proportion	A Lower value is associated with low risk	It indicates mining activities and environmental stability. A higher value is associated with high risk	Very High
std stone prim pop ln	Primarily stone mines, mines per county population, as proportion	A Lower value is associated with low risk	It indicates mining activities and environmental stability. A higher value is associated with high risk	High
Total	Total Housing Stock	A lower number of housing units indicates less damage during a disaster and is associated with low risk	A higher number of housing units indicates the possibility of greater risk during disasters	Low
Transport	Percentage Employed in Transportation Occupations	Like retail, transportation businesses are often associated with having business plans, more structurally sound and meets standards. Thus a higher employment in transportation indicates a low risk	A lower employment in transportation business could mean that the businesses are not widely spread out and less economically resilient. It is interpreted as a high risk.	Moderate
Transport LQ	Location Quotient of Transportation Occupations	A higher LQ in transportation industries is associated with low risk	A lower LQ in transportation industries associated with high risk	Very Low
Unemployment percent	Percentage of Unemployed Persons	A lower rate of unemployment indicates a more stable and resilient economic environment and is therefore associated with lower disaster risks	A high rate of unemployment could indicate a range of socio-economic vulnerabilities and political struggles. It indicates lower economic resilience during disasters and is therefore associated with high risk	Moderate

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Units SingleFamily	Percentage of Single Family Units	A lower porportion of single family units signals greater housing mix, affordability and greater housing resilience. It is therefore associated with low risk	A greater proportion of single family homes signals lesser housing diversity and therefore higher risks for low income populations. It is associated with higher risk	Very Low
UnstableEmployment Percent	Percentage Population with Unstable Employment	A lower proportion of workers with unstable employment indicates greater economic stability and resilience, higher incomes and greater access to disaster recovery resources. It is therefore a low risk	Unstable employment is correlated with lower incomes, health problems, negative familial effects and other challenges lowering economic resilience post disaster. A greater proportion of workers with unstable employment indicates a higher risk	Very Low
Vacancy	Percentage Vacant Units	A lower proportion of vacant units signals greater utilization of available built environment resources, greater maintenance and lower probability of structural damage. It is therefore associated with low risk	A high proportion of vacant units signals a weak economic base and possibilities of blight and structural damage. It is therefore associated with a high risk	Very High
Vice related business rate	Rate of vice-related businesses per county as proportion of total businesses	A Lower value is associated with low risk	Greater proportion of vice-related business indicate hightened economic instability during disasters. A higher value is associated with high risk	Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Violent Crime Rate	Number of reported violent crime offenses per 100,000 population.	A Lower value is associated with low risk	A high of crimes indicates safety issues within the community. A higher value is associated with high risk	High
W As ln	Arsenic in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Moderate
W Ba ln	Barium in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Moderate
W Cd ln	Cadmium in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Moderate
W CN ln	Cyanide in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Moderate
W Cr ln	Chromium (total) in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Moderate
W FL ln	Fluoride in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	High
W HG ln	Mercury (inorganic) in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Very Low
W NO2 ln	Nitrite (as N) in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Very Low
W NO3 ln	Nitrate (as N) in mg/L, log transformed	A Lower value is associated with low risk	It is a pollutant. A higher value is associated with high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Walkability Score	Walkability score (ordinal)	A higher value is associated is low risk	High walkability scores indicate greater community vitality and economic accessibility. A lower value is associated with high risk	High
Wholesale	Percentage Employed in Wholesale Trade	A lower employment in wholesale businesses signals a greater economic resilience and low risk	Wholesale and retail businesses are more vulnerable to natural disasters and are more likely to close after disasters. They are also more likely to be low mitigators. A higher proportion of employment in the wholesale industry signals a high disaster risk	Very Low
Wholesale LQ	Location Quotient of Wholesale Trade Occupations	A lower LQ in wholesale industries is associated with low risk	A higher LQ is wholesale industries is associated with high risk	Low
Workers to OtherCounties	Number of resident workers who commute to work in other counties	A Lower value is associated with low risk	A lower commute time is assocatied with a health local economy. A higher value is associated with high risk	Very Low
Working Nonworking ratio	Ratio of Working to Non-working Population	A high ratio indicates lower risk	This ratio indocates the amount of labor resources available in the market, and signals unemployment, income and other economic factors. A low ratio indicates a lower economic resilience to market shocks and is therefore high risk.	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
WorkNearby percent	Percentage Workers who live near their place of work	A greater proportion of persons who live near their place of work indicates a lower dependence on commute and transportation networks and a more robust resilient economy. Therefore it is a low risk	A lower proprotion of persons who live near their place of work indicates a high dependence on transportation networks for economic activities and a greater risk of disruption during disasters. It is therefore a high risk	Very High
Young percent	Percentage of Young Persons	A small percentage of children would mean less vulnerability to disasters	A large percentage of children would indicate a greater vulnerability to disasters	Moderate

Appendix B

High Risk and Low Risk Areas at Rural, Urban and Census Place Levels

Indicator	Risk Level (Rural)	Risk Level (Places)
Agri	Moderate	Very Low
Agri LQ	Moderate	Very Low
Agro Percent	Moderate	Very Low
Airports	Moderate	Moderate
ALLNPDESperKM ln	High	High
Arts	Very High	Very High
Arts LQ	Very High	Very High
Avg HHsize	High	Very Low
Avg Temp	Very Low	Very Low
Bridges	Very High	Very High
Business establishments	Very High	Very High
CaAve ln	Very Low	Very Low
Civic related business rate	Very Low	Very Low
CO8	Moderate	Moderate
Commuters withinCounty	Very Low	Very Low
CommuteTime	Low	Low
construction	Low	Low
construction LQ	Moderate	Moderate
Cost IncomeRatio	Very High	Moderate
COVID-19 death rate	Moderate	Moderate
D303 Percent ln	Very Low	Very Low
Disabled Percent	Very High	Low
Docks	Low	Low
Edu	Very High	Low
Edu LQ	Very High	Moderate
Educated percent	Very High	Very High
Education related business rate	Low	Low
Elderly growth percent	Moderate	Moderate
FemaleHeaded HHs Percent	Low	Very Low
FemaleLaborforce percent	Moderate	Moderate

(continued)

Indicator	Risk Level (Rural)	Risk Level (Places)
Females Percent	Very Low	Very Low
Finance	Very High	Moderate
Finance LQ	Very High	Very High
Food Environment Index	High	High
Freight railroad miles	High	High
fungicide ln	Very Low	Very Low
Gender Pay Gap	Low	Low
GINI Index	Low	Very High
GroupQuarters	Moderate	Moderate
Healthcare related business rate	Moderate	Moderate
HelperPool	Moderate	Moderate
herbicide ln	Very Low	Very Low
Homewownership	High	Very High
Inadequate Facilities	Very Low	Very Low
Info	Moderate	Very Low
Info LQ	Moderate	Very Low
insecticide ln	Very Low	Very Low
Kave ln	Very Low	Very Low
LargeFam Percent	High	Very Low
LowIncome Percent	Very High	Very High
Management	Low	Low
Management LQ	Moderate	Very Low
Manufacturing	Very Low	Very Low
Manufacturing LQ	Very Low	Moderate
Max Temp	Very Low	Very Low
MBS	Moderate	Moderate
MBS LQ	Very High	Moderate
MedianHomeValue	High	Very High
MentalHealth Provider Rate	Very Low	Very Low
MHHI	Very High	Very High
Min Temp	Very Low	Very Low

(continued)

Indicator	Risk Level (Rural)	Risk Level (Places)
MobileHomes	Very High	Very High
NewHomes	Low	Low
NO21	Moderate	Moderate
NO2AM	Moderate	Moderate
NO3Ave.x	Very Low	Very Low
NonWhite Percent	Very High	Very High
NotMarried Percent	High	Very High
NoVehicle Pop	Low	Very Low
O3	Low	Low
Old percent	High	Very High
OldHomes	Low	Low
Other county workers	Low	Low
Others	Very Low	Moderate
Others LQ	Very Low	Low
Overcrowding	Very High	Low
Passenger railroad miles	High	High
Pb3	Moderate	Moderate
pct au ln	Moderate	Moderate
pct disease acres ln	Moderate	Moderate
pct harvested acres ln	Very Low	Very Low
PCT IRRIGATED ACRES ln	Very Low	Very Low
pct manure acres ln	Very Low	Very Low
Per PSWithSW.x	High	High
Per TotPopSS.x	Very Low	Very Low
Percent MediumFairCondition Bridges	Moderate	Moderate
Percent AssistanceNeed	Very High	Moderate
Percent BachelorsDegree	Very High	Moderate
Percent BroadbandAccess	High	High
Percent Children in Poverty	Very High	Very High
Percent Commuters	Moderate	Moderate
Percent commuters by transit	High	High
Percent Disconnected Youth	Low	Low

(continued)

Indicator	Risk Level (Rural)	Risk Level (Places)
Percent Exercise Access	Moderate	Moderate
Percent Food Insecure	Very High	Very High
Percent HousingProblems	High	High
Percent income required for childcare expenses	Very High	Very High
Percent LanguageBarrier	Very Low	Low
Percent Limited Access to Healthy Foods	Low	Low
Percent NoHealthIns	Very High	Very High
Percent PoorCondition Bridges	Moderate	Moderate
Percent rural	High	High
Percent Section8	High	High
Percent Vaccinated	Low	Low
Percent work at home	Very High	Very High
Physically Unhealthy Days	Very High	Very High
PM10	Moderate	Moderate
PM2.5	Low	Low
PM2Point5	Low	Low
Population	High	NA
poverty	Very Low	Very Low
Precipitation	Very High	Very High
PrimaryCare Physicians Rate	Very High	Very High
PrimeWorkingAge percent	Very High	High
PT	Low	High
PT LQ	Very Low	Very Low
Radon.x	Very High	Very High
Recent Immigrants Percent	Moderate	Moderate
Recreation related business rate	Very Low	Very Low
Rental CostBurden below	Moderate	NA
Rental CostBurden below20000	NA	High
Rental Overcrowding	Very High	Very High
Rented	Moderate	Very High

(continued)

Indicator	Risk Level (Rural)	Risk Level (Places)
Renter MHHI	Very High	High
Renters Cost IncomeRatio	Very High	Low
Resident Workers	Very High	Very High
Retail	Low	Very Low
Retail LQ	Low	Moderate
Sales	Low	Very Low
Sales LQ	Very Low	Very Low
Segregation Index	High	High
Service	Very Low	Very Low
Service LQ	Very Low	Very Low
SingleParent Percent	Moderate	Very Low
Skilled Percent	Very High	Moderate
SO21	Moderate	Moderate
SO4Ave ln	Very Low	Very Low
Social Association Rate	Low	Low
std coal prim pop ln	Low	Low
std metal prim pop ln	Moderate	Moderate
std nonmetal prim pop ln	Low	Low
std sandandgravel prim pop ln	Very High	Very High
std stone prim pop ln	High	High
Total	Very High	High
Transport	Very Low	Very Low
Transport LQ	Very Low	Very Low
Unemployment percent	Low	Low
Units SingleFamily	Very Low	Very Low
UnstableEmployment Percent	Low	Moderate
Vacancy	Very High	Very High
Vice related business rate	Low	Low
Violent Crime Rate	High	High
W As ln	Moderate	Moderate
W Ba ln	Moderate	Moderate
W Cd ln	High	High

(continued)

Indicator	Risk Level (Rural)	Risk Level (Places)
W CN ln	High	High
W Cr ln	High	High
W FL ln	High	High
W HG ln	Moderate	Moderate
W NO2 ln	Very Low	Very Low
W NO3 ln	Very Low	Very Low
Walkability Score	High	High
Wholesale	Moderate	Very Low
Wholesale LQ	Moderate	Very Low
Workers to OtherCounties	Very Low	Very Low
Working Nonworking ratio	Moderate	Moderate
WorkNearby percent	Very High	Moderate
Young percent	Moderate	Low