



DisasterSmart
LEADERSHIP FOR A RESILIENT FUTURE

Resources

Building Code and Disaster Mitigation Cost Benefit Information

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- AIR Worldwide. *Improving Wind Mitigation Incentives*. 2013. <http://www.air-worldwide.com/Publications/AIR-Currents/2013/Improving-Wind-Mitigation-Incentives/>.
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- Institute for Business and Home Safety (IBHS). *Hurricane Charley – Nature’s Force vs. Structural Strengths, Executive Summary*. 2004. http://www.disastersafety.org/wp-content/uploads/hurricane_charley.pdf.
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- U.S. Department of the Treasury. *How to Modernize and Improve the System of Insurance Regulation in the United States*, A report from the Federal Insurance Office completed pursuant to Title V of the Dodd-Frank Wall Street Reform and Consumer Protection Act. (Section IV, Subsection “Natural Catastrophes”). Washington, D.C.: U.S. Government Printing Office. <http://www.treasury.gov/initiatives/fio/reports-and-notice/2013/01/20/How-to-Modernize-and-Improve-the-System-of-Insurance-Regulation-in-the-United-States.pdf>.
- Urban Land Institute. *Returns on Resilience – The Business Case*. 2015. <http://uli.org/wp-content/uploads/ULI-Documents/Returns-on-Resilience-The-Business-Case.pdf>.
- Van de Lindt, John W., et al. *Dual-Objective-Based Tornado Design Philosophy*. 2013. <http://ascelibrary.org/doi/abs/10.1061/%28ASCE%29ST.1943-541X.0000622>.

Disaster Resilience Policy Examples

- Agency policies promoting disaster resilience by integrating building codes and standards into agency programs include two recent FEMA policies: *Disaster Risk Reduction Minimum Codes and Standards*, and *Public Assistance Required Minimum Standards*
- Aid to state and local governments with elements to support mitigation and recovery, including residential construction include FEMA *Hazard Mitigation Grant Program (HMGP)*, HUD *Community Development Block Grant Disaster Recovery Program (CDBG-DR)*, and *Flood Mitigation Assistance Program (FMA)*
- Enacted disaster-resilience legislation includes the *Stafford Act* (and amending legislation), *National Earthquake Hazards Reduction Program (NEHRP)*, and *National Windstorm Impact Reduction Program (NWIRP)*
- Executive Orders include *Executive Order – Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*, *Executive Order: Establishing a Federal Earthquake Risk Management Standard*, and *Executive Order – Wildland-Urban Interface Federal Risk Mitigation*
- Grant program for high-wind and hurricane residential retrofits: [South Carolina Safe Home Program](#)
- Pending disaster-resilience legislation includes *Safe Building Code Incentive Act of 2015*, *National Mitigation Investment Act*, *Disaster Savings and Resilient Construction Act of 2015*, and *Disaster Savings Accounts Act of 2015*
- [State of Georgia’s disaster-resilient building code appendices](#) to the Georgia-adopted versions of the IBC and IRC. Additionally, see Smart Home America [Building Code Supplement](#) integrating FORTIFIED beyond-code recommendations
- White House forums facilitating disaster-resilient practices, e.g., [White House Conference on Resilient Building Codes](#), and [White House Forum on Smart Finance for Disaster Resilience](#)

Disaster Resilience Publications

- **Affordable Housing**
 - Comerio, Mary C. “Disaster Recovery and Community Renewal: Housing Approaches.” *Cityscape: A Journal of Policy Development and Research*. 16 (2): 51. 2014. <https://www.huduser.gov/portal/periodicals/cityscpe/vol16num2/ch3.pdf>
- **Disaster Assistance Programs**
 - FEMA - 229, *Disaster Assistance: A Guide to Recovery Programs*. 2005. <http://www.fema.gov/media-library-data/20130726-1538-20490-9100/recoveryprograms229.pdf>.
- **Disaster Resilience**
 - Chapman-Henderson, Leslie and A. Rierson.
 - *Building Codes: The Foundation for Resilience*. 2014. <http://www.flash.org/building-codes.pdf>.
 - *Disaster Resilience Rising Means the Time is Right*. 2015. <http://www.flash.org/disasterresiliencerising.pdf>.
 - *Understanding the Intersection of Resilience, Big Data, and the Internet of Things in the Changing Insurance Marketplace*. 2015. <http://flash.org/intersectionofresilience.pdf>.
 - Cutter, Susan L. *Community and Regional Resilience: Perspectives from Hazards, Disasters, and Emergency Management*. CARRI Research Report 1. http://www.resilientus.org/wp-content/uploads/2013/03/FINAL_CUTTER_9-25-08_1223482309.pdf.
 - SmarterSafer. *Bracing for the Storm – How To Reform U.S. Disaster Policy To Prepare For A Riskier Future*. 2015. <http://www.smartersafer.org/wp-content/uploads/Bracing-for-the-Storm.pdf>.
 - The National Academies. *Disaster Resilience: A National Imperative*. 2012. <https://www.nap.edu/catalog/13457/disaster-resilience-a-national-imperative>. This publication is an extensive treatment of the disaster resilience in the United States. Additional comprehensive treatments of disaster resilience available from the National Academies Press (<https://www.nap.edu/>).
 - U.S. Department of Housing and Urban Development. “Federal Disaster Policy: Toward a More Resilient Future.” *Evidence Matters*. 2015. <https://www.huduser.gov/portal/periodicals/em/winter15/highlight1.html>.
 - Vaughan, Ellen, and J. Turner. *The Value and Impact of Building Codes*. <http://www.coalition4safety.org/toolkit.html>.
- **Disaster-Resilience Incentivization**
 - National Institute of Building Sciences. *Developing Pre-Disaster Resilience Based on Public and Private Incentivization*. Oct. 29, 2015. http://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/MMC/MMC_ResilienceIncentivesWP.pdf. This publication and the addendum to same provide a comprehensive analysis of incentives for disaster resilience.
- **Public-Private Partnerships**
 - *A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action*. 2011. https://www.fema.gov/media-library-data/20130726-1813-25045-0649/whole_community_dec2011_2.pdf.
 - FEMA Public-Private Partnerships - <https://www.fema.gov/public-private-partnerships>

- Examples of public-private partnerships include the [Ready Campaign](#) and [Hurricane Strong](#)
 - [Project Impact](#) – past example of successful public-private partnership
 - Kunreuther, Howard. *The Role of Insurance in Reducing Losses from Extreme Events: The Need for Public-Private Partnerships*. 2015. http://opim.wharton.upenn.edu/risk/library/J2015GPP40_The-Role-of-Insurance-in-Reducing-Losses-from-Extreme-Events_Kunreuther.pdf.
- **Resilience Frameworks/Indices/Metrics**
 - Examples of metrics/frameworks/indices available for a community to measure its resiliency:
 - Baseline Resilience Indicator for Communities (BRIC)ⁱ
 - CARRI Community Resilience Systemⁱⁱ
 - Community Disaster Resilience Indexⁱⁱⁱ
 - MCEER R4 Resilience Framework^{iv}
 - NIST Community Resilience Planning Guide^v
 - NOAA Coastal Community Resilience Index^{vi}
 - Oregon Resilience Plan^{vii}
 - PEOPLES Resilience Framework^{viii}
 - Resilience Capacity Index (Buffalo Regional Institute, NY)^{ix}
 - ResilUS^x
 - Rockefeller Foundation City Resilience Framework^{xi}
 - SPUR model (San Francisco Planning and Urban Research Association)^{xii}
 - US Resiliency Council's Building Rating System^{xiii}

Disaster Resilience Case Studies/Publications by Peril

- **Earthquake**
 - 2014 South Napa Earthquake demonstrated vulnerability of URM buildings and importance of seismic design for nonstructural components.
 - FEMA P-1024, *Performance of Buildings and Nonstructural Components in the 2014 South Napa Earthquake*. <https://www.fema.gov/media-library/assets/documents/103966>.
 - Los Angeles Seismic Retrofit Ordinance
 - Cardno, Catherine A. *Los Angeles Passes Nation's Strictest Seismic Retrofit Ordinance*. <http://www.asce.org/magazine/20151103-los-angeles-passes-nation-s-strictest-seismic-retrofit-ordinance/>.
- **Flood**
 - Floodplain Management Community Case Studies
 - Association of State Floodplain Managers. *No Adverse Impact Floodplain Management. Community Case Studies 2004*. http://www.floods.org/PDF/NAI_Case_Studies.pdf.
 - Post Sandy Building Code Changes Regarding Flood Prevention
 - FEMA. *Building Science Support and Code Changes Aiding Sandy Recovery*. Hurricane Sandy Recovery Fact Sheet No. 3. 2014. http://www.fema.gov/media-library-data/1416428696553-d2b2c680a77990ed9e786b8821f850b0/SandyFS3Recovery_508.pdf.

- **Hurricane**
 - Statewide Building Code Post-Hurricane Andrew
 - For information regarding the history and development of the Florida Building Code and activities of the Florida Building Commission, see Florida Building Commission Annual Reports, https://floridabuilding.org/c/c_publications.aspx.
 - Dumm, Randy E., et al. *The Capitalization of Stricter Building Codes in Miami, Fla., House Prices*. The Florida Catastrophic Storm Risk Management Center. 2009. <http://www.stormrisk.org/sites/default/files/Capitlization%20of%20Building%20Codes%20Miami.pdf>.
- **Severe Wind/Tornado**
 - Building Code Improvements Post-Joplin, Missouri Tornado
 - NIST. 2014. *Technical Investigation of the May 22, 2011, Tornado in Joplin, Missouri*. http://ws680.nist.gov/publication/get_pdf.cfm?pub_id=915628.
 - NIST. *First Code Improvements Adopted Based on NIST Joplin Tornado Study*. 2015. <https://www.nist.gov/news-events/news/2015/12/first-code-improvements-adopted-based-nist-joplin-tornado-study>.
 - NIST. *Progress Toward National Resiliency: NIST Marks Joplin Tornado 5th Anniversary*. 2016. <https://www.nist.gov/news-events/news/2016/05/progress-toward-national-resiliency-nist-marks-joplin-tornado-5th>.
 - Residential Building Code Focusing on Tornadic Impact - Moore, Oklahoma
 - *City Adopts New Building Codes, First in the Nation*. <http://www.cityofmoore.com/node/2111>.
- **Wildfire**
 - Quarles, Stephen, et al. *Lessons Learned from Waldo Canyon: Fire Adapted Communities Mitigation Assessment Team Findings*. <http://wildfiretoday.com/2013/03/19/lessons-learned-about-survival-of-structures-during-waldo-canyon-fire/>.
 - Texas A&M Forest Service. *2011 Texas Wildfires: Common Denominators of Home Destruction*. http://texasforestservice.tamu.edu/uploadedFiles/FRP/New_-_Mitigation/Safety_Tips/2011%20Texas%20Wildfires.pdf.

Organizations

- **Organizations Addressing Disaster Resilience Across Multiple Perils**
 - BCEGS Program - <https://www.isomitigation.com/bcegs/>
 - BuildStrong Coalition - <http://buildstrongamerica.com/>
 - Coalition for Current Safety Codes - <http://www.coalition4safety.org/>
 - Community & Regional Resilience Institute - <http://www.resilientus.org/>
 - Federal Alliance for Safe Homes (FLASH) - <http://www.flash.org/>
 - FEMA Building Science Publications (broken out by peril and other categories) - <https://www.fema.gov/building-science-publications>
 - America's PrepareAthon! - <https://community.fema.gov/>
 - FEMA Building Codes Toolkit - <https://www.fema.gov/building-codes-toolkit>
 - FEMA Helpline

- FEMA Mitigation Assessment Team (MAT) Reports (addressing building performance during natural and man-made disasters) - <https://www.fema.gov/fema-mitigation-assessment-team-mat-reports>
 - FEMA Protecting Homes - <https://www.fema.gov/protecting-homes>
 - International Code Council (ICC) - <http://www.iccsafe.org/>
 - Insurance Institute for Business & Home Safety (IBHS), FORTIFIED - <https://disastersafety.org/fortified/>
 - Insurance Services Office (ISO) - <http://www.verisk.com/iso.html>
 - National Academy of Sciences - <http://www.nasonline.org/>
 - National Institute of Building Sciences - <http://www.nibs.org/>
 - National Institute of Standards and Technology (NIST) - <http://www.nist.gov/>
 - NFPA - <http://www.nfpa.org/>
 - NOAA - <http://www.noaa.gov/>
 - National Hurricane Center - <http://www.nhc.noaa.gov/>
 - National Weather Service - <http://www.weather.gov/>
 - Ready - <https://www.ready.gov/>
 - Rockefeller Foundation - 100 Resilient Cities - <http://www.100resilientcities.org/#/-/>
 - Smart Growth America - <http://www.smartgrowthamerica.org/>
 - Smart Home America - <http://www.smarthomeamerica.org/>
 - Texas State Collaborative - <http://www.texasstatecollaborative.org/>
 - The American Institute of Architects - <http://www.aia.org/>
 - U.S. Department of Housing and Urban Development (HUD) - <http://portal.hud.gov/hudportal/HUD>
 - U.S. Geological Survey (USGS) - <https://www.usgs.gov/>
 - Wharton University of Pennsylvania, Risk Management and Decision Processes Center: <http://opim.wharton.upenn.edu/risk/papers/>
- **Organizations Addressing Disaster Resilience by Individual Peril**
 - **Earthquake**
 - California Earthquake Authority - <http://www2.earthquakeauthority.com/Pages/default.aspx>
 - Cascadia Region Earthquake Workgroup (CREW) - <http://www.crew.org/>
 - Center for Earthquake Research and Information (CERI) - <http://www.memphis.edu/ceri/>
 - Central U.S. Earthquake Consortium (CUSEC) - <http://www.cusec.org/>
 - Earthquake Brace + Bolt - <https://www.earthquakebracebolt.com/>
 - Earthquake Engineering Research Institute (EERI) - <https://www.eeri.org/>
 - Great ShakeOut Earthquake Drills - <http://www.shakeout.org/>
 - NEHRP - <http://www.nehrp.gov/>
 - Northeast States Emergency Consortium (NESEC) - <http://nasec.org/>
 - Pacific Earthquake Engineering Research Center (PEER) - <http://peer.berkeley.edu/>
 - Post-event evaluations available at Applied Technology Council website (<https://www.atcouncil.org/projects-sp-1235934887/project-atc692-3>), including Recovery Advisories for the South Napa Earthquake (ATC-125).
 - Southern California Earthquake Center (SCEC) - <https://www.scec.org/>
 - Western States Seismic Policy Council (WSSPC) - <http://www.wsspc.org/>

- **Flood**
 - Association of State Floodplain Managers - <http://www.floods.org/>
 - Community Rating System Program - <https://www.fema.gov/community-rating-system>
 - National Flood Insurance Program - <http://www.floodsmart.com/>
- **Hurricane and Severe Wind/Tornado**
 - National Hurricane Center - <http://www.nhc.noaa.gov/>
 - National Storm Shelter Association - <http://www.nssa.cc/>
 - National Windstorm Impact Reduction Program (NWIRP) - <https://www.nist.gov/el/mssd/nwirp>
- **Wildfire**
 - FEMA Region VIII Wildfire Timeline - <https://www.fema.gov/fema-region-8-wildfire-timeline>
 - Firewise - <http://www.firewise.org/>

ⁱ Susan L. Cutter, “Disaster Resilience Indicators for Benchmarking Baseline Conditions.” *Journal of Homeland Security and Emergency Management*. Vol. 7, Issue 1, (2010) <http://www.degruyter.com/view/j/jhsem.2010.7.1/jhsem.2010.7.1.1732/jhsem.2010.7.1.1732.xml>

ⁱⁱ Community & Regional Resilience Institute. *Frequently Asked Questions. CRS Community Resilience System*, http://www.resilientus.org/wp-content/uploads/2013/03/CRS-FAQs_CARRI_website_1321021479.pdf; Community & Regional Resilience Institute, *Community Resilience System*, <http://www.resilientus.org/recent-work/community-resilience-system/>.

ⁱⁱⁱ Walter Gillis Peacock, et al., *Advancing the Resilience of Coastal Localities: Developing, Implementing and Sustaining the Use of Coastal Resilience Indicators: A Final Report*, 2010, http://hrrc.arch.tamu.edu/media/cms_page_media/558/10-02R.pdf.

^{iv} Framework discussed in: Keith Fudge, “The Research Basis for Disaster Resilience.” *Evidence Matters*, U.S. Department of Housing and Urban Development, <http://www.huduser.org/portal/periodicals/em/winter15/highlight2.html>.

^v NIST *Community Resilience Planning Guide*, NIST Special Publication 1190, Community Resilience Planning Guide for Buildings and Infrastructure Systems Volume 1, <http://www.nist.gov/el/resilience/upload/Community-Resilience-Planning-Guide-Volume-1.pdf>.

^{vi} T.T. Sempier, et al., *Coastal Resilience Index: A Community Self Assessment*, MASGP-08-014, 2010, http://masgc.org/assets/uploads/publications/662/coastal_community_resilience_index.pdf.

^{vii} Oregon Seismic Safety Policy Advisory Commission, *The Oregon Resilience Plan*, 2013, http://www.oregon.gov/OMD/OEM/osspace/docs/Oregon_Resilience_Plan_Final.pdf.

^{viii} Chris. S. Renschler, *The PEOPLES Resilience Framework—An Integrated Quantitative Measure and Modeling of Sustainable Development and Disaster Risk Reduction*, 2013, <http://www.preventionweb.net/english/hyogo/gar/2015/en/bgdocs/inputs/Renschler,%202013.%20The%20PEOPLES%20Resilience%20Framework.pdf>; PEOPLES Resilience Framework. ...*Seven dimensions of community resilience*, <http://peoplesresilience.org/what-is-peoples>.

^{ix} University of California Berkeley, *Resilience Capacity Index*, <http://brr.berkeley.edu/rci/>; Rachel M. Teaman, ‘Resilience’ of U.S. Metros Measured by Online Index Developed by UB Researchers, July 11, 2011, <http://www.buffalo.edu/news/releases/2011/07/12707.html>.

^x Scott. B. Miles, et al., *ResilUS: A Community Based Disaster Resilience Model*, 2011, http://www.tandfonline.com/doi/abs/10.1559/1523040638136#.VS_d7PnF960; S.B. Miles,

ResilUS—Modeling Community Capital Loss and Recovery, 2008,
http://www.iitk.ac.in/nicee/wcee/article/14_09-01-0095.PDF.

^{xi} Ove Arup & Partners International Limited, *City Resilience Framework*, 2014,
<https://www.rockefellerfoundation.org/app/uploads/2014/07/City-Resilience-Framework1.pdf>.

^{xii} Chris Poland, *The Resilient city: Defining What San Francisco Needs From Its Seismic Mitigation Policies*. San Francisco Planning + Urban Research Association, 2009,
http://www.spur.org/sites/default/files/publications_pdfs/SPUR_Seismic_Mitigation_Policies.pdf.

^{xiii} U.S. Resiliency Council, *Why are Building Rating Systems Needed?*
<http://www.usrc.org/building-rating-system>.