

County-Level Risk Assessment: DuPage County, Illinois

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Guide to the Report

Table 1: This table contains basic statistics of the county as a whole which helps set the context for the rest of the analysis and visualizations as described below.

Table 2: This table describes the number of census tracts grouped by their computed resilience levels. The basic resilience values of each tract are grouped into 5 quantiles (resilience levels), where 5 (very high resilience) covers counties having resilience values in the top 20

Table 3: This table contains the Indicator Group Rankings, which contain a five-point rating across five indicator themes: housing, economy, community health, infrastructure, and environment. It shows where the current county falls compared to other counties in the state (Low Risk means the resilience value for the current county is in the top 20

Table 4: This table contains the Indicator Group Rankings computed across all tracts in the county which correspond to rural areas, similar to Table 3. The resilience values across all tracts are aggregated at the county level, which is then converted into quantiles which serve as rankings.

Table 5: This table contains the Indicator Group Rankings computed across all tracts in the county which correspond to urban areas, similar to Table 3. The resilience values across all tracts are aggregated at the county level, which is then converted into quantiles which serve as rankings.

Table 6: This table describes the Census Places in the county grouped by their resilience categories. This is similar to Table 2, the resilience values are categorized into 5 levels and aggregated over all the Census Places over the county.

Table 7: This table contains the Indicator Group Rankings computed across all census places in the county, similar to Table 3. The resilience values across all census places are aggregated at the county level, which is then converted into quantiles which serve as rankings.

Figure 1: This maps plots each census tract in the entire county and color-codes each tract with its computed resilience levels.

Figure 2: This pie chart shows the composition of the county on the basis of percentage of census tracts in each resilience category.

Figure 3: This map shows the urban resilience of all tracts which are classified as 'urban', i.e. they are assigned a USDA RUCA code of 1. Urban resilience is only computed across all urban tracts in the entire state, whereas overall resilience is computed across all tracts.

Figure 4: This map shows the rural resilience of all tracts which can be classified as 'rural', i.e. they are assigned a USDA RUCA code different from 1. Rural resilience is computed across all rural tracts in the state, similar to urban resilience.

Figure 5: In this map, the census places within the state are shown and the subject county is highlighted using a red border that outlines the county boundary.

Figure 6: This figure is a map of the subject county showing all the census places inside it, color coded with the places resilience levels. Place resilience is computed across all census places in the state, similar to rural and urban resilience.

Figure 7: This is a pie chart and table showing composition of the county on the basis of percentage of census places in each disaster resilience category.

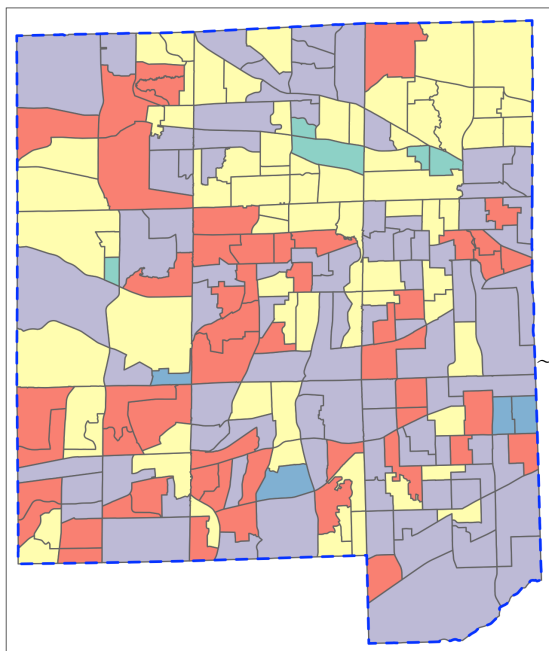
Appendix A: This table contains the different indicators used in the analysis, their definition, what it means when the indicator is said to be at low or high risk, and the risk level computed for this indicator at the county level. The risk level is computed by comparing the value of the indicator across all counties in the state and converting the raw values into quantiles: Very High, High, Moderate, Low, and Very Low.

Appendix B: This table contains the different indicators used in the analysis and their computed risk level for all rural, urban census tracts as well as the census places present inside the county. The risk level is computed across all counties in the state and converted into quantiles: Very High, High, Moderate, Low, Very Low.

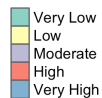
Disclaimer: Variables from County health patterns, EQI and County transportation patterns might have aggregation errors at the tract, urban, rural and census place levels owing to unavailability of data beyond the county level.

Census Tracts within DuPage County, Illinois

Figure 1



Resilience Category



Basic Statistics

Table 1: Basic Statistics (County level)

Information	Value
Population	926005 persons
Area sq. miles	328.42 sqm
Gross Density(persons/sq mil)	2820 p/sqm
Avg HH Size	2.65 persons
Median HH Income	94930 USD

Count of Tracts in each Category

Figure 2

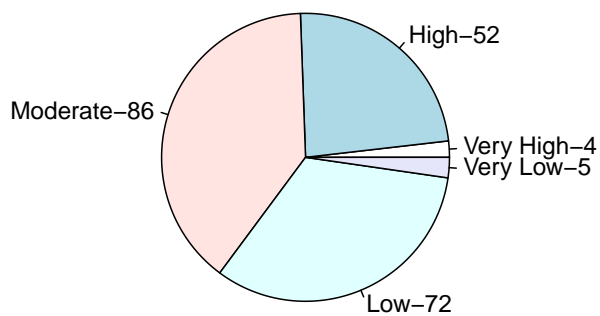
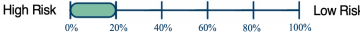






Table 2: Percentage of Census Tracts under each Resilience Category(County level)

Very High	High	Moderate	Low	Very Low
2	24	39	33	2

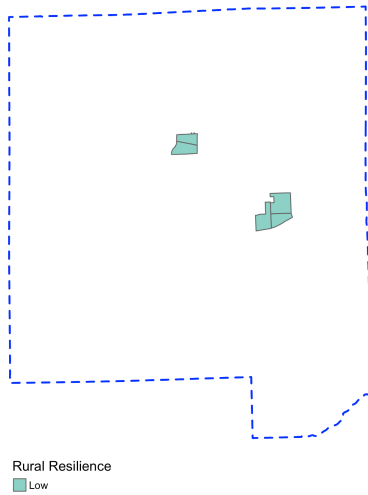
Indicator Group Rankings

Table 3: Overall Indicator Group Rankings

Indicator Group	High Risk Areas	Low Risk Areas
Community 	Skilled Percent, HelperPool, Percent BachelorsDegree, Physically Unhealthy Days, Food Environment Index, Percent Exercise Access, PrimaryCare Physicians Rate, Percent Vaccinated, Percent Food Insecure, Percent rural	Working Nonworking ratio
Economy 	Income, UnstableEmployment percent, LowIncome Percent, poverty, WorkNearby percent, MBS, MBS LQ, Service, Sales, construction, Retail, Retail LQ, Transport, Transport LQ, Info, Info LQ, Finance, Finance LQ, Management, Edu, Civic related business rate, Healthcare related business rate	Service LQ, Edu LQ, Gender Pay Gap.x
Housing 	Vacancy, MobileHomes, Renters Cost IncomeRatio, Renter MHHI, MedianHomeValue, NoVehicle Pop, Percent Children in Poverty.y	Overcrowding, Percent income required for childcare expenses.y
Environment 	so2, nox, Pct BS, D303 Percent, ALLNPDESperKM, CaAve, NO3Ave, W Cd	co, pct defoliate acres, Per PSWithSW
Infrastructure 	Pubtrans Dependent, Pubtrans heavilyDependent, Percent BroadbandAccess	

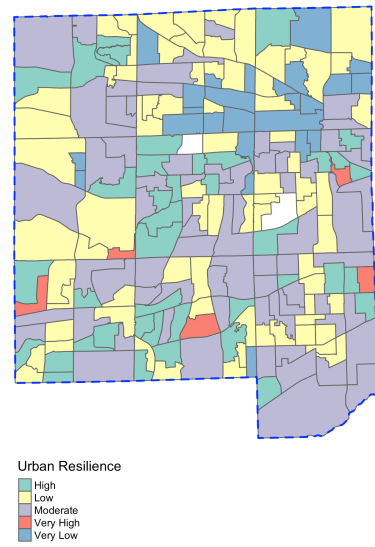
Rural Resilience within DuPage County, Illinois

Figure 3



Urban Resilience within DuPage County, Illinois

Figure 4



Rural Indicator Rankings

Table 4: Rural Indicator Group Rankings

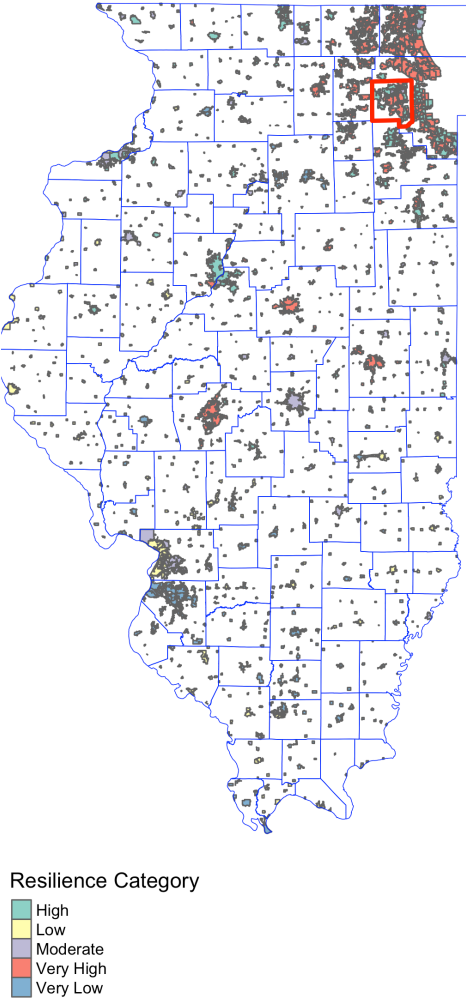
Indicator Group	High Risk Areas	Low Risk Areas
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Urban Indicator Rankings

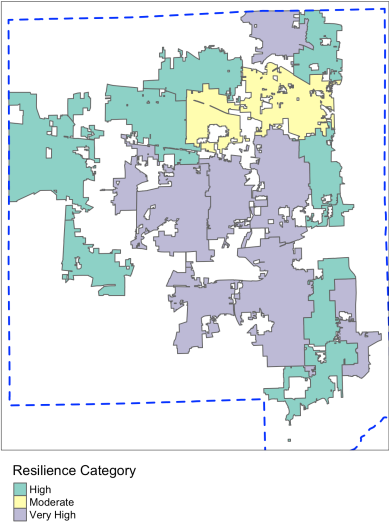
Table 5: Urban Indicator Group Rankings

Indicator Group	High Risk Areas	Low Risk Areas
Community 	Food Environment Index, Percent Exercise Access, PrimaryCare Physicians Rate, MentalHealth Provider Rate	Population, Old percent, PrimeWorkingAge percent
Economy 	Unemployment percent, WorkNearby percent, MBS LQ, Retail LQ, Transport LQ, Management LQ, Others LQ, Civic related business rate	Service LQ, Manufacturing, Info, Finance, Vice related business rate
Housing 	MedianHomeValue	OldHomes, NewHomes, Units SingleFamily
Environment 	nox, Pct BS, ALLNPDESperKM	co, Facilities Rate, Per TotPopSS, ClAve, W Cd, W XYLENES
Infrastructure 	Pubtrans heavilyDependent, Percent BroadbandAccess	

State-Level Places Map
Figure 5



Places Map within DuPage County, Illinois County, IL
Figure 6



Count of Places in each Category
Figure 7

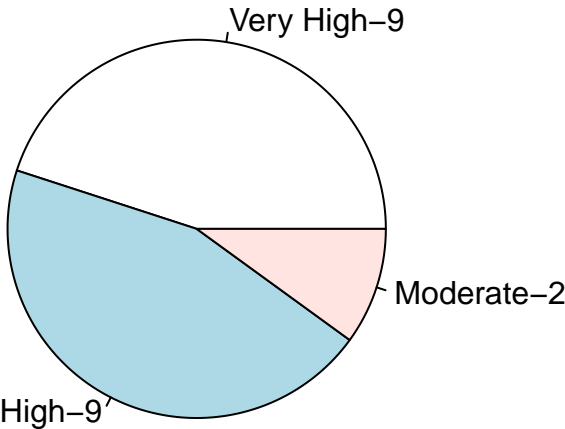
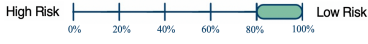



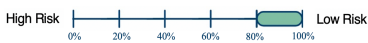


Table 6: Percentage of Census Tracts under each Resilience Category(County level)

Very High	High	Moderate	Low	Very Low
45 %	45 %	10 %	0 %	0 %

Places Indicator Rankings

Table 7: Places Indicator Group Rankings

Indicator Group	High Risk Areas	Low Risk Areas
Community 	SingleParent Percent, Educated percent, Skilled Percent, Working Nonworking ratio, HelperPool, Percent BachelorsDegree, Physically Unhealthy Days, Food Environment Index, Percent Exercise Access, PrimaryCare Physicians Rate, Percent Vaccinated, Percent Food Insecure, Percent rural	Females Percent
Economy 	Income, UnstableEmployment percent, LowIncome Percent, poverty, WorkNearby percent, MBS, MBS LQ, Service, Sales, construction, Retail, Retail LQ, Transport, Transport LQ, Info, Info LQ, Finance, Finance LQ, Management, Edu, Others, Civic related business rate, Healthcare related business rate	Gender Pay Gap.x
Housing 	Vacancy, Renter MHHL, MedianHomeValue, NoVehicle Pop, Percent Children in Poverty.y	Percent income required for childcare expenses.y
Environment 	so2, nox, Pct BS, D303 Percent, ALLNPDESperKM, CaAve, NO3Ave	co, pct defoliate acres, W As, W Ba, W SE, W ENDRIN, W METHOXYCHLOR, W DEHP, W PCB, W DBCP
Infrastructure 	Pubtrans Dependent, Pubtrans heavilyDependent, Protective Services, Percent BroadbandAccess	No CommunicationSources

Relevant Resources

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

- Economy

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).

Economy

Agriculture and Rural Economy

- **Branching Out: Agroforestry As A Climate Change Mitigation And Adaptation Tool For Agriculture**

Organization : Journal of Soil and Water Conservation

Year : 2012

Document_type : General Resource/ Foundational Research, Planning Tool

Disasters : Flood, Drought, Extreme Weather, Man-Made Disasters, Soil Erosion/Landslides, Agricultural Disasters

Abstract : US and Canadian agricultural lands are being pressed to provide more environmental and economic services, while at the same time their capacity to provide these services under potential climate change (CC) is being questioned (Field et al. 2007; CAST 2011). Producers are already experiencing weather patterns outside of climate norms (e.g., the 2011 droughts in Texas, and flooding along the Missouri River in the United States and along the Red River in Canada) that have had significant impacts on production. Predictions of future climate conditions for the US Midwest include longer growing seasons that could potentially increase crop yields but also increase heat waves, floods, droughts, and insect and weed issues that may then adversely impact production (USGCRP 2009). Climate change drives many stressors and interacts with many non-climatic stressors. This makes it difficult to forecast outcomes in any general way other than many existing threats to agricultural production, such as erosion and pests, which will most likely be exacerbated under shifting climate (Field et al. 2007; USGCRP 2009). Creating profitable and healthy operations under this unpredictable interplay of factors driven by shifting climate (and, along with it, shifting markets) will be a daunting task.

It will be essential that farmers, ranchers, and even communities have a variety of land management options to minimize the risks and maximize services under such uncertain conditions.

Plan_Components : Strategies

- **Disaster Assistance Programs At A Glance**

Organization : USDA

Year : 2020

Document_type : General Resource/ Foundational Research

Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Man-Made Disasters, Biological Disasters, Soil Erosion/Landslides, Agricultural Disasters

Abstract : A clean easy to read guide to programs that USDA offers for farm production and conservation

Plan_Components : Funding Mechanisms

- **Soil Health Matrix Decision Tool**

Organization : North Central Region Water Network

Year : 2022

Document_type : Web-based Resource, Planning Tool

Disasters : Man-Made Disasters, Agricultural Disasters

Abstract : This tool is designed to serve as a 101 tool for producers who are considering implementing new soil health practices on their operation. It is not meant to provide specific metrics on the impact of practice implementation. Instead, it is designed to give producers an overall feel for the soil health benefits of a range of management decisions and help narrow down which practices might be the best fit for their operation. After using this tool, it is critical for producers to work with advisors and educators about the specifics of their operation prior to implementation. The values in this tool are regional in nature.

Plan_Components : Tools

- **Dealing With Flooding**

Organization : Iowa State University Extension and Outreach

Document_type : General Resource/ Foundational Research, Web-based Resource

Disasters : Flood

Abstract : Floods are one of the most common, and most costly, natural disasters. Preparing for flood situations can minimize injury to yourself and your family and speed the recovery process. These resources will help you prepare and recover from flooding situations.

Plan_Components : Tools

- **Dairy And Livestock Farm Disaster Preparedness And Recovery Guide For Maine Farmers**

Organization : University of Maine Cooperative Extension

Year : 2018

Document_type : General Resource/ Foundational Research, Web-based Resource, Planning Tool, Manual for an Local Organization

Disasters : Flood, Extreme Weather, Wildfires, Man-Made Disasters, Biological Disasters, Agricultural Disasters

Abstract : This fact sheet contains tip sheets and checklists to help you prepare for and recover from an on-farm or community disaster, especially if you are unfamiliar with emergency management limitations regarding livestock.

Plan_Components : Strategies, Planning Processes, Tools, Information

- **Farmable Wetlands Program**

Organization : Farm Service Agency USDA

Year : 2022

Document_type : General Resource/ Foundational Research, Web-based Resource, Funding Opportunities

Disasters : Flood, Drought, Man-Made Disasters, Biological Disasters, Soil Erosion/Landslides, Agricultural Disasters

Abstract : The Farmable Wetlands Program (FWP) is designed to restore previously farmed wetlands and wetland buffer to improve both vegetation and water flow. FWP is a voluntary program to restore up to one million acres of farmable wetlands and associated buffers. Participants must agree to restore the wetlands, establish plant cover, and to not use enrolled land for commercial purposes. Plant cover may include plants that are partially submerged or specific types of trees.

Plan_Components : Strategies, Funding Mechanisms, Tools, Green Infrastructure, Information

- **Plant Pest And Disease Management And Disaster Prevention Program**

Organization : USDA

Year : 2022

Document_type : Planning Tool, Funding Opportunities

Disasters : Biological Disasters, Agricultural Disasters

Abstract : Under the Plant Pest and Disease Management and Disaster Prevention Program, APHIS funds projects organized around specific goal areas that represent critical needs and opportunities to strengthen, prevent, detect, and mitigate invasive pests and diseases.

Plan_Components : Strategies, Funding Mechanisms, Information

- **Invasive Species**

Organization : UDSA Forest Service

Document_type : General Resource/ Foundational Research

Disasters : Man-Made Disasters, Biological Disasters, Agricultural Disasters

Abstract : Invasive species have two main characteristics: they are non-native (exotic/alien) to the ecosystem that they occupy, and their existence in that ecosystem causes or is likely to cause harm to the economy, environment, or human health. If left unchecked, invasive species can threaten native species, biodiversity, ecosystem services, recreation, water resources, agricultural and forest production, cultural resources, economies and property values, public safety, and infrastructure.

Plan_Components : Strategies, Information

Economic Recovery, Restoration and Resilience

- **Managed Aquifer Recharge And The U.S. Army Corps Of Engineers: Water Security Through Resilience**

Organization : Institute for water resources

Year : 2020

Document_type : Manual for an Local Organization

Disasters : Flood, Drought, Man-Made Disasters

Abstract : The Institute for Water Resources (IWR) is a U.S. Army Corps of Engineers (USACE) Field Operating Activity with centers located in Alexandria, VA, Davis, CA; New Orleans, LA; Lakewood, CO; and Pittsburgh, PA. IWR was created in 1969 to analyze and anticipate changing water resources management conditions and develop methods and analytical tools to address economic, social, institutional, and environmental needs in water resources. Since its inception, IWR has been a leader in the development of strategies and tools for planning and executing USACE water resources and water management programs.

Plan_Components : Strategies, Funding Mechanisms, Case Studies

- **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

- **Innovative Drought And Flood Mitigation Projects**

Organization : FEMA

Year : 2017

Document_type : General Resource/ Foundational Research

Disasters : Flood, Drought, Extreme Weather, Soil Erosion/Landslides

Abstract : FEMA commissioned a report titled FEMA Mitigation Support for Planning and Implementation of Climate Resilient Infrastructure (CDM Smith, 2015a) in February 2015. In this report, over 70 climate resilient project options were identified that may reduce the risk of impacts to people and infrastructure attributed to climate change weather extremes. This list was reduced to 14 project types for further evaluation and analysis of various technical, economic-financial, implementation, and environmental considerations. Of the 14 project types 4 of these projects were selected based on their high performance

related to the aforementioned criteria and their ability to meet basic requirements consistent with HMA Guidance.

This document evaluates the four project types from the standpoint of HMA program requirements: technical feasibility and effectiveness, cost effectiveness, Environmental and Historic Preservation (EHP) requirements and identifies areas of potential overlap with other Federal Agencies to support FEMA's evaluation of Duplication of Programs (DOP) while also considering areas where Federal agencies could successfully coordinate to fund these project types from multiple Federal programs.

Plan_Components : Surveys/Assessments, Case Studies

- **Ecosystem Service Benefits In Benefit-Cost Analysis For Fema's Mitigation Programs Policy**

Organization : FEMA

Year : 2016

Document_type : General Resource/ Foundational Research, Policy

Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Man-Made Disasters, Biological Disasters, Soil Erosion/Landslides, Agricultural Disasters

Abstract : This policy provides guidance for using ecosystem service benefits in the evaluation of the cost-effectiveness of mitigation projects funded under FEMA's Hazard Mitigation programs and rescinds FP-108-024-01 and eliminates the BCR 0.75 requirement, allowing consideration of ecosystem service benefits for a project regardless of BCR value. FEMA rescinds that policy in recognition that the natural environment is an important component of a community's resilience strategy.

Plan_Components : Strategies

- **Hazard Mitigation Assistance Guidance**

Organization : FEMA

Year : 2015

Document_type : Planning Tool, Manual for an Local Organization

Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Man-Made Disasters, Biological Disasters, Soil Erosion/Landslides, Agricultural Disasters

Abstract : The U.S. Department of Homeland Security (DHS) FEMA HMA programs present a critical

opportunity to reduce the risk to individuals and property from natural hazards, while simultaneously reducing reliance on Federal disaster funds. HMA programs provide funding for eligible activities that are consistent with the National Mitigation Framework's Long-Term Vulnerability Reduction capability. HMA programs reduce community vulnerability to disasters and their effects, promote individual and community safety

and resilience and promote community vitality after an incident. Furthermore, HMA programs reduce response and recovery resource requirements in the wake of a disaster or incident, which results in a safer community that is less reliant on external financial assistance.

Plan_Components : Strategies, Planning Processes, Funding Mechanisms

- **Supplemental Guidance For Conducting A Benefit-Cost Analysis (Bca) For A Floodplain And Stream Restoration Project**

Organization : FEMA

Year : 2016

Document_type : General Resource/ Foundational Research, Planning Tool

Disasters : Flood, Drought, Extreme Weather, Soil Erosion/Landslides

Abstract : According to the FY2016 Pre-Disaster Mitigation (PDM) program Notice of Funding Opportunity (NOFO), Climate Resilient Mitigation Activities are eligible for PDM funding. The NOFO lists the Floodplain and Stream Restoration (FSR) project type as one of these eligible project types. Because the benefits that could be applicable to an FSR project have not yet been incorporated into the BCA Tool, this document was developed to assist users of FEMA's BCA Tool in performing a benefit cost analysis for an FSR project. The process for conducting a BCA may involve inputting data in existing data fields in the BCA Tool, using a FEMA-created spreadsheet, and/or calculating losses manually and then entering them into new loss category fields in the BCA Tool.

Plan_Components : Planning Processes, 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

- **Coronavirus State And Local Fiscal Recovery Funds**

Organization : U.S. DEPARTMENT OF THE TREASURY

Year : 2022

Document_type : Others

Disasters : Flood, Biological Disasters

Abstract : The Coronavirus State and Local Fiscal Recovery Funds (SLFRF) program, a part of the American Rescue Plan, delivers \$350 billion to state, local, and Tribal governments across the country to support their response to and recovery from the COVID-19 public health emergency.

Plan_Components : Strategies, Funding Mechanisms

- **Community Solutions For Stormwater Management**

Organization : EPA

Year : 2016

Document_type : Planning Tool

Disasters : Flood, Man-Made Disasters

Abstract : The purpose of this draft guide is to assist EPA, states and local governments in developing new or improving existing long-term stormwater plans that inform stormwater management implemented by communities on the ground. The document describes how to develop a comprehensive long-term community stormwater plan that integrates stormwater management with communities' broader plans for economic development, infrastructure investment and environmental compliance.

Plan_Components : Strategies, Planning Processes, Tools, Green Infrastructure

- **Living With Weather**

Organization : Midwestern Regional Climate Center

Year : 2022

Document_type : Web-based Resource, Planning Tool

Disasters : Tornado, Flood, Drought, Extreme Weather, Wildfires

Abstract : Weather extremes have occurred, do occur, and will occur and can variously affect your personal health and safety, energy and water availability and usage, home and business structures, agricultural and transportation resources, air and water quality. Information collected primarily from governmental agencies is provided for easier living with extreme weather events (such as heat waves and droughts, thunderstorms, floods and ice storms and snowstorms).

Resources are outlined for individuals to better plan for their own safety, for communities to help their residents to plan for and cope with weather hazards, and to aid individuals and communities to begin their recovery from weather hazards.

Plan_Components : Surveys/Assessments, Strategies, Tools, Information

- **Flood Risk Overview For Illinois**

Organization : Flood Factor

Document_type : Web-based Resource, Planning Tool

Disasters : Flood, Extreme Weather

Abstract : There are 492,334 properties in Illinois that have greater than a 26% chance of being severely affected by flooding over the next 30 years. This represents 10% of all properties in the state. In addition to damage on properties, flooding can also cut off access to utilities, emergency services, transportation, and may impact the overall economic well-being of an area. Explore the maps below to learn more about the homes, roads, businesses, and services at risk in Illinois.

Plan_Components : Strategies, Tools, Green Infrastructure, 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

- **Forests For Indy Executive Summary: Urban Forest Protection Strategy**
 Organization : Indiana Forest Alliance and The Conservation Fund
 Year : 2021
 Document_type : Specific Plan, Manual for an Local Organization
 Disasters : Flood, water quality, heat, atmospheric CO2
 Abstract : Coordinated by the Indiana Forest Alliance, this data-driven framework fulfills a key directive in the White River Vision Plan: to “identify forests that are not protected, assess their quality and establish priorities for preserving high quality forests and forest cover in general.” Forest preservation also advances the goals of the Thrive Indy plan by equitably expanding green space, improving stormwater infiltration, and building climate resilience — boosting livability for every Indianapolis resident.
 Plan_Components : Surveys/Assessments, Strategies, Funding Mechanisms, Tools, Green Infrastructure
- **Mitigation Ideas A Resource For Reducing Risk To Natural Hazards**
 Organization : FEMA
 Year : 2013
 Document_type : Planning Tool
 Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides
 Abstract : The purpose of this document is to provide a resource that communities can use to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters. The focus of this document is mitigation, which is action taken to reduce or eliminate long-term risk to hazards. Mitigation is different from preparedness, which is action taken to improve emergency response or operational preparedness.
 Plan_Components : Strategies, Green Infrastructure, Information
- **Comprehensive Plan Village Of Savoy**
 Organization : Village of Savoy
 Year : 2019
 Document_type : Specific Plan
 Disasters : Tornado, Flood, Wildfires
 Abstract : The comprehensive plan is an official statement of a local government that establishes goals, policies, and actions for future development. As the leading policy document guiding the development of local jurisdictions, the comprehensive plan has an important role to play in meeting local and regional challenges such as economic uncertainty, resource depletion, climate instability, and social disparities.
 Plan_Components : Surveys/Assessments, Strategies, Planning Processes, Green Infrastructure
- **Cape Cod Green Infrastructure Guide**
 Organization : Tufts University
 Year : 2015
 Document_type : General Resource/ Foundational Research, Web-based Resource
 Disasters : Flood, Man-Made Disasters, Biological Disasters, Agricultural Disasters
 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. The group primarily focused on nitrogen mitigation strategies in Cape Cod. Excess nitrogen has led to

eutrophication and degraded water habitats, resulting in significant environmental impacts. Nitrogen loading to Cape Cod's watersheds must be reduced in order to restore ecological health and preserve this unique system into the future.

Plan_Components : Case Studies, Green Infrastructure, Information

- **Community Flood Resilience In Vinton: Engaging Residents Affected By The Floods Of 2008 And 2016**

Organization : Iowa Watershed Approach, U.S. Department of Housing and Urban Development (HUD)

Year : 2020

Document_type : Planning Tool, Manual for an Local Organization

Disasters : Flood

Abstract : Vinton was selected to be included in the Iowa Watershed Approach's Flood Resilience Program, which recognizes that social resources are often absent or minimally evident when it comes to flood resiliency.

The program strives to improve the use of social resources in watersheds by connecting local partners and stakeholders, enhancing the presence of social resources in watershed planning efforts, and increasing the awareness and communication about established and novel flood resilience initiatives.

Plan_Components : Surveys/Assessments, Strategies, Planning Processes, Case Studies

- **Plan Today For Tomorrow's Flood**

Organization : Purdue University

Year : 2010

Document_type : Planning Tool

Disasters : Flood

Abstract : This publication raises the awareness of how floodwaters pose risks to both agricultural retailers and their communities. It includes the lessons many retail managers learned from their flooding experiences, and helps retailers examine what they need to do to create a flood preparation plan.

Plan_Components : Planning Processes, Information

- **Disaster Recovery Resource Fair**

Organization : University of Minnesota Extension

Document_type : Planning Tool, Manual for an Local Organization

Disasters : Disasters in general

Abstract : Holding Disaster Recovery Resource Fairs in the affected community can help reduce many barriers people may encounter as they attempt to access disaster assistance programs and services. A Disaster Recovery Resource Fair is a local, one-stop shop for disaster survivors to access multiple assistance programs at one location. They are held at times when survivors may be available to attend and are offered on more than one occasion. More people participate when the resource fair is held in a familiar place within the affected community and is organized, promoted, and staffed by people familiar to the disaster survivors. A Disaster Recovery Resource Fair might resemble a Community Health Fair, trade show, or Home & Garden Expo where individuals can interact with a variety of resources in one setting.

Plan_Components : Planning Processes, Tools, Information

- **Indiana Coad Guidance Manual**

Organization : Purdue University

Year : 2012

Document_type : Planning Tool, Manual for an Local Organization

Disasters : disasters in general

Abstract : This document was written to help all community organizations and individuals understand

how collaborative efforts can prepare communities for disaster. The main goals of these collaborations are to help communities avoid some disasters and recover from other unavoidable disasters.

Plan_Components : Strategies, Planning Processes, Information

- **Green Infrastructure: Green Roofs And Walls**

Organization : The American Society of Landscape Architects

Year : 2022

Document_type : General Resource/ Foundational Research, Web-based Resource

Disasters : Flood, Extreme Weather, Man-Made Disasters

Abstract : Green roofs can help regulate a building's internal temperature, reduce stormwater runoff, and mitigate the urban heat island effect. Green roofs offer significant economic benefits, including a longer roof life and heating and cooling energy savings. Green roofs also provide an opportunity for urban food production, and increasing urban biodiversity. If well-designed and cared for, green roofs can offer people the psychological benefits of nature.

Plan_Components : Tools, Green Infrastructure, Information

- **Flood Resilience Checklist**

Organization : EPA

Year : 2014

Document_type : Planning Tool

Disasters : Flood

Abstract : This checklist includes overall strategies to improve flood resilience as well as specific strategies to conserve land and discourage development in river corridors; to protect people, businesses, and facilities in vulnerable settlements; to direct development to safer areas; and to implement and coordinate stormwater management practices throughout the whole watershed.

Plan_Components : Strategies, Tools

- **Flood Resilience A Basic Guide For Water And Wastewater Utilities**

Organization : EPA

Year : 2014

Document_type : Planning Tool

Disasters : Flood

Abstract : This guide is particularly useful for small and medium utilities.

It provides easy-to-use worksheets with corresponding videos (based on the Berwick pilot). To increase your resilience to flooding, consider your utility's priorities and available resources. Although this guide focuses on flood resilience, the same approach can be applied to enhancing resilience to other hazards (e.g., earthquakes, tornadoes)

Plan_Components : Strategies, Tools

- **Hazard Resources**

Organization : EDEN

Year : 2021

Document_type : General Resource/ Foundational Research, Planning Tool

Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Man-Made Disasters, Biological Disasters, Soil Erosion/Landslides, Agricultural Disasters

Abstract : Hazard resource database that can be used to search for hazard related resources.

Plan_Components : Tools

- **2010 – 2035 Comprehensive Plan**

Organization : Sangamon County Regional Planning Commission

Year : 2011

Document_type : Specific Plan

Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Soil Erosion/Landslides

Abstract : The plan is designed to show the Village's past and present conditions and also to highlight scenarios that the Village may pursue to further enhance our community in the future years. We have studied the plan and have worked to offer long term guidance in the critical planning areas that will enhance our community.

Plan_Components : Planning Processes, Green Infrastructure

Development and Finances

- **Supplemental Guidance For Conducting A Benefit-Cost Analysis (Bca) For A Floodwater Diversion And Storage Project**

Disasters : Flood, Drought

Abstract : According to the FY2016 Pre-Disaster Mitigation (PDM) program Notice of Funding Opportunity (NOFO), Climate Resilient Mitigation Activities are eligible for PDM funding. The NOFO lists the Floodwater Diversion and Storage (FDS) project type as one of these eligible project types. Because the benefits that could be applicable to an FDS project have not yet been incorporated into the BCA Tool, this document was developed to assist users of FEMA's BCA Tool in performing a benefit cost analysis for an FDS project. The process for conducting a BCA may involve inputting data in existing data fields in the BCA Tool, using a FEMA-created spreadsheet, and/or calculating losses manually and then entering them into new loss category fields in the BCA Tool

Plan_Components : Strategies, Planning Processes, Funding Mechanisms

- **Usda Forest Service Urban & Community Forestry 2022 Challenge Cost Share Grant Program**

Organization : USDA, U.S. Forest Service

Year : 2022

Document_type : Web-based Resource, Funding Opportunities

Disasters : Flood, Soil Erosion/Landslides

Abstract : Urban forests are trees for people, where they live, work and play, which includes natural resources on public and private property that contribute to quality of life, supports community development, green infrastructure, and provide a wealth of benefits to cities and towns.

The USDA Forest Service Urban & Community Forestry (U&CF) Program is the only dedicated urban forest program in the federal government. It is a technical, financial, and educational assistance program delivers nature-based solutions to more than 84 percent of Americans. The program works in partnership to restore, sustain, and manage more than 140 million acres of urban and community forest lands for the benefit of communities in the United States. Healthy urban & community forests and green infrastructure are not only critical to all our nation's forests, but research and studies have also shown that our urban and community forests are essential to the economic, environmental, physical, and mental well-being of our citizens.

Plan_Components : 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

- Hazard Mitigation Assistance Cost Share Guide

Organization : FEMA

Year : 2016

Document_type : General Resource/ Foundational Research, Manual for an Local Organization, Funding Opportunities

Disasters : Tornado, Flood, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides

Abstract : The Federal Emergency Management Agency (FEMA) offers three Hazard Mitigation Assistance (HMA) grant programs: the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation (PDM) Program, and the Flood Mitigation Assistance (FMA) Program. Each of the HMA programs have specific non-Federal, cost share contribution requirements administered in accordance with the Federal cost-sharing requirements outlined in Title 2 of the Code of Federal Regulations (CFR), Sections 200.29, 200.306, and 200.434 and consistent with Title 44 of the CFR, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and the National Flood Insurance Act, as amended.

This Guide is intended to provide a brief overview that will be helpful to grant Applicants in making cost share decisions and meeting Federal cost share requirements in the context of HMA grant programs

Plan_Components : Funding Mechanisms, Tools

- Iema Public Assistance Program

Organization : IEMA

Year : 2022

Document_type : General Resource/ Foundational Research, Web-based Resource, Funding Opportunities

Disasters : Tornado, Flood, Drought, Extreme Weather, Earthquakes, Wildfires, Soil Erosion/Landslides

Abstract : The Public Assistance (PA) Program provides federal disaster assistance to states, local units of government, and certain private non-profit organizations, for debris removal, emergency protective measures and the permanent restoration or replacement of public facilities as a result of a major disaster or emergency declaration being made by the President.

Plan_Components : Funding Mechanisms, Information

- Sustainable Communities Extension Program

Organization : Purdue University Extension, Illinois-Indiana Sea Grant

Document_type : General Resource/ Foundational Research, Web-based Resource

Disasters : Flood, Man-Made Disasters, Soil Erosion/Landslides

Abstract : The efforts of the Illinois-Indiana Sea Grant and Purdue University Extension Sustainable Communities Extension Program support community planning and sustainable development strategies in communities across Indiana and Great Lakes states.

Plan_Components : Strategies, Planning Processes, Green Infrastructure

- The Sustainable Sites Initiative

Organization : SITES

Year : 2022

Document_type : General Resource/ Foundational Research, Web-based Resource

Disasters : Flood, Drought, Extreme Weather, Man-Made Disasters, Biological Disasters, Soil Erosion/Landslides

Abstract : SITES offers a comprehensive rating system designed to distinguish sustainable landscapes, measure their performance and elevate their value. SITES is used by landscape architects, designers, engineers, planners, ecologists, architects, developers, and policy-makers to align land development and management with innovative sustainable design.

Plan_Components : Strategies, Tools

- Professional Practice Green Infrastructure: Wildlife Habitat And Corridors

Year : 2022

Document_type : General Resource/ Foundational Research, Web-based Resource

Disasters : Flood, Man-Made Disasters, Biological Disasters, Soil Erosion/Landslides

Abstract : An array of independent and uncoordinated land-use decisions often leads to a landscape

comprised of fragmented wildlife habitats which serve both human and wildlife needs poorly. Landscape ecology proposes instead to design landscape mosaics – matrices of patches, corridors, and ecological edges – to serve a broader and more diverse range of ecological systems and functions. Comprehensive land-use planning and design done in this way will better promote the enhancement, protection, and management of landscapes that support wildlife and provide ecosystem services to human populations.

Plan_Components : Tools, Green Infrastructure, Information

- Integrated Planning In Action Funding The Development Of An Integrated Plan

Organization : EPA

Document_type : Funding Opportunities

Disasters : Flood, Man-Made Disasters, Biological Disasters, Soil Erosion/Landslides

Abstract : EPA's Integrated Municipal Stormwater and Wastewater Planning Approach Framework helps municipalities meet clean water goals while prioritizing infrastructure investments with the greatest water quality improvements and community benefits. The Framework lays out a comprehensive, yet flexible planning process based on a set of overarching principles. EPA created a series of fact sheets—including this one—to inform municipalities interested in integrated planning.

Plan_Components : Funding Mechanisms

- 2013 Comprehensive Plan

Organization : Houseal Lavigne Associates, Gewalt Hamilton Associates, Conservation Design Forum

Year : 2013

Document_type : Specific Plan, Manual for an Local Organization, Example Ordinances and Codes

Disasters : Flood, Man-Made Disasters, Soil Erosion/Landslides

Abstract : The City has commissioned this Comprehensive Plan in order to uphold this mission statement. The last Comprehensive Plan was adopted in 1996. Major changes that have occurred since the last plan's adoption include the First Street Redevelopment (2006), adoption of an Inclusionary Housing Ordinance (2008), and an updated Zoning Ordinance (2006).

Plan_Components : Surveys/Assessments, Strategies, Planning Processes, Green Infrastructure

- Des Plaines Comprehensive Plan

Year : 2019

Document_type : Specific Plan

Disasters : Flood, Soil Erosion/Landslides

Abstract : A comprehensive plan establishes the 10-year vision of a community's desired physical environment and outlines the process by which the community can realize that vision. In addition to serving as a framework for future reinvestment and redevelopment

in the community, the plan seeks to explore and promote new opportunities that reflect changes in the community and surrounding socioeconomic landscape. This plan serves as a guide for elected and appointed officials, City staff, community residents, local business owners, and potential investors, allowing each to make informed administrative and implementation choices regarding land use, transportation, infrastructure, and capital improvements throughout the City. The comprehensive plan is a statement of policy; it is not a regulatory document. This plan should be flexible and able to adapt to change. At any time, this plan can be updated to better match shifting local needs, interests, and opportunities. It is recommended that the plan be reviewed every five years to ensure the document remains relevant.

Plan_Components : Strategies, Planning Processes, Green Infrastructure

Appendix A

Interpretation of High Risk and Low Risk Areas at County Level

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
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	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	High
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.	Very Low
NonWhite_Percent	Percentage of Non-White Population**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.	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
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	Low
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
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
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	Very High

(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.	Very High
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 proportion of single parent households represents a higher disaster risk	Very Low
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.	Very 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 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 disaster risks owing to functional problems, health and medication concerns. A greater percentage of older adults represents a higher risk.	Moderate
Working_Nonworking_Ratio	Ratio of Working to Non-working Population	A high ratio indicates lower risk	This ratio indicates 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.	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 good 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 Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
FemaleLaborforce_percent	Percentage of Labor Force constituted by Women	A higher participation 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 participation indicates a low disaster risk	A lower participation of women in the labour force is associated with lower household incomes and poverty. Therefore a lower female workforce participation means a higher disaster risk owing to lower economic support.	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.	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 propotion of resources available to individuals and is therefore interpreted as a high risk	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
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 Low
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 High
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

(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 High
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.	Low
Physically_Unhealthy_Average	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 Low
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.	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
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	Very Low
PrimaryCare_Physician_Rate	Rate 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 Low
MentalHealth_Provider_Rate	Rate 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
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	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	Very High

(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	Low
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	Low
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	Low
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 Low
Percent_Limited_Access_to_Healthy_Food	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	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Percent_DisconnectedYouth	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, unemployment and crime. A higher value is associated with high risk	High
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 geographically isolated. A higher value is associated with high risk	Very Low
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	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
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 Low
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
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	Very High
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 proportion 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 Low

(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 Low
MBS_LQ	Location Quotient of Management, 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 Low
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.	Very Low
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	Moderate

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
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	Very Low
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	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 infrastructure. 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 Low
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 indicates a high disaster risk	Very 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 availability of local natural resources and are therefore more susceptible to natural disasters. A higher employment in such industries signals greater disaster risk.	Very High

(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 industry indicates a low risk	A higher LQ for the Production and Transportation Industry indicates a high risk	Very High
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 High
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	Very High
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 High
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 High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
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 High
Wholesale_LQ	Location Quotient of Wholesale Trade Occupations	A lower LQ in wholesale industries is associated with low risk	A higher LQ 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	Very Low
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	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
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.	Very Low
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
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 information industries signals a less diverse economic base and a higher susceptibility to natural disasters. It is therefore associated with higher disaster risks	Very Low
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	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Finance	Percentage Employed in Finance Occupations	Finance, real estate, etc. jobs are positively correlated with high incomes, job security and high economic resilience during disasters. Therefore a greater employment in such 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 Low
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 Low
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	Very Low
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	Very High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
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 Low
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	Moderate
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 proportion of 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.	Very High
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
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 High

(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 associated with a health local economy. A higher value is associated with high risk	Very Low
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	Very High
Vice_related_business_rate	Ratio 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 heightened economic instability during disasters. A higher value is associated with high risk	Low
Civic_related_business_rate	Ratio 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
Education_related_business_rate	Ratio 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	High

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Healthcare_related_Businesses	Business rate 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	Very Low
Recreation_related_Businesses	Business rate recreation-related businesses per county	A lower value is associated with low risk	Greater proportion of recreation-related business indicate heightened economic instability during disasters. A higher value is associated with high risk	Very 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	Very High
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.	Very Low
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

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
NewHomes	Percentage of New Homes as part of Total Housing Stock	A higher proportion of new homes indicates a greater structural resilience to natural disasters and is associated with a low risk	A lower proportion of new homes indicates the possibility of greater structural damage during disasters. It is therefore associated with a high risk	Low
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	High
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 Low
Units_SingleFamily	Percentage of Single Family Units	A lower proportion 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	Low
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 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 overcrowded 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.	Moderate
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	Very High
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.	Very High

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Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
Renters_Cost_Income_Ratio	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 Low
Rental_CostBurden_Helow20000	Percentage of 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	High
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 Low
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	Very Low
NoVehicle_Pop	Percentage of Households without a Vehicle	A lower percentage of households without a vehicle indicates greater socio-economic stability within the community and is therefore associated with low risk	Vehicles count as additional economic assets which add to household mobility. A higher percentage of households without a vehicle is therefore associated with a high risk	Very Low

(continued)

Indicator	Definition	Low Risk Interpretation	High Risk Interpretation	Risk Level
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 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	Very High

Appendix B

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

Indicator	Risk Level (Rural)	Risk Level (Urban)	Risk Level (Places)
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