



U.S. Department of Housing and Urban Development | Office of Community Planning and Development

Climate Resilience Implementation Guide

Nature-based Solutions



Nature-based Solutions

HUD grantees are in a unique position to increase community resilience to climate change. Community members with low and moderate incomes (LMIs) are disproportionately affected by climate change because they are less able to prepare for, respond to, and recover from the impacts of extreme events and natural hazards.^{1,2} Recognizing these risks, HUD promulgated a rule in 2016 that requires grantees to account for resilience to natural hazard risks in their Consolidated Plans. To support grantees in this work, HUD hosts a [Supporting Local Climate Action webpage](#) with resources on how to use HUD funding to build more resilient communities.

The **Community Resilience Toolkit** provides information on potential impacts from six climate hazards and identifies a broad range of resilience actions that local and state governments can implement to address these risks.

Six **Implementation Guides** provide step-by-step instructions on how to implement specific resilience programs.

- Resilience Education and Outreach Activities
- Cool Roofs
- Nature-based Solutions
- Single-family Retrofits
- Resilient Public Facilities
- Community Driven Relocation

About the Resilience Action

This Implementation Guide provides step-by-step instructions to assist communities in implementing nature-based solutions. As detailed in the Community Resilience Toolkit, viable resilience options for many hazards include nature-based solutions.

In practice, these solutions use natural systems or processes to lessen impacts of natural hazards, such as relying on natural floodplains or engineered reservoirs to capture and infiltrate rainfall to prevent flooding. This guide covers two broad categories of nature-based solutions.

1. Green infrastructure – engineered solutions incorporating natural and built elements, such as rain gardens or green roofs.
2. Natural infrastructure – existing or rehabilitated environments for resilience, such as restored wetlands or urban forests.

There is precedent for using Community Development Block Grant (CDBG) funding to implement nature-based solutions in the form of parks and recreation facilities. Since 2016, grantees have spent 3-4% of all CDBG expenditures on parks and recreational facilities.⁴

COMMUNITY PLANNING AND DEVELOPMENT (CPD) CONSIDERATIONS

State and local governments may use CPD formula programs – including Community Development Block Grants, HOME Investment Partnerships program, and Section 108 Loan Guarantee Program – to implement resilience actions. The principal purpose of CPD funding is to benefit low- and moderate-income persons.

Implementation of a nature-based solutions program may be an eligible project or eligible cost under the following CPD-eligible activities categories:

-  **Public facilities and infrastructure improvements** with CDBG or Section 108, under certain circumstances.
-  **Housing rehabilitation** with CDBG, HOME, or Section 108.
-  **New housing construction** with HOME (as part of an eligible rehabilitation project).
-  **Economic development** with CDBG or Section 108.

Nature-based solutions are sustainable planning, design, environmental management, and engineering practices that weave natural features or processes into the built environment to promote adaptation and resilience.³

About the Resilience Action



Examples of Nature-based Resilience Solutions

Nature-based resilience solutions may address one climate hazard or multiple hazards. For example, an effort to restore wetlands may support resilience to inland flooding, coastal storms, and erosion and landslides. Here are some examples of nature-based solutions from the Community Resilience Toolkit.

Multiple Hazards

Incorporate hardy native vegetation into public facilities and housing rehabilitation projects, such as introducing grasses and shrubs that can absorb water in flood retention areas and withstand drought.



Increasing Temperatures and Extreme Heat

Partner with city planners to create or preserve green space, such as community gardens and parks, and incorporate natural spaces in development plans.



Sea Level Rise and Coastal Storms

Use [artificial dunes](#) to slow the inland progress of storm-related wind and water.



Inland Flooding

Encourage the use of rain gardens, vegetation, landscaping, or other techniques that can “[Soak Up the Rain](#)” and manage stormwater runoff.



Wildfire

Plant [fire-resistant vegetation](#) and create [home ignition zones](#).



Drought

Use [permeable pavement](#) for streets, parking lots, or sidewalks, and increase urban green space to reduce runoff, promote groundwater recharge, and mitigate drought impacts.



Erosion and Landslides

Encourage the use of [natural bank stabilization techniques](#).

Benefits of Nature-based Solutions

Nature-based solutions are associated with many benefits that may protect communities from multiple climate hazards. Resilience benefits vary based on the solution implemented. For example, restoring urban tree canopies may reduce the heat island effect and inland flooding; planting drought-resistant vegetation supports water conservation in dry conditions; and planting vegetative buffers around streams and other water sources may boost resilience to inland flooding, erosion, and coastal storms by absorbing and managing runoff.

Recreation

Nature-based solutions can enhance opportunities for local recreation and amenities.

Property Values

Parks and greenspaces are often associated with higher property values.

Climate Change Mitigation

Nature-based solutions may reduce cooling costs, energy use, greenhouse gas, and emissions; and they may act as carbon sinks.

Health and Wellbeing

Nature-based solutions provide aesthetic value and habitat. They improve human interaction with nature, benefiting physical and mental health. They may also improve air quality and reduce the heat island effect.

Cost Parity

Nature-based solutions, such as green infrastructure, often have similar or lower development, operational, and maintenance costs than other efforts. They also reduce damage related to natural hazards.

Equity

By engaging with stakeholders, nature-based solutions can address key resilience and co-benefit priorities for communities where incomes are low and moderate (e.g., health and safety, increased property values, and job creation).

Step 1. Determine Nature-based Priorities



Initially, identify existing information on natural hazard risks and resilience priorities for your area. For example, your community or region may have existing disaster, climate, resilience, or sustainability plans that identify resilience priorities – including nature-based solutions. The **Resilience in Practice** box shows how Baltimore approaches nature-based solutions.

A variety of state or local entities may be responsible for implementing nature-based activities. Explore resources across many agencies and departments.

- Planning and transportation departments, public works, or the sewer/water district may lead green infrastructure programs
- Environment, parks, or sustainability departments may administer programs for restoration of natural areas and tree planting
- Emergency management agencies or the fire department may be responsible for wildfire mitigation
- Water/sewer departments may operate water conservation or stormwater reduction programs
- Transportation or public works departments may operate programs that encourage depaving or permeable paving
- Departments of planning or housing or the electric utility may operate green roof programs

Where resilience priorities exist, determine how those priorities align with nature-based solutions. For example, many communities aim to reduce stormwater runoff to reduce flooding, but may not have established programs to convert unused parking lots to community gardens, parks, or greenspaces. Similarly, existing nature-based programs might need to be reinvigorated. For example, additional funds might let a wildfire fuel management campaign host wood chipping events in LMI neighborhoods, where residents might not have the means to hire landscaping crews to clear fuel or haul it away. Note whether LMI communities and priorities are known through existing resilience efforts.

Where no resilience priorities exist, engage with key stakeholders to identify resilience priorities. Details on engaging collaborators appear in Step 2.

RESILIENCE IN PRACTICE Baltimore, MD



In 2018, the Baltimore Planning Commission approved the [Baltimore Green Network Plan](#). The Green Network Plan is multi-faceted – striving to transform the city’s 20,000 vacant lots into a network of community-managed greenspaces and corridors that will improve the quality of life for community members; generate family-sustainable jobs for residents; provide green spaces for areas that don’t have access to city-managed parks; create economic opportunities for areas that experienced historical disinvestment; and address environmental priorities, such as the heat island effect. The planning emphasized inclusive stakeholder engagement with community organization leaders, residents, and government agencies. Based on the Plan, the city began two pilot projects:

1. [Cab Calloway Legends Park](#) will be surrounded by 35 affordable townhomes for first-time homebuyers and 16 market rate homes.
2. [Racheal Wilson Memorial Park](#), completed in 2022, honors Maryland’s first female firefighter who died in the line of duty. This park, designed by the community, includes a playground, a mural, and a mosaic with plans to add a horseshoe pit and swings.

Lessons from the Baltimore experience include listening and working with members of disinvested communities to address their priorities, hiring local residents and contractors to support ongoing maintenance and keep resources inside the community, maintaining a flexible timeline to allow community members to arrive at a solution, and respecting the solution developed by the community.

 **CPD Considerations:** Park development in eligible LMI areas is a CDBG-eligible activity under public facilities.

Step 2. Identify and Engage Partners, Collaborators, and the Community



SAMPLE PARTNERS AND COLLABORATORS

Community Organizations

- Residents
- Faith-based and nonprofit organizations
- Neighborhood and homeowner associations
- Other community and volunteer groups

Business and Industry

- Businesses
- Chamber of commerce
- Labor unions
- Real estate associations
- Utilities

Local, State, Federal, and Tribal Governments

- Economic development, commerce, or labor
- Emergency management
- Environment or land management
- Health, housing, and social services
- Infrastructure agencies

CPD CONSIDERATIONS

To use CDBG to fund a nature-based solution, ensure that the proposed activity is eligible and meets a national objective by documenting expected benefits to LMI communities. Consider consulting with local HUD field staff, public and private agencies to identify opportunities and barriers to activity implementation.

When CDBG or other CPD funding is used, ensure that community consultation includes actions required in the established Citizen Participation Plan.

PARTNERING WITH AMERICORPS

The [federal AmeriCorps program](#) supports volunteer service throughout the country by bringing together eligible agencies and organizations with [AmeriCorps service members](#). Your [State Service Commission](#) can connect you with existing programs sponsoring AmeriCorps service members, or share how your organization can sponsor members.

1

Determine priorities

Building from available information on resilience priorities and existing nature-based resilience activities (if any) in Step 1, take stock of existing and established networks to align partners for your effort.

 Engage all stakeholders throughout the prioritization, design, implementation, and evaluation of nature-based solutions.

2

Identify and engage partners

Ensure engagement efforts include contacts or organizations representing local, LMI residents or indigenous groups (the box shares examples of stakeholders to engage). Keep in mind, stakeholders may also span ability, age, gender, race/ethnicity, and other socio-demographic spectrums. Targeted messaging may be important for outreach to organizations representing or comprising LMI community members, as they may have higher-priority concerns than natural hazard resilience, such as meeting the basic needs of housing, food, employment, childcare, or transportation.

 Acknowledge competing priorities; in subsequent steps seek to collaboratively develop nature-based solutions that address multiple community-identified needs.

3

Establish goals and assess feasibility

4

Design the solution

Evaluate whether there are opportunities to closely partner with one or more community organizations to design and execute a nature-based solution. Building such strong and lasting partnerships can be key to successfully implementing a nature-based solution, including ongoing care and maintenance. Such strong partnerships may include a project volunteer base that acts as community stewards for the nature-based solution.

5

Implement the solution

Education and outreach are particularly critical for LMI communities, which may have fewer resources to cope with climate risks and increase their resilience. A series of resources on resilience engagement appear in HUD's [Resilience Education and Outreach Activities implementation guide](#).

6

Measure success

Step 3. Establish Goals and Assess Feasibility



1

Determine priorities

2

Identify and engage partners

3

Establish goals and assess feasibility

4

Design the solution

5

Implement the solution

6

Measure success

With input from partners and collaborators, consider which nature-based solutions target the community's key climate hazards, will achieve the intended resilience objectives, and will gain community acceptance.

Define the Goals. With community partners, build a shared vision of resilience goals and objectives. Keep in mind, goals may be broad in scope to cover multiple hazards or focused on one hazard that particularly affects your community. Examples of goals include increasing the resilience of neighborhoods to inland flooding, creating a safe and inviting space for children and young adults to congregate, reducing the entire community's heat island effect, and/or enhancing local employment opportunities through resilience activities. Resilience goals do not need to be constrained to natural hazards alone; consider where resilience solutions can address multiple objectives, such as creating jobs or bringing parks to community areas historically disinvested.

Identify and Screen the Solution(s). Identify what types of nature-based solutions are most likely to improve and support resilience goals. Examples of solutions might be a project to reduce inland flooding by depaving vacant lots and creating park space with permeable pavements, or a program to reduce the local heat island effect by planting trees and establishing a job training program in the landscaping trade.

Use existing screening tools to determine whether the nature-based project or program is likely to yield measurable and cost-effective benefits (see **Making the Case** at the end of this guide). For the desired project or program, assess whether costs align with available resources, additional funding needs to be secured, or certain services could be donated in-kind.

 Assess equity and environmental justice implications of the identified nature-based solution project or program. Use tools that assess equity, such as [EJScreen](#), or [Tree Equity Score Analyzer](#). Consult with community members most affected.

Identify Metrics. Based on the goals, determine what metrics to track and how you can measure progress toward those goals. Identify what you will measure, how you will measure it, and who will collect the information. Where possible, draw on existing metrics rather than creating new ones, and enlist community partners where possible to assist in tracking metrics. Step 6 covers measuring and evaluating outcomes.

CPD CONSIDERATIONS

CDBG grantee communities may want to consider prioritizing nature-based solutions in their target neighborhoods. One way grantees can meet the requirement to spend at least 70% of their funds to benefit people of low and moderate incomes is to assist a primarily residential area in which at least 51% of the residents have incomes at or below 80% of the area median income [based on reliable data](#), such as the American Community Survey or local survey data.

HUD strongly encourages grantees to prepare environmental review documents early in their planning, as this will allow for the broadest range of options to streamline the process and avoid delays. [Field and Regional Environmental Officers](#) are available to help design a procedure to prepare efficient and effective environmental reviews.

Establish Baselines. For nature-based solutions, some metrics may require measurements at pre- and post-implementation to monitor success over time. For example, a program seeking to reduce the heat island effect and increase tree canopy coverage will need baseline heat island and tree canopy data. Additional metrics related to community engagement can also be measured before (and after) projects or programs are implemented. For example, you might monitor usage of redeveloped parks or trails in the community, or people taking advantage of revamped programs to install rain gardens or clear wildfire fuel.

Learn more about nature-based solutions.

- [What Is Green Infrastructure? \(U.S. EPA\)](#)
- [Building Community Resilience with Nature-Based Solutions \(FEMA\)](#)
- [Nature as Resilient Infrastructure \(Environmental and Energy Study Institute\)](#)

Step 4. Design the Nature-based Solution



1

Determine priorities

2

Identify and engage partners

3

Establish goals and assess feasibility

4

Design the solution

5

Implement the solution

6

Measure success

An array of nature-based solutions can be tailored to the local context. As you design a nature-based solution in line with your goals, ensure the project's or program's scope and approach are likely to gain acceptance. The **Design Guides** box in this guide features examples for multiple hazards.

Solution Scope

The scope of nature-based solutions typically fall in two categories.

- **Projects** are tailored in scope and may have only one or limited instances of implementation, such as the use of natural vegetation to stabilize a slope at one site.
- **Programs** are broader in scope and may have multiple instances of implementation. Programs may be appropriate when you want a resilience action to become embedded throughout your community, such as a program that helps property owners remove wildfire fuel loads on their properties.

If you have limited staff resources, are unsure about which solution will be the most effective, or have limited experience with the type of solution you would like to try, consider starting with a pilot project or program and then expanding. A pilot can achieve quick wins, demonstrate success, build community support, and allow you to adjust the project or program.



In the initial design, establish a process for making future changes or updates to your project or program based on feedback from the community members, lessons learned, or metrics of success.

Solution Approach

The nature-based solution may be designed as voluntary, mandatory, or a combination of these approaches.

- **Voluntary activities** could include the development of parks or other nature-based solutions (e.g., land conservation, green infrastructure).
- **Voluntary policies** could include the creation of plans or guidelines; informational outreach programs; incentives for property owners; rebate programs; tax credits; or loans or cost-sharing for community members with low incomes, nonprofits, or multifamily housing.
- **Mandatory policies** could include the creation or adoption of procurement guidelines, ordinances, regulations, zoning or building codes, or design standards. Examples of policies appear in HUD's [Single-family Retrofits implementation guide](#). Such requirements can include specifications for nature-based solutions.

Solution Outreach

In the design phase, consider how you will conduct outreach for the intended project or program, and develop associated outreach plans and materials. Both the selected nature-based solution and related communication should reach LMI community members. Write documents in plain language; if relevant for your area, translate them into languages commonly spoken in the community. HUD's [Resilience Education and Outreach Activity implementation guide](#) contains resources on community engagement.

RESILIENCE IN PRACTICE

Louisville, KY

Greening Efforts Combat Heat

In 2016, the Louisville, KY [Urban Heat Management Study](#) identified high-heat areas of the community, aligned with low tree canopy cover and areas historically disinvested. In coordination with [local government](#), nonprofit [TreesLouisville](#) has established a robust program to increase the city's tree canopy. Efforts include canopy restoration efforts in areas with the greatest need; a tree rebate program; and projects at targeted sites, such as school campuses and industrial facilities. For example, [Parkland Plaza](#), in a historically Black neighborhood, is being depaved to create a new community park. Through community engagement, TreesLouisville and partners are integrating community-driven design concepts, including a space for a farmers' market and community art, and new turf and trees. One way in which TreesLouisville measures its success is monitoring changes in urban tree canopy cover. An assessment of changes between 2012 and 2019 shows a 1% increase in tree canopy coverage, affirming progress. Lessons from TreesLouisville's experience include the importance of community partnerships, a commitment to ongoing maintenance with the help of property managers or the surrounding community, the use of assessments to measure success, and complementary education and outreach for all its efforts.

CPD Considerations: Tree planting (matrix code O3N) and park and recreational improvements (matrix code O3F) are CDBG-eligible activities in eligible LMI neighborhoods.

Step 5. Implement the Nature-based Solution



1

Determine priorities

2

Identify and engage partners

3

Establish goals and assess feasibility

4

Design the solution

5

Implement the solution

6

Measure success

The implementation process will vary, depending on the selected solution. Key components of any nature-based solution include aligning partners, conducting outreach, and planning for ongoing maintenance.

Align Partners. Strong partnerships can ease the implementation process. For example, community-based organizations may be vital partners for identifying project sites or acting as a primary implementer. Many community-based organizations can also serve as subgrantee to help with project/program implementation. An active volunteer base also can support implementation. For example, you might enlist individual community members to act as neighborhood stewards or engage local organizations that sponsor volunteers. Finally, engaging local businesses – including small, woman-, or minority-owned – supports local economic development.



Solutions may benefit from hiring workers from within the community for full-time, part-time, or contract/seasonal positions. Such job creation often has positive impacts within a community.

Conduct Outreach. Outreach and communication with community members will continue through project or program implementation, including LMI community members, to encourage acceptance or adoption.

Sustain the Solution. Resilience requires ongoing action. Many nature-based solutions must be maintained as intended to reach resilience goals (e.g., sweeping/cleaning permeable paving, watering plantings, trimming trees, re-engaging property owners to remove accumulated wildfire fuel). Without these critical actions, many nature-based solutions will not flourish. Therefore, enacting a maintenance plan is part of effective implementation, as well as create jobs in the community.

Find additional details on education and outreach for resilience activities.

- [Meeting People Where They Are \(ICMA\)](#)
- [Resilience Education and Outreach Activity implementation guide \(HUD\)](#)

RESILIENCE IN PRACTICE Santa Clara Valley, CA



Converting Lawns to Drought-Tolerant Landscaping

The [Santa Clara Valley Water District](#) provides funding to a local organization, Our City Forest, to operate the [Lawn Busters](#) program. Qualifying homeowners receive services to convert grass to drought-tolerant landscaping. Depending on the homeowner, Our City Forest can provide a landscape plan, materials, training, or labor for a water-wise turf conversion. The program targets disadvantaged populations including persons with low incomes, U.S. Veterans, persons with disabilities, or older persons. For eligible participants, the program schedules a site visit and develops an agreed-upon landscape design. Within a month, the Lawn Busters volunteer force conducts the “bust,” including planting drought-tolerant species. The “bust” takes two to three days using a mulching method that doesn’t pull up the turf. The program relies heavily on AmeriCorps, with 30 service members that support Lawn Busters and other efforts. The program also relies heavily on local volunteers including a trained community volunteer force called the “Tree Amigos.” The program has been so successful that it has a wait list, is expanding to nearby communities, and recently started a do-it-yourself model that trains homeowners to “bust” their own lawns. To meet local drought resilience goals, Valley Water also runs a landscape rebate program open to all community members.



CPD Considerations: Similar programs in conjunction with home improvements may be eligible for CDBG funding under rehabilitation.

Step 6. Measure Success



1

Determine priorities

2

Identify and engage partners

3

Establish goals and assess feasibility

4

Design the solution

5

Implement the solution

6

Measure success

Tracking and reporting progress is an important part of demonstrating the success of nature-based solutions. Identify a team or point person for tracking metrics and determine how you will report outcomes to funders and the public.

Capture Data. Measure and record project or program data. Determine who will collect it, how they will convey it, and to whom. For example, if it is important to track where in your community program activities are taking place (i.e., areas historically disinvested), are records being kept with addresses or coordinates? Is there a plan in place to enter the information into a digital mapping program that can be easily shared? Where possible, turn qualitative issues into quantitative data so that you can track progress consistently over time. The **Measuring Success** box covers examples of metrics to track.



Don't forget to track metrics related to the outreach and promotion of your project or program through social media, community events, and local news.

Evaluate the Data. Determine how often you will analyze and evaluate the data. Some data may be reviewed annually (e.g., the estimated volume of stormwater runoff captured) whereas you may review other data more frequently (e.g., number of people taking advantage of a nature-based rebate/incentive). Where possible, compare the data to the baseline.

Share the Data. Reporting success can solidify public, political, and financial support. Determine how you will share results. Think about your audience, delivery method, content/language, timing, and messengers.

Reassess the Solution. Use data to assess strengths and weaknesses, and identify opportunities to improve. This may include going back to Step 4 and redesigning aspects. You may discover, for example, that you are not reaching your target population and need to try a different form of engagement. Give community members the opportunity to weigh in on program modifications. Strong engagement at every step will help increase transparency and build trust.

CPD CONSIDERATIONS

CPD-funded nature-based resilience activities would be set up during the creation of the Annual Action Plan, or through an Annual Action Plan/Consolidated Plan amendment. All key reporting elements of CPD formula grant programs should be integrated into HUD's [Integrated Disbursement and Information System \(IDIS\)](#). Grantees typically create new IDIS projects through the AP-35 Projects screens while setting up their Annual Action Plan. This is also the best way to ensure that any projects funded through CPD sources will be properly tied to the Action Plan.

MEASURING SUCCESS

It is important to assess the performance of the nature-based solution. Monitoring metrics will depend on the specific nature-based solution. If a goal is equity, consider tracking metrics by income, neighborhood, or race/ethnicity where appropriate and possible; this will allow you to identify the impact of your activity on different communities and subgroups.

Sample Equity Metrics

- Number of target individuals who participated in the program or event or took advantage of rebate, incentive, or other opportunities
- Number of local LMI employment opportunities created

Sample Resilience Metrics

- Number of gallons of water infiltrated or conserved
- Number of rain gardens planted or bioswales installed
- Number of feet or miles of coastline restored

Sample Economic Metrics

- Value of rebates or incentives offered
- Value of contracts to locally owned businesses
- Value of wages earned in job creation programs

[Resilience Metrics](#) offers information on how to select and monitor a variety of climate change quantitative indicators and metrics.

Implementation Resources



Making the Case for Nature-based Solutions in Step 3 Establish Goals and Assess Feasibility

For Step 3, conduct a feasibility study or benefit-cost analysis to determine whether a nature-based project/program will provide net benefits in the area and will be eligible for funding. Consider these screening tools to help make the case for your nature-based solution.

[Benefit-Cost Analysis - FEMA](#) (All hazards)

[Integrated Valuation of Ecosystem Services and Tradeoffs](#) - Natural Capital Project (All hazards)

[i-Tree Landscape](#) - U.S. Forest Service (Flooding, Heat)

[The Benefits of Complete Streets](#) - Smart Growth America (Flooding, Heat)

[Guidance for Considering the Use of Living Shorelines](#) - National Oceanic and Atmospheric Administration (Sea Level Rise and Coastal Storms)

[Gulf Coast Resilience Decision-support Tool](#) - The Nature Conservancy (Sea Level Rise and Coastal Storms)

[Green Infrastructure Modeling Toolkit](#) - U.S. EPA (Flooding, Heat, Drought, Erosion)

[Green Infrastructure Valuation Tool](#) - Earth Economics (Flooding, Heat, Drought, Erosion)

[Self-Assessment Tool](#) - Fire Adapted Communities (Wildfire)

Nature-based Solution Design Guides for Step 4 Design the Nature-based Solution

Nature-based solutions must be properly designed and maintained to function as intended. These design guides provide details on how to correctly plan and execute selected nature-based solutions.

Multiple Hazards

[Green Infrastructure Two-part Equity Framework](#) (Green Infrastructure Leadership Exchange)

[Digging In: A Guide to Community-Based Habitat Restoration](#) (California Coastal Commission)

[Guidelines for Developing and Managing Ecological Restoration Projects](#) (Society for Ecological Restoration International)

Increasing Temperatures and Extreme Heat

[Adapting to Urban Heat: A Tool Kit for Local Governments](#) (Georgetown Climate Center)

Sea Level Rise and Coastal Storms

[Natural Solutions](#) (Coastal Resilience)

[Climate Change and Coastal Zones](#) (U.S. Agency for International Development)

Inland Flooding

[Green Infrastructure Wizard](#) (U.S. EPA)

[Enhancing Sustainable Communities with Green Infrastructure](#) (U.S. EPA)

[Green Streets Handbook](#) (U.S. EPA)

[Local Water Policy Innovation: A Road Map for Community Based Stormwater Solutions](#) (U.S. EPA)

Wildfire

[Community Wildfire Safety Through Regulation](#) (National Fire Protection Association)

Drought

[Landscape Wisely](#) (Water - Use It Wisely)

[Water-Smart Landscapes](#) (U.S. EPA)



Additional Resources

- [Building Community Resilience with Nature-Based Solutions: A Guide for Local Communities \(FEMA\)](#)
- [Community Resilience Toolkit \(HUD\)](#)
- [HUD Exchange](#)
- [Natural and Nature-based Flood Management Methods \(World Wildlife Fund\)](#)
- [Nature-based Solutions Evidence Platform \(University of Oxford\)](#)
- [Step-by-Step Guide to Integrating Community Input into Green Infrastructure Projects \(Environmental Law Institute\)](#)
- [Wildfire Risk to Communities \(U.S. Forest Service\)](#)

Additional Funding Opportunities

HUD CPD funding can be combined with other funding opportunities to create more comprehensive resilience programs in communities.

- [AmeriCorps](#) through your [State Service Commission \(AmeriCorps\)](#)
- [Building Resilience through Natural Infrastructure: Barriers and Opportunities within FEMA Hazard Mitigation and HUD CDBG Programs \(National Wildlife Federation\)](#)
- [Clean Water State Revolving Fund Best Practices Guide for Financing Nonpoint Source Solutions \(U.S. EPA\)](#)
- [Financing Natural Infrastructure for Coastal Flood Damage Reduction \(Lloyd's Tercentenary Research Foundation\)](#)
- [Grants.gov \(U.S. Department of Health and Human Services\)](#)
- [Green Infrastructure Federal Collaboration \(U.S. EPA\)](#)
- [Promoting Nature-Based Hazard Mitigation Through FEMA Mitigation Grants \(Nature Conservancy\)](#)
- [Wildfire Resilience Funding: Building Blocks for a Paradigm Shift \(Nature Conservancy\)](#)

Notes

1. U.S. Global Change Research Program. 2018. [Human Health \(Chapter 14\)](#). In Fourth National Climate Assessment. Volume II: Impacts, Risks, and Adaptation in the United States.
2. U.S. EPA. 2021. [Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts](#). EPA 430-R-21-0003.
3. FEMA. 2021. [Building Community Resilience with Nature-Based Solutions: A Guide for Local Communities](#).
4. HUD. 2021. [National Expenditure Reports \(FY 2001-FY 2021\): CDBG Activity Expenditure Reports-HUD Exchange](#).

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