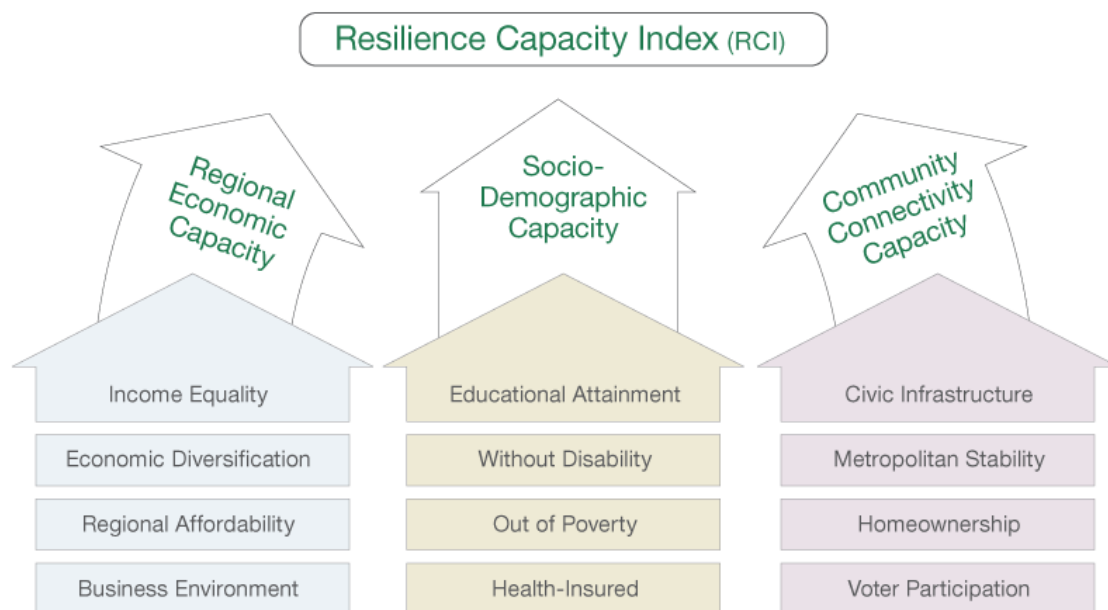


<http://brr.berkeley.edu/rci/>

Resilience Capacity Index

One way to assess a region's resilience is by its qualities to cope with future challenges, a concept we label **resilience capacity**. Developed by Kathryn A. Foster, member of the BRR research network and director of the University at Buffalo Regional Institute, the **Resilience Capacity Index (RCI)** is a single statistic summarizing a region's score on 12 equally weighted indicators—four indicators in each of three dimensions encompassing Regional Economic, Socio-Demographic, and Community Connectivity attributes. As a gauge of a region's foundation for responding effectively to a future stress, the RCI reveals regional strengths and weaknesses, and allows regional leaders to compare their region's capacity profile to that of other metropolitan areas. See **Data and Rankings** for index scores, ranks, and maps for the overall RCI and its underlying dimensions ("capacity types"). For details on index creation and indicators, see **FAQs** and **Sources and Notes**.



What is resilience?

Used differently by a range of fields from psychology to engineering, resilience has no single widely accepted definition. The concept typically connotes an ability to "bounce back" from a stress or disturbance, potentially returning to a pre-stress norm or a transformed post-stress condition. A versatile concept, resilience may pertain to any material or non-material phenomenon—people, structure, concept, or place, for example—with the property of being buoyant. For more on the concept of resilience, see Rolf Pendall, Kathryn A. Foster and Margaret Cowell. 2010. "Resilience and Regions: Building Understanding of the Metaphor." *Cambridge Journal of Regions, Economy and Society* 3 (1): 71-84.

What is regional resilience?

Regional resilience refers to the ability of a place to recover from a stress, either an acute blow, as in the case of an earthquake or major plant closing, or a chronic strain, as may occur with longstanding economic decline or unremitting rapid population growth. Conceiving of regions as capable of adaptation and transformation in response to challenges allows researchers and practitioners to understand the conditions and interventions that may make one place more or less resilient and why. For more on the project of regional resilience, see Kathryn A. Foster. 2007. "Snapping Back: What Makes Regions Resilient?" *National Civic Review* 96 (3): 27-29.

How do you measure regional resilience?

Because regions are complex, multi-faceted, continually changing phenomena, defining and measuring regional resilience as a post-stress phenomenon is difficult. Challenges of concept (*absolute or relative resilience?*), cause (*resilience to what?*), scope (*resilience of what?*), and time (*resilience by when?*) complicate resilience research. Comparative regional analysis, which requires similar stresses at roughly the same time to permit apples-to-apples analysis, is especially problematic. For more on definitional and methodological challenges of resilience, see Kathryn A. Foster. Forthcoming 2011. "In Search of Regional Resilience." In *Building Regional Resilience: Urban and Regional Policy and Its Effects*, edited by Nancy Pindus, Margaret Weir, Howard Wial, and Harold Wolman. Washington, D.C.: Brookings Institution Press.

Why measure resilience capacity?

Due to challenges in measuring post-stress resilience, researchers may focus on assessing a region's pre-stress capacity for resilience to unknown future stresses. Resilience capacity research entails identifying and measuring regional conditions hypothesized to position a region best for responding to and recovering from a disturbance. The Resilience Capacity Index (RCI) takes this approach.

What is the Resilience Capacity Index (RCI)?

The Resilience Capacity Index (RCI) is a single statistic summarizing a region's status on twelve factors hypothesized to influence the ability of a region to bounce back from a future unknown stress (see [Sources and Notes](#)). The index permits comparisons across metropolitan regions and identification of strong and weak conditions relative to other metropolitan regions.

Who developed the RCI?

The Resilience Capacity Index (RCI) was developed by Dr. Kathryn A. Foster, co-PI of the MacArthur Foundation Research Network on Building Resilient Regions, assisted by graduate assistants at the University at Buffalo Regional Institute, State University of New York. Assistance with data collection and mapping for the current index came from Jack N. Daugherty, graduate assistant from the University at Buffalo Department of Urban and Regional Planning. Assisting with earlier concepts and iterations of the resilience index were graduate assistants Michelle K. Sunm, University at Buffalo Department of Industrial and Systems Engineering, and Thomas Lombardi, University at Buffalo Department of Geography.

What factors of resilience capacity does the RCI include?

The index reflects scores on twelve indicators, each hypothesized to shape a region's overall resilience for an unknown future stress. Capacity indicators are classified into one of three capacity types, Regional Economic, Socio-Demographic, and Community Connectivity. Regional Economic indicators capture concepts of industrial diversification, business dynamics, regional affordability measured as a product of housing costs and income levels, and income equality. Socio-Demographic indicators capture concepts of poverty, disability, educational attainment and the proportion of the region's residents with health insurance. Community Connectivity indicators capture how familiar with and civically active a region's residents are as expressed by voter participation rates, homeownership, organizational density, and metropolitan stability measured by resident tenure within the region.

What factors of resilience capacity does the RCI not include?

Key factors hypothesized to influence regional resilience capacity but for which readily measured and reported data across metropolitan regions are not available are missing from the RCI. These include indicators capturing environmental or geographic factors, including topography, climate, and infrastructure systems, hypothesized to influence a region's physical vulnerability to and ability to recover from a stress. Also not included are measures of governance, including the nature and level of processes, relationships, behaviors, and capacities (including money, information, political culture, and clout) that may shape a region's performance in preparing for and responding to a stress. Exclusion of these factors does not imply their irrelevance, but rather the unavailability of comparable data across all metropolitan regions. Capacity factors specific to a particular challenge, such as a hurricane or flood, are also excluded from the analysis. These exclusions necessarily qualify the RCI, and should be considered in assessing findings.

How are the indicators measured?

The indicators are measured to achieve a consistent logic by which a high value signifies higher hypothesized levels of resilience capacity. In some instances this necessitates defining the indicator in untraditional ways, as for "out of poverty" or "without a disability," or by taking the inverse of a common measure, as for the Gini coefficient of "income equality" or "economic diversification." See [Sources and Notes](#) for indicator-specific details.

How is the RCI calculated?

The RCI incorporates each of the 12 underlying resilience capacity indicators in equal weight. To accommodate different indicator scales and metrics, indicator values are reported as z-scores, which quantify how many standard deviations—in a positive or negative direction—a region's performance on an indicator deviates from the all-metropolitan average. The RCI for any metropolitan region is the simple average of its z-scores for each of the 12 underlying RCI indicators.

For example, Fort Loveland-Collins, CO metropolitan area has underlying indicator z-scores of -0.07 (income equality), 0.73 (economic diversification), -0.68 (regional affordability), 2.50 (business environment), 2.37 (educational attainment), 1.31 (without disability), -0.10 (out of poverty), 0.10 (health-insured), -0.11 (civic infrastructure), -1.13 (metropolitan stability), -0.17 (homeownership), and 1.58 (voter participation) (see data in [RCI by Metro](#)). These twelve z-scores average to 0.53, which is the Overall RCI for the Fort Collins-Loveland, CO metropolitan region.

What is a z-score?

A z-score is a statistic of variance quantifying the distance, measured in standard deviations, a raw value is from the mean (average) value for a population. Z-scores may be positive (above the mean) or negative (below the mean). The formula is $z\text{-score} = (\text{raw value} - \text{mean value})/\text{standard deviation}$.

For example, the Regional Affordability indicator (the percentage of a region's households paying less than 35 percent of their income on housing) has a mean value for all 361 metropolitan regions of 74% and a standard deviation of 6%. A metropolitan region with a Regional Affordability value of 80%, signifying that 80% of that region's households pay less than 35 percent of their income on housing, has a z-score of $(80-74)/6 = (6)/6 = 1.00$, which signifies that the region is one standard deviation above the mean on this indicator. A region with a Regional Affordability raw value of 71% has a z-score of $(71-74)/6 = (-3)/6 = -0.50$, which signifies that the region is half a standard deviation below the mean for this indicator. A region with an indicator value equal to the mean has a z-score of zero.

With z-scores, indicators measured on different scales can be combined into a single index such as the RCI. Using z-scores to determine the probability that a region will fall within a range of the mean, for example, within 1 standard deviation of the mean, is appropriate only for variables exhibiting a normal distribution, that is, a roughly symmetrical distribution of values above and below the mean. Because some RCI indicators have asymmetrical rather than normal distributions, it is not possible to calculate z-score probabilities.

How are resilience capacity ranks determined?

Ranks reflect the relative resilience capacity of regions, with a rank of 1 signifying the highest level of resilience capacity and 361 the lowest level of capacity for the universe of 361 metropolitan areas. All ranks, specifically those for the overall RCI, RCI by Capacity Type, and indicator-level z-scores on the RCI by Metro pages, break apparent ties at the two-decimal level by using the underlying decimal places not shown. The site shows ties only if z-scores are actually tied to the full length of underlying decimal places.

How are metropolitan areas classified by their resilience capacity?

The RCI analysis uses scores and ranks to classify the 361 regions by quintile, with one-fifth of the metropolitan areas in each of five resilience capacity quintiles: Very High, High, Medium, Low, and Very Low. (Because $361/5$ equals 72.2, four of the five quintiles have 72 metropolitan regions and one, in this analysis the Medium quintile, has 73 regions.)

Does having Very High or High resilience capacity mean a region will recover from a stress?

Not necessarily. Having the capacity to be resilient is no guarantee that in the face of a stress the region will effectively respond to and recover from the disturbance. Having higher capacity does imply, however, that the region has factors and conditions thought to position a region well for effective post-stress resilience performance. As case study research may reveal, regions may squander their resilience capacity, performing “under expectations” in the wake of a stress.

Does having Very Low or Low resilience capacity mean a region will not recover from a stress?

Not necessarily. Lacking capacity to be resilient is no sentence that a region will falter in the face of a stress. Having lower capacity does imply, however, that the region lacks factors and conditions thought to position a region well for effective post-stress resilience performance. As case study research may reveal, regions may rise to the occasion, performing “above expectations” in the wake of a stress.

What is a RCI Capacity Type?

The RCI summarizes resilience capacity across three different dimension of capacity, labeled “capacity types.” The three dimensions are Regional Economic capacity, Socio-Demographic capacity, and Community Connectivity capacity.

If a region has High resilience for one type of capacity, will it have High resilience for other types of capacity?

Not necessarily. The RCI Capacity Types measure different aspects of resilience capacity. Just as an individual may have strength in one realm, such as income level, but weakness in another, such as personal health, so too can metropolitan regions be strong in one capacity type and weak in another. The data reveal many instances of metropolitan regions with quite different levels of resilience capacity by capacity type. Variable performance is also common by indicators within a single type of capacity.