

Promoting Resilience Post-Sandy Through Innovative Planning and Design

#rebuildbydesign

REBUILD BY DESIGN: Hurricane Sandy Regional Planning and Design Competition

INTRODUCTION

The Hurricane Sandy Rebuilding Task Force is pleased to launch REBUILD BY DESIGN, a multi-stage regional design competition to promote resilience for the Sandy-affected region. The goal of the competition is two-fold: to promote innovation by developing regionally-scalable but locally-contextual solutions that increase resilience in the region, and to implement selected proposals with both public and private funding dedicated to this effort. The competition also represents a policy innovation by setting aside HUD Community Development Block Grant Disaster Recovery (CDBG-DR) funding specifically to incentivize implementation of winning projects and proposals. Design solutions are expected to range in scope and scale -- from large-scale urban and multi-functional green infrastructure, to small-scale distributed flood protection measures and resilient residential structures, for example. The competition process will also strengthen our understanding of regional interdependencies, fostering coordination and resilience both at the local level and across the United States.

On December 7, 2012 President Obama signed an [executive order](#) creating the Hurricane Sandy Rebuilding Task Force to "...ensure that the Federal Government continues to provide appropriate resources to support affected State, local, and tribal communities to improve the region's resilience, health, and prosperity by building for the future." The Task Force exists to ensure cabinet-level, government-wide and region-wide coordination to help communities as they are making decisions about long-term rebuilding.

OBJECTIVES

The competition seeks to bring local, regional, and international knowledge to bear in order to:

1. Contribute to a better understanding of the region's vulnerabilities, strengths, and interdependencies;
2. Generate design proposals that focus on regionally applicable solutions, increase resilience, develop and promote innovation, and integrate local efforts in the region;
3. Build capacity of local communities and federal agencies while promoting an integrated regional approach;
4. Connect to local efforts and strengthen the collaboration within governments and between government, business, academic, non-profit, and other organizations;
5. Ignite innovation, outside-the-box perspectives, and address new trends; and
6. Execute world-class projects with regional impact (either large scale or replicable across the region).

SITE / FOCUS AREAS

While REBUILD BY DESIGN may result in design solutions that are applicable across the United States, design teams are asked to focus on the most-affected and most-vulnerable areas

of the Sandy-affected region within Connecticut, Maryland, New Jersey, New York, and Rhode Island.

This is a complex region, with differing governance structures, culture, etc. To help navigate this complexity, the competition is organized around four focus areas: coastal communities, high-density urban environments, ecological and water body networks, and a catch-all category of unidentified or unexpected focus. Design teams will be expected to select one of the four focus areas outlined below:

Coastal communities

This category focuses on small- to mid-sized coastal communities. These communities are characterized by limited capacity and high coastal vulnerability. Here, there is often a tension between environmental and economic systems (i.e. the tourism industry is dependent on the environment and also vulnerable to it).

High-density urban environments

These economically-significant areas have impacts on both the region and the nation as a whole. These communities have highly complex built and human systems and significant economic value for the entire region. When storms like Sandy hit these communities they cause major disruptions to both the local and regional economy.

Ecological and waterbody networks

These networks are regional by nature; watersheds and ecosystems disregard administrative boundaries and must be considered from the regional scale. This category focuses on the interdependencies between the built and natural environments.

The unidentified and unexpected

This category allows for selected teams to pursue unexpected questions and innovative proposals outside of the framework provided above. This is an open category to encourage outside-the-box approaches and proposals.

PHASING: ANALYSIS AND PROBLEM DEFINITION TO SPECIFIC SOLUTIONS

Stage One: June – July 2013

- Request for qualifications and concepts issued
- Selection of teams to participate

Stage Two: August – October 2013

- Research and collaborative analysis of the region with a wide-variety of stakeholders
- Identification of key design opportunities

Stage Three: November 2013 – February 2014

- Development of site-specific schematic design solutions
- Community engagement and intense collaboration with state/local government partners

Stage Four: March 2014 – TBD

- Design development of winning design solutions
- Implementation of winning design solutions with federal disaster recovery funds

DETAILED PROCESS, TIMELINE, AND DELIVERABLES

Stage One: June – July 2013

Request for qualifications and selection of 5-10 Design Teams

Process: Applicants must submit a short proposal, detailed in the REBUILD BY DESIGN Request for Qualifications (see Appendix A), which summarizes their interdisciplinary expertise and presents an initial approach related to one of the four focus areas. Applicants will have to submit both an idea on how they want to work on this (process) and what their initial thinking is on the issues at stake and the possible concepts that might emerge. Applicants will be asked to illustrate these concepts in regard to what vulnerabilities their team would focus on. These concepts will serve as illustrations of the applicant’s approach and innovative thinking; however, it is expected that selected Design Teams adjust their approach based on the analysis process in Stage Two.

Applicants must include professional expertise in at least three of the following fields: infrastructure engineering, landscape design, urban design, architecture, land-use planning, industrial design, community engagement, and communications design. Applicants with additional expertise in the following fields are preferred: community building, social-science, economics, ecology, hydrology, water safety, transportation, resilience, sustainability, project-management, finance, arts, graphic design, and others. Applicants must have demonstrable experience in interdisciplinary research, analysis, and design – especially related to the spatial impacts of ecological, economic, and social development on the regional scale.

While by no means exhaustive, a Starter Kit of helpful information about the region has been compiled (see Appendix B) and is attached to this design brief. It contains a preliminary list of relevant datasets, general analyses, and existing plans.

At the end of Stage One, the Task Force, serving as the Selection Committee, will identify 5-10 applicants to proceed to Stages Two and Three as Design Teams

<i>Timeline:</i>	June 20, 2013	Request for Qualifications and Approach is Released
	July 20, 2013	Deadline to Submit Response
	July 25, 2013	Review/Selection of 5-10 Design Teams to Proceed

Early August, 2013 Public Announcement of selected Design Teams

Deliverables: PDF proposal outlining applicant's qualifications and conceptual approach.

Stage Two: August – October 2013

Analysis of the region through collaborative process

Process: Applicants selected to proceed to Stage Two as Design Teams will receive \$100,000 USD for all their efforts in Stage Two. The selected Design Teams will participate in an intense participatory process organized by New York University's Institute of Public Knowledge (IPK) in close collaboration with the U.S. Department of Housing and Urban Development (HUD) and other partners in the region. This process will include engagement with a wide-range of stakeholders (including state and local government) and experts to develop a comprehensive understanding of the region, its interdependencies, key vulnerabilities, and areas that warrant integrated design thinking and solutions.

Teams will be expected to participate in the following over the three-month analysis stage:

- Ongoing seminars around relevant themes and knowledge;
- A series of team symposia (one every three weeks) to discuss common needs for information/resources;
- Several regional site visits to interact with local stakeholders, engage the public, and witness affected spaces and structures; and
- An opening and closing conference for the analysis stage.

NOTE: Content from this facilitated analysis process, being collaborative in nature and involving a wide-range of stakeholders, will be public, meaning that it can be used by all teams and will be collected throughout the process and presented by NYU IPK through a variety of mediums.

This iterative research process will underpin the analysis conducted by each of the Design Teams in their chosen focus area, and inform each Design Team's production of a research report and public presentation.

As part of the research and analysis stage, Design Teams must also identify at least 3-5 design opportunities resulting from their research. Design opportunities are defined as key opportunities or key projects that have the potential for maximum impact on the region's strengths and vulnerabilities. These opportunities can be both site-specific and/or representative of a typology that is regionally replicable.

Through a collaborative process with the Design Teams, Competition Jury (see below), and other stakeholders, each Design Team will end up with one design

opportunity for development and refinement in Stage Three in collaboration with state and local communities.

By defining the design questions through the competition process, this competition will incorporate the regional scale and perspective and will reflect the insight and interests of state and local stakeholders.

Design Teams will then select one design opportunity to focus on in Stage 3.

Timeline:

Mid-August, 2013	Opening Conference
August - October	Ongoing Seminars and Team Symposia
August - October	Six Regional Site Visits (exact sites TBD)
Late October, 2013	Closing Conference

Deliverables: Each Design Team must submit a highly-accessible digital research report that includes visual and non-visual analysis, and identification of at least 3-5 design opportunities within their focus area. Design Teams will publicly present their research at a conference in October 2013. These analyses will be compiled by NYU IPK into a public catalog of submissions and synthesis document that could be used by a wide variety of stakeholders. NOTE: At the start of Stage Two, selected Design Teams will meet with NYU IPK to identify an agreed-upon format for each of the Stage Two deliverables.

Stage Three: November 2013 – February 2014

Development of design solutions and community/partner engagement

Process: During this stage, Design Teams will receive an additional \$100,000 to design site-specific proposals for locally-implementable and/or regionally-scalable projects. In addition to design drawings, Design Teams will be expected to propose a strategy for implementation that identifies partners, funding, and timing.

The design phase will involve a facilitated, iterative community engagement process with all levels of government. Design Teams will engage with local political leadership in order to identify specific sites and individual projects relevant to the design opportunity identified in Stage Two, and to partner with a local or state government entity.

The Competition Jury will evaluate the final design proposals (based on criteria that will be provided) and identify winning projects that may be implemented by local or state governments with federal disaster recover resources. Winning projects will be presented publicly at a regional planning and design conference in the Sandy-affected region, as well as at TBD international venues.

Stage Three partners will include the Municipal Art Society of New York, the Regional Plan Association, and the Van Alen Institute. These partners will develop an iterative design process, rooted in the research from Stage Two, to help connect Design Teams with key partners and develop place-based design solutions.

Timeline: TBD

Deliverables: Design and refinement of place-based design solutions implementable with CDBG-DR and other funding.

Stage Four: March 2014 – TBD

Implementation of winning designs by state and/or local governments with federal disaster recovery funds

Process: A winning Design Team or Design Teams will proceed from Stage 3 to Stage 4 and work closely with state and/or local government entities to implement their winning designs and key projects. Following the announcement of the competition winners, HUD will make an allocation of CDBG-DR funds for Sandy impacts and identify how the use of these funds will align with leveraging the implementation of the winning projects/proposals.

Timeline: Spring 2014

Deliverables: State or local governments receiving a final round CDBG-DR allocation will submit an action plan or action plan amendment to HUD identifying how it intends to use the funds consistent with guidelines and requirements published by Notice in the Federal Register.

COMPETITION LEADERSHIP

Managing Partners

While the Hurricane Sandy Rebuilding Task Force is launching the competition, lead responsibility will transfer to the U.S. Department of Housing and Urban Development as the Task Force winds down in Late Summer/Early Fall 2013. The National Endowment for the Arts is lending their expertise to advise the Task Force and HUD in management and design of the overall process. In addition, many other federal departments and agencies are involved in the process both through the Task Force and in subsequent stages.

The Task Force is partnering with New York University's Institute of Public Knowledge, in collaboration with regional partners, to design and run the analysis process in Stage Two. In addition, the Task Force is partnering with the Municipal Art Society of New York, the Regional

Plan Association, and the Van Alen Institute to design and run the design process in Stage Three.

Competition Jury

The REBUILD BY DESIGN Jury functions as an expert panel throughout the competition process, providing critical input during the analysis and design stages. The Jury will also help evaluate submissions at the end of Stage Two and ultimately judge the final designs at the end of Stage Three.

Jury members confirmed to date include:

- **Hon. Shaun Donovan**, Secretary, U.S. Department of Housing and Urban Development and Chair, Hurricane Sandy Rebuilding Task Force
- **Dr. Howard Frumkin**, Dean, School of Public Health. Professor, Env. and Occ. Health Sciences. University of Washington
- **Dr. Susan Cutter**, Carolina Distinguished Professor and Director, Hazards and Vulnerability Research Institute, University of South Carolina
- **Ricky Burdett**, Professor of Urban Studies at the London School of Economics and Political Science (LSE), Head of the Department of Sociology and Director of LSE Cities and the Urban Age Program
- **Bruce Katz**, Vice President and Director, Metropolitan Policy Program, The Brookings Institution
- **Dr. Dirk Sijmons**, Professor of Landscape Architecture TU-Delft NL, curator 6th International Architecture Biennale Rotterdam 2014 'Urban by Nature'
- **Mark Tercek**, President and Chief Executive Officer, The Nature Conservancy
- **TBD**, Representative from the American Society of Landscape Architects
- **TBD**, Representative from the Urban Land Institute
- **TBD**, Representative from the American Institute of Architects

A final list of jurors will be published at a later date.

For more information on all of the REBUILD BY DESIGN partners and jurors see Appendix C.

CONTACT

Please direct all competition-related inquiries to rebuildbydesign@hud.gov.

APPENDICES

- A. REBUILD BY DESIGN Request For Qualifications (Stage One)
- B. REBUILD BY DESIGN Starter Kit (Stage One)

APPENDIX A: REBUILD BY DESIGN Request for Qualifications

Timeline

June 20, 2013	RFQ Released
July 20, 2013	Deadline to Submit Responses
July 25, 2013	Task Force Review/Selection of 5-10 Teams
Early August, 2013	Public Announcement of Selected Teams

Eligibility

Teams are required to demonstrate professional expertise in at least three of the following fields: infrastructure engineering, landscape design, urban design, architecture, land use planning, community development, communications design, public finance, or real estate.

Teams with additional expertise in the following fields are encouraged: social-science, economic development, ecology, hydrology, water safety, transportation, resilience, sustainability, project-management, finance, arts, graphic design, industrial design, or other disciplines as appropriate.

Teams must have demonstrable experience in interdisciplinary research, analysis, and design – especially related to the spatial impacts of ecological, economic, and social development on the regional scale.

All levels of experience are encouraged to apply in order to attract innovative thinking and new approaches, however, at least one team member must have experience working with publically-funded projects.

Submission Requirements

Applicants must submit a proposal in response to this Request for Qualifications to rebuildbydesign@hud.gov no later than 5:00 PM EDT on Friday, July 19, 2013. All proposals must be submitted in PDF format; hardcopy proposals will not be accepted.

Proposals should be no longer than 12 one-sided pages (format US Letter), including text, images, and/or drawings. Font size cannot exceed 11 points; file size cannot exceed 20MB.

Applicants must address the following in their proposals.

- **List of team members (1 page):** Include each team member's name, affiliation, contact information, and website. Clearly identify a single lead contact for follow up.
- **Focus area:** Clearly identify your team's selected focus area (i.e. coastal communities, high-density urban environments, ecological and waterbody networks, or other). See Page 1 of the Competition Brief for detailed information.

- **Summary of team's strengths and relevant experience (2-3 pages):** Provide a narrative summary of the team's collective strengths and experience relevant to the goals of the competition and to the team's selected focus area. Clearly articulate each team member's specific contribution to this effort and the interdisciplinary strength that distinct the team. Discuss past collaborative efforts among team members, if applicable.
- **Selected relevant projects and expertise (3-6 pages):** Submit highlights of previous work relevant to the goals of the competition and to the team's research focus and design approach. Include both visual and non-visual examples. Do not include links to external documents.
- **Conceptual approach (2-4 pages):** Include a narrative description of the team's proposed research and design approach and initial ideas within one of the four focus areas. Submit your ideas on how the team wants to work (process) and what your initial thinking is on the issues at stake and the possible concepts that might emerge. Illustrate these concepts in regard to what vulnerabilities your team would focus on. Elaborate on your strategy for connecting research and analysis activities to the development of implementable, place-based design solutions. Note that these ideas are illustrations for the team's approach and innovative thinking. Selected Design Teams will finalize their focus based off of their research during Stage Two.

Selection Process

Designees from the Hurricane Sandy Rebuilding Task Force* will serve as the Stage One Selection Committee and will select 5-10 design teams based on the criteria listed below. *On December 7, 2012, President Obama established the Task Force and appointed U.S. Department of Housing and Urban Development Secretary, Shaun Donovan, as Chair. The Task Force is made up of executive-level representation from over 20 federal departments and agencies including White House offices.

Applicants that are chosen by the Selection Committee will be invited to participate in Stages Two and Three, at which point they will be expected to enter into an agreement and provided a Scope of Work. Then, these Design Teams will be provided \$100,000 USD to participate in Stage Two. Teams proceeding to Stage Three will be provided with another \$100,000 USD to advance their design proposals.

Evaluation Criteria

The Stage One Selection Committee will identify Design Teams based on the following criteria:

1. Team composition
 - a. Depth of interdisciplinary experience
 - b. Capacity to work collaboratively on interdisciplinary teams
2. Quality of past work
 - a. Demonstrated excellence in each of the team member's respective disciplines

- b. Commitment to participatory design and public engagement – especially to underserved populations
 - c. Relevance of the team’s experience to the proposed research focus and design approach
 - d. Track record of publically-funded, built projects. NOTE: This criterion is not required for all design team members; however, someone on the team must have experience successfully working through a public process.
3. Clarity, style, and thoroughness of proposal

Rules and Regulations

- 1. All proposals must be sent in English.
- 2. Proposals must not exceed 12 single-sided pages and be no larger than 20 megabytes.
- 3. Individual practitioners or offices may participate on multiple teams for the purpose of a submitting a response to the RFQ, however if selected they must select one team on which they will serve.
- 4. If your team is selected to proceed to Stages Two and Three then any changes to team members must approved by the Task Force/HUD.

APPENDIX B: REBUILD BY DESIGN Starter Kit (Stage One)

OVERVIEW

The Sandy-affected region faces increasing risks from extreme weather events, sea level rise, and flooding. The coastal region must enhance its resilience to be able to effectively respond and thrive given these future risks and vulnerabilities. REBUILD BY DESIGN will produce designs that enhance regional resilience to disaster risks, to support its ongoing economic development, ecological health, and the well-being of its citizens. The process will generate innovative ideas from planners, designers and engineers that take into account the changing nature of the coastal environment.

The communities, cities, waterways, and ecosystems in the Sandy-affected region are part of complex, coupled human-natural systems. Such systems have interdependencies and dynamic interactions between human and natural elements that create nonlinear feedbacks across temporal and spatial scales (Liu et al 2007; Machlis et al 1997; Adger et al 2005). These interactions and feedbacks have implications for the regional economy, environment, human health, and well-being.

Producing a twenty-first century design for coastal communities, high-density urban ecosystems, and ecological networks and waterways requires a system perspective that addresses these interdependencies and feedbacks. Regional scale analyses identify biophysical and socioeconomic patterns and processes that influence system resilience; discuss how demographic, economic, and environmental trends influence system resilience; and assess how urban or coastal community design influences system resilience. This level of analysis will provide the basis for design concepts that present innovative ideas that meet the following standard of resilience.

RESILIENCE

According to the National Disaster Recovery Framework, “Resilience incorporates hazard mitigation and land use planning strategies; critical infrastructure, environmental and cultural resource protection; and sustainability practices to reconstruct the built environment, and revitalize the economic, social and natural environments.” An effectively designed built environment can maintain ecosystem services that provide natural protection against disaster risks, reduce environmental impacts to lessen disaster vulnerability, and provide collateral benefits for communities, the economy, and public health. Resilient communities recover critical social and civic functions quickly after a disaster. Regional planning and design can provide a more resilient built environment; it can also facilitate the social processes that underlie a community’s resilience (e.g. core values, adaptive capacity, social capital and networks, sense of place, agency, trust in institutions, effective leadership, and public engagement). Achieving resilience is a long-term process. Resilient systems have the following characteristics:

1. **Diversity:** A diversity of ecological, human, and economic resources allows for a wide range of responses to a stressor.
2. **Redundancy:** Having back-up or substitutable components and processes increases resiliency.
3. **Network connectivity:** Tight couplings between system nodes allow for rapid detection of changes, but lead to brittleness and cascading failures. Loose couplings may provide a buffer to stressors, but not facilitate responsiveness across the system.
4. **Modularity:** Individual units retain self-sufficiency and autonomy if disconnected from larger networks. Allows for continued functionality during a widespread event.
5. **Adaptability:** Capacity to learn and adapt. Capable of functioning despite uncertainties. Helps avoid brittleness, or incapability of modifying responses to stressors.

DATA FOR REGIONAL ANALYSIS AND DESIGN

This Starter Kit presents set of data for applicants to use and incorporate, as appropriate, in their initial responses to the Request for Qualifications. This is not intended to be an exhaustive list of relevant datasets or resources. Some regional assets and trends, for instance, are not easily captured by geospatial data or other indicators, such as local environmental knowledge and community values.

Coastal Environment – Cultural Resources

Coastal cultural resources include heritage sites and trails, museums, and libraries. The region is also host to Indian tribal lands and cultural heritage. Cultural resources contribute to the diverse and vibrant cultural life in high-density urban environments and coastal communities. They shape community sense of place, our national identity, and the tourism economy. However, these resources are vulnerable to flooding, storm surge, and sea level rise. Data is available from the [National Park Service](#).

Coastal Environment – Environmental Concerns

Coastal communities and high-density urban environments face environmental concerns that pose risks to public health, urban and coastal ecosystems. Storm hazards exacerbate risks by spreading contamination and producing waste. Resilient design should promote a clean urban environment, which is linked to improved public health, stronger local economies, and lower crime rates. It should strive to not place vulnerable populations already working to achieve environmental justice further in harm's way. It also involves return to operations of urban environmental systems such as water treatment and sanitation, and requires attention to waste disposal and decontamination. The Environmental Protection Agency provides [geospatial data](#) and community-specific data at [EJView](#), [Envirofacts](#). State data are available for [CT](#), [MD](#), [NJ](#), [NY](#), [RI](#).

Coastal Environment – Natural Resources

Natural resources of the coast contribute to the regional economy, including small businesses, and to the area's quality of life. Water resources are especially critical to shipping, [navigation](#), transportation, community water sources, tourism and outdoor recreation (e.g. to [parks](#), [wildlife](#)

[refuges](#), US [National Forest Service lands](#)), [recreational and commercial fishing](#). Natural resources such as [wetlands](#) provide ecosystem services that support resilience. [Coastal barriers](#) serve as the mainland's first line of defense against the impacts of severe coastal storms and erosion. However, these resources may already be under stress from human activity. [Environmental Sensitivity Index](#) maps provide a concise summary of coastal resources at risk if an oil spill occurs nearby (e.g. birds, shellfish beds, sensitive shorelines, public beaches). Effective urban and natural ecosystem management can enhance disaster resilience and reduce risk to coastal natural resources. State natural resources data are available for [CT](#), [MD](#), [NJ](#), [NY](#), [RI](#). The [National Map](#) provides current topographic and base map layers from the USGS.

Demographic Trends

The region contains a diverse and vibrant population. Resilience requires capitalizing on this diversity of human resources. However, vulnerable subpopulations may be particularly at risk in the face of disasters (e.g. elderly, impoverished, children, disabled, linguistically isolated, tourists, renters, homeless). Understanding demographic trends help us estimate demands on supply chains, infrastructure and the built environment, ecosystem services, and natural and cultural resources. [Decennial Census and American Community Survey](#) data are available at [Spatial Trends in Coastal Socioeconomics \(STICS\)](#). [Current Population Survey](#) supplement data on [Civic health](#) indicates volunteerism, political, and other civic engagement.

Economic Trends

The Sandy-affected region is a cornerstone of the global marketplace. It is also host to thousands of small businesses that help communities and residents thrive. Economic data help us understand the regional economy's reliance on its infrastructure, marine and coastal resources. Achieving resilience means that critical economic assets, business operations, agricultural production, and supply chains are preserved or quickly restored to function. Resilience increases as the diversity, quantity, and equitable distribution of economic resources increases. Economic data can help us identify who is socioeconomically vulnerable to coastal disasters. [STICS](#) compiles individual, household, and regional economic data from the Decennial Census, American Community Survey, [Bureau of Economic Analysis](#) and [Bureau of Labor Statistics](#) for Coastal Shoreline Counties. [ENOW](#) provides economic indicators on business establishments, employment, wages, and GDP for coastal counties. [National Ocean Economics](#) program provides data on ocean and coastal markets, tourism and recreation, ports and cargo, natural resources, population and housing, non-market values, and public expenditures. [Human Development Index for States](#) provides a composite indicator of states' economic development and well-being. [Small Business Administration](#) links to business, trade, GDP, and other economic data. [Innovation in American Regions](#) presents innovation indicators for state, counties, and metro regions.

Hazards – Climate trends

Climate trends indicate changing temperatures, precipitation, and extreme events. There are data on [Historical hurricane tracks](#) and [Federally declared disasters](#). Historic precipitation and temperature data are at the [Natural Resources Conservation Service](#).

Hazards – Flood Risk and Vulnerability

Coastal and riverine flooding, overwash, and sediment deposition can cause significant damages. Coastal data are available via [NOAA Digital Coast](#). Floodplain management and post-Sandy planning should rely on best available coastal [flood hazard data](#) that is [currently available for NJ and NY](#).

Hazards – Sea Level Rise

During the 21st century, sea-level rise is projected to have a wide range of effects on coastal environments, development, and infrastructure. [Coastal vulnerability](#) to sea level may vary regionally, and have varying degrees of inundation and [shoreline change](#). NOAA's [Sea Level Rise Viewer](#) lets users visualize [potential impacts from sea level rise](#).

Hazards – Storm Risk

[Natural hazard statistics](#) detail damages, injuries, and fatalities from past storms. Climate change affects storm frequency and intensity. Storms cause storm surge, [riverine and coastal flooding](#), and erosion.

Infrastructure- Critical infrastructure

Critical infrastructure includes telecommunications, energy, transportation, and water. It includes lifelines, or large, geographically distributed networks that need to become operational quickly after a disaster. Interoperability aids resilience. Critical infrastructure fulfills important socioeconomic and civic functions. It is essential to national security and to local community functioning. However, it may be vulnerable to sea level rise, flooding, and storm surge. Climate change has the potential to directly damage infrastructure via sea level rise, intense precipitation, extreme heat and increases in hurricane intensity. The Federal Emergency Management Agency's HAZUS, available on [STICS](#), provides critical facility data for: transportation, medical, emergency response, energy, water, schools. The Department of Transportation has the [National Transportation Atlas](#) and [National Transportation Statistics](#).

Infrastructure – Housing

Housing structures have differing vulnerabilities to sea level rise, flooding, and other storm effects. This difference may be due to its structure (e.g. high rise v. mobile home), as well as to its social role (e.g. vacation rental v. owner-occupied). Housing structural and demographic data thus indicate household and community resilience. [STICS](#) provides housing data from the Decennial Census and American Community Survey. [American Housing Survey](#) data and [CPDmaps](#) (showing Community Development Block Grants, HOME, ACS, and other housing data) are available from the Department of Housing and Urban Development.

Land Surface – Land cover

Knowing how agricultural lands, developed areas, and natural habitat aids are distributed, and how these distributions change over time, aids land use planning to improve coastal living conditions and maintain ecological processes. Data on coastal land cover will be at NOAA's [Coastal Change Analysis Program \(C-CAP\)](#) (Regional Land Cover, expected Summer, 2013). The 2006 [National Land Cover Dataset](#) is available via the Multi-Resolution Land Characteristics Consortium.

Land surface-Topography

The coastal zone, in addition to being proximal to the ocean, is a zone of dynamic, low-relief topography. Climate-change and sea-level rise amplify coastal communities' risks of inundation, erosion, sediment deposition, and salt water intrusion, particularly during major weather events. High-definition [LiDAR](#) (NOAA) data provide useful, real-world ground conditions for coastal design and risk estimation. [LiDAR](#) (US Geological Survey) help planners identify features such as shoreline, assess elevation relative to hazard risks, and visualize post-disaster alterations to the physical landscape.

Public Health

Public health data indicate the coastal population's vulnerability to coastal disasters. People with chronic medical conditions were less able to evacuate during Hurricane Sandy. Disasters pose immediate health threats such as drowning during storm surge; health threats from mold or CO poisoning may arise later. Regional resilience is indicated by the absence of disaster-induced mortality or pathology, as well as by aggregate well-being. Design can be used to promote public health, such as by ensuring that neighborhoods are walkable and have access to healthful foods. The Center for Disease Control's [Snap Shots of State Population Data \(SNAPS\)](#) provides public health snapshots to be used for emergency response. Other public health data include the Center for Disease Control's [Behavioral Risk Factor Surveillance System](#), [Community Health Status Indicators](#), and [Health Indicators Warehouse](#), and the Department of Health and Human Services's [healthdata.gov](#).

[A full list of Starter Kit datasets is available here.](#)

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