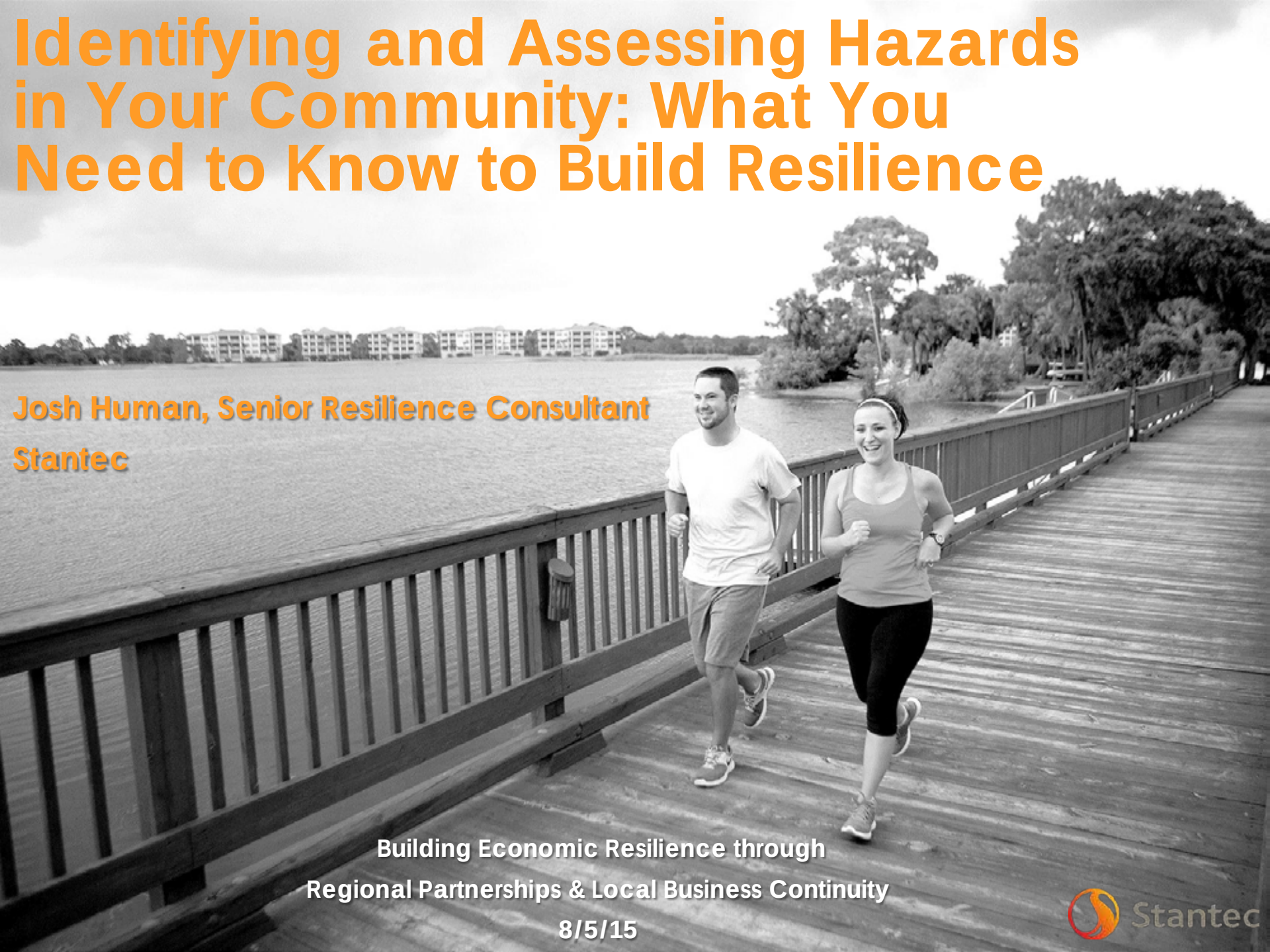
Identifying and Assessing Hazards in Your Community: What You Need to Know to Build Resilience



Josh Human, Senior Resilience Consultant
Stantec

Building Economic Resilience through
Regional Partnerships & Local Business Continuity
8/5/15

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Presentation Outline

- Hazards Overview
- Assessing Risk (Shocks, Stresses, Exposures, Hazards, Vulnerability)
- How to use your Risk Data for your Benefit
- Aligning and strengthening decisions

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Hazards Overview:

- What are the trends
  - More Hazard Occurrences?
  - More Damages?
  - More Deaths?
  - More People Affected?

Let's look at the data…It's ALL about the data

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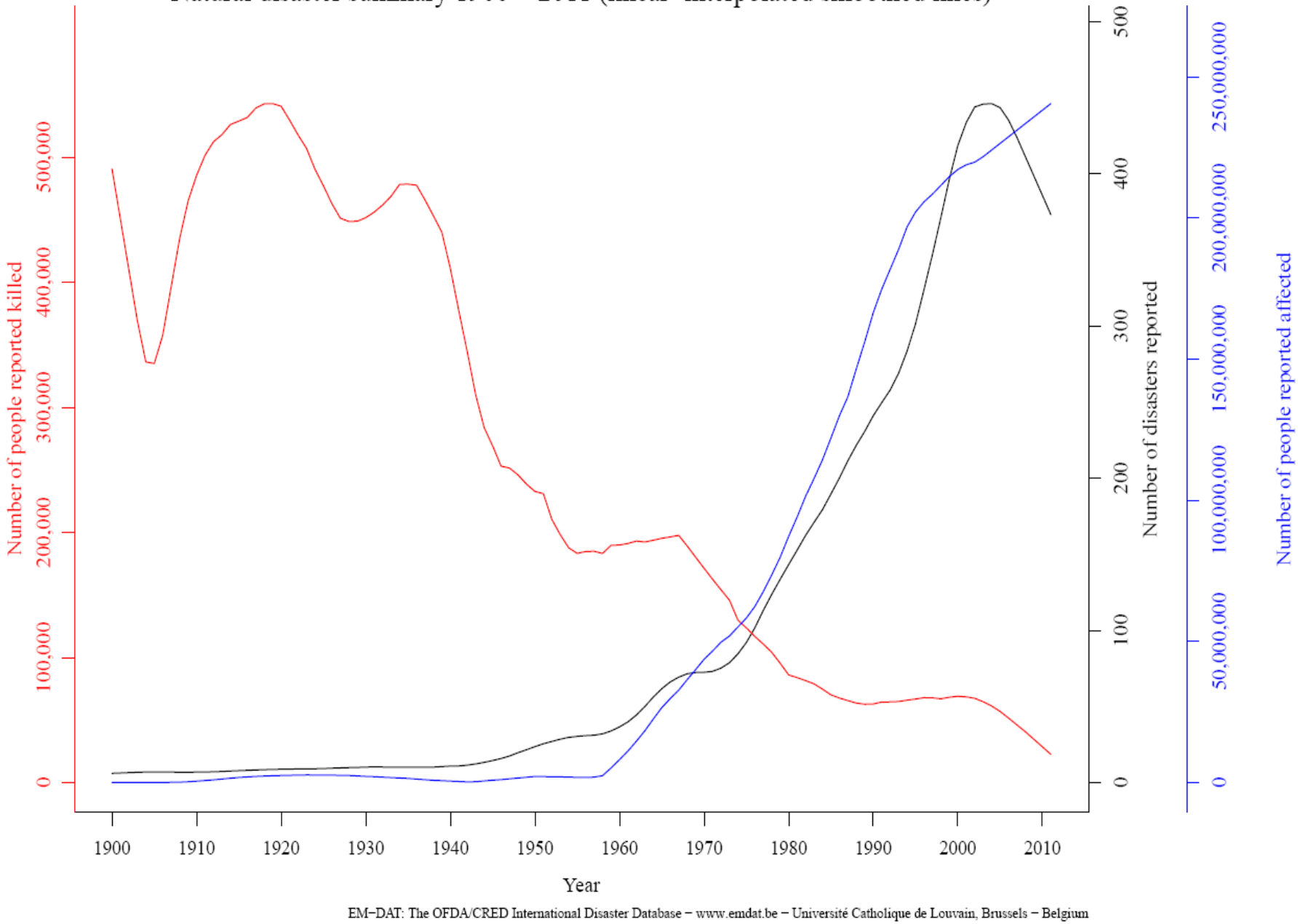
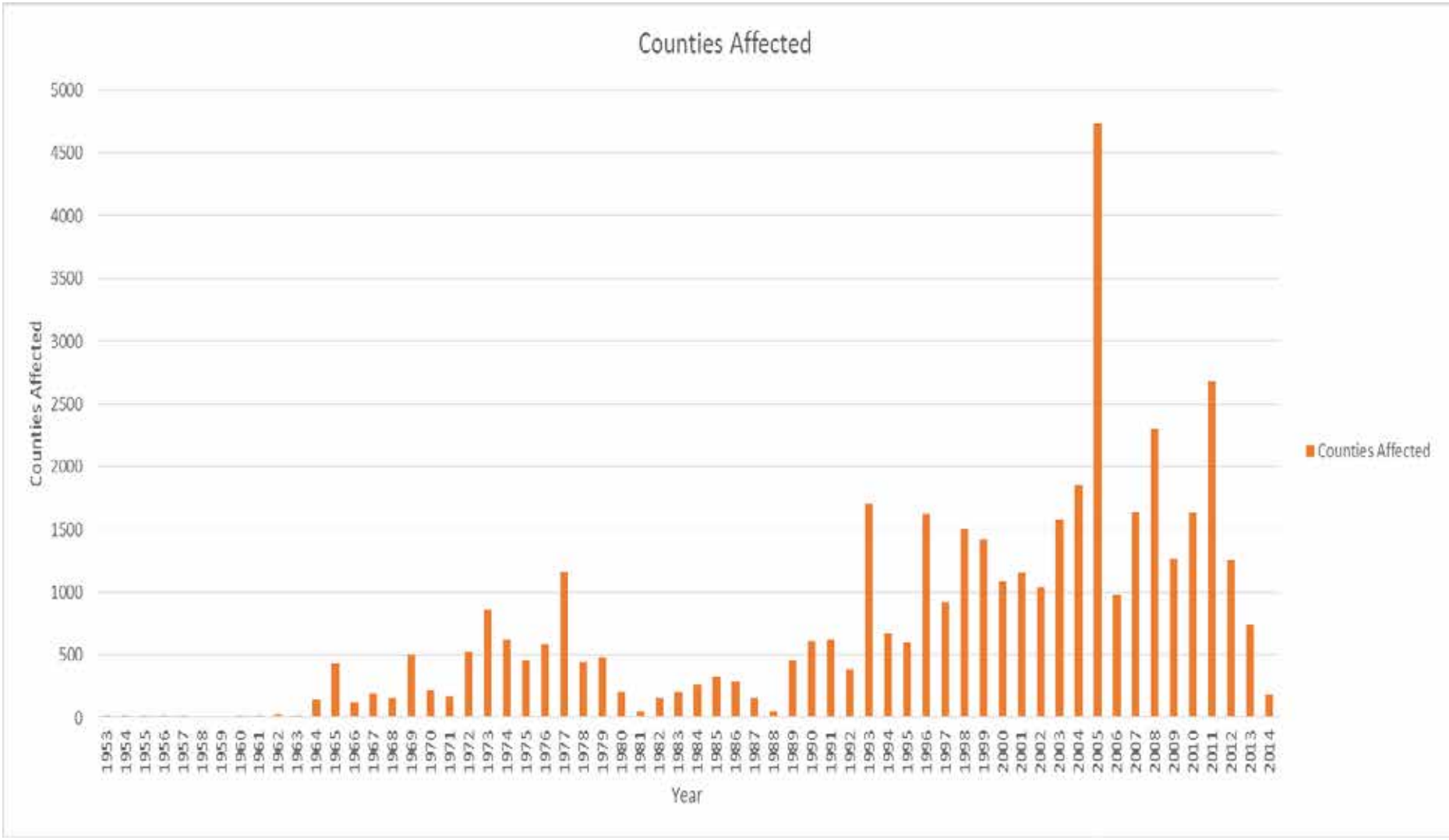

Natural disaster summary 1900 − 2011 (linear−interpolated smoothed lines)
Number of people reported killed
0
100,000
200,000
300,000
400,000
500,000
Number of disasters reported
0
100
200
300
400
500
Number of people reported affected
0
50,000,000
100,000,000
150,000,000
200,000,000
250,000,000
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Year
EM−DAT: The OFDA/CRED International Disaster Database − www.emdat.be − Université Catholique de Louvain, Brussels − Belgium

FEMA Declarations



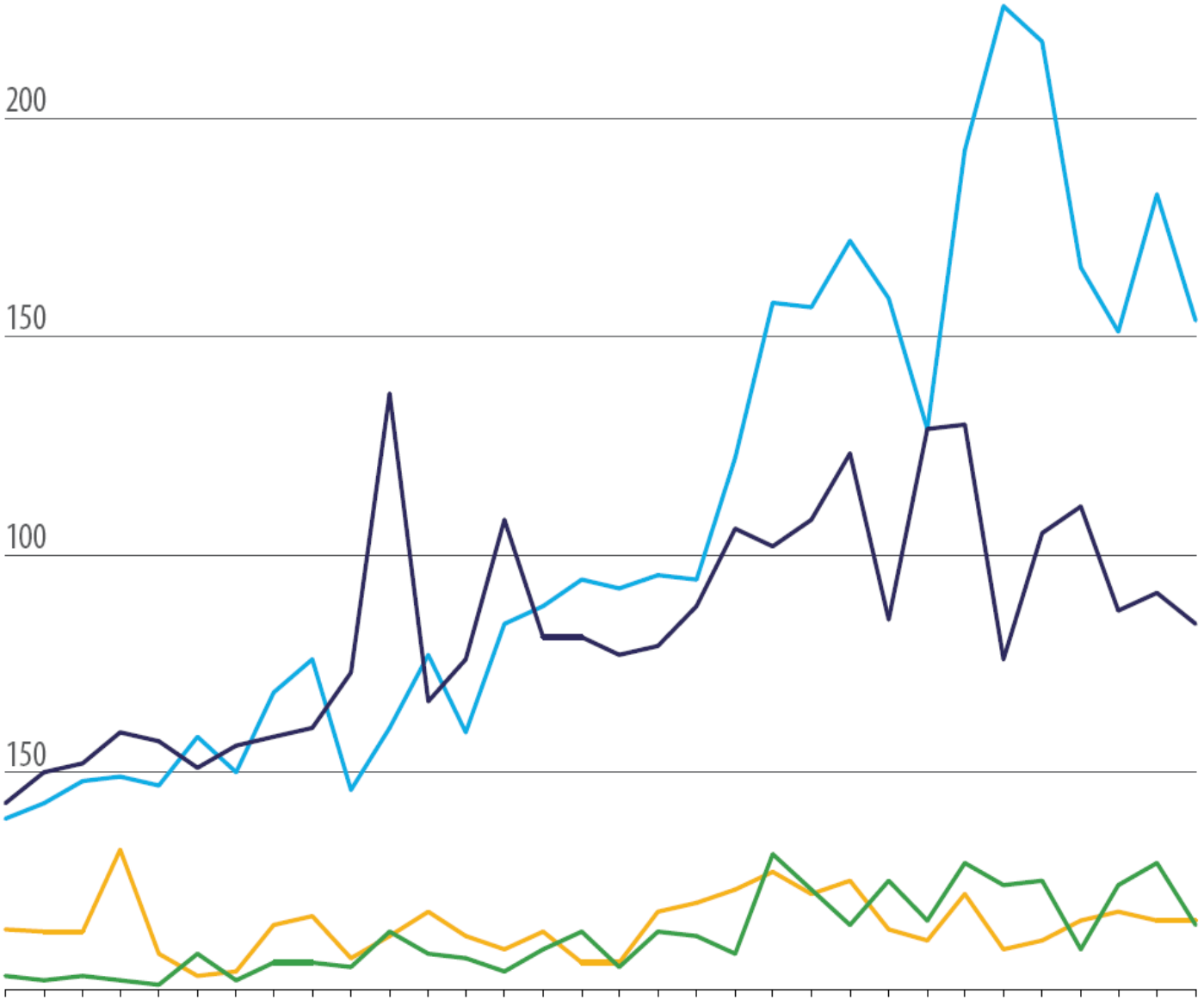
Number of Climate-related Disasters Around the World (1980-2011)

3455 FLOODS

2689 STORMS

470 DROUGHTS

395 EXTREME TEMPS



UNISDR
The United Nations Office for Disaster Risk Reduction
http://www.unisdr.org

Created on 13 June 2012

DATA SOURCES

EM-DAT - http://www.emdat.be/ - The OFDA/CRED International Disaster Database; Data version: 13 June 2012 - v12.07

Humanitarian Symbol Set (2008): http://www.ungiwg.org/map/guideline.php

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
FLOOD	39	43	48	49	47	58	50	68	76	46	60	77	59	84	88	94	92	95	94	122	158	157	172	159	129	193	226	218	166	151	183	154
STORM	43	50	52	59	57	51	56	58	60	73	137	66	76	108	81	81	77	79	88	106	102	108	123	85	129	130	76	105	111	87	91	84
DROUGHT	14	13	13	32	8	3	4	15	17	7	12	18	12	9	13	6	6	18	20	23	27	22	25	14	11	22	9	11	16	18	16	16
EXTREME TEMPERATURE	3	2	3	2	1	8	2	6	6	5	13	8	7	4	9	13	5	13	12	8	31	23	15	25	16	29	24	25	9	24	29	15

UNISDR
The United Nations Office for Disaster Risk Reduction

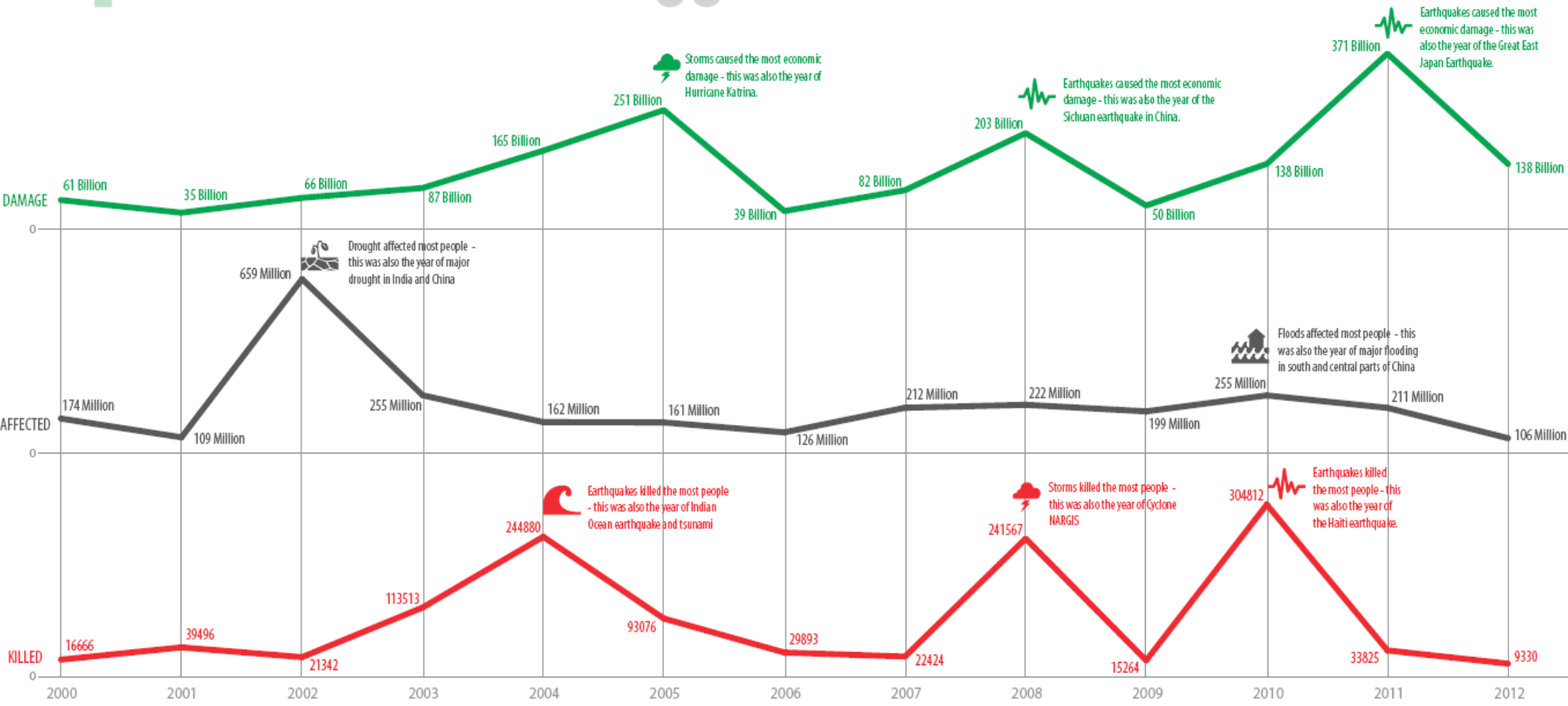
DISASTER IMPACTS / 2000-2012

*Disasters refers to drought, earthquake (seismic activity), epidemic, extreme temperature, flood, insect infestation, mass movement (dry &wet), storm, volcano, and wildfire / Data source: EM-DAT: The OFDA/CRED International Disaster Database / Data version: 12 March 2013 - v12.07
OCHA Humanitarian Symbol (2012): http://reliefweb.int/map/world/world-humanitarian-and-country-icons-2012 / Find out more about UNISDR: http://www.unisdr.org

$1.7 TRILLION DAMAGE (USD)

2.9 BILLION AFFECTED

1.2 MILLION KILLED



Impacts of Disasters since the 1992 Rio de Janeiro Earth Summit

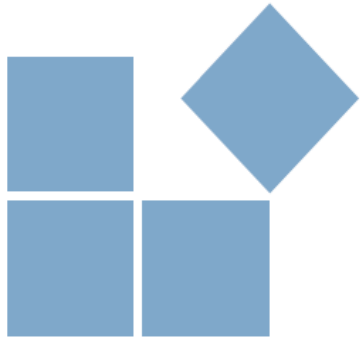
In 1992, the United Nations organized a conference on environment and development in Rio de Janeiro, called the Earth Summit. The purpose of the conference was to rethink economic growth, advance social equity and ensure environmental protection.

Twenty years later, the UN is organizing Rio+20, a chance to move away from business-as-usual and to end poverty, address environmental destruction and build a bridge to the future. Disaster risk reduction (DRR) plays an important part in this future of sustainable development.

Here's a look at the impact of disasters since the Earth Summit (1992-2012).

4.4 BILLION AFFECTED

Equal to 64% of the world's population[1].



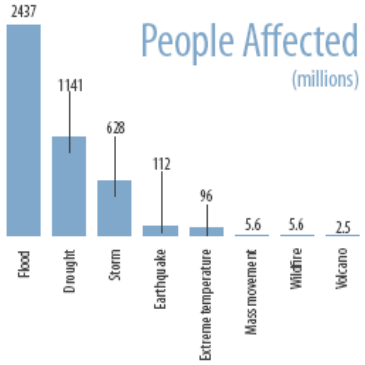
$2.0 TRILLION DAMAGE (USD)

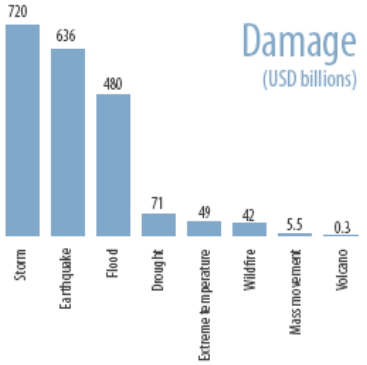
Similar to 25 years of total Overseas Development Aid[2].

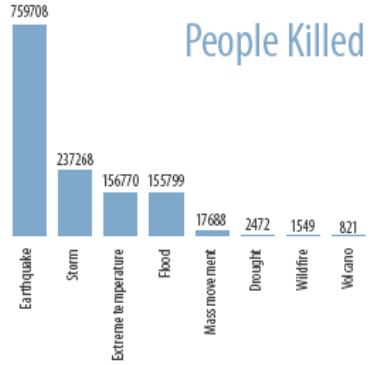
1.3 MILLION KILLED

Comparable to 3125 jumbo jets[3].

Impact by disasters







Impact by top 10 countries

China
2.5 BILLION
people affected

India	928 million
Bangladesh	136 million
Philippines	92 million
Thailand	72 million
Pakistan	64 million
Ethiopia	46 million
Kenya	44 million
Iran Islam Rep	40 million
Viet Nam	39 million

USA
560 BILLION
in damage (USD)

Japan	402 billion
China P Rep	331 billion
Thailand	45 billion
India	43 billion
Italy	36 billion
Germany	31 billion
France	31 billion
Chile	31 billion
Australia	28 billion

Haiti
230675
people killed

Indonesia	185152
Myanmar	139351
China P Rep	128298
India	103182
Pakistan	85332
Russia	61152
Sri Lanka	36000
Iran Islam Rep	32680
Venezuela	30463

UNISDR
The United Nations Office for Disaster Risk Reduction

http://www.unisdr.org

Version: 14 December 2012

DATA SOURCES

EM-DAT: - http://www.emdat.be/: The OFDA/CRED International Disaster Database; Data version: 11 June 2012 - v12.07; Disasters: Natural Disasters as categorized in EM-DAT; Affected: The sum of injured, homeless, and people requiring immediate assistance during a period of emergency - it can also include displaced or evacuated people.from disasters; Damage: Estimated figures; Killed: Persons confirmed as dead and persons missing and presumed dead.

[1] UN Stats - http://unstats.un.org: Estimated mid-year world population for 2010 is 6.9 billion.

[2] OECD - http://stats.oecd.org: ODA from 1986-2010 totals approximately USD1.7 trillion.

[3] Boeing 747 - http://goo.gl/s5ea2: Typical 3-class passenger capacity is 416.

Trends of the Data

- ***Damages going up***
- *People Affected going up*
- *Deaths going down*
- *Occurrences appear to be trending upwards*

In order to combat Risk's the first step is to understand what your up against...HAZARD IDENTIFICATION!!!!

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Local and State Hazard Mitigation Plans:

Provide information on your local identified Hazards

- **2015 Metropolitan Nashville-Davidson County Multi-Hazard Mitigation Plan**
  - Dam Levee, Flooding, Geologic Hazards, Earthquake, Landslides, Sinkholes, Communicable Diseases, Manmade Hazards, Severe Weather, Drought, Wildfires, Extreme Temperatures, Thunderstorms, Tornadoes, Winter Storm
- **2013 State of Tennessee Hazard Mitigation Plan**
  - Drought, Earthquake, Extreme Temperature, Flood, Geologic, Severe Storms, Tornado, Wildfire, Communicable Diseases, Dam/Levee, Hazardous Material, Infrastructure Incidents, Terrorism
- **2013 State of Kentucky Hazard Mitigation Plan**
  - Flood, Earthquake, Karst/Sinkhole, Mine/Land Subsidence, Landslide, Forest Fire, Drought, Extreme Temperature, Hail Storm, Severe Storm, Severe Winter Strom, Tornado, Dam Failure, Infrastructure Failure, Transportation-Related Failure

Assessing Risk

Now the ***EASY*** part kicks in!!!!!!!!!!

Risk Assessment

Google Search "Risk Assessment"

- 64,500,000 results come back

- Questions you need to ask yourself
  - Scale, What are you assessing, Variables you need to include, Subjective vs. Objective, Audience (EM vs. ED)…End Result

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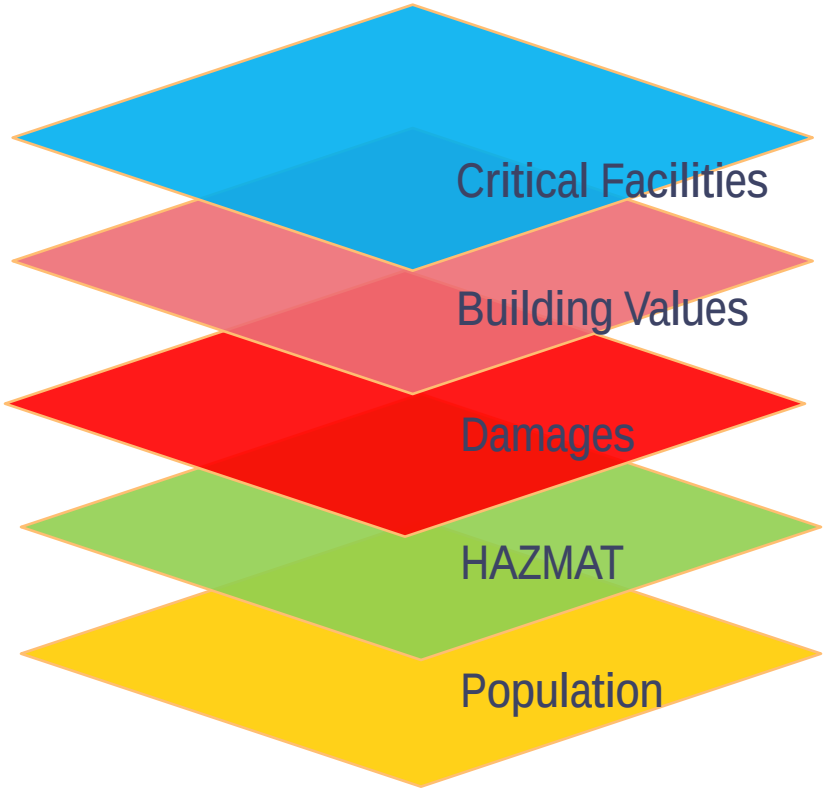
Geographic Information Systems (GIS)

GIS architecture facilitates an inventory of assets.

Ability to visualize on a map which buildings/areas are more vulnerable.

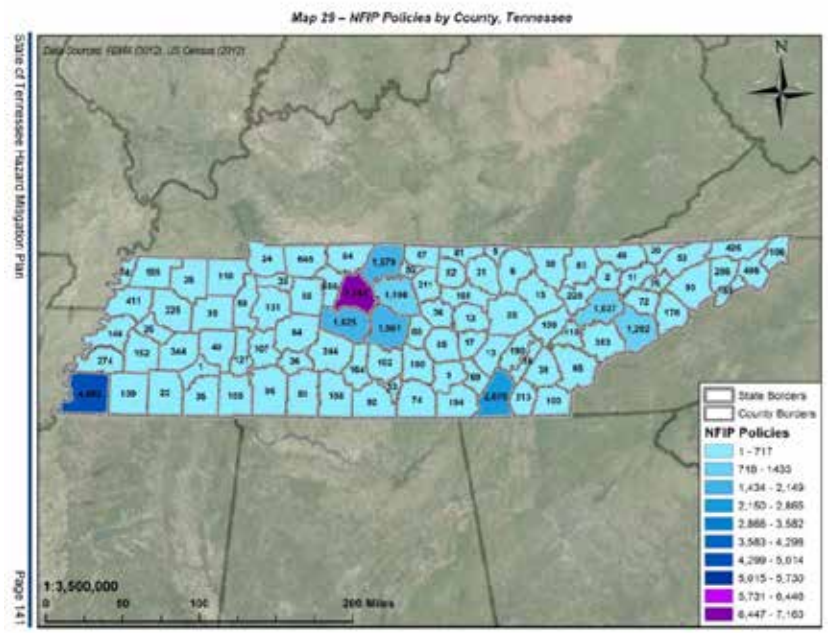
GIS architecture allows for a model to calculate vulnerabilities via the digital database created for the vulnerability assessment.

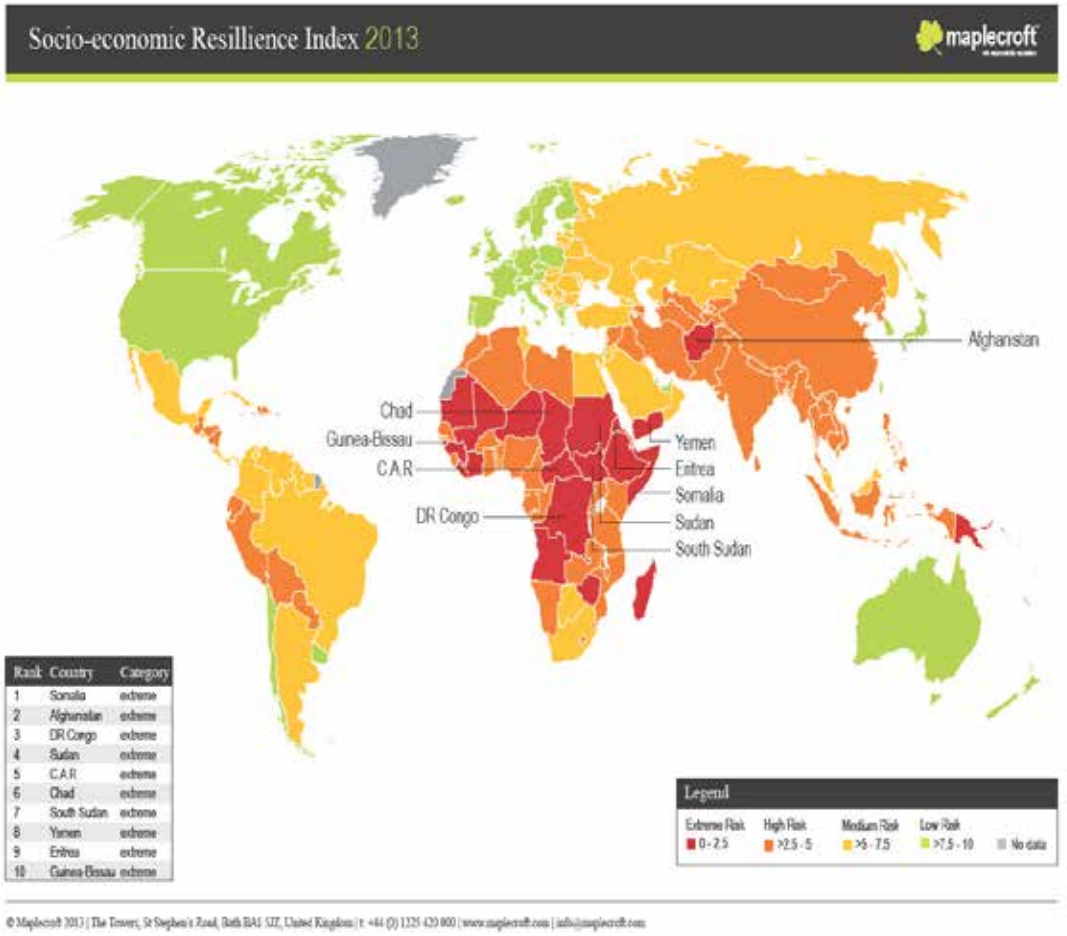


Examples

Scale: Country, State, County, Census tract/block, Grid, Parcel, Building

Large Scale



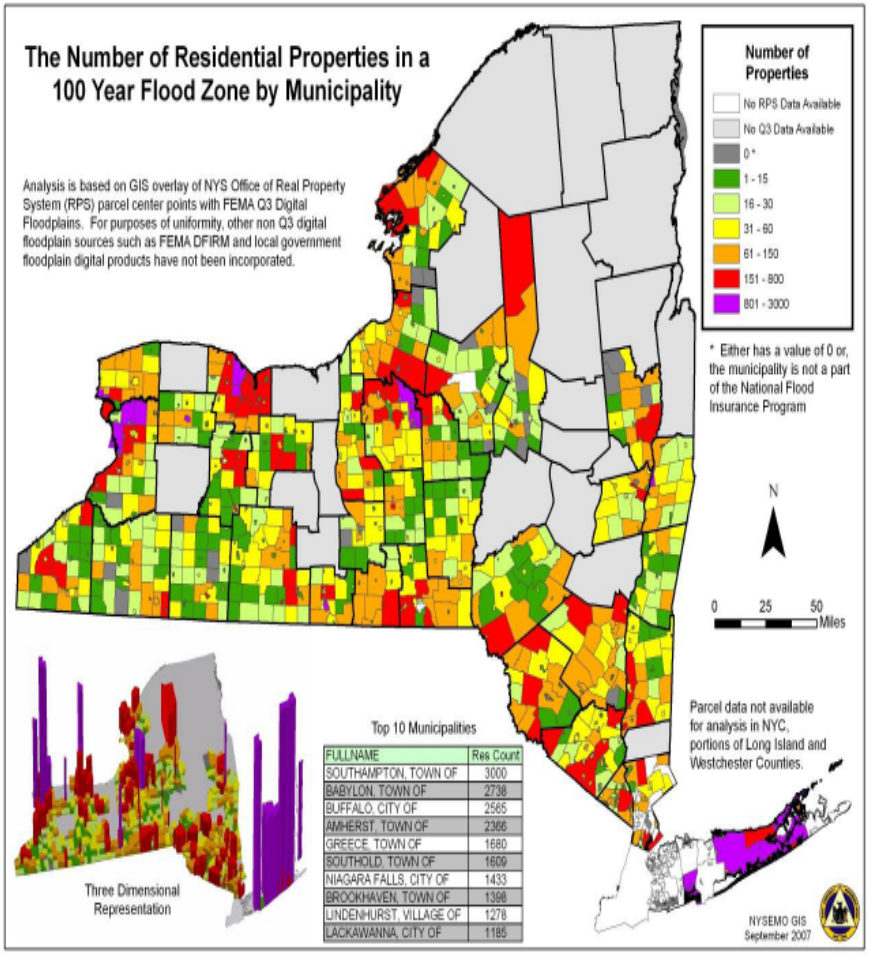


Examples

Small Scale

Figure A.3-6: 100-Year Floodplain Property Exposure Analysis

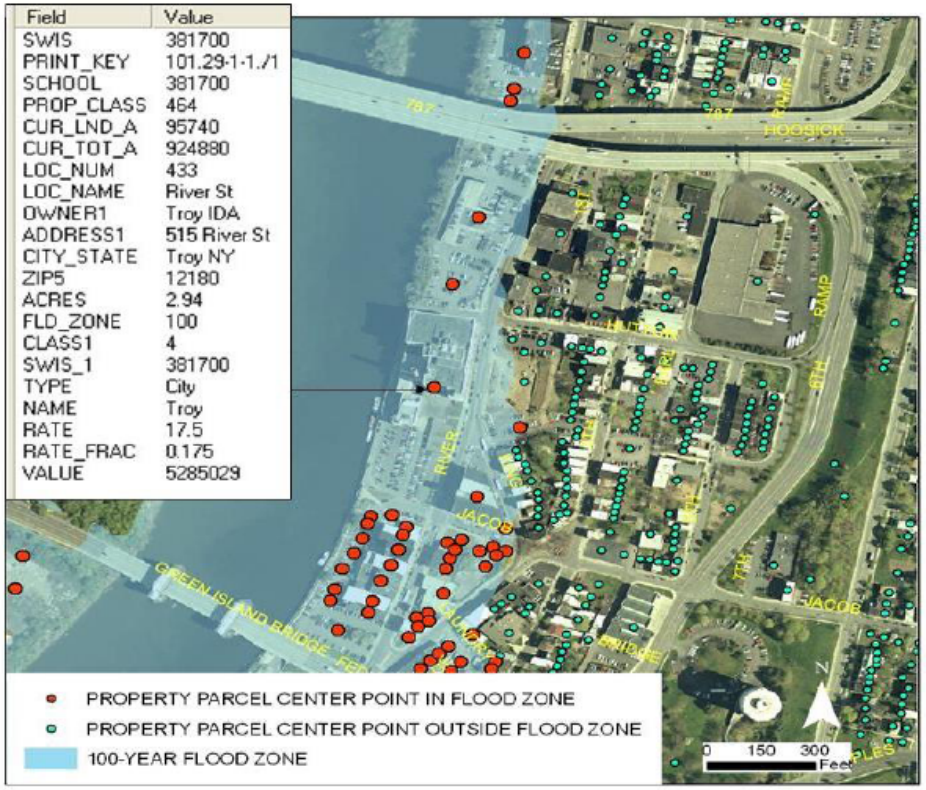
Figure A.3-7: The Number of Residential Properties in a 100 Year Flood Zone by Municip



100–Year Floodplain Property Exposure Analysis

A major effort of the 2008 State Hazard Mitigation Plan – Risk Assessment has been the GIS-based analysis of property within a 100-year floodplain. Using the NYS Real Property System (RPS) GIS laye of property parcel center points and FEMA's "Q3" digital flood maps, the total number, type and estima ed value of property within a 100-year floodplain was calculated and summarized for 1002 New York State municipalities (based on availability of RPS and Q3 data). While this information provides only property exposure as opposed to flood damage or estimated dollar losses, it nonetheless provides a general indication of the extent and distribution of a community's flood risk that is useful for mitigatio planning. The below example shows property parcel center points in an area of Troy, NY that fall in or out of the 100-year floodplain. The sample parcel record shows the property to be owned by the Troy Industrial Development Authority (IDA). The property class is 464 (Commercial – Office Building). The estimated property value is $5,285,029 based on an assessed value of $924,880 (CUR_TOT_A) divided by 0.175 (RATE_FRAC) from the State Equalization Rate for the City of Troy of 17.5%.

Field	Value
SWIS	381700
PRINT_KEY	101.29-1-1./1
SCHOOL	381700
PROP_CLASS	464
CUR_LND_A	95740
CUR_TOT_A	924880
LOC_NUM	433
LOC_NAME	River St
OWNER1	Troy IDA
ADDRESS1	515 River St
CITY_STATE	Troy NY
ZIP5	12180
ACRES	2.94
FLD_ZONE	100
CLASS1	4
SWIS_1	381700
TYPE	City
NAME	Troy
RATE	17.5
RATE_FRAC	0.175
VALUE	5285029



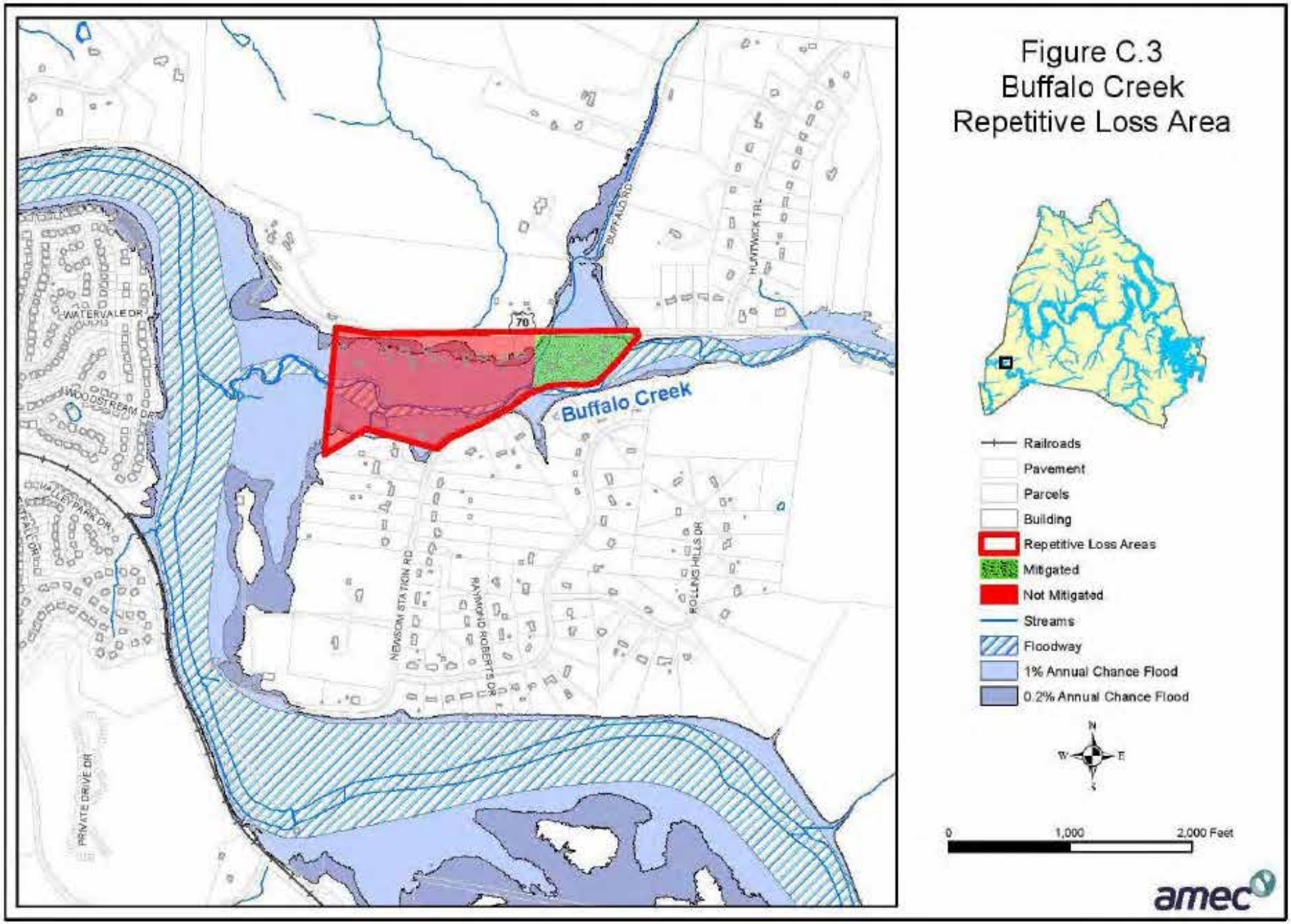
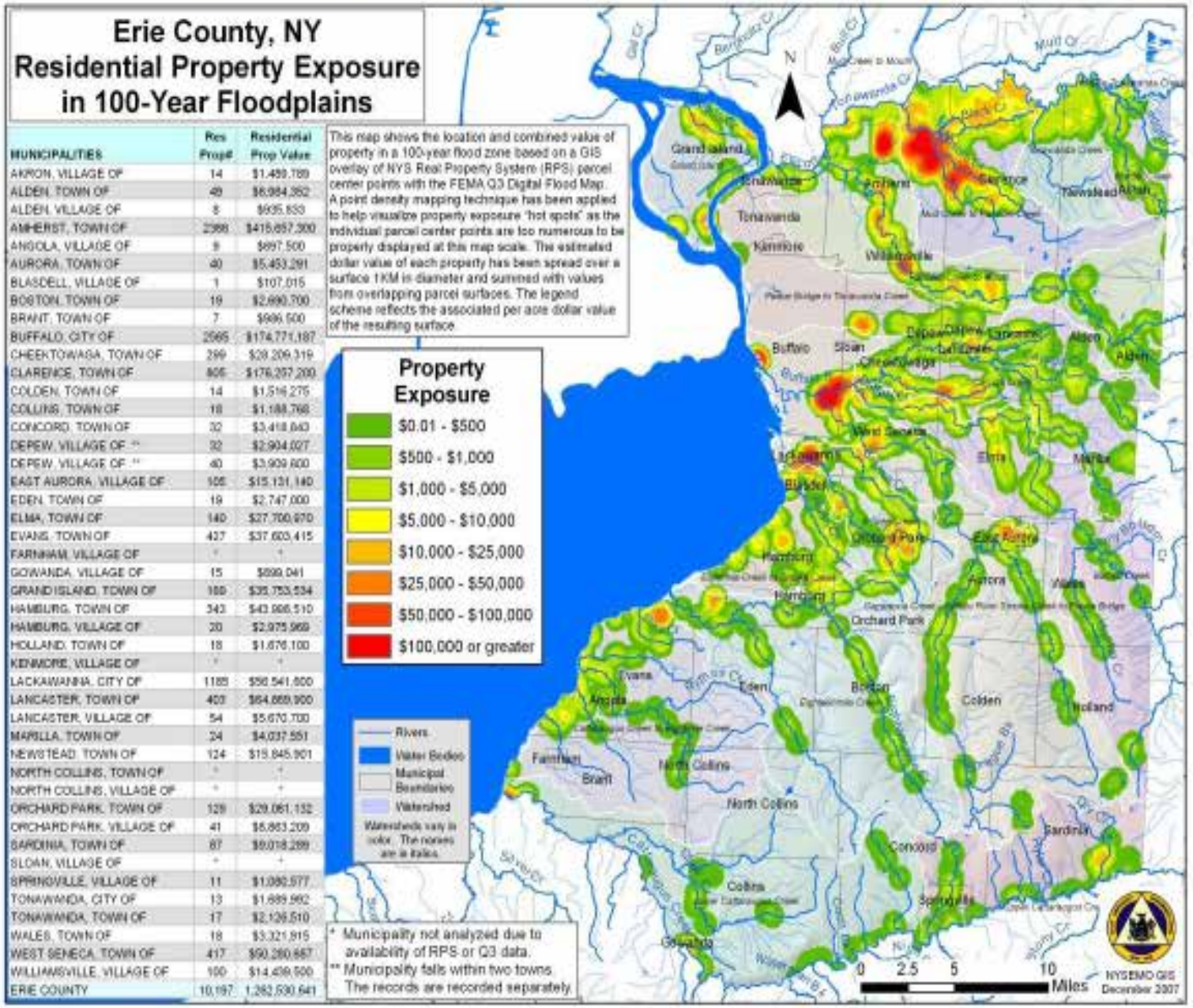


Figure C.3
Buffalo Creek
Repetitive Loss Area
Buffalo Creek
WATERVALE DR
WOODSTREAM DR
VALLEY PARK DR
PRIVATE DRIVE DR
BUFFALO RD
HUNTWICK TRL
NEWSOM STATION RD
RAYMOND ROBERTS DR
ROLLING HILLS DR
70
Railroads
Pavement
Parcels
Building
Repetitive Loss Areas
Mitigated
Not Mitigated
Streams
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
N
W
E
S
0
1,000
2,000 Feet
amec

Figure A.3-24: Erie County, NY Residential Property Exposure in 100-Yr Floodplains

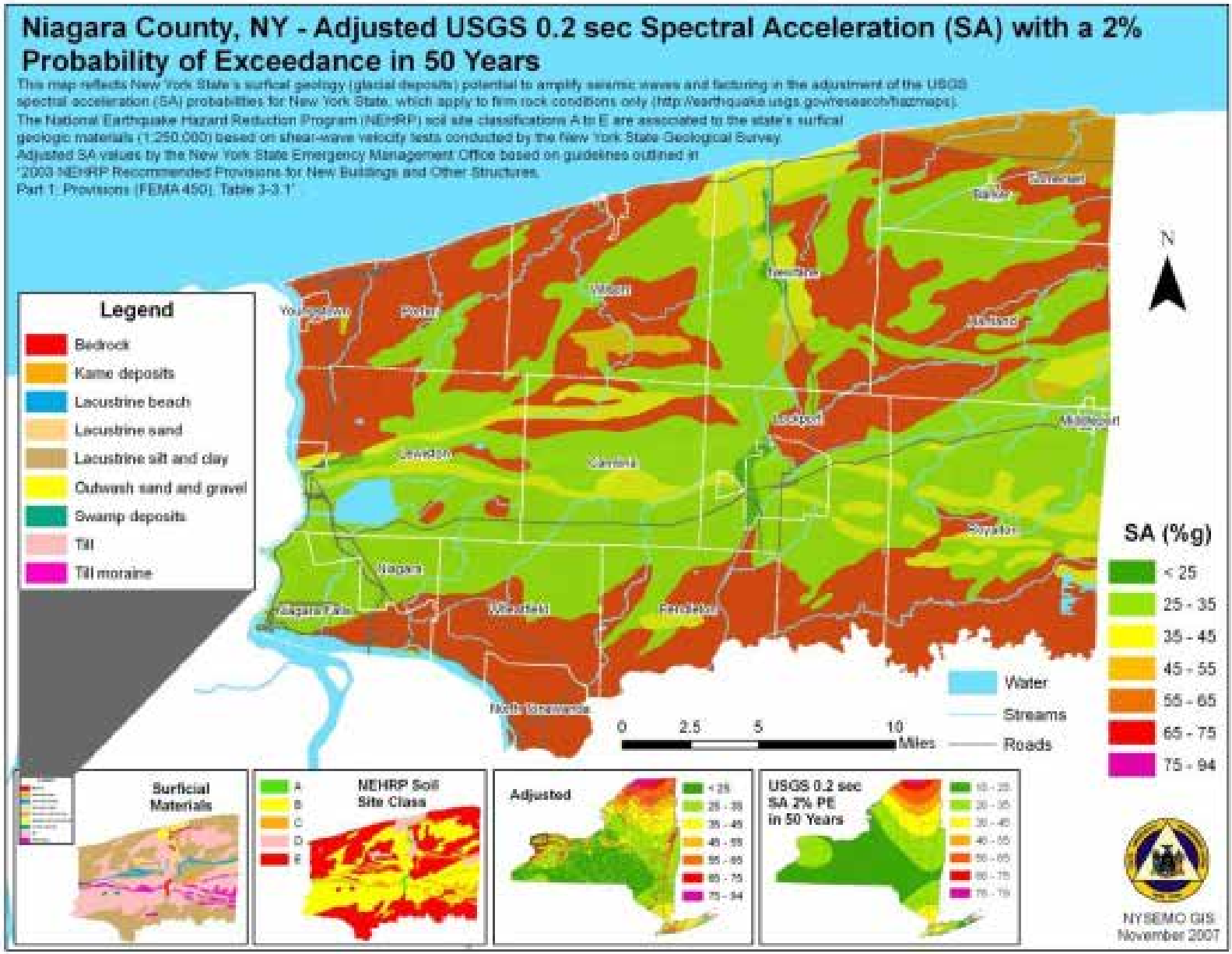
Assessing What?

Property vs. Population = Different Results



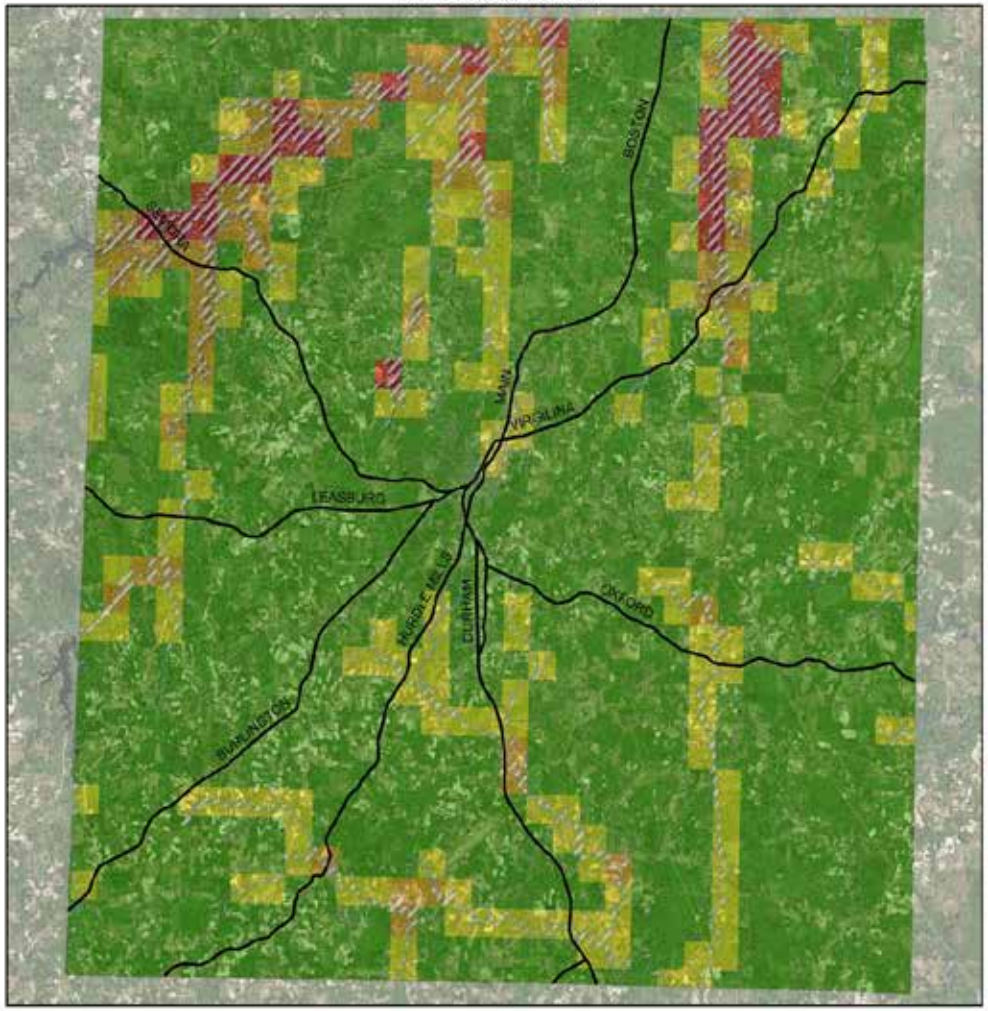
MUNICIPALITIES	Res Prop#	Residential Prop Value
AKRON, VILLAGE OF	14	$1,489,789
ALDEN, TOWN OF	49	$6,984,352
ALDEN, VILLAGE OF	5	$935,833
AMHERST, TOWN OF	2388	$415,657,300
ANGOLA, VILLAGE OF	9	$897,500
AURORA, TOWN OF	40	$5,453,291
BLASDELL, VILLAGE OF	1	$107,015
BOSTON, TOWN OF	19	$2,690,700
BRANT, TOWN OF	7	$996,500
BUFFALO, CITY OF	2565	$174,771,187
CHEEKTOWAGA, TOWN OF	299	$28,209,319
CLARENCE, TOWN OF	805	$176,257,200
COLDEN, TOWN OF	14	$1,516,275
COLLINS, TOWN OF	18	$1,188,768
CONCORD, TOWN OF	32	$3,418,643
DEPEW, VILLAGE OF **	32	$2,904,027
DEPEW, VILLAGE OF **	40	$3,909,600
EAST AURORA, VILLAGE OF	105	$15,131,140
EDEN, TOWN OF	19	$2,747,000
ELMA, TOWN OF	140	$27,700,670
EVANS, TOWN OF	427	$37,603,415
FARNHAM, VILLAGE OF	*	*
GOWANDA, VILLAGE OF	15	$899,041
GRAND ISLAND, TOWN OF	189	$35,753,534
HAMBURG, TOWN OF	343	$43,986,510
HAMBURG, VILLAGE OF	20	$2,975,969
HOLLAND, TOWN OF	18	$1,676,100
KENMORE, VILLAGE OF	*	*
LACKAWANNA, CITY OF	1185	$56,541,600
LANCASTER, TOWN OF	403	$64,669,900
LANCASTER, VILLAGE OF	54	$5,670,700
MARILLA, TOWN OF	24	$4,037,551
NEWSTEAD, TOWN OF	124	$15,845,901
NORTH COLLINS, TOWN OF	*	*
NORTH COLLINS, VILLAGE OF	*	*
ORCHARD PARK, TOWN OF	129	$29,061,132
ORCHARD PARK, VILLAGE OF	41	$6,663,209
SARDINIA, TOWN OF	87	$9,018,299
SLOAN, VILLAGE OF	*	*
SPRINGVILLE, VILLAGE OF	11	$1,080,977
TONAWANDA, CITY OF	13	$1,689,992
TONAWANDA, TOWN OF	17	$2,126,510
WALES, TOWN OF	18	$3,321,915
WEST SENECA, TOWN OF	417	$90,280,687
WILLIAMSVILLE, VILLAGE OF	100	$14,409,500
ERIE COUNTY	10,197	1,282,530,641

Figure A.3-88: Niagara County, NY Adjusted Spectral Acceleration with a 2% Probal Exceedance in 50-Yrs



Variables

Person County
Flood Hazard Score



Legend

Minor Road
Major Road
1% Chance Flood Area

Flood Hazard

Low
Moderate
High
Severe

N
W E
S

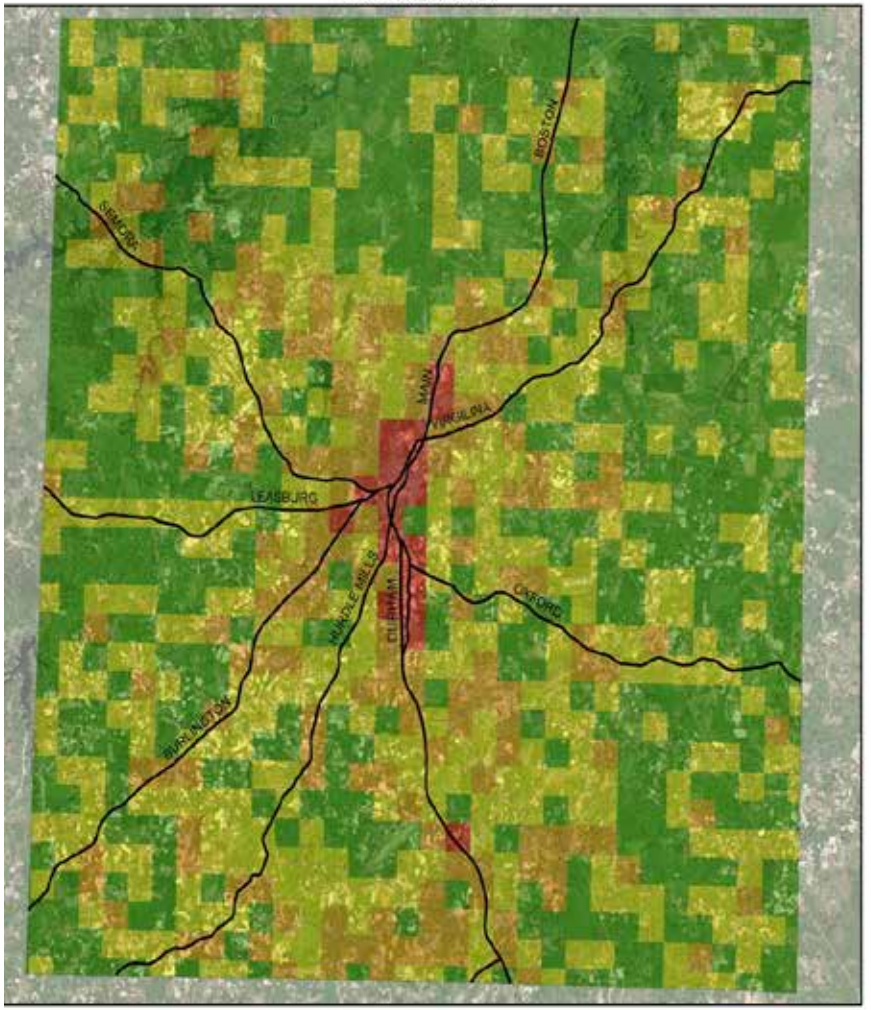
0 2.25 4.5 9 Miles

This map contains information from the following sources: Person County, Kerr Tar, North Carolina Center for Geographic Information and Analysis (CGIA), The Center for Hazards Research and Policy Development, The National Weather Service, U.S. Geological Survey, U.S. Census Bureau, FEMA, National Dam Inventory, USDA Forest Service and ESRI.
BaseMap Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

CENTER FOR HAZARDS RESEARCH AND POLICY DEVELOPMENT

Kerr Tar Regional Council Of Governments

Person County
Buisness Score



Legend

Minor Road
Major Road

Buisness

Low
Moderate
High
Very High

N
E
S

2.25 4.5 9 Miles

This map contains information from the following sources: Person County, Kerr Tar, North Carolina Center for Geographic Information and Analysis (CGIA), The Center for Hazards Research and Policy Development, The National Weather Service, U.S. Geological Survey, U.S. Census Bureau, FEMA, National Dam Inventory, USDA Forest Service and ESRI.
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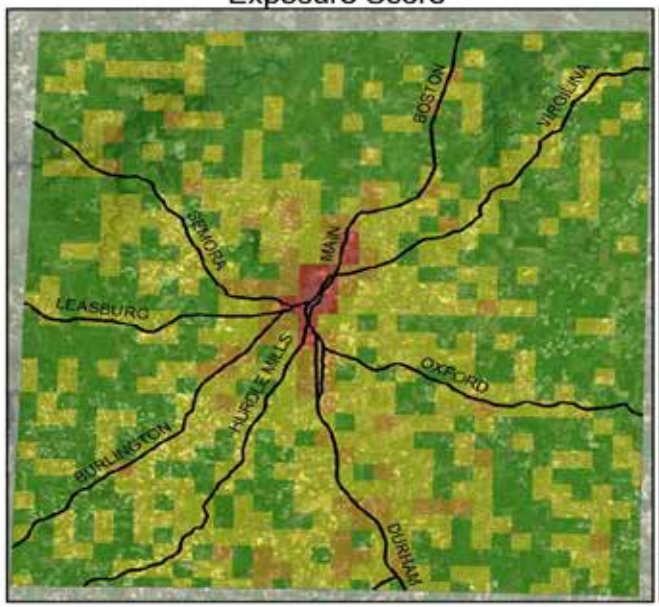
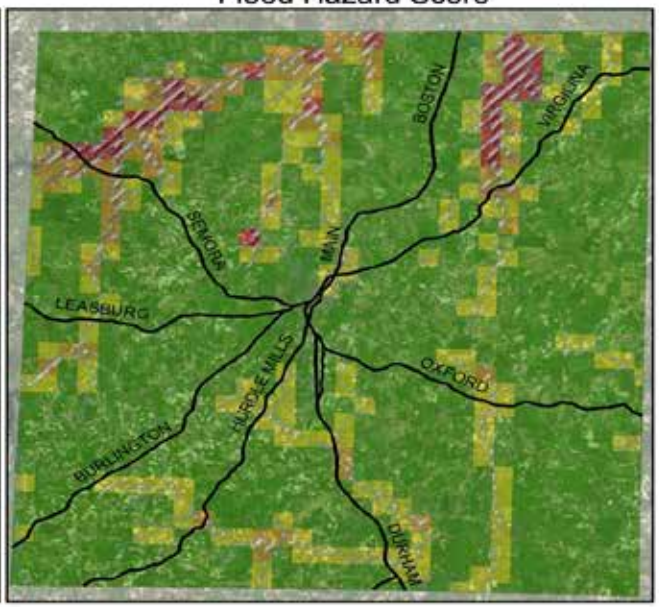
Kerr Tar Regional Council Of Governments

Person County

Exposure Score



Flood Hazard Score



Legend

Minor Road

Major Road

1% Chance Flood Area

Exposure/Risk Rank

Low

Moderate

High

Severe

N

W E

S

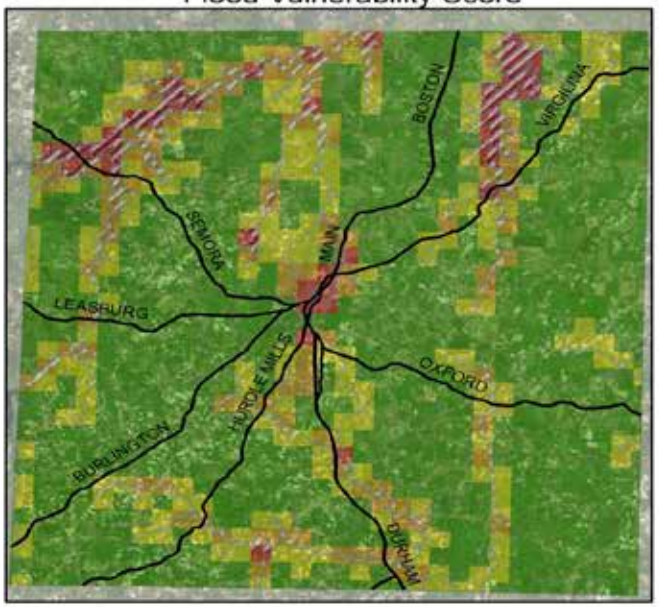
0 4 8 16 Miles

This map contains information from the following sources: Person County, Kerr Tar, North Carolina Center for Geographic Information and Analysis (CGIA), The Center for Hazards Research and Policy Development, The National Weather Service, U.S. Geological Survey, U.S. Census Bureau, FEMA, National Dam Inventory, USDA Forest Service and ESRI.
BaseMap Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

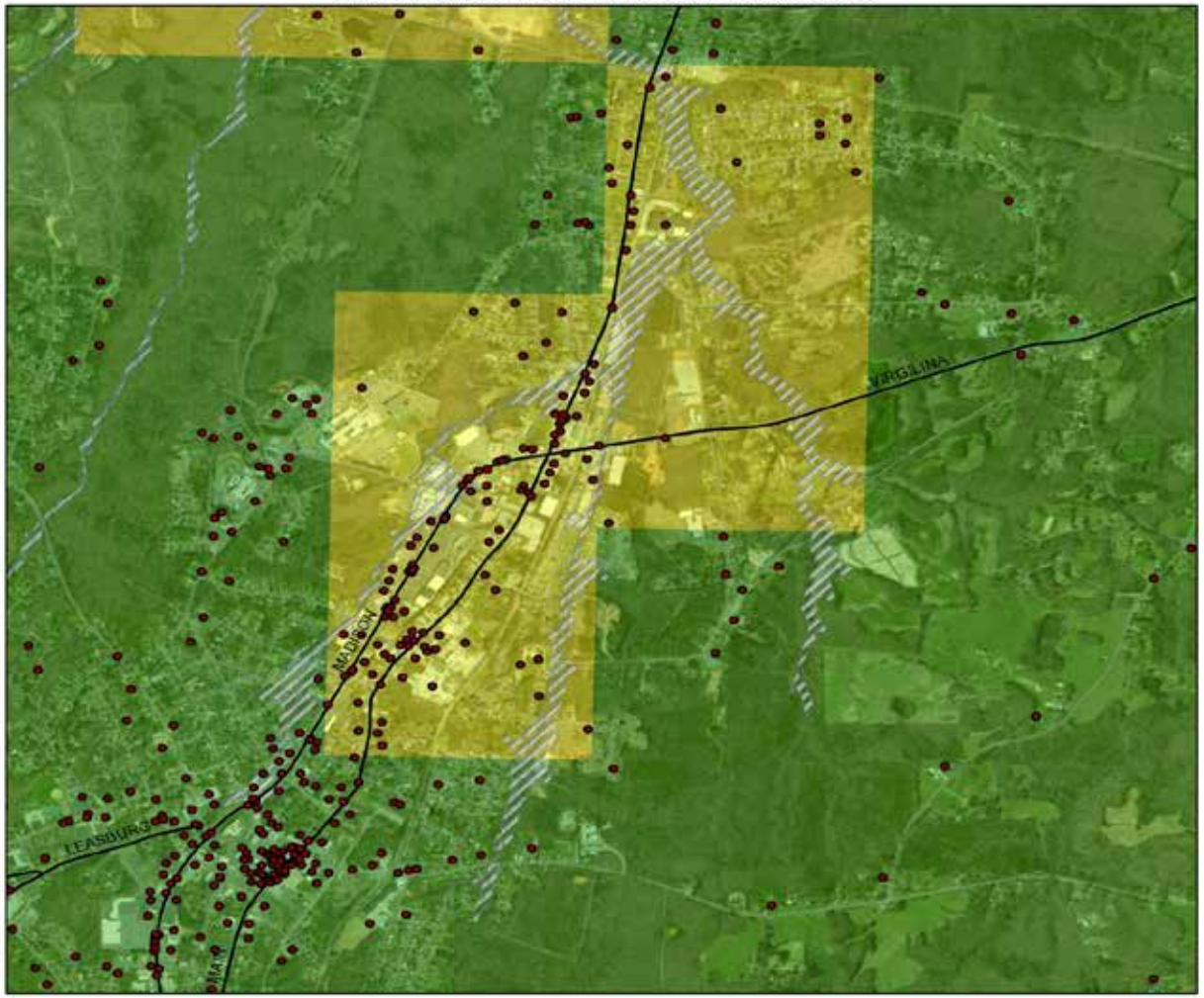
CENTER FOR HAZARDS RESEARCH AND POLICY DEVELOPMENT
UNIVERSITY OF SOUTH CAROLINA

Kerr-Tar Regional Council Of Governments

Flood Vulnerability Score



Person County
Flood Hazard With Business Points Score



Legend

- Minor Road
- Major Road
- Business Points
- 1% Chance Flood Area

Flood Hazard

- Low
- Moderate
- High
- Severe

N
W E
S

0 0.275 0.55 1.1 Miles

This map contains information from the following sources: Person County, Kerr Tar, North Carolina Center for Geographic Information and Analysis (CGIA), The Center for Hazards Research and Policy Development, The National Weather Service, U.S. Geological Survey, U.S. Census Bureau, FEMA, National Dam Inventory, USDA Forest Service and ESRI.
BaseMap Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

CENTER FOR HAZARDS RESEARCH AND POLICY DEVELOPMENT

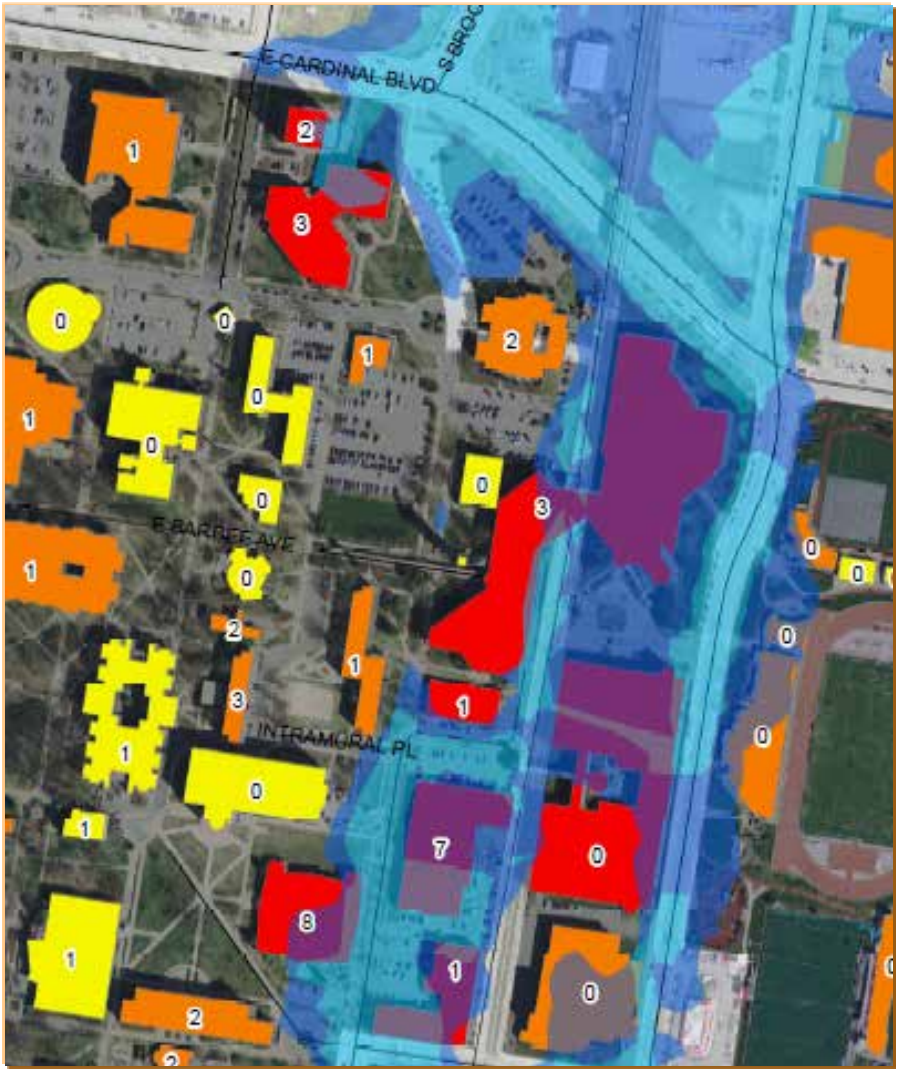
Kerr Tar Regional Council Of Governments

Mapping Your Community's Hazard Vulnerability

Identifying hazards and exposures

Target locations/properties that need mitigation/resilience

Use assessment results to precisely identify proper and needed actions



Subjective vs. Objective

HAZARD AND VULNERABILITY ASSESSMENT TOOL
NATURALLY OCCURRING EVENTS

KAISER PERMANENTE®

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 - 100%*
Hurricane								0%
Tornado								0%
Severe Thunderstorm								0%
Snow Fall								0%
Blizzard								0%
Ice Storm								0%
Earthquake								0%
Tidal Wave								0%
Temperature Extremes								0%
Drought								0%
Flood, External								0%
Wild Fire								0%
Landslide								0%
Dam Inundation								
Volcano								0%
Epidemic								0%
AVERAGE SCORE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0%**

**Threat increases with percentage.*

RISK =	PROBABILITY *	SEVERITY
0.00	0.00	0.00

Subjective vs. Objective

Ready Business.

Risk Assessment Table

INSTRUCTIONS

Column 1: Compile a list of assets (people, facilities, machinery, equipment, raw materials, finished goods, information technology, etc.) in the left column.

Column 2: For each asset, list hazards (review the "Risk Assessment" page from Ready Business) that could cause an impact. Since multiple hazards could impact each asset, you will probably need more than one row for each asset. You can group assets together as necessary to reduce the total number of rows, but use a separate row to assess those assets that are highly valued or critical.

Column 3: For each hazard consider both high probability/low impact scenarios and low probability/high impact scenarios.

Column 4: As you assess potential impacts, identify any vulnerabilities or weaknesses in the asset that would make it susceptible to loss. These vulnerabilities are opportunities for hazard prevention or risk mitigation. Record opportunities for prevention and mitigation in column 4.

Column 5: Estimate the probability that the scenarios will occur on a scale of "L" for low, "M" for medium and "H" for high.

Columns 6-10: Analyze the potential impact of the hazard scenario in columns 6 - 10. Rate impacts "L" for low, "M" for medium and "H" for high.

Column 8: Information from the business impact analysis should be used to rate the impact on "Operations."

Column 10: The "entity" column is used to estimate potential financial, regulatory, contractual, and brand/image/reputation impacts.

Column 11: The "Overall Hazard Rating" is a two-letter combination of the rating for "probability of occurrence" (column 5) and the highest rating in columns 6 – 10 (impacts on people, property, operations, environment, and entity).

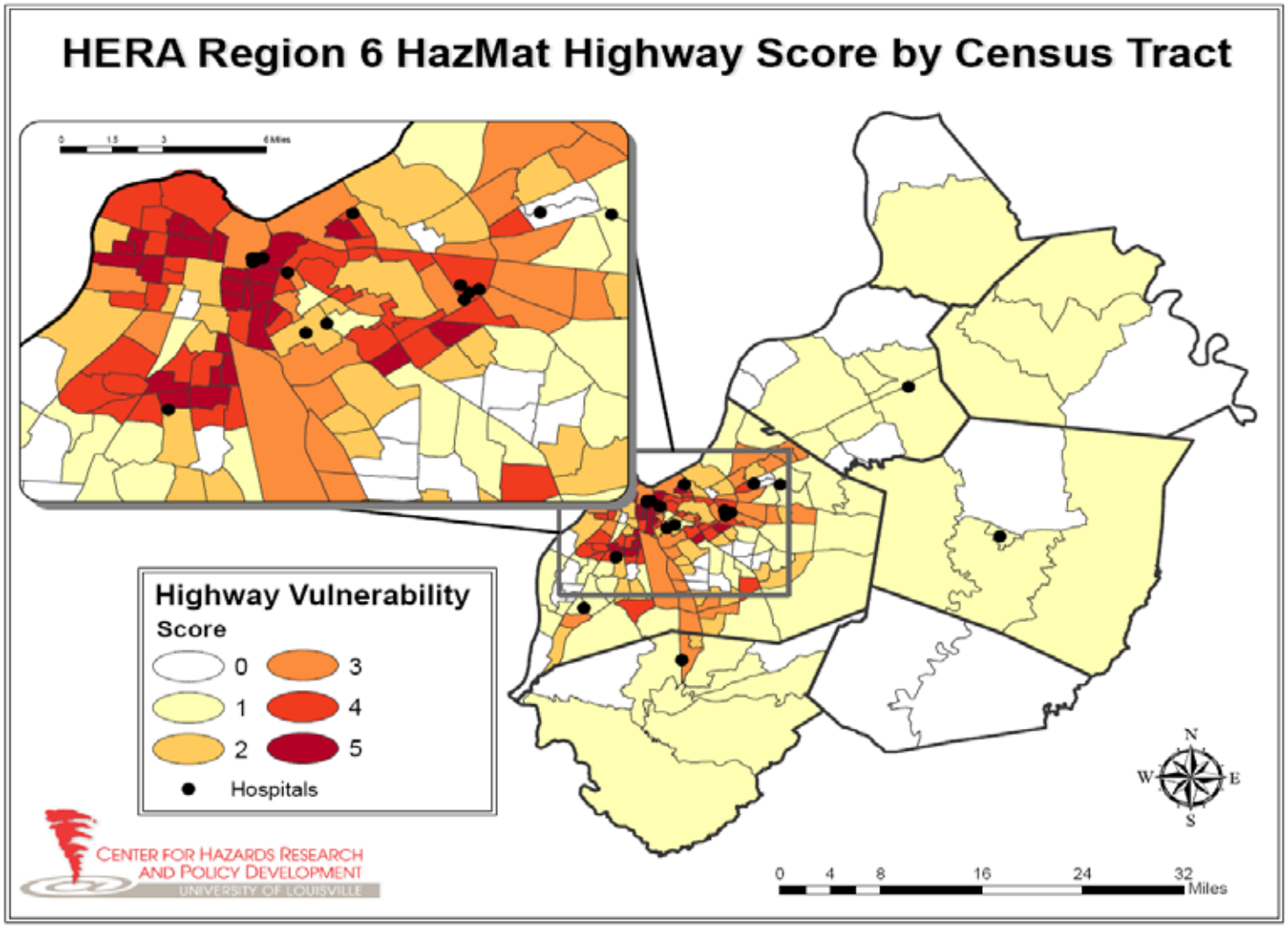
Carefully review scenarios with potential impacts rated as "moderate" or "high." Consider whether action can be taken to prevent the scenario or to reduce the potential impacts.

Using Risk Assessment Data

Subjective vs. Objective

- Put them together to build a clearer picture!

Example:
Use Objective (factual based) Data for your Subjective (judgment call) assessments



Using Risk Assessment Data

Example: Corporate Risk Assessment
Recently provided Risk Assessment data from our State and local Hazard Mitigation Plan to Business Resiliency ADP

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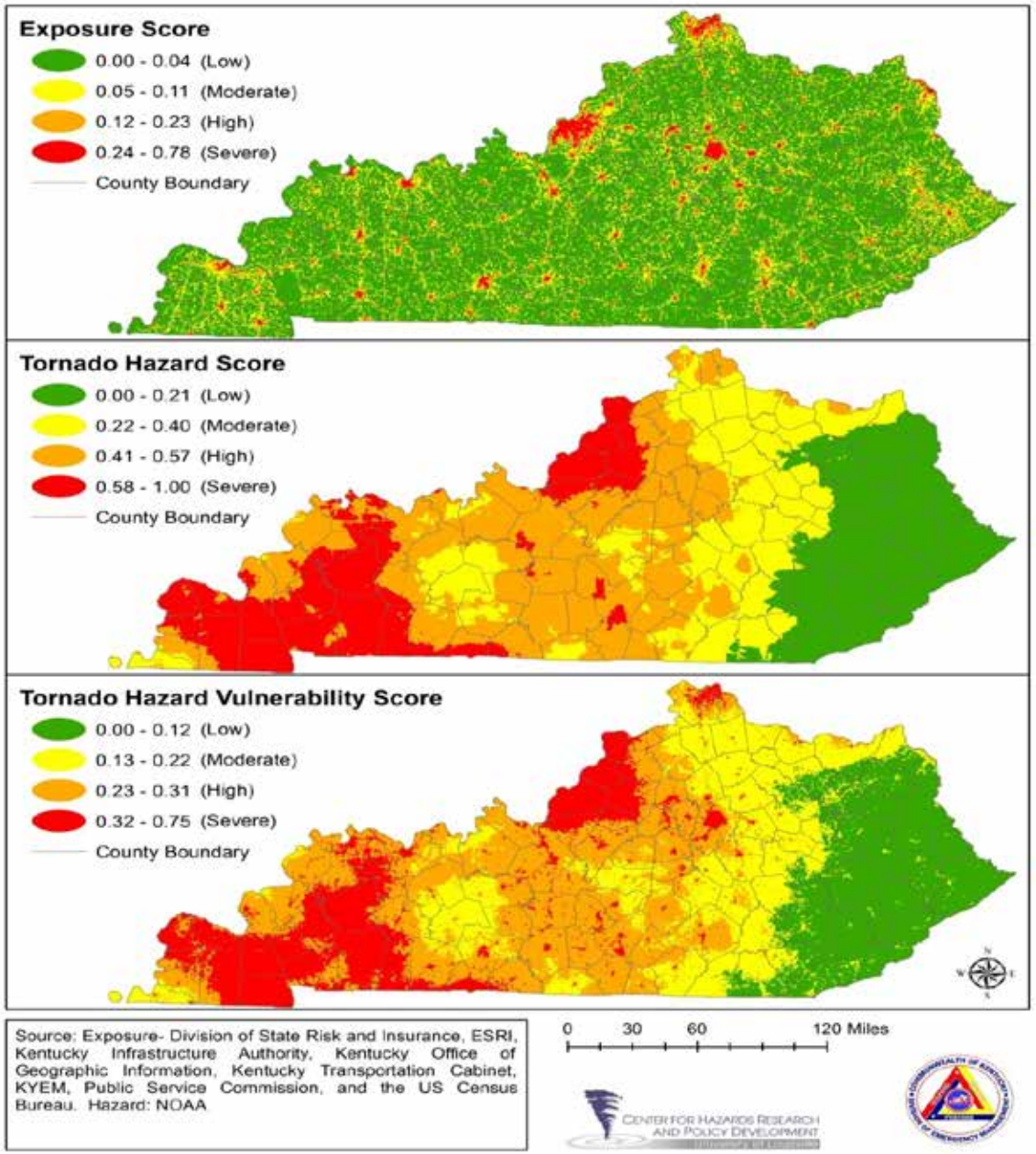
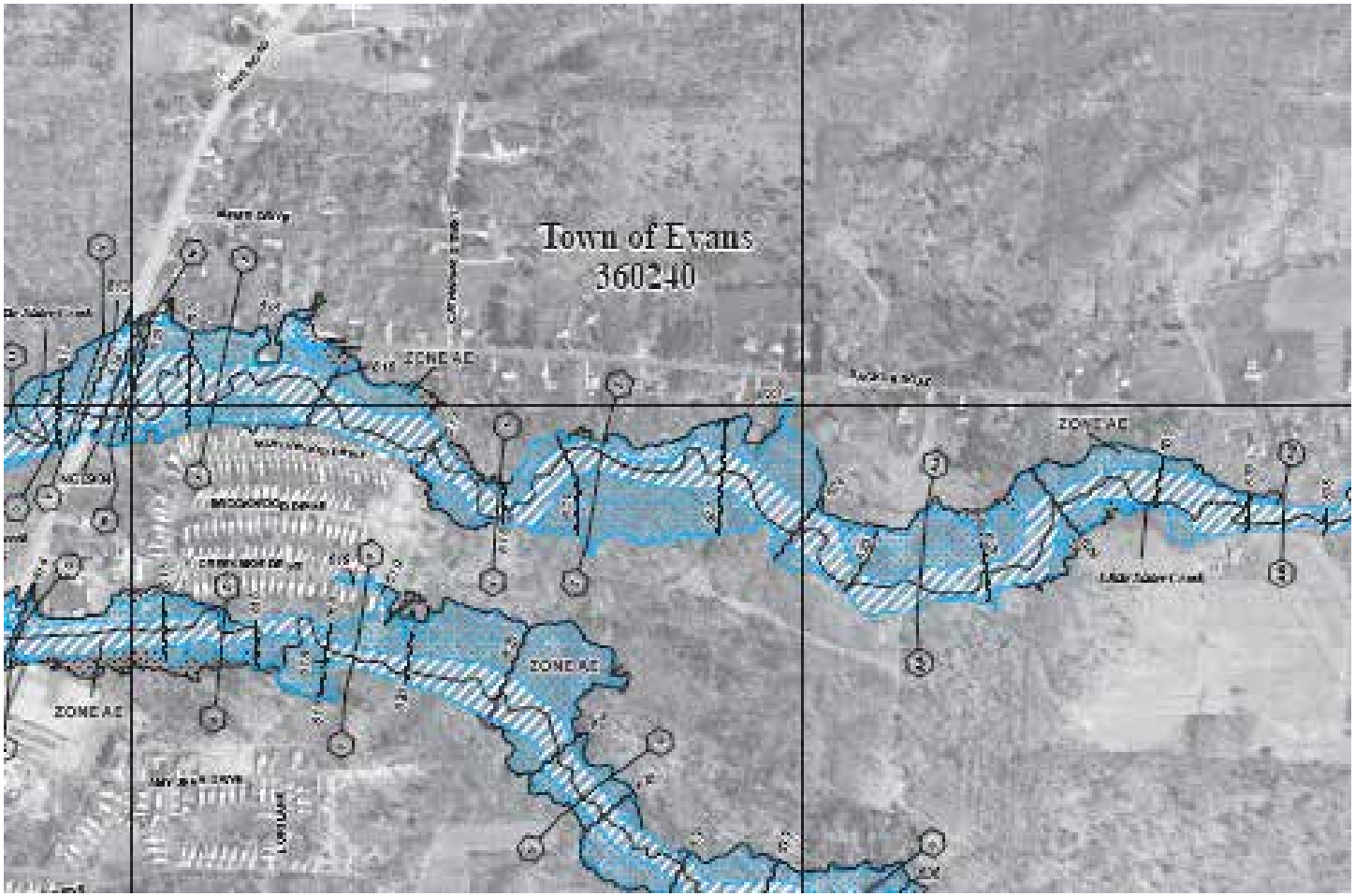
60,000 Employees

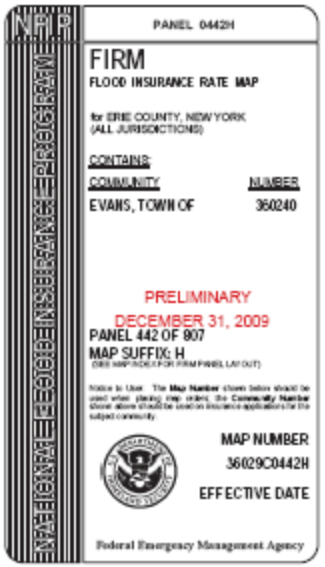
"I used it to answer two or three sections on a threat analysis form sent to me by headquarters. They are conducting these analysis worldwide. It was greatly appreciated as it saved me a lot of research time."



Using Risk Assessment Data

Business location, evacuation routes, business opportunity





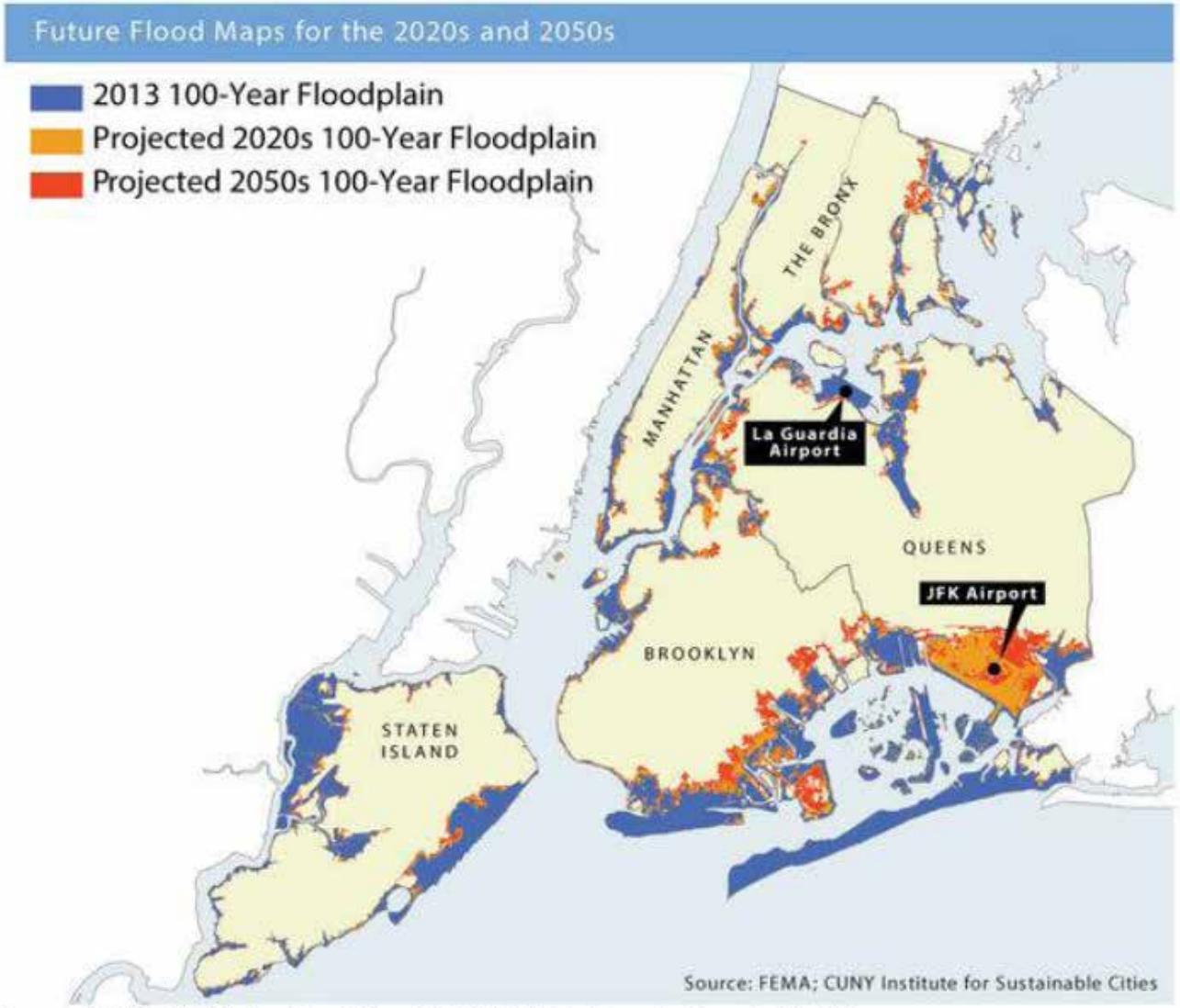
https://www.rampp-team.com/ny.htm

Understanding Your Risk

Climate Variability/ Climate Change:

- Causing more intense storms
- Water level rise ?
- Increasing our *Risk*

Figure 3.9m: Projected 100-Year Floodplain Maps



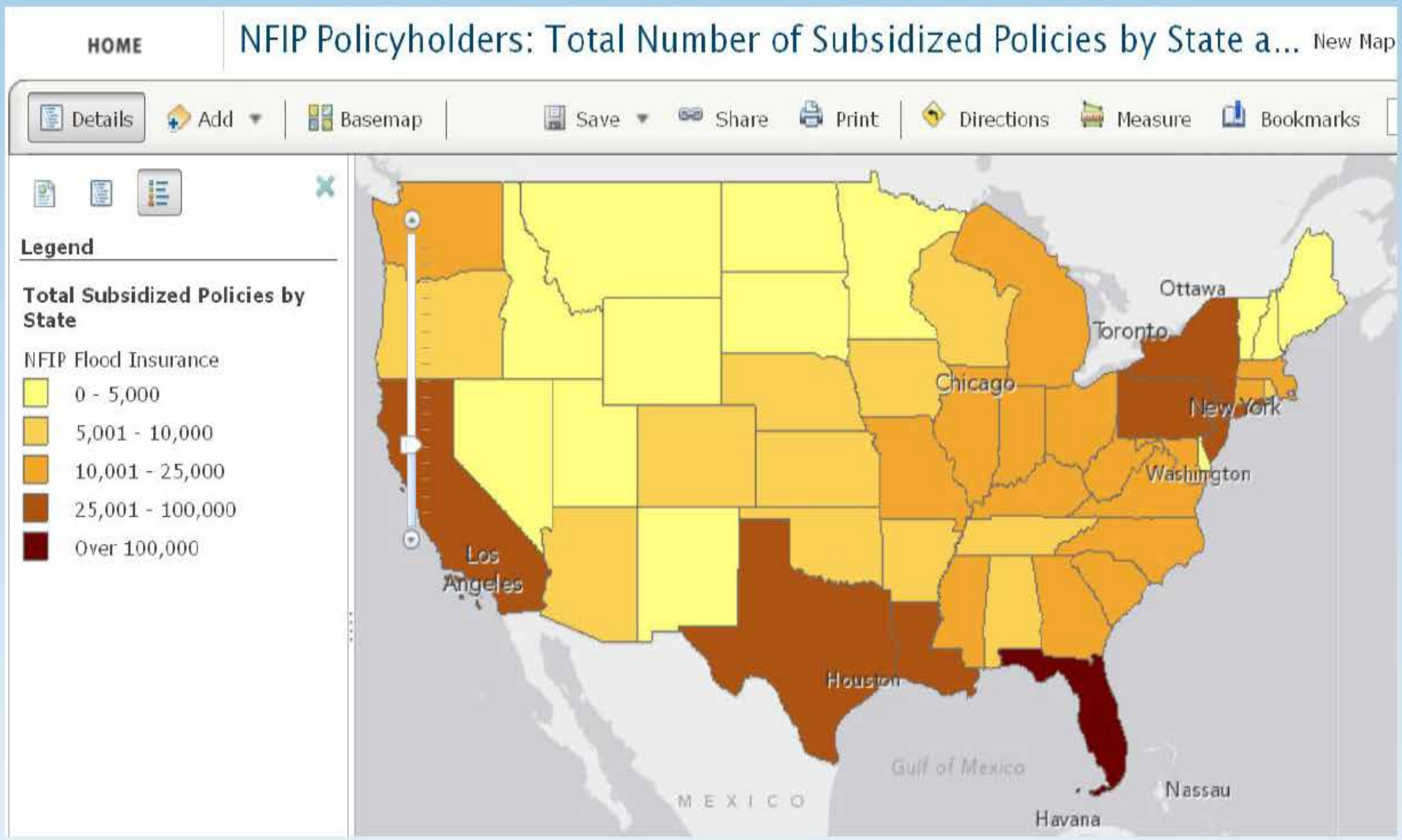
Source: FEMA, City University of New York (CUNY) Institute for Sustainable Cities

Higher Insurance Rates are coming (Risk Based)

Biggert-Waters 2012 (BW-12) What Everyone Needs to Know

- Flood risks are changing
  - Risks may have increased since the last maps
- Flood insurance rates will reflect those changes
  - With new maps, rates on many properties will rise
- Don't rely on subsidized rates
  - Most subsidized rates for older properties will be eliminated
- Building & re-building higher *lowers risk* and can save money!
  - Consider flood insurance when making construction decisions

Where are people most affected by changing rates?



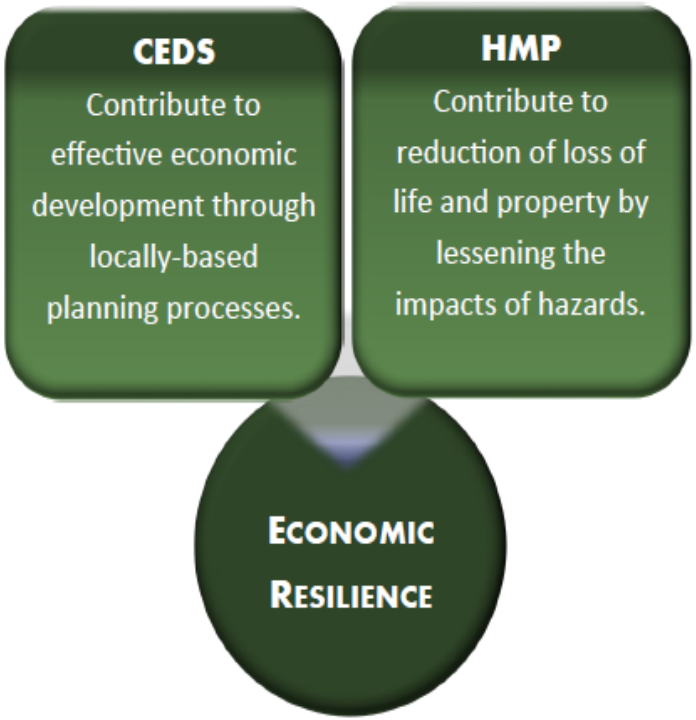
Strengthening Decisions

Mitigation Opportunities:

- Understanding your Risk allows you to be proactive against the Risks and properly move to action.

- Businesses and business districts located in safe areas;
- Commercial buildings built to standards that allow them to withstand storms;
- Businesses that continue operating or reopen quickly after severe weather events;
- Critical facilities and infrastructure that continue serving key employers and the public during and after severe weather events;
- Prioritized business reentry for key economic drivers;
- Open space and natural resource preservation that reduces hazard impacts and attracts tourism;
- Diversified economies that reduce reliance on sectors that are particularly vulnerable to hazards and climate change;
- Marketability of the region to businesses and investors looking to locate in communities that are safe and well-prepared for disasters;
- Job market stability as a result of businesses being better prepared for disasters; and
- Stable tax revenue streams for local governments when businesses are able to continue operating during and after severe weather events and workers are able to continue working.

Aligning Programs: Hazard Mitigation Plans and Comprehensive Economic Development Strategies (CEDS)



Strengthening Decisions

Local Plans and Regulations
- Zoning and Ordinances
  - o Easements
  - o Setbacks
  - o Open Space Preservation
  - o Enclosure Limits
- Building Codes
  - o Enforcement
  - o Higher Floodway Standards
  - o Additional Freeboard (2 ft above BFE)
  - o International Building Code
  - o International Residential Code
  - o Post Disaster Code Enforcement
  - o Other
- Establish Funding Source for Risk Reduction
- Incentives for Risk Reduction
- National Hazards Integrated into Other Plans
  - o Capital Improvement Plan
  - o Comprehensive Plan
  - o Master Plan
  - o Site Plan
  - o Storm water Management
  - o Coastal Zone Management
  - o Floodplain Management

Structure and Infrastructure Projects
- Acquisition
- UHI Albedo Enhancement
- Elevation
  - o Structure
  - o Utilities
  - o Other
- Flood Control/Management
  - o Culvert Expansion/Modification
  - o Bridge Expansion/Modification
  - o Sediment Retention
  - o Detention/Retention Basin
  - o Dams/Levees
  - o Drainage Improvements
  - o Green Roofs
  - o Jetties
  - o Permeable Paving
  - o Rain Gardens
  - o Revetments
  - o Seawalls
  - o Other
- Retrofit
  - o Structural
  - o Non-Structural
  - o Other
- Safe Room Construction
- Underground Utilities
- Other

Natural Systems
- Forest/Vegetation Management
- Fuel Reduction
- Open Space Preservation
- Protect and Restore Natural Functions
  - o Beach Nourishment
  - o Dune Rehabilitation/Protection
  - o Ground Water Recharge
  - o Sediment Trapping Vegetation
  - o Wetland Restoration
  - o Other
- Soil Stabilization or Erosion Control
  - o Sloping/Grading
  - o Vegetation
  - o Terracing
  - o Rip Rap
  - o Geotextile Fabric
  - o Other
- Stream Maintenance
- Tree Management
- Other

More things to think about after you have properly identified your Risk's

- Business Continuity Plans
- Alternative routes
- Assess suitability of other branches for recovery
- Supply Chain resiliency/sustainability
- Protect Business Records
- Install Generator
- Anchor Large Equipment
- Raise Electrical System Components
- Install Sewer Backflow Valves

Small steps now will pay huge dividends (40 to 60% of small businesses never reopen following a disaster)

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Key Points

- Identify your Hazards/Risks using best available data (hazard mitigation plans) (Get involved in your local planning initiatives)
  - Maintain your own loss records…your gonna need it
- Review local Risk Assessment data to locate your particular areas Risk/Vulnerability
- Once you know your Risk/Vulnerability take steps to mitigate
- Search for partners and funding to complete mitigation (local govt., insurance companies, FEMA Hazard Mitigation Grant Program, HUD, EDA, Resilience grant opportunities)
  - Talk about what you can bring to the table as a local business during a disaster

Be Proactive and plan for disasters…it is not if it is going to happen…when it is going to happen. Allow your community to survive, adapt and THRIVE!

Make sure you use Hazard Data when planning your future!!!

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Resources:

https://www.floodsmart.gov/floodsmart/ (Flood Data)

https://www.fema.gov/hazard-mitigation-planning-resources (FEMA Hazard Mitigation Plan)

https://www.nashville.gov/Portals/0/SiteContent/OEM/docs/MultiHazardMitigation/FINAL%20PDF%20W%20ADOPTIONS%202015.pdf (Nashville Hazard Mitigation Plan)

http://www.nathazmap.com/hazard_map_resources (a link to USGS, NOAA, FEMA, NASA etc. hazard data)

http://www.fema.gov/planning-templates (continuity plans)

http://www.fema.gov/small-business-toolkit (toolkit for small businesses)

http://www.preparemybusiness.org/ (SBA toolkit)

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