



## Regional Resilience and Vulnerability Indexes: A Progress Report

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### The Project:

The Institute of Public Policy, with funding from a National Science Foundation EPSCoR grant, has spent the first years of the grant researching what makes communities resilient in the face of natural and human-made threats. The goal of this research was to provide communities with the capacity and tools to prepare resilience plans for a range of human-made and natural threats. In order to make the research relevant and easily digestible for local planners and leaders, an index system was developed to easily identify and compare counties based on their relative resiliency and vulnerability to the country as a whole. These indexes are used to map resiliency and vulnerability at the county level across the United States. The indexes rank all counties into four quadrants based on their relative resilience and vulnerability to the national median in four main categories (social, economic, infrastructure, and environmental) deemed to be of primary importance in the literature. Each category has its own set of indicators used to determine relative resiliency and vulnerability in that category. A complete list of the indicators used to formulate relative resiliency as well as a detailed explanation of the methodology used to determine these rankings are all publically available on the project's website in the form of working papers. A final paper summarizing this methodology was completed in May 2017 and can be found on the project's website: [www.BuildingRegionalResilience.org](http://www.BuildingRegionalResilience.org).

### Vulnerability and Resilience Indexes:

The Indexes are organized based on indicators in four categories—social, economic, infrastructure and environmental—for every county in the United States. In each category the index matrix was used to categorized counties based on a set of county-level indicators gathered through publicly accessible data sources. From this, counties were scored and ranked on the index according to their standing relative to the national median resiliency and vulnerability in each category. Many indicators used in determining this score were updated in April 2017 with the most recent data available from the 2011-2015 American Community Survey from the US Census Bureau. In total, about half of the infrastructure datasets were updated and over two-thirds of the social and economic indicators.

Interactive maps were developed for the website that show where each county falls in regards to the respective resiliency categories, offering users the opportunity to easily compare counties to themselves, a customized region, a state, or the US as a whole based on the index matrix. The index matrix is divided into four quadrants indicating relative high or low resilience and vulnerability based on the national median score for resilience and vulnerability in each category (see [“Research Methodology of Resilience and Vulnerability Indexes”](#) for more information). Figure 1 details the four resilience and vulnerability quadrants on the index matrix into which all US counties were categorized for each overarching resilience category – Social, Economic, Infrastructure, and Environmental.

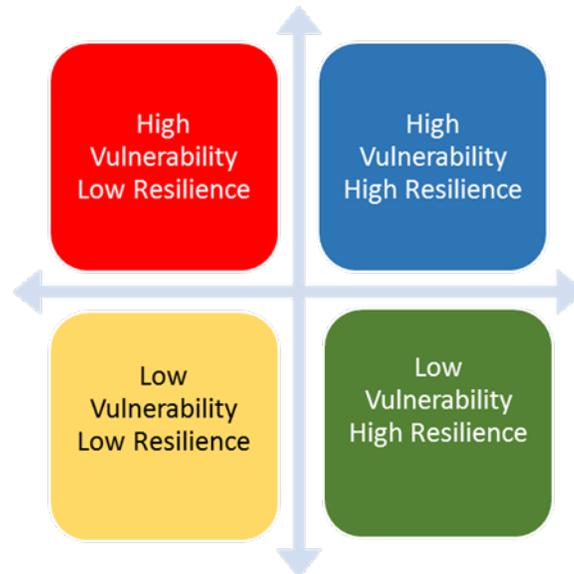
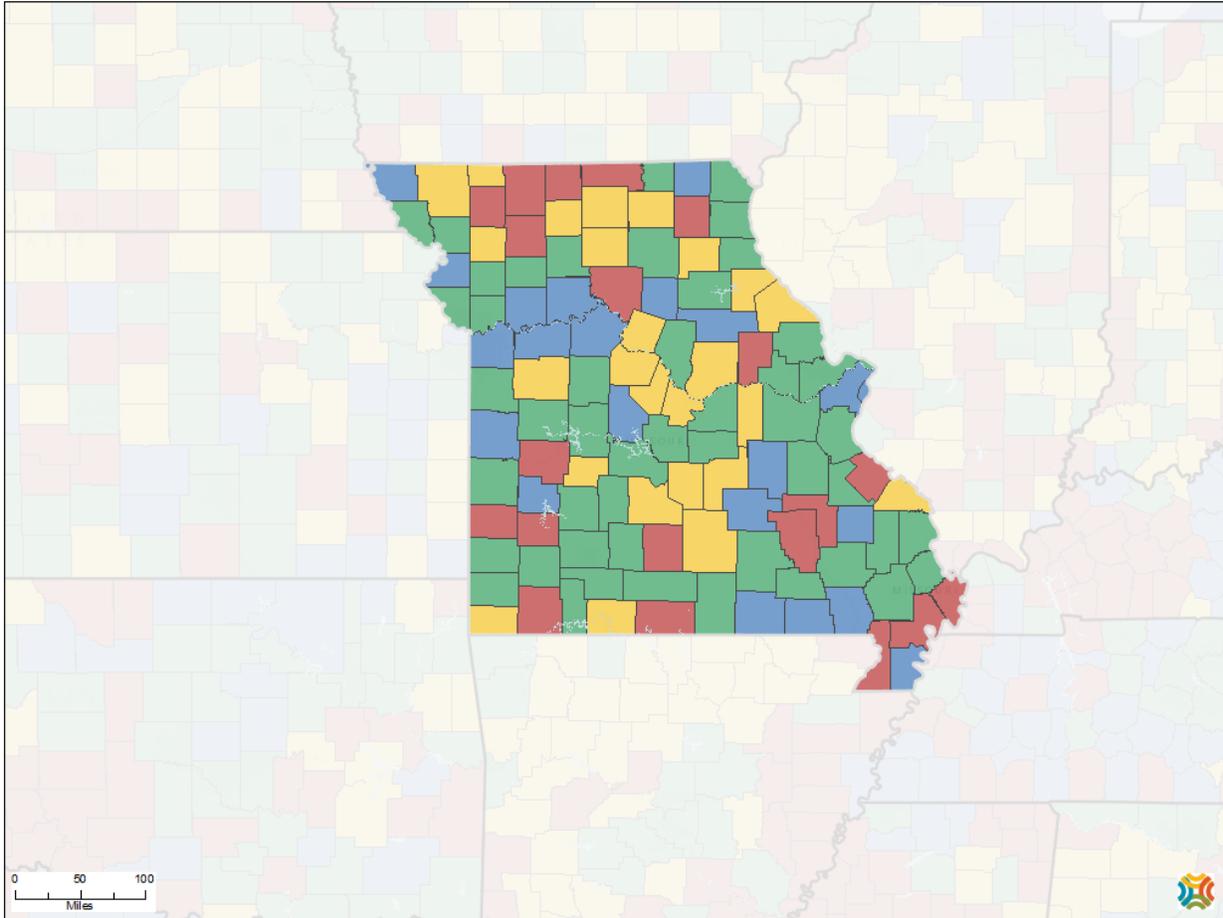


Figure 1: Resilience and Vulnerability Quadrants

An example of the map for the economic resiliency category for the state of Missouri and accompanying indicators used to determine resiliency and vulnerability in this category are found in the map and corresponding table below. Maps for all four categories are accessible are now available publically through the interactive mapping and reporting tools at [www.BuildingRegionalResilience.org](http://www.BuildingRegionalResilience.org). A complete list of all the indicators used to measure resiliency and vulnerability can be found by clicking the “Resilience Toolkit” tab from the homepage or by clicking [here](#). In general, resiliency indicators are data that as they increase, they *increase* resiliency and vulnerability indicators are data that as they increase, they *decrease* resiliency according to the literature.



Map Legend

Economics, Resilience / Vulnerability Quadrant by County, EPSCOR 2017

- High Resilience / Low Vulnerability
- High Resilience / High Vulnerability
- Low Resilience / Low Vulnerability
- Low Resilience / High Vulnerability

Community Commons, 7/10/2017

ECONOMIC RESILIENCE INDICATORS	ECONOMIC VULNERABILITY INDICATORS
<ul style="list-style-type: none"> <li>• Measure of economic diversity</li> <li>• Proprietors as a percentage of total nonfarm employment</li> <li>• Average nonfarm proprietors' income</li> <li>• Labor force participation rate</li> <li>• Establishment birth rate</li> </ul>	<ul style="list-style-type: none"> <li>• Percentage employed in extractive industries</li> <li>• Cost-burdened households</li> <li>• Unemployment rate</li> <li>• Business vacancy rate</li> </ul>



### **The Tool:**

The online tool provides a convenient and interactive medium to allow community planners, leaders, and decision makers to have access to the wealth of information gathered specific to resiliency and vulnerability across the country. The tool has many features that allow for immense customization of the data gathered. This means the tool can quickly and easily be tailored specifically for regions of interest to those seeking to use it and can narrow down findings in any of the four categories – Social, Economic, Infrastructure, Environmental – through interactive mapping and reporting. This online tool was made publically available in early 2017 and can be accessed online at [www.BuildingRegionalResilience.org](http://www.BuildingRegionalResilience.org). Detailed instructions were developed in spring 2017 and have been uploaded to the homepage to serve as a tutorial in using the website to guide users in how to make the tool useful for their needs. One can find these instructions by clicking the “Resilience Toolkit Instructions” link from the homepage or by clicking [here](#).

The website has two core components: an interactive mapping tool and an interactive reporting tool.

The mapping tool allows maps to be compiled based on the resiliency data. This aspect of the tool allows for more regional visualization when looking into resilience and vulnerability. It also allows users to see the “big picture” and easily allows one to navigate counties across the country to see patterns and possible trends geographically in regards to resiliency. The mapping tool also has many features that allow extra data beyond the resiliency index coding to be displayed. For example, one could easily superimpose the location of all hospitals or all public schools onto a map of Missouri. The map would show where all the counties fall on the resiliency index in regards to infrastructure for example in addition to the location of all hospitals and public schools. This can aid in determining regionally why some counties might have fewer resources available, like hospitals, if a natural disaster were to occur.

The reporting tool allows one to breakdown the resiliency and vulnerability findings at the county level by allowing the user to choose specifically which state and which counties in a region are of interest to the user. From there, the data is broken down by the resilience and vulnerability categories (Social, Economic, Infrastructure, and Environment) and automatically formulates a sample table and map specific to the counties chosen by the user that details the report area in specific terms relative to each data category. Further detail can conveniently be derived by clicking on “Underlying Data” which will show the actual underlying data used to determine a county’s relative vulnerability and resilience. Indicators such as labor force participation rate, home ownership, voter participation, and the multitude of other indicators that were used to measure resiliency and vulnerability in the four main categories can specifically be compiled here. The data can even be downloaded for use outside of the website for use in other local research efforts and projects.

### **Piloting the Tool:**

IPP has been at work since the site went live this spring in performing outreach efforts to spread awareness and access to the website and the data tools available. The goal is to pilot a program on the ground with community planners, local leaders, or other interested groups in using the data tools to better formulate disaster planning, mitigation planning, and other local planning efforts by aiding those decision makers with the information necessary to make better informed decisions. The goal is that by knowing these data in terms of resiliency and vulnerability that it will aid communities in thinking more proactively in how they can improve their resiliency and provide an easy framework for thinking about all the facets that go into becoming a resilient community. The ability to see resiliency broken down at the local county level also



serves to bring the issue close to home and brings more relevance to some of the issues facing communities in their efforts to become more resilient.

IPP has been in contact with and is continuing outreach efforts with many partners to facilitate the piloting of a project in using the resiliency tools that have been developed. Contacts include FEMA, SEMA, Mid-Missouri Regional Planning Commission, the Missouri Association of Councils of Governments, Office of the Mayor – City of St. Louis, Missouri Department of Economic Development, University of Missouri - Extension, and other fellow members of the Missouri EPSCoR project. IPP has worked alongside the Center for Applied Research and Environmental Systems in holding workshops to spread awareness in the EPSCoR community for further possible collaboration as well early this summer.

Since the site went live earlier this year there have been

- 463 sessions on the website
- 202 unique users of the website
- 936 unique pageviews within the building regional resilience hub
- 2,984 unique pageviews from the community commons website that also navigated to the building regional resilience hub