



PREPARED FOR ENVIRONMENTAL CHANGE GRAND CHALLENGE INITIATIVE

**ENVIRONMENTAL RESILIENCE
INSTITUTE**

INDIANA UNIVERSITY

**Hoosier Resilience Index
Readiness Assessment**

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PREPARED FOR ENVIRONMENTAL CHANGE GRAND CHALLENGE INITIATIVE

ENVIRONMENTAL RESILIENCE INSTITUTE

The Hoosier Resilience Index

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The Hoosier Resilience Index was developed by researchers at Indiana University with experience in a wide range of disciplines related to climate science, data analytics, and resilience and mitigation policies and programs. The Environmental Resilience Institute eagerly sought and gratefully received input from local government officials and staff, and many other external parties along the way. Two counties and two municipalities participated in a beta test of the Index and provided invaluable feedback.

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Introduction

Preparing for climate change is one of the most challenging issues facing local governments in Indiana today. It is also one of the most important. Climate change and its impacts are complex and both global and local in scope. Reducing the worst impacts of climate change will require actions at global, national, state, and local levels. Being prepared for the impacts of climate change in our communities, neighborhoods, and farms, however, falls more directly on local governments. Some actions to become more resilient can be costly and difficult to implement, but many will actually save money and can be readily integrated into ongoing government operations. Good information about a community's vulnerabilities and solutions is key to reducing the worst impacts of the changing climate and increasing communities ability to deal with and recover from unavoidable impacts.

The Hoosier Resilience Index Readiness Assessment provides a succinct and logical roadmap of feasible actions county and incorporated city and town governments in Indiana can take to prepare their communities and lessen anticipated impacts. Local governments can complete the Readiness Assessment online by submitting a [request form](#) to receive a set of questions tailored to their individual community based on size, type of government, and location. This document varies from the online Assessment in that it includes *all* readiness questions; each local government in Indiana will only see a subset of what is included below based on what is relevant to them. Combined with the community-specific vulnerability information available through the Hoosier Resilience Index, the Readiness Assessment is an excellent first step for communities that want to increase their resilience.

The Readiness Assessment questions outline actions local governments can take to prepare their communities for climate change impacts specific to Indiana. Descriptive paragraphs are included with most questions to provide definitions, background information, and relevant resources, with hyperlinks provided where appropriate. The Assessment does not provide *every* action that could be taken to prevent or alleviate climate change impacts; instead, the Assessment includes actions that have been identified as the most useful based on feasibility, relevance in the state of Indiana, the technologies available, and the ability of an action to address cascading impacts. All of the actions included have been implemented by one or more local governments in the Midwest and are considered first order responses.

Communities in Indiana are already doing many of the actions included in the Assessment; the Readiness Assessment helps local governments think about how they can integrate resilience into community services already provided, such as increasing street sweeping schedules, addressing emergency flood response in Multi-hazard Mitigation Plans, and educating residents about heat related illness and prevention through the County's health department or other outlets.

The Readiness Assessment also does not address *every* impact Indiana communities may experience as a result of the changing climate. The Assessment focuses on impacts related to



increasing temperatures and more extreme precipitation events because they are significant and widespread, and because of the opportunities local governments have to respond or prepare. The following impacts were not included, but should be considered, if pertinent, by all local governments in Indiana as they prepare their communities for climate change:

- Dam failures – The U.S. Army Corps of Engineers anticipates dam failures will become more frequent as a result of increased precipitation and the age of most dams across the state. Local governments should be aware of dam locations within their jurisdiction, and the areas at risk of flooding should a dam fail. The local government should have emergency response plans for this type of disaster.
- Landslides, sinkholes, and flooding made worse by bedrock formations – Some parts of Indiana and the Midwest have experienced an increase in sinkholes and landslides, often stemming from increases in precipitation. Bedrock formations influence flooding. The geographic formations, including karst topography, that lead to these events only exist in certain parts of the state. Maps of sinkholes, bedrock formations, and areas at greater risk of landslide are provided in the [2019 Indiana State Multi-hazard Mitigation Plan](#).

The questions in the Readiness Assessment are organized into eight sections: Built Environment, Economic Development, Emergency Management, Energy and Public Utilities, Food and Agriculture, Natural Resources, Planning and Land Use, and Public Health and Safety. Each section starts with a descriptive paragraph, a list of relevant resilience principles, and a list of suggested local government departments that could be consulted to assist with the completion of the section’s questions. The actions included in the Readiness Assessment are based on the traits of resilient systems, as defined by Reynolds *et al.* (in preparation). Resilient communities and the systems that support those communities exhibit these traits:

<i>Resilience Principle</i>	<i>Description</i>
Diversity	Variation in system components, enabling the flexibility to adapt to changed conditions.
Redundancy	Functional similarity of system components, buffering against the loss of any one part (e.g., having a spare tire in your car).
Modularity	Degree of functional independence of system components. Modularity facilitates ease of reconstruction after damage and/or innovative system transformation. Modularity can also limit harms.
Connectivity	Degree of linkage of system components, promoting essential information flow. There is a tension between modularity and connectivity.
Regenerative Ability	Capacity to regrow or reestablish after damage.
Equitability	Degree of accessibility and/or fairness, promoting overall system strength.

Each question presents the responder with six possible answers: five answers that reflect increasing attentiveness to the particular issue and a sixth, which can be selected if the



responder feels the question is not applicable to their community. The first five answers will be scored 1, 2, 3, 4 or 5; a score of 1 means the community has not thought about the issue at all, a score of 5 means the community is comprehensively addressing the issue, and 2-4 reflect increasing levels of planning and action in between. The responder should select the description that best aligns with the programming and other initiatives that exist within the local government's operations or geographic jurisdiction. If not all of the statements within a description are true for the community, the responder should select a lower level or a description that best reflects the community's level of preparedness. In this way, the questions not only allow a community to assess its current state of preparedness for a particular impact; they also provide a specific roadmap for how the community can increase its preparedness. If a responder indicates that the question is not applicable, there will be a comments box in which to provide an explanation.

The Readiness Assessment may be filled out by a single person familiar with all of the relevant operations; more likely, however, a team of local government employees representing different areas (public works, planning, public health, etc) will work together, with each addressing the questions within their area of responsibility.

Once a local government completes all eight sections via the online Readiness Assessment, three scores, each out of 10 points, will be automatically calculated based on the submitted responses:

- Extreme Heat Readiness Score
- Extreme Precipitation Readiness Score
- Floodplain Readiness Score

The Environmental Resilience Institute encourages local governments to refer back to their responses, which are saved in the online Readiness Assessment, to seek ways to improve their overall scores in the future. The scores are based on the answers provided, and are only as useful as the answers are candid; scores based on responses that accurately reflect the community's status will be most useful. Completing the Hoosier Resilience Index Readiness Assessment once will provide an excellent baseline of readiness; revisiting the questions on a regular basis can help a community track its progress towards climate preparedness.

For more information on how the actions and impacts were selected and how the readiness score is calculated, please refer to the [Hoosier Resilience Index Technical Document](#).

Use of Data

Information submitted through the Readiness Assessment and the scores received by each community will not be displayed to the public. Indiana University may use the information to study and report on resilience trends in Indiana, as well as other reasonable purposes consistent with the Environmental Resilience Institute's mission, including use of such information in public presentations and potential grant applications. Indiana University will not publish a list of ranked communities using the information collected through the Hoosier



Resilience Index. Any questions about data use can be directed to the Environmental Resilience Institute at resindex@iu.edu.

Notwithstanding the foregoing, Indiana University is a state agency subject to the provisions of the Indiana Open Records Law, I.C. 5-14-et-seq., and that disclosure of some or all information provided pursuant to the Readiness Assessment, and the assessment itself, may be compelled pursuant to that law. In the event that Indiana University is required by the Indiana Open Records Act, or any other law, to disclose a community's information relating to the Readiness Assessment, Indiana University will notify the community, consult with the community regarding whether there are legitimate grounds to narrow or contest such disclosure, and only disclose that information that Indiana University, in the opinion of its legal counsel, is obligated to disclose.



Built Environment

Indiana is experiencing higher maximum temperatures, more freeze-thaw cycles throughout winter months, more rain on average, and more frequent heavy rain events that lead to flooding. These events are predicted to occur more often with time, and the likelihood of impacts to transportation networks, buildings, houses, and other developed areas will increase. The questions below outline initiatives your community can take to increase the resilience of transportation networks, storm sewers, wastewater treatment, and developed areas. (Water delivery systems are also part of our built environment, but have been included in the Energy and Public Utilities category.) Diversity, regenerative ability, and equitability are key principles in this section.

Suggested Department(s): Public Works, Planning, Community Services, Stormwater Services

Impact 1: Increased stress on roadways, bridges, and transportation systems

A. Prepare roadways and bridges for higher maximum temperatures and more freeze-thaw events

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation

Relevant To: All Communities

Designing roadways and bridges for higher maximum temperatures and more freeze-thaw events includes tactics such as using heat-tolerant street landscaping, ensuring asphalt/concrete mixtures and other construction materials are appropriate for anticipated flooding and temperatures changes (e.g., to reduce potholes), adopting and implementing increased standards for drainage capacity for new transportation infrastructure and major rehabilitation projects, and ensuring pavement grooving and sloping is appropriate for anticipated flooding, among other strategies.

- ✓ Please select the description that best aligns with the status of this action in your community.
1. The roadway and bridge replacement and new construction process does not account for anticipated higher maximum temperatures or more freeze-thaw events in replacements or new construction.
 2. The local government has started conversations with its department responsible for roads and/or its contractor to consider ways to design and install transportation infrastructure for anticipated higher maximum temperatures or more freeze-thaw events.
 3. The local government has identified and implemented one feasible method to design and install transportation infrastructure for anticipated higher maximum temperatures and/or more freeze-thaw events.
 4. The local government has identified and implemented two or three feasible methods to design and install transportation infrastructure for anticipated higher maximum temperatures and more freeze-thaw events.



The local government is preparing to implement upgrades in an equitable manner across the community.

5. The local government has programs in place to make sure that all new projects and upgrades/repairs are designed in an equitable manner and in a way that is resilient to higher maximum temperatures and more freeze thaw events.
 - This question does not apply to my community. I have provided an explanation in the comments box.

B. Prepare bridge openings, culverts, and ditches for flooding

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

- ✓ Please select the description that best aligns with the status of this action in your community.

1. The local government has not assessed which bridge openings (the area below a bridge), culverts, and ditches are prepared for heavier rain events and flooding. The local government has not considered increasing maintenance resources for these water flow areas.
2. The local government has some idea which bridge openings, culverts, and ditches are not prepared for heavier rain events and flooding, but no retrofits have taken place. The local government has considered increasing maintenance resources for these water flow areas, but no action has been taken.
3. The local government has some idea which bridge openings, culverts, and ditches are not prepared for heavier rain events and flooding, and some retrofits have taken place. The local government has begun planning and identifying funding for dealing with bridge scour and/or increasing bridge opening, culvert, and ditch maintenance.
4. The local government has comprehensively assessed which bridge openings, culverts, and ditches are not prepared for heavier rain events and flooding, and some retrofits have taken place. The local government has identified funding for dealing with bridge scour and/or an increase in bridge opening, culvert, and ditch maintenance. Bridges are inspected every other year.
5. The local government has comprehensively assessed which bridge openings, culverts, and ditches are not prepared for heavier rain events and flooding, and most or all retrofits have taken place. The local government has a plan and funding for dealing with bridge scour, and has funded and implemented an increase in bridge opening, culvert, and ditch maintenance. Bridges are inspected every other year.
 - This question does not apply to my community. I have provided an explanation in the comments box.

C. Promote robust and diverse transportation options

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use



Relevant To: Mid-sized and Larger Cities

A community with multiple transportation options is better able to function when extreme weather or other shocks and stressors occur. During these events and every day, communities offering a suite of transportation options are often better equipped to serve a diversity of residents, including lower income households and individuals not physically able to use some modes of transportation. Transportation options, apart from the typical private gasoline or diesel fueled vehicles, include public transportation such as buses or trains; carpool programs; gasoline or electric car-share; bike-sharing; a strong sidewalk network; a strong bikeways and off-road trail network; and robust infrastructure for electric vehicles, to name a few.

- ✓ Please select the description that best aligns with the status of this action in your community.
1. The only way for residents to get from place to place in the community is through the use of private vehicles fueled by gasoline or diesel, and a few, sparse sidewalks. There are no publicly available electric vehicle charging stations, bike- or car-share programs, or public transportation systems.
 2. In addition to having roads designed for cars, there are a few, disconnected bike lanes throughout the community, a mostly complete sidewalk network that isn't well maintained, and a bus system that covers a few parts of the city.
 3. The city is actively installing additional bikeways, is working to expand and improve its existing sidewalk network, and is researching ways to improve access to its bus system. The city has installed or is considering installing off-road hike and bike trails, electric vehicle charging stations, a car-share program, and/or a bike-share program. A bus system covers a few parts of the city, and the local government or transit agency is researching ways to improve access and use.
 4. The city is getting closer to having a comprehensive network of bikeways and sidewalks and has a plan for and has partially completed an off-road hike and bike trail network that could be used for residents' everyday transportation needs. The city has a robust bus system and electric vehicle charging stations in most parts of town, and a bike-share and/or car-share program exists in the community. In addition, the city has adopted a complete streets ordinance, which is a street design policy that promotes various types of transportation, including walking, bicycling, taking public transit, and driving.
 5. The community has developed a robust and diverse set of transportation options, and has adopted and actively implements its complete streets ordinance. The local government feels confident in the ability of residents to get around without undue stress if and when extreme weather or another event impacts one of the community's core transportation systems.



- This question does not apply to my community. I have provided an explanation in the comments box.

D. Promote robust and diverse transportation options

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: Smaller Towns and Cities

A community with multiple transportation options is better able to function when extreme weather or other shocks and stressors occur. During these events and every day, communities offering a suite of transportation options are often better equipped to serve a diversity of residents, including lower income households and individuals not physically able to use some modes of transportation. Transportation options, apart from the typical private gasoline or diesel fueled vehicles, include public transportation such as buses or trains; carpool programs; gasoline or electric car-share; bike-sharing; a strong sidewalk network; a strong bike lane and off-road trail network; and robust infrastructure for electric vehicles, to name a few.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The only way for residents to get from place to place in the community is through the use of private vehicles fueled by gasoline or diesel, and a few, sparse sidewalks.
 2. In addition to having roads designed for cars, there are a few, disconnected bikeways throughout the community and a mostly complete sidewalk network that isn't well maintained.
 3. The town is actively installing additional bikeways, is working to expand and improve its existing sidewalk network, and is researching additional projects to support more transportation options such as installing electric vehicle charging stations or launching a car-share or bike-share program.
 4. The town is getting closer to having a comprehensive network of bikeways, and is planning for or has installed an off-road hike and bike trail that could be used for community members' everyday transportation needs. The community has a mostly complete sidewalk network that is actively maintained and improved. The town features either a network of electric vehicle charging stations, a car-share program, or a bike-share program. In addition, the town has adopted a complete streets ordinance, which is a street design policy that promotes various types of transportation, including walking, bicycling, taking public transit, and driving.
 5. The community has developed robust and diverse transportation options, and has adopted and actively implements its complete streets ordinance. The local government feels confident in the ability of residents to get around without undue stress if and when extreme weather or another event impacts one of the community's core transportation systems.
- This question does not apply to my community. I have provided an explanation in the comments box.



Impact 2: Increased likelihood of river and surface flooding in developed areas

A. Identify housing and businesses most susceptible to river flooding and minimize or eliminate the impact

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Heavy rain events can lead to on-site or downstream river flooding. Government, residential, commercial, and industrial properties located in the floodplain are the most susceptible. Properties located in the 100-year floodplain are already required to purchase flood insurance, but as rains become heavier and more frequent, buildings in the 500-year floodplain are increasingly at risk. Land outside of the defined floodplain can become inundated, as well. Strategies to minimize impacts from river floods include working with landowners and on public lands to increase greenspace and on-site water retention opportunities across the community; installing smart sensors in the 100-year or 500-year floodplain and areas prone to floods; upgrading existing infrastructure with flood-proofing measures, and requiring new infrastructure located in flood-prone areas to be built to withstand floods; relocating residents; using permeable pavement; and more.

- ✓ Please select the description that best aligns with the status of this action in your community.
1. The local government has not yet considered how more frequent river flooding will impact housing and businesses in its community.
 2. The local government has learned that one or more businesses and single-family, multi-family, and public housing units are located in the 100-year or 500-year floodplain, but has not started addressing the issue.
 3. The local government has identified the specific businesses and single-family, multi-family, and public housing units that are most likely to be impacted by river flooding, and has notified those building owners. The local government has begun making a plan to guide building owners toward a solution, or to protect or remove those businesses and homes from the floodplain.
 4. The local government has identified the specific businesses and single-family, multi-family, and public housing units that are most likely to be impacted by river flooding, and has notified those building owners. The local government has begun implementing a plan to guide building owners toward a solution, or to protect or remove those businesses and homes from the floodplain. The plan identifies and provides equitable support to socially vulnerable residents and business owners.
 5. The local government has compared 100-year and 500-year flood maps with a map of housing and business locations, and any houses or businesses in the floodplain have been adequately protected from anticipated flood levels. The local government has adopted a zoning



ordinance that prevents new housing and business construction in the 100-year and 500-year floodplain.

- This question does not apply to my community. I have provided an explanation in the comments box.

B. Identify housing and businesses most susceptible to surface flooding and minimize or eliminate the impact

Relevant Vulnerabilities: Extreme Precipitation

Relevant To: All Communities

Surface flooding occurs when precipitation is unable to soak into the ground or travel through drainage ditches or underground infrastructure, whether because the infrastructure is blocked or is full. Surface flooding is an increasing risk due to heavy downpours made worse by climate change, and because increasing development sends more rainwater and snowmelt into stormwater infrastructure. Strategies to minimize surface flooding include working with landowners and on public lands to increase greenspace and on-site water retention opportunities across the community; replacing paved surfaces and bare earth with vegetation; keeping storm grates, culverts, and drainage pipes clean through street sweeping and other measures; [installing smart sensors and valves in drainage pipes](#); and using permeable pavement and cover whenever possible; among other strategies.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not yet considered how more frequent heavy precipitation events will impact housing and businesses in its community.
 2. The local government understands that more frequent heavy precipitation events, which lead to surface flooding, will generally impact businesses and single-family, multi-family, and public housing units, but has not started addressing the issue.
 3. The local government has identified the specific areas of its jurisdiction that are most likely to be impacted by surface flooding, and has begun to develop strategies to decrease impacts in an equitable manner.
 4. The local government has identified the specific areas of its jurisdiction that are most likely to be impacted by surface flooding, and has begun to implement strategies to decrease impacts in an equitable manner.
 5. The local government has compared topographic and watershed maps with a map of housing and business locations, and any housing or businesses at risk of surface flooding have been adequately protected from anticipated water impacts. The local government has adopted a zoning ordinance that prevents new housing and business construction in areas prone to surface flooding or has implemented an ordinance that requires on-site stormwater management.
- This question does not apply to my community. I have provided an explanation in the comments box.



C. Develop and adopt policies and procedures for post-flood repairs

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Post-flood policies should minimize service disruption due to damaged infrastructure. These contingency plans should be incorporated into other planning efforts, updated regularly to remain consistent with any changes in utility services or assets, and provide response and repair services equitably across the community – meaning that the particular needs of the most vulnerable residents and neighborhoods should be considered.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government does not have any policies or procedures for post-flood repairs.
 2. The local government is identifying possible repair policies and procedures to follow after a flood.
 3. The local government has drafted policies and procedures to address post-flood repair in an equitable manner, and these policies and procedures are being reviewed by appropriate local groups.
 4. The local government has adopted equitable post-flood repair policies and procedures, but does not have a plan to regularly update them or incorporate them into other planning efforts. The local government is researching methods to increase funding allocated for maintenance/repair.
 5. The local government has adopted equitable post-flood repair policies and procedures, which have been incorporated into other planning efforts. The policies and procedures are updated regularly. The local government has increased funding allocated for maintenance/repair.
- This question does not apply to my community. I have provided an explanation in the comments box.

Impact 3: Increased likelihood of impacts on stormwater management infrastructure

A. Understand and address green stormwater collection and treatment system weaknesses, ensuring capacities are appropriate for heavier precipitation events

Relevant Vulnerabilities: Extreme Precipitation

Relevant To: All Communities

Communities have two types of stormwater infrastructure – gray and green. Traditional "gray" systems move stormwater using curbs, gutters, drains, piping, and collection systems. "Green" stormwater infrastructure (vegetation designed and planted to manage stormwater on-site) includes natural buffers, bio-retention areas (rain gardens), green roofs, swales (depressions to capture water) and the general use of vegetation instead of impervious surfaces. Communities can benefit from evaluating both types of stormwater infrastructure for existing weaknesses and



preparedness for climate change. Furthermore, as development continues and stormwater system expansions are needed, local governments have an opportunity to require developers to use green stormwater infrastructure and/or size gray stormwater infrastructure to accommodate expected higher volumes of water. This question prompts the evaluation of a community's green stormwater infrastructure network, and the next question addresses gray stormwater infrastructure. Learn more about the [benefits of green stormwater infrastructure from the USEPA](#).

✓ Please select the description that best aligns with the status of this action in your community.

1. The local government has not assessed how green stormwater infrastructure is being impacted by its climate hazards, nor has it conducted a capacity assessment of its green stormwater infrastructure network.
2. The local government is developing an inventory of its green stormwater infrastructure network to understand how it will be impacted by climate hazards, but it has not conducted a capacity assessment of this network.
3. The local government has developed an inventory of its green stormwater infrastructure network and is conducting an assessment on how it will be impacted by climate hazards.
4. The local government has developed an inventory of its green stormwater infrastructure network and has conducted an assessment on how it will be impacted by climate hazards. The local government is developing a plan for more intensive system maintenance, and, working across departments and with relevant community organizations, is piloting or designing land use and water capture programs to divert rainwater from the storm system using green stormwater infrastructure strategies. The local government is considering ordinances or other policy options to require new developers to manage stormwater on-site and/or size green stormwater infrastructure to accommodate expected higher volumes of water.
5. The local government understands how climate vulnerabilities will impact existing and planned green stormwater infrastructure across the community, and is starting to plan protection and adaptation efforts. The local government has completed a few retrofits so that green stormwater infrastructure is better able to handle heavier rain events. The local government has adopted and is implementing a more intensive maintenance program, and, working across departments and with relevant community organizations, has launched one or more land use and/or water capture programs to divert rainwater from the storm system. The local government is in the process of proposing ordinances or other policy options to require new developers to manage stormwater on-site and/or size green stormwater infrastructure to accommodate expected higher volumes of water.



- This question does not apply to my community. I have provided an explanation in the comments box.

B. Understand and address gray stormwater collection and treatment system weaknesses, ensuring capacities are appropriate for heavier precipitation events

Relevant Vulnerabilities: Extreme Precipitation

Relevant To: All Communities

Precipitation variability will increase in most areas of the state. Even in areas where precipitation and runoff may decrease on average, the distribution of rainfall patterns (i.e., intensity and duration) could change in ways that impact water infrastructure. In particular, more extreme storms may overwhelm combined wastewater and stormwater systems. Furthermore, as development continues and stormwater system expansions are needed, local governments have an opportunity to require developers to use green stormwater infrastructure and/or size stormwater infrastructure to accommodate expected higher volumes of water.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not assessed how gray stormwater infrastructure is being impacted by its climate vulnerabilities, nor how well the stormwater infrastructure will be able to handle heavier rain events.
 2. The local government is aware that flood conditions could surpass the capacity of its gray stormwater system, but no plans exist to address the issue. The local government has started working to understand how its gray stormwater infrastructure is being impacted by its vulnerabilities.
 3. The local government is aware that flood conditions could surpass the capacity of its gray stormwater system, and is actively working on a plan to address this issue. The local government has developed an inventory of already impacted gray stormwater infrastructure and needed modifications to handle heavier rain events. The local government is considering ordinances or other policy options to require new developers to size gray stormwater infrastructure to accommodate expected higher volumes of water.
 4. The local government is aware that flood conditions could surpass the capacity of its gray stormwater system, and is actively implementing a solution. The local government has completed a few retrofits so that gray stormwater infrastructure is better able to handle heavier rain events. The local government has adopted and is implementing a more intensive maintenance program, which includes working across departments and with relevant community organizations. The local government has proposed an ordinance or policy that requires new developers to combine green stormwater infrastructure installations with appropriately sized stormwater infrastructure to accommodate expected higher volumes of water.



5. The local government has completed enough gray stormwater system retrofits, has effectively integrated a more intensive maintenance program, and launched a sufficient number of programs that prevent rainwater from entering the gray infrastructure system, such that they are confident in the system's ability to handle heavier rain events. The local government has adopted an ordinance or policy that requires new developers to combine green stormwater infrastructure installations with appropriately sized stormwater infrastructure to accommodate expected higher volumes of water.
 - This question does not apply to my community. I have provided an explanation in the comments box.

C. Develop adaptive stormwater management best practices and integrate them into a plan to reduce stormwater runoff from impervious surfaces

Relevant Vulnerabilities: Extreme Precipitation

Relevant To: All Communities

Adaptive stormwater management practices such as green infrastructure and low-impact development methods can help reduce runoff and stormwater flows that may otherwise exceed system capacity. Green stormwater infrastructure is designed to catch and manage stormwater on-site – where it falls. Green infrastructure includes trees and forests, rain gardens and bioswales, wetlands, and more. Examples of non-vegetation based low-impact development methods include rain barrels and downspout disconnection programs, curb cuts that divert water to vegetated areas, porous pavement, and catch basins or cisterns installed where a street gutter would normally discharge into the stormwater system.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government and members of the community have not installed any green stormwater infrastructure or other low-impact development projects.
 2. There are a few green stormwater infrastructure and/or low-impact development projects installed in the community, but there is no formal strategy or plan in place to expand the amount of land dedicated to managing stormwater on-site.
 3. The local government, perhaps with community partners, is researching, developing, and/or piloting programs to increase the number of green stormwater infrastructure and other low-impact development projects.
 4. The local government has identified and implemented a program to increase the number of private green stormwater infrastructure or other low-impact development projects and is tracking its success. The local government is considering a strategy to adopt stormwater management regulations that encourage the use of these techniques. The local government is making a plan that lists specific projects to reduce stormwater runoff from impervious surfaces across its jurisdiction. The



plan targets parking lots, alleys, parks, vacant lots, parkways, and grading near sidewalks for green stormwater infrastructure.

5. The local government has launched a program to increase the number of private green stormwater infrastructure or other low-impact development projects, has implemented an ordinance or other policy mechanism to increase their use, and can demonstrate through maps or other metrics the increased presence of these techniques. Additionally, the local government is implementing strategies to reduce stormwater runoff from impervious surfaces across its jurisdiction, with a focus in the most vulnerable areas of the community. Strategies are being implemented in parking lots, alleys, parks, vacant lots, parkways, and grading near sidewalks for green stormwater infrastructure. The local government is starting to prioritize managing stormwater on-site in all new construction.
 - This question does not apply to my community. I have provided an explanation in the comments box.

D. Increase street sweeping and stormwater drain maintenance

Relevant Vulnerabilities: Extreme Precipitation,

Relevant To: Cities and Towns

One of the easiest ways to prevent or reduce surface flooding is to make sure stormwater drains are not blocked. Regular street sweeping and drain maintenance schedules are one method of achieving this goal.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government does not have a program in place to clean streets or stormwater drains.
 2. The local government has a program in place to clean streets and/or stormwater drains, but has not considered updating it to address increased risks from surface flooding or flooding from nearby rivers and streams.
 3. The local government is working on a plan to increase its street sweeping schedule and implement, refresh, or improve a stormwater drain cleaning program. The plan will include regular maintenance inspections.
 4. The local government has either increased its street sweeping schedule or has an effective program in place to regularly clean its stormwater drains. The local government has scheduled regular inspections of its stormwater drains.
 5. The local government has increased its street sweeping schedule and has an effective program in place to regularly clean its stormwater drains. The local government has scheduled and regularly completes inspections of its stormwater drains.
- This question does not apply to my community. I have provided an explanation in the comments box.



E. **Develop a watershed-wide approach to stormwater management with neighboring jurisdictions**

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Bringing together relevant agencies, organizations, and individuals responsible for stormwater management decisions from across watersheds can help address barriers presented by different regulations, budget limitations, and expectations for growth, and can enable management of stormwater in a coordinated manner that respects the realities of how the water will behave. Representatives of water management, environmental, land use planning, public works, and transportation departments (among others) are important to include because each of these agencies plays a role in stormwater management.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not met with other local governments, relevant agencies and organizations, and individuals responsible for stormwater management decisions (stormwater influencers and decision-makers) within its watershed to discuss stormwater management issues.
 2. The local government will soon attend or is in the process of planning a watershed-wide meeting with stormwater influencers and decision-makers.
 3. The local government is working with stormwater influencers and decision-makers within its watershed to identify problem areas and strategies to reduce stormwater runoff that leads to surface flooding and/or river flooding.
 4. The local government and stormwater influencers and decision-makers within its watershed are implementing a plan to reduce stormwater runoff that leads to surface flooding and/or river flooding.
 5. The local government and stormwater influencers and decision-makers within its watershed have implemented joint solutions to deal with heavier rain events that often lead to surface flooding and/or river flooding. These communities and entities meet regularly to evaluate the results of the implemented solutions and tweak them as needed.
- This question does not apply to my community. I have provided an explanation in the comments box.

Economic Development

As various climate impacts occur with more regularity and severity, and communities and businesses begin offering preparedness solutions, local economies will shift. Tourism and recreation offerings many change, job offerings may transition to new sectors, and residents and businesses may incur new costs and income streams. Local governments can help their



communities prepare for this transition by considering how their local economies will be impacted, planning ahead, and updating existing programs and plans to consider the new climate reality. Connectivity, diversity, regenerative ability, and equitability are key principles in this section.

Suggested Department(s): Economic Development, Planning

Impact 4: Increased likelihood of climate change impacting the local economy and low-income residents

A. Evaluate how climate change impacts could affect the local economy

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

More is understood about estimating the economic impacts of climate change mitigation and preparedness measures than estimating the cost of inaction. Anticipated impacts likely to affect local economies include adverse impacts on agriculture, change in expected revenues from tourism and recreation, and increased likelihood of changes in workforce productivity as a result of more extreme weather events and higher summertime temperatures, among others. Businesses can anticipate increased costs from extreme weather event recovery, supply chain disruptions, insurance rates, and more. Many, if not all, of the adaptation actions listed in the Hoosier Resilience Index Readiness Assessment are an investment in reducing the economic impacts of climate change on local economies. In addition to these actions, local governments can also consider how the vulnerabilities listed in Part I of the Hoosier Resilience Index will impact local tourism, local businesses, and residents financially. Knowing this information can help with future decision-making. Furthermore, conducting a climate change economic impact analysis can help a community understand how the changing climate will affect local economic activity.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not evaluated how the climate change vulnerabilities specific to its community will impact the local economy.
 2. The local government has a general idea about how the climate change vulnerabilities specific to its community will impact the local economy, but it has not conducted an in-depth economic impact analysis.
 3. The local government has identified an existing economic development board or is starting to pull together a task force of residents, business owners, and industry representatives to evaluate how the climate change vulnerabilities specific to its community will impact the local economy.
 4. The local government has identified an existing economic development board or has established a task force of residents, business owners, and industry representatives to evaluate how the climate change vulnerabilities specific to its community will impact the local economy.



The group has begun meeting and discussing potential local economic impacts.

5. The local government has identified an existing economic development board or has established a task force of residents, business owners, and industry representatives to evaluate how the climate change vulnerabilities specific to its community will impact the local economy. The group is developing a report or other way to communicate its findings to the community.
 - This question does not apply to my community. I have provided an explanation in the comments box.

B. Incorporate climate and disaster resilience into economic development strategic plans

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

The [Indiana Climate Change Impacts Assessment](#) offers several easy-to-read reports that outline how climate change is impacting Indiana now, and how it is expected to impact the state in the future. While most impacts are negative and will increase upfront costs or long-term costs dramatically if no preparation activities take place, there are a few impacts that may offer positive benefits, such as opportunities for increased tourism and recreation in certain parts of the state. Local governments should consider both the positive and negative impacts of climate change when outlining economic development strategies and plans.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not incorporated climate and disaster resilience into local economic development strategies or plans.
 2. The local government has had some initial conversations internally about how climate change impacts should be considered within its economic development strategy and how climate preparedness activities can contribute to economic development.
 3. The local government has had internal conversations about how climate change impacts should be considered within its economic development strategy and how climate preparedness activities can contribute to economic development. The local government is starting to identify local partners to expand this discussion.
 4. The local government has met with local partners to discuss how climate change impacts should be considered within its economic development strategy and how climate preparedness activities can contribute to economic development. The group is starting to draft updates to its economic development strategy or plan to incorporate climate and disaster resilience.
 5. The local government has updated its economic development strategy or plan to address climate and disaster resilience.



- This question does not apply to my community. I have provided an explanation in the comments box.

C. Consider and plan for implications of climate change on the local job market

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: Cities and Towns

Job losses and opportunities are among the ways in which climate change will impact the local economy. Farmers may opt to change professions due to crop challenges, coal miners may need to find training programs for new opportunities, and nearby wind farms may need on-site technicians. Through workforce development programs, community colleges, local chambers of commerce, and other organizations, local government can facilitate connections to ensure that residents can seek out and find opportunities when transitions are needed.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. Neither the local government nor local partners have considered the impact of climate change on the local job market.
 2. The local government and/or local partners have begun assessing how climate change may impact the local job market both positively and negatively, but no programs are in place to support residents' transitions.
 3. The local government and/or local partners have completed an assessment on how climate change may impact the local job market, and they have started developing a plan to update skills training programs, internships, and job search assistance to take advantage of new and growing sectors.
 4. The local government and/or local partners have completed an assessment on how climate change may impact the local job market, and they have partially updated skills training programs, internships, and job search assistance to take advantage of new and growing sectors.
 5. The local government and/or local partners have completed an assessment on how climate change may impact the local job market, and have a plan in place to update the assessment on a regular basis. The local government and/or local partners have integrated skills relevant to sectors that are new and/or growing because of climate change into skills training programs, internships, and job search assistance.
- This question does not apply to my community. I have provided an explanation in the comments box.

D. Establish a protocol for providing assistance to residents that may face financial strain caused by climate hazards

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Vulnerable residents often do not have the resources necessary to respond to or recover from climate hazards. These individuals may not be able to recover quickly, if at all, after extreme weather events. To prevent vulnerable residents from being



disproportionately affected by climate hazards, local governments can dedicate thoughtful planning, funding, and assistance while recognizing that some populations will be especially vulnerable and understanding what their needs might be. Local governments can determine the resource and preparedness needs of vulnerable communities by conducting a social vulnerability assessment. The social vulnerability information provided by the Hoosier Resilience Index can help local governments identify vulnerable areas of a community.

✓ Please select the description that best aligns with the status of this action in your community.

1. The local government has not looked into providing assistance to residents that may face financial strain caused by climate hazards.
 2. The local government is engaging local community-based organizations that work with vulnerable residents. The local government is looking at which residents or neighborhoods will be most affected by climate hazards and what financial strains will exist (e.g. higher utility bills, insurance, rebuilding and relocation costs, and more).
 3. The local government is identifying funding sources to support vulnerable residents and is working with community-based organizations to determine how best to allocate funding. Community input is being meaningfully considered to properly understand where the money will be needed most.
 4. The local government has a plan in place for diverting funding and assistance to vulnerable residents. The plan includes funding that is available for multiple weeks to accommodate parts of the community that might not have power or access to resources for an extended period.
 5. The local government is working with community-based organizations to assess its plan to financially assist vulnerable residents during or after extreme weather or related events. The assessment takes place on a regular basis to ensure the amount of funding is adequate. The local government regularly re-evaluates its vulnerability assessment to determine the potential amount of damage the community can expect for different climate hazards and compares it to the amount of funding they have dedicated.
- This question does not apply to my community. I have provided an explanation in the comments box.

E. Develop a plan for accepting people displaced by climate change impacts

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: Cities and Towns

As sea levels rise and hurricanes, droughts, and other extreme weather events increase in severity, cities and towns in Indiana can expect new residents, some temporary and some permanent, from areas that have been hit hard by climate change. For example, more than 3000 survivors of Hurricane Katrina came to Indianapolis in 2012.^a Although it is difficult to expect if or when a community will

experience an influx of new residents from these events, there are steps local governments can take now to prepare. The local government or a local partner could form a task force or planning committee to consider the potential needs of climate refugees; develop a list of organizations in the community that are willing to offer temporary, transitional, or permanent services, food, and housing; and create a plan of action that can be used when an influx of new residents is expected.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. Neither the local government nor local partners have a plan in place to accept people displaced by climate change impacts.
 2. The local government and/or local partners have a general sense of organizations that could be asked to support an influx of new residents displaced by climate change, but no formal plan exists to deal with this situation.
 3. The local government and/or local partners have established a committee or task force, and the group is starting to consider the potential needs of climate refugees, as well as potential support organizations.
 4. The local government and/or local partners have established a committee or task force that is starting to compile a plan of action for when the community is asked to accept new residents displaced by climate impacts.
 5. The local government and/or local partners have established a committee or task force that has written a plan of action for when the community is asked to accept new residents displaced by climate impacts. The plan matches new residents' needs with local organizations that are willing to provide temporary, transitional, or permanent services, food, housing, and other necessities.
- This question does not apply to my community. I have provided an explanation in the comments box.

Emergency Management

The extreme weather we have been experiencing is not caused by climate change, but it is often worse because of climate change. Emergency management planning and training already exists in counties across Indiana, among numerous local, state and private entities, but the concern is that natural disasters are anticipated to occur with increasing frequency and strength, which will likely stress existing capacity to respond and exacerbate a community's existing vulnerabilities. As local governments face the threat of climate change along with other hazards, the success of emergency management is more important than ever. The questions below outline initiatives your community can take to increase the resilience of emergency management services. Although emergency management services are coordinated at the



county level and are often constrained by a very tightly-knit suite of federal, state, and county programs, cities and towns can take steps to support response efforts, too. Connectivity, regenerative ability, and equitability are key principles in this section.

Suggested Department(s): Emergency Management

Impact 5: Increased stress on existing communication systems during extreme weather

A. Identify and address the strengths and weaknesses of your community's existing communication networks

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Following or during severe weather, people rely on cell phones, landline telephones, internet access, radio, and television to monitor the event and to contact family members, schools, employers, and emergency responders. Local governments and other public agencies disseminate information to the public through one-way communication systems.^b With increasing frequency and severity of extreme weather, communication systems may be more likely to fail, and service disruptions may become more common as user demand exceeds the capacity of a system during the aftermath of an event. To learn more, see the [U.S. Climate Resilience Toolkit's Communications](#) page.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not considered the strengths and weaknesses of its communication systems in the event of a disaster.
 2. The local government is organizing a stakeholder group, including service providers, critical facilities representatives, local businesses, and representatives of interdependent infrastructure systems, to explore strengths, weaknesses, threats, and improvement solutions for its communication networks. This research includes finding temporary solutions for when traditional communication networks fail.
 3. The local government has drafted a plan to improve its communications network and is developing short-term, medium-term, and long-term policies and procedures to accomplish its recovery needs in the event of a disaster. The plan includes methods of communication that will be able to reach residents, including diverse and vulnerable households, when traditional communication networks fail.
 4. The local government has adopted and is implementing a plan to improve its communications network. The plan includes short-term, medium-term, and long-term policies and procedures to accomplish its recovery needs in the event of a disaster. The plan includes methods of communication that will be able to reach residents, including diverse and vulnerable households, when traditional communication networks fail.



- 5. The local government has fortified its communications network following an in-depth analysis of related strengths and weaknesses. The system is routinely tested. The local government has adopted post-event recovery policies and procedures to repair communications services. The policies and procedures are updated regularly, and are appropriate for reaching diverse and vulnerable households, including residents for whom English is not their first language.
 - This question does not apply to my community. I have provided an explanation in the comments box.

B. Develop and distribute a local, state, and federal contacts list to keep necessary services up and running

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not assessed its communication needs between or among units managing different kinds of infrastructure and social services, and does not have a list of important local, state, and federal agency contacts to keep necessary services up and running before, during, and after floods, heat waves, droughts and other extreme weather events that could be made worse by climate change.
 2. The local government has a sense of what agencies to contact before, during, and after extreme weather events, but does not have a formal list of specific individuals and their contact information.
 3. In order to develop a list of important contacts, the local government is assessing needs before, during, and after extreme weather events, including those that could be made worse by climate change.
 4. The local government has assessed its communication needs with respect to climate change, and has developed a partially complete list of local, state, and federal agency contacts that could be needed before, during, and after an extreme weather event.
 5. The local government has assessed its communications needs with respect to climate change, and has developed a complete list of local, state, and federal agency contacts that could be needed before, during, and after an extreme weather event. The local government updates the list annually, at minimum.
 - This question does not apply to my community. I have provided an explanation in the comments box.



Impact 6: Increased strain on government services, critical facilities, resources, and emergency infrastructure

A. Identify and protect critical infrastructure from flooding

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

The US Department of Homeland Security defines critical infrastructure as the systems and assets that are so vital that their incapacity or destruction would have a debilitating impact on security, public health, or safety.^c Flooding can make critical infrastructure inaccessible or dysfunctional. Flood damage to infrastructure and transportation systems can prevent aid from reaching an area. Identifying which infrastructure is critical and then determining whether reinforcement or relocation is needed to adequately protect the site will ensure functionality during crises. Learn more about critical infrastructure sectors on the [US Department of Homeland Security website](#).

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not determined which parts of its community's infrastructure are critical or if any of this infrastructure is located in a floodplain.
 2. The local government is starting to inventory its critical infrastructure and has started comparing its inventory with area flood maps.
 3. The local government has a list of its critical infrastructure, has marked each piece of critical infrastructure on a map, knows which parts are susceptible to flooding, and is making a plan to relocate, protect, or upgrade assets as needed.
 4. The local government has a list and map of its critical infrastructure, knows which parts are susceptible to river and surface flooding, and is actively working to relocate, protect, or upgrade assets as needed. The local government is in the process of relocating mechanical and electrical equipment above the ground-level flooding threat. Detours to reach critical infrastructure have been identified. Plans are under development to improve drainage around key transportation routes.
 5. The local government has a list and map of its critical infrastructure, and any of it located in a flood-prone area has been adequately protected so that inundated infrastructure will not impede community functionality during high water events. Detours to reach critical infrastructure have been identified, and a plan is in place to notify travelers when detours become necessary. Plans have been completed and are being enacted to improve drainage around key transportation routes.
- This question does not apply to my community. I have provided an explanation in the comments box.

B. Identify and protect critical infrastructure from higher temperatures

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

The US Department of Homeland Security defines critical infrastructure as the systems and assets that are so vital that their incapacity or destruction would have a debilitating impact on security, public health, or safety.^d Extreme heat can prevent electric plants from being able to cool down because source water will be too warm to cool the plant. If plants have to cut back on power generation, and power demand increases, blackouts and brownouts can occur. Heat waves can also cause roadways and pavement to buckle, and other infrastructure failures. Identifying which infrastructure is critical and then determining whether reinforcement or reconstruction is needed to adequately protect the site will ensure functionality during crises. Learn more about critical infrastructure sectors on the [US Department of Homeland Security website](#).

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not determined which parts of its community's infrastructure are critical or if any of this infrastructure will be impacted by more frequent extreme heat events.
 2. The local government is starting to inventory its critical infrastructure and has started considering how it will be impacted by more frequent extreme heat events.
 3. The local government has a list of its critical infrastructure, has marked each piece of critical infrastructure on a map, knows which parts are susceptible to more frequent extreme heat events, and is making a plan to reinforce, upgrade, or rebuild assets as needed.
 4. The local government has a list and map of its critical infrastructure, knows which parts are susceptible to more frequent extreme heat events, and is actively working to reinforce, upgrade, or rebuild assets as needed.
 5. The local government has a list and map of its critical infrastructure, and any of it expected to be affected by more frequent extreme heat events has been upgraded to ensure high temperatures will not substantially degrade or prevent functionality of critical facilities and resources.
- This question does not apply to my community. I have provided an explanation in the comments box.

C. Involve critical facility and emergency infrastructure managers in climate change preparedness and management

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

The effects of climate change can impact most, if not all, parts of a community. Involving the on-site managers of critical facilities and community infrastructure can ensure that these individuals understand the increasing threats posted by climate

change, and how to prepare and respond. Involving these individuals in preparedness planning and activities will also increase the communication connections that exist across the local emergency preparedness community.

✓ Please select the description that best aligns with the status of this action in your community.

1. The local government has not identified critical facility and emergency infrastructure managers.
 2. The local government has identified the community partners that manage hospitals, medical service providers, senior homes, childcare facilities, shelters, major and alternate transportation routes, public transit facilities, and other identified critical facilities.
 3. The local government has developed model procedures with community partners managing critical facilities and emergency infrastructure to ensure they are prepared for the effects of climate change.
 4. The local government has developed model procedures with relevant community partners to ensure on-site managers employ best practices in the event of flooding, power outages, extreme heat, or other climate related emergencies, but the procedures have not been tested.
 5. The local government and its community partners have developed model procedures for ensuring on-site managers of critical facilities and emergency infrastructure employ best practices in the event of flooding, power outages, extreme heat, or other climate related emergencies. The procedures are tested and updated annually.
- This question does not apply to my community. I have provided an explanation in the comments box.

D. Develop an emergency response plan that can be implemented during a flood to ensure adequate transportation and logistics for critical resources

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: Cities and Towns

Heavy precipitation events can wash out culverts, inundate low-lying roadways, make bridges inaccessible, fill reservoirs beyond capacity, and require that floodgates be closed. Floods make it difficult to transport resources to neighborhoods in need or move people out of unlivable or dangerous areas.^e Local governments can develop flood emergency response plans to minimize or eliminate challenges posed during inundations.

✓ Please select the description that best aligns with the status of this action in your community.

1. The local government does not have a flood emergency response plan or its plan does not include information on transportation and logistics for critical resources that are susceptible to flooding.
2. The local government is starting to identify the persons responsible for the management of the community's critical resources, the transportation infrastructure, and for moving people and supplies. The



local government does not have a flood emergency response plan that includes information on transportation and logistics for critical resources that are susceptible to flooding.

3. The local government is drafting an emergency response plan with the relevant managers identified for each necessary service and critical asset. The local government is mapping vulnerable neighborhoods, critical assets, and transportation infrastructure that may be affected by a flood. Identified managers will have access to this information.
4. The local government has developed a plan to provide transportation and logistics for critical resources, such as medical supplies and drinking water. The local government, including identified managers, has a map that identifies critical facilities (e.g., hospitals, fire stations, shelters, and distribution centers) and transportation routes between them. This map includes identification of neighborhoods and routes that are likely to be inundated under various scenarios to help the local government evaluate how to get resources to those areas. To address regional-scale events, plans specify procurement of supplies from outside the region via reliable transportation routes. The plan has not been tested.
5. The plan has been fully developed with the local government and the designated managers understand their role in each scenario. The plan has an annual review and update at the end of flooding season. The plan is tested at least every three years to ensure continued effectiveness.
 - This question does not apply to my community. I have provided an explanation in the comments box.

E. Develop and adopt a Multi-Hazard Mitigation Plan that addresses emergency response needs during floods

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: Counties

Heavy precipitation events can wash out culverts, inundate low-lying roadways, make bridges inaccessible, fill reservoirs beyond capacity, and require that floodgates be closed. Floods make it difficult to transport resources to neighborhoods in need or move people out of unlivable or dangerous areas.^f Integrating flood preparedness into a Multi-Hazard Mitigation Plan can help decrease response times, ensure resources reach areas and facilities in need, and allow a community to access FEMA and/or state funding after an officially declared disaster.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not developed or adopted a Multi-Hazard Mitigation Plan and it does not have a flood emergency response plan.
 2. The local government has a flood emergency response plan that addresses transportation and logistics for critical resources that are



susceptible to flooding. The local government has not developed or adopted a Multi-Hazard Mitigation Plan.

3. The local government is drafting its Multi-Hazard Mitigation Plan and is considering how to include flood emergency response in the plan. Contributors are identifying the persons responsible for the management of the community's critical facilities, the transportation infrastructure, and for moving people and supplies.
4. The local government has drafted a Multi-Hazard Mitigation Plan that addresses flood emergency response, but it has not yet been adopted. The Plan lists the relevant managers for each necessary service and critical asset.
5. A Multi-Hazard Mitigation Plan has been adopted within the past five years that provides transportation and logistics for critical resources, such as medical supplies and drinking water. The local government has a map that identifies both critical facilities (e.g., hospitals, fire stations, shelters, and distribution centers) and transportation routes between them. This map includes identification of neighborhoods and routes that are likely to be inundated under various scenarios to help the local government evaluate how to get resources to those areas. To address regional-scale events, plans specify procurement of supplies from outside the region via reliable transportation routes.
 - This question does not apply to my community. I have provided an explanation in the comments box.

F. Develop a debris management plan to direct post-flood response

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Climate change will lead to more frequent and intense storms that may put communities and sites at risk that have not been previously impacted by flooding. More powerful storms may also generate large amounts of debris that will need to be appropriately managed. Much of this debris can be reused or recycled (e.g., limbs and branches can be chipped and composted; construction debris can be reused). Having a plan ready for these situations will enable quick and sustainable cleanup to get operations back to normal.^g

- ✓ Please select the description that best aligns with the status of this action in your community.
1. The local government does not have a debris management plan and has not thought about it.
 2. The local government is identifying individuals and groups that should be engaged in the planning process (e.g. individuals or groups who represent transportation, sanitation, emergency response, environmental health, public health, public works, zoning, agriculture, industry, and business, among others). The local government is also identifying unique, local circumstances and issues that may affect debris management during a



flood, which may include determining legal and regulatory waste management considerations.

3. The local government is developing a debris management plan with relevant local individuals and groups, including waste management facilities such as haulers, owners, and operators of waste management facilities, including reuse and recycling facilities.
4. The local government and relevant partners have developed a community-scale debris management plan, but have not tested it. The plan prioritizes reuse and recycling ahead of disposal and includes a list of contacts and their capacities. Facilities outside of the area are also included on the list for instances when local facilities become damaged or reach capacity. Debris types are identified and amounts are forecasted under different flooding scenarios. The local government has collaborated with neighboring jurisdictions who would also be impacted.
5. The local government has put the plan into place that prioritizes reuse and recycling ahead of disposal. The local government reaches out to recycling entities, reuse organization, and waste facility managers at least annually to review and update the plan. Debris management-related exercises and trainings occur yearly for all staff affiliated with the plan.
 - This question does not apply to my community. I have provided an explanation in the comments box.

G. Design and launch a community volunteer response program

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

During extreme weather events, emergency services can become overly strained, creating a need for volunteer response teams. In addition, some disasters lead to volunteers who show up wanting to help. Local governments can establish supervised and directed volunteer response teams that can focus on safely responding to hazards and organizing basic disaster response, allowing professional responders to focus on more complex tasks. Volunteer programs can be grass roots or formal. Examples of formalized programs include [Community Emergency Response Teams \(CERTs\)](#) and [Community Organizations Active in Disaster \(COADs\)](#). COADs are most commonly formed at the county level, and CERTS can be established anywhere, including workplaces, airports, college campuses, local governments, and more.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government does not have a community volunteer response program in place.
 2. The local government knows of a few community groups it could call on for help during an emergency, but a formal volunteer program specifically designed for climate hazard response does not exist.



3. The local government is planning a community volunteer response program, which may include training sessions on what climate hazards are likely to prompt emergencies and response exercises.
4. The local government has trained community members and has established an activation plan that is shared with volunteers who have completed the training. The volunteers have received proper identification and are aware of their job in the event of an emergency.
5. The local government holds regular response trainings for new volunteers and refresher trainings for existing volunteers. The plan of action for each potential climate hazard is tested annually through emergency response drills and updated accordingly. Additional outreach is conducted to encourage more community members to volunteer.
 - This question does not apply to my community. I have provided an explanation in the comments box.

Impact 7: Increased impacts on residents during and after flood and heat events

A. Educate residents about steps they can take to improve personal emergency preparedness

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use
Relevant To: All Communities

Local governments are already strapped for resources and capacity. Even in small- and medium-sized disasters, employees may become overwhelmed quickly with response needs and service gaps can arise. In today's changing climate reality, as extreme events become more frequent and severe, local governments can benefit from taking steps in advance to increase individual household preparedness and engage members of the community as vital partners.^h

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government does not conduct community preparedness outreach and has not thought about it.
 2. The local government is starting to research how it would conduct community preparedness outreach, including which parts of the government would be involved. The local government also has a sense of some community groups to contact and is looking into which public and private resources could be employed.
 3. The local government is updating its emergency plans, ideally with help from community partners, with specific climate change related materials, such as press release templates, information on cooling/heating centers, specific plans for residents requiring mobility assistance, and steps to identify neighborhoods affected by extended power outages, flooding, and other extreme weather events. The local government is meeting with public and private groups to determine what they can contribute during



different extreme weather events, such as space, power generation, and other resources.

4. The local government is conducting outreach on community preparedness using up-to-date climate change related materials, and is collaborating with one or two community partners that have volunteered to provide outreach and/or response resources. The outreach process allows for community feedback to ensure the whole community is considered, including traditionally underserved residents. The community partners are serving as a conduit to a larger group of local residents.
5. The local government is conducting a whole community preparedness approach and is working with multiple community partners to further reach and acceptance. The plan accommodates traditionally underserved communities, and is accessible across different languages and abilities. Feedback is collected at least annually and the plan is updated accordingly.
 - This question does not apply to my community. I have provided an explanation in the comments box.

B. Identify and prepare for hazardous conditions that could occur from higher temperatures and floods

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

As floods increase in frequency and intensity due to climate change, their secondary impacts can create additional hazardous events. Floods can come in contact with hazardous waste – such as sewage treatment plants, coal ash pits, livestock waste lagoons, superfund and brownfield sites, and more – and contaminate the area affected by flooding. Flood damage to infrastructure and transportation systems can also prevent aid from reaching the area. Extreme heat can prevent electric plants from being able to cool down because source water will be too warm to cool the plant. If plants have to cut back on power generation, and power demand increases, blackouts and brownouts can occur.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not identified hazardous events that could occur from higher temperatures or floods.
 2. The local government is starting to inventory possible hazardous events that could occur from higher temperatures and floods, including a list of locations where hazardous chemicals are used or stored.
 3. The local government has a list of possible hazardous events, and is assessing which areas of the community would be impacted. The local government is identifying how the most vulnerable residents would be impacted, and is planning for an equitable response.
 4. The local government has a list of possible hazardous events, knows which areas of the community would be impacted, and is working with



the managers of those facilities to actively work to protect those parts of the community. The local government is also implementing measures to equitably protect the most vulnerable residents.

5. The local government has a list of possible hazardous events, and has adequately and equitably protected areas and residents that would be affected.
 - This question does not apply to my community. I have provided an explanation in the comments box.

C. Enhance community networks and connections for vulnerable communities

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

As the impacts of climate change worsen, individuals with special circumstances may face difficulties that make preparing for and responding to flooding, extreme heat, and other impacts more challenging. Language and cultural barriers, health issues, and strained incomes are only a few examples. To reach and protect all residents, local governments can make special accommodations through existing community networks.ⁱ

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not thought about enhancing community networks for vulnerable communities.
 2. The local government is identifying vulnerable communities and has started to identify representative advocacy organizations and community-based organizations that have an existing relationship with diverse and vulnerable residents. A directory is being created of leaders or representatives from vulnerable communities to communicate with before, during, and after an emergency to ensure proper messaging and outreach.
 3. The local government is working with the representative advocacy organizations to conduct targeted outreach to vulnerable residents to understand their needs and how the city can best help them be prepared for climate hazards. Relationships are being built with these organizations to better understand how to help and to get more information out to the communities.
 4. The local government has created a plan with the organizations to enhance community networks and connections for those who require special attention, such as the elderly, homebound, disabled, isolated, or those likely to need financial assistance during or after extreme weather events.
 5. The local government monitors the plan with the organizations and updates it accordingly, with reviews at least once a year. A collection of pre-written and pre-recorded messages has been created in multiple languages for flooding and extreme heat events.



- This question does not apply to my community. I have provided an explanation in the comments box.



Energy and Public Utilities

Increasing temperatures and heavy precipitation events can overwhelm the energy grid and stormwater, drinking water, and wastewater infrastructure. Identifying back-up power supply, reducing building energy needs, and investing in solar and other distributed energy sources can make the grid more resilient. And although precipitation is expected to increase during winter and spring, droughts are more likely during summer and fall. Identifying a back-up drinking water source can be useful for droughts and even during times of heavy precipitation, when existing drinking water sources can experience high turbidity (or cloudiness, with high levels of sediment) or harmful algal blooms. Diversity, redundancy, modularity, and equitability are key principals in this section.

Suggested Department(s): Public Works, Municipal Utility, Water Delivery, Wastewater Services, Community Services

Impact 8: Increased likelihood of power supply issues

A. Work internally and with the local utility to increase power supply preparedness

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

There are a number of initiatives that local governments with municipally owned utilities can implement to decrease the risk of power outages during and after storms and heat waves. Even if a local government does not operate the community's power grid, local officials can run internal and community-wide programs to support energy efficiency, and they can meet with electricity and natural gas providers to express their interest and concern in decreasing power supply issues due to the threats of climate change.

- Weatherization, energy efficiency, and geothermal heat pumps – Local governments can make government buildings more energy efficient, reducing the energy load required by the local utility. Local governments can also launch community weatherization (e.g., increasing building insulation, window caulking, and repairing roofs) and energy efficiency programs to help local businesses and homeowners decreased their energy needs. Another option is [geothermal heat pumps](#), which make buildings more energy efficient by transferring heat from buildings into the ground during the summer, and transfer heat from the ground into the buildings during winter.
- System hardening – Local governments can encourage utilities to develop and implement strategies to make energy systems more resilient by installing smart meters that reduce the occurrence and duration of power outages, replacing wooden poles with steel poles, burying lines underground, trimming trees, and identifying back-up plans for power transformers, among other tactics.

- Power generation source diversity – Local governments can identify the current fuel and generation sources used to produce electricity for the community, and work with the utility to diversify the power sources supplying the grid, including promoting distributed energy (instead of centralized). Promoting private and public renewable energy that can operate without grid functionality is also an important way to enhance the resilience of a community’s power supply. Diversifying the power grid is addressed in the next question.
- ✓ Please select the description that best aligns with the status of this action in your community.
 1. Whether through a municipally owned utility or through conversations with local energy providers, the local government has not engaged in any power supply preparedness initiatives, such as energy efficiency or system hardening projects or programs.
 2. The local government has engaged in one or more power supply preparedness initiatives, whether through a municipally owned utility or through conversations with local energy providers, but is not actively working to comprehensively address the issue.
 3. The local government, perhaps with community partners or local utility providers, is researching, developing, and/or piloting multiple programs to increase power supply preparedness. Weatherization, energy efficiency, and/or geothermal heat pumps are being considered for integration into local government operations or will soon be promoted through a community program.
 4. The local government and/or the local utility providers have implemented two or three comprehensive power supply preparedness initiatives, are tracking their success, and have ensured that the programs are focused, at least in part, on the most vulnerable parts of the community. Implemented power supply preparedness initiatives include at least one community-wide weatherization and energy efficiency program.
 5. The local government and/or the local utility providers have implemented multiple power supply preparedness initiatives, are tracking their success, and have ensured that the programs are focused, at least in-part, on the most vulnerable parts of the community. Weatherization and/or energy efficiency initiatives are commonplace in building renovations and new construction. The local utility provider has undergone multiple system hardening efforts, and has a plan in place to maintain existing systems.
 - This question does not apply to my community. I have provided an explanation in the comments box.



B. Encourage alternative energy generation, energy storage systems, and distributed energy

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Fossil fuel prices and supply are prone to price swings. As temperatures continue to rise, electricity demand will increase and may cause price spikes during more frequent extreme heat events. Switching to alternative energy generation and energy storage systems can provide resilience to energy price spikes since they have a stable cost over time. Alternative energy and energy storage systems, combined with decentralized microgrids, offer resilience to extreme weather events, whereas traditional power generation systems can lead to widespread blackouts. Some of these technologies are well developed and increasingly cost-competitive with traditional generation sources; others are at earlier stages of development, but will become more available and affordable over time.

- A microgrid is a small network of energy users that are served by a smaller-scale, local energy source and can operate independently, but is still connected to the national grid.
 - Decentralized or distributed energy generation is the existence of multiple sites of power production – many of which are located closer to where the energy is used – enabling the integration of multiple power producing technologies such as combined heat and power systems, solar panels, fuel cells, and wind turbines. Decentralized or distributed energy storage examples include batteries and other storage technologies.
- ✓ Please select the description that best aligns with the status of this action in your community.
1. The local government and/or local power utility have not looked into encouraging alternative energy generation, energy storage systems, or distributed energy.
 2. The local government and/or local power utility are looking into alternative energy generation, energy storage, and distributed energy systems to see which are appropriate in their area.
 3. The local government and/or local power utility have identified at least one large-scale alternative energy generation, energy storage, or distributed energy opportunity that could work in their community. The local government and/or local power utility are taking steps to implement the energy project.
 4. The local government and/or local power utility have completed at least one large-scale alternative energy generation, energy storage, or distributed energy system to serve their community. The local government and/or local power utility are researching the design of assistance programs to reduce the financial burden of the upfront cost of these energy systems for low-income residents.



5. The local government and/or local power utility have completed two or more large-scale alternative energy generation, energy storage, or distributed energy systems to serve their community. The local government and/or local power utility are examining the diversified energy strategies they have implemented to determine which have been successful and are adapting accordingly. Assistance programs are in place to reduce the financial burden of the upfront cost of these energy systems for low-income residents.
 - This question does not apply to my community. I have provided an explanation in the comments box.

C. Install back-up power options for critical facilities and systems

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Most critical facilities and systems rely on energy to operate. During and after extreme weather, power grids are likely to fail, rendering critical infrastructure unusable. Back-up power sources include battery-stored back-up power, solar power, small- or large-scale wind electric systems, diesel-powered generators (although controversial due to their greenhouse gas emissions), and fuel cells, which are similar to batteries, but use chemical energy from a fuel source to produce electricity.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government does not have back-up power options for any of its critical facilities or systems.
 2. The local government is developing an inventory of its critical facilities and systems (e.g. wastewater treatment, water delivery pump stations, key government service buildings, hospitals, nursing care facilities, emergency shelters), and may have back-up power options for some of them.
 3. The local government has an up-to-date inventory of its critical facilities and systems, and is developing a plan to ensure that each location has a back-up power option.
 4. The local government has an up-to-date inventory of its critical facilities and systems, and is installing a back-up power option at each location.
 5. The local government has an up-to-date inventory of its critical facilities and systems, and has ensured that each location has a back-up power option.
 - This question does not apply to my community. I have provided an explanation in the comments box.

D. Establish a protocol for providing assistance to residents who may face financial strain caused by higher energy costs

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities



Low-income residents might not have access to air conditioning or be able to afford to run it if they do have it as the number and severity of high heat events increases. These residents might also struggle to keep up with energy costs during recurrent cold snaps. To prevent vulnerable households from being disproportionately affected by the financial strain of energy bills, local governments can implement measures to reduce these impacts and consider the need for funding assistance. In addition to weatherization and financial support programs, planting trees and installing other forms of green infrastructure can be a complementary way to lower utility bills.

- ✓ Please select the description that best aligns with the status of this action in your community.
1. The local government, local power utility, and local community organizations have not looked into providing assistance to residents who may face financial strain caused by energy costs from increasing summertime temperatures and wintertime cold snaps.
 2. The local government, local power utility, and/or a community organization offer some summertime and/or wintertime energy bill support programs, but do not have a sense of how effective they are. No weatherization, strategic tree planting, or general vegetation planting programs exist for low-income households in the community.
 3. The local government, local power utility, and/or a local community organization are identifying funding sources to support low-income households' energy bills, and are working with community-based organizations to determine how best to allocate funding. Community input is being meaningfully considered to accurately understand where the money will be needed most. At least one weatherization, strategic tree planting, or general vegetation planting program exists in the community for the purpose of reducing energy bills.
 4. The local government, local power utility, and/or a local community organization has a plan in place for diverting funding and assistance to low-income households to alleviate the pressures of increasing utility bills in the summer and in the winter. The plan includes funding that is available for multiple weeks to accommodate parts of the community that might not have power or access to resources for an extended period. At least one weatherization, strategic tree planting, or general vegetation planting program exists in the community for the purpose of reducing energy bills.
 5. The local government, local power utility, and/or a local community organization is working with community-based organizations to monitor, support, or assess the program designed to financially assist low-income households during or after winter cold snaps and extreme heat events. The assessment takes place on a regular basis to ensure the amount of funding is adequate. A robust combination of weatherization, strategic tree planting,



and vegetation planting programs exist in the community for the purpose of reducing energy bills.

- This question does not apply to my community. I have provided an explanation in the comments box.

Impact 9: Increased likelihood of impacts on drinking water sources and distribution infrastructure

A. Ensure back-up energy systems are in place for maintaining access to drinking water

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: Cities and Towns

Drinking water distribution systems, including access to cisterns, wells, and aquifers, rely on electricity to run pumps and treatment systems. Ensuring access to drinking water includes the presence of redundant pumps and power generation systems. On-site sources can include solar, wind, inline microturbines and biogas (i.e., methane from wastewater treatment). New and back-up electrical equipment should be located above potential flood levels.

- ✓ Please select the description that best aligns with the status of this action in your community.

1. The local government or local water utility has not assessed if it has any back-up pumps or power generation devices for its drinking water distribution system.
 2. The local government or local water utility has assessed its infrastructure and knows that it does not have any back-up pumps or power generation devices for its drinking water distribution system.
 3. The local government or local water utility is inventorying existing back-up systems and making a list of locations where back-up pumps or power generation devices are needed for its drinking water distribution system.
 4. The local government or local water utility is in the process of adding back-up systems within its water distribution system.
 5. The local government or local water utility has enough back-up pumps and power generation devices to ensure that water delivery will be maintained equitably throughout the community if a flood or other major disaster strikes.
- This question does not apply to my community. I have provided an explanation in the comments box.

B. Ensure drinking water treatment system capabilities are acceptable for predicted climate impacts

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: Cities and Towns

More frequent heavy rain events can lead to increased turbidity (the state of being cloudy with suspended particles) of drinking water sources. In addition, increased fertilizer use on agricultural lands due to more frequent heavy rain events can lead



to algal blooms in drinking water sources. Existing water treatment systems may be inadequate to handle significantly reduced source water quality. Improvements to existing treatment processes or the adoption of additional treatment technologies may be necessary to ensure that drinking water supply quality continues to meet standards as climate change impacts source or receiving water quality.

✓ Please select the description that best aligns with the status of this action in your community.

1. The local government has not assessed whether or not it needs to improve or expand its water treatment capabilities.
2. The local government is conducting a risk assessment of its water treatment system using future climate change scenarios.
3. The local government has conducted a risk assessment of its water treatment systems, and is determining if the systems in place are sufficient for projected water quality impacts. If needed, the local government is researching different adaptation options available to treat water of reduced quality, such as changes to operations and management of the treatment facilities, policy adaptations to improve water quality, and infrastructure investments.
4. The local government has implemented a plan to increase its treatment capabilities, if needed. The plan can include strategies to improve the process for treating water, efficiency upgrades, and infrastructure protections to deal with the increase in flow and decrease in water quality.
5. The local government's water treatment system is sufficient to handle projected water quality impacts. The local government conducts a regular audit to determine if its system is adequate for updated anticipated climate impacts.^j
 - This question does not apply to my community. I have provided an explanation in the comments box.

C. Improve efficiency of water use in local government operations

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Improving the efficiency of water use can help cities, towns, and counties save money and conserve resources. Water treatment and operations use a large amount of electricity. By being more efficient with water use, the local government will require less water treatment, which can reduce energy demand. As climate change impacts increase over time and more energy is demanded for other purposes (e.g. cooling), it will become more and more important to reduce energy use to prevent stress on the electrical grid. Additionally, using water inefficiently will help prevent water shortages during droughts or periods of contamination during floods.

✓ Please select the description that best aligns with the status of this action in your community.



1. The local government has not looked at improving water efficiency in its operations.
2. The local government is conducting a self-assessment, either internally or externally, to identify water use in its operations.
3. The local government is reviewing its self-assessment to determine areas for improvement, and is researching projects that will reduce inefficiencies.
4. For areas determined to be inefficient, the local government is implementing efficiency upgrades and practices, such as infrastructure upgrades, water reduction efforts, water recycling, system improvements, smart technology for monitoring, and more.
5. After completing comprehensive water efficiency upgrades and implementing best practices to reduce water use, the local government is conducting yearly audits to assess its current performance. The local government is continuing to increase water efficiency in their lower performing areas using the successful strategies identified during the yearly assessment.
 - This question does not apply to my community. I have provided an explanation in the comments box.

D. Develop a drought protection and response plan

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

Diversifying water sources helps to reduce the risk that water supply will fall below water demand. Examples of diversified source water portfolios include using a varying mix of surface water and groundwater, and establishing water trading with other utilities in times of water shortages or service disruption. Increasing available storage is another strategy to protect water levels. Methods for increasing drought tolerance include evaluating existing systems for water losses such as leaks and fixing them, monitoring aquifer storage and recovery, removing accumulated sediment in reservoirs, and lowering water intake elevation. Identifying an alternative water source is important for when all other options fail.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government or local water utility has not considered the need for drought-protection strategies or access to alternate water sources.
 2. The local government has some initiatives in place to maintain adequate access to drinking water, but a comprehensive strategy or plan has not been developed.
 3. The local government or local water utility is beginning to identify possible drought-protection strategies and alternate sources for water, such as a lake, aquifer, river, or rainwater harvesting and storage facility.
 4. The local government or local water utility has developed a drought protection and response plan to maintain the community's access to



drinking water. The plan includes strategies to increase the community's water storage capacity and diversify options for water supply.

5. The local government or local water utility has implemented its drought protection plan to maintain the community's access to drinking water. The local government has procedures in place if it becomes necessary to implement its drought response plan.
 - This question does not apply to my community. I have provided an explanation in the comments box.

E. Educate rural residents about the impacts of climate change on drinking water sources

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: Counties

Individuals who live in rural areas often do not have access to city or town water delivery services. Instead, they pump water from wells or cisterns, have water trucked in, or treat water from nearby waterways. Climate change can have a significant impact on the availability of safe drinking and non-potable water for rural residents. Pumps and treatment systems do not work during power outages, run dry during water shortages, and water sources can become bacteria-ridden in times of flood. Local governments, often through public health departments, can educate residents about threats that are likely to increase due to climate change, and about backup systems and other possible solutions.

- ✓ Please select the description that best aligns with the status of this action in your community.
1. Neither the local government, nor a community partner, has conducted any public education on the increasing threats to drinking water sources posed by climate change.
 2. The local government or a local partner has talked to a few residents about the increasing threats to drinking water sources posed by climate change, but an organized educational outreach program or campaign does not exist.
 3. The local government or a local partner has held at least one educational program or campaign to educate residents about the increasing threats to drinking water sources posed by climate change.
 4. The local government or a local partner is developing an educational outreach program or a regularly scheduled campaign on the threats to drinking water sources posed by climate change and on the importance of regular source water testing. The local government or a local partner is developing a plan to provide drinking water to rural residents unable to afford drinking water during droughts, floods, or other water emergencies.
 5. The local government or a local partner coordinates an educational outreach program or a regularly scheduled campaign on the threats to drinking water sources posed by climate change and on the importance of regular source water testing. The local government or a local partner



has a plan with an identified funding source to provide drinking water to rural residents unable to afford drinking water during droughts, floods, or other water emergencies.

- This question does not apply to my community. I have provided an explanation in the comments box.

Impact 10: Increased stress on wastewater treatment systems

A. Evaluate and upgrade the sewer system and sewage treatment infrastructure as needed

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Upgrading sewer system and sewage treatment infrastructure can reduce sewage contamination of waterways. Many communities in Indiana are working on long term control plans to address current and historical inadequacies in their wastewater treatment systems. Many are on court-ordered schedules and may be tentative to introduce new considerations into their work. However, as extreme rainfall and flooding become more common, sewage systems are increasingly at risk of being infiltrated by flood waters. In some communities, the infiltration can lead to overflows that force facilities to release untreated or partially treated sewage directly into waterways.^k

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not assessed whether it needs to upgrade its sewer system and sewage treatment infrastructure to handle increasing heavy precipitation events.
 2. The local government has begun an evaluation of its sewer system and/or sewage treatment infrastructure, and is starting to look into improvement strategies, where needed. This research may include working with consultants and researchers.
 3. The local government has completed an evaluation of its sewer and sewage treatment infrastructure and is creating a plan to complete needed upgrades, such as installing smart technology to monitor and manage water levels, building holding tunnels to provide extra capacity, installing gray and green stormwater infrastructure to reduce stormwater flowing into the sewage system, and more.
 4. The local government has upgraded its sewer system and/or treatment infrastructure to reduce or eliminate sewage contamination of waterways given anticipated increases in precipitation. Monitoring systems are in place to track the effectiveness of the system and the local government is continuing to look into other ways the system can be improved.
 5. The sewer system and sewage treatment infrastructure are sufficient to handle anticipated increases in precipitation. The local government monitors the system regularly.



- This question does not apply to my community. I have provided an explanation in the comments box.



Food and Agriculture

Increases in average annual temperature and extreme precipitation events are occurring more and more here in Indiana, and around the globe. These events can impede agriculture and food distribution systems. Many neighborhoods and communities already struggle with access to fresh and healthy food, and climate shifts and extreme weather are expected to make this situation worse. Increasing the community's understanding of where food comes from and how it is distributed, increasing local food production, and promoting and protecting farmers and farmland can help alleviate the stressor of food insecurity. Connectivity and equitability are key principals in this section.

Suggested Department(s): Planning, Sustainability, Community Services, Economic Development, Parks, Solid Waste

Impact 11: Increased likelihood of short-term and long-term food shortages of the local and global food supply

A. Protect farmland and urban farms and gardens

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Extreme weather will cause more frequent droughts and flooding, as well as alter and exacerbate pest and weed patterns. These changes threaten farmers' ability to produce food in rural and urban environments. They also threaten the overall productivity of the land and farming as a livelihood. Conserving farmland, encouraging healthy soil strategies, and ensuring that local policies support urban gardening are important steps in reducing greenhouse gases and ensuring productive farms and gardens.

- ✓ Please select the description that best aligns with the status of this action in your community.
1. Neither the local government nor a local partner (i.e. local or regional land trust) has any goals or mechanisms in place to protect and preserve farmland, and the local government has not evaluated existing zoning codes and ordinances to ensure that they support, and do not hinder, food production.
 2. The local government and/or partner have begun working on policies and programs to conserve and protect farmland. They have identified a small number of zoning codes and ordinances that could be updated to better support food production, but a comprehensive review has not been completed.
 3. The local government is developing a metrics-based goal to protect farmland, which includes protecting farmland that produces ecologically appropriate agricultural products and a diversity of other agricultural products. They have started a comprehensive evaluation of the



community's zoning codes and ordinances to ensure that they support, and do not hinder, food production such as urban farming and gardening.

4. The local government has begun working on ordinances, zoning, or other mechanisms to support farmland preservation while a local partner is working to permanently protect farmland in order to help support farmland preservation and future food production. The local government has completed a comprehensive review of land use regulations and policies in order to identify where they can remove barriers, create incentives, and fill gaps with respect to regulation of urban food production.
5. The local government has set a metrics-based goal to protect farmland, which includes protecting farmland that produces ecologically appropriate, locally-sold, and diverse agricultural products. The local government has adopted ordinances, codes, or other mechanisms to support farmland preservation while a local partner is working to permanently protect farmland in order to help support farmland preservation and future food production. The local government has completed a comprehensive review of land use regulations and policies and has adopted revisions to language that formerly restricted urban farms and gardens. Finally, local and regional organizations and agencies have established a program to assist farm owners in transferring operations and ownership of their farms to the next generation of farmers. The program supports land access for incoming farmers and the continuation of small and medium farms.
 - This question does not apply to my community. I have provided an explanation in the comments box.

B. Develop a plan to address local and global food supply emergencies

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Rising temperatures and extreme weather can affect the resilience of the food storage and distribution systems. Transit time, reliability, and efficiency can be negatively impacted by climate events as roadways and other infrastructure are damaged. Accordingly, communities should develop and maintain a plan to address local and global food supply emergencies, and be well prepared to enact it. Although local governments do not govern the distribution of food, residents often turn to their local governments when crises arise. Working with community organizations to make sure that at least one entity can oversee and implement a food shortage response plan is one way to increase resilience.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. Neither the local government nor a local partner organization has considered developing an emergency food plan for the community in partnership with hunger relief organizations, food producers, food



aggregators/processors/manufacturers, and others that provide food to locations within and outside the jurisdiction.

2. Neither the local government nor a local partner organization has an emergency food plan for the community, but they have some understanding of the area's businesses, agencies, and organizations that are part of the food system either via aggregation/processing/manufacturing/distribution, or by providing food in the community. The local government or partner organization also has general knowledge of the nearby farmers who produce food for human consumption.
3. Neither the local government nor a local partner organization has an emergency food plan for the community, but they are compiling a list of the nearby farmers who produce food for human consumption. The local government or a partner is also compiling a list of the area's businesses, agencies, and organizations that are part of the food system either via aggregation/processing/manufacturing/distribution, or by providing food in the community.
4. The local government or a partner is in the process of writing a comprehensive emergency food plan that contains processes to address local and global food supply emergencies, a list of the nearby farmers who produce food for human consumption, and a list of the area's businesses, agencies, and organizations that are part of the food system either via aggregation/processing/manufacturing/distribution, or by providing food in the community.
5. The local government or a partner has published and regularly updates a comprehensive emergency food plan that contains processes to address local and global food supply emergencies, a list of nearby farmers who produce food for human consumption, and a list of the area's food producers, aggregators/processors/manufacturers, distributors, and other food-related organizations. The local government or partner is well prepared to enact the plan, which has been shared with the community.
 - This question does not apply to my community. I have provided an explanation in the comments box.

C. Increase local food purchasing

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

Local food purchasing can encourage more resilient local production. As climate change increasingly threatens farm viability and distribution networks, a more diverse and localized set of food resources (farms, processors, distributors) can protect communities against food insecurity. When local governments and institutions prioritize, or even require, food purchases from local producers, the guaranteed market supports those local producers, who know there will be purchasers for their products. Local food procurement can support a robust local



food system that is more resilient and less vulnerable to external shocks such as droughts, heat waves, and hurricanes. Localized food systems also reduce energy used for transportation.

✓ Please select the description that best aligns with the status of this action in your community.

1. No programs or projects are in place to increase local food purchasing.
2. The local government is starting to review zoning codes to understand language that might create barriers for local food sales and purchasing. The local government is also starting to research and consider policies, ordinances, or resolutions that support local food procurement community-wide.
3. Some programs and projects are in place to encourage the existence and expansion of local food outlets such as farmers markets or local supply chains in existing grocery stores.
4. The local government is revising zoning codes to reduce unnecessary barriers for local food sales and purchasing, or one or more ordinance, policy, or resolution is being developed to support a diversity of local food outlets such as supermarkets, smaller groceries, farmers markets, and farm stands. The local government is considering incentives to support the purchasing of local food by larger institutions (e.g. schools, hospitals).
5. The local government has either verified that existing zoning codes do not create unnecessary barriers for local food sales and purchasing, or it has revised zoning codes to accomplish that goal. The local government has adopted an ordinance, policy, or resolution to support a diversity of local food outlets such as supermarkets, smaller groceries, farmers markets, and farm stands. The local government has one or more programs or incentives in place to support the purchasing of local food by larger institutions (e.g. schools, hospitals).
 - This question does not apply to my community. I have provided an explanation in the comments box.

D. Enhance food access

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

As climate impacts worsen, food systems may be disrupted, affecting food production, prices, and access. Programs to help with improving food resilience include education programs on in-home emergency food storage, resources and training on how to use food pantries and food banks, neighborhood-level education and outreach related to food assistance and food literacy resources, Supplemental Nutrition Assistance Programs (SNAP) in farmers markets, and the availability of transportation to access food outlets. Programs and projects that help reduce food deserts (parts of a community where it is difficult to find and/or afford good-quality



vegetables and other food) are especially important for building food resilience within a community.

✓ Please select the description that best aligns with the status of this action in your community.

1. No programs or projects are in place to address local food prices and physical access to food.
2. There are a few, small-scale initiatives to improve physical access to food and/or establish acceptable food prices for all income levels, but their success rate is unknown. There are a few food retailers in the community accept SNAP, WIC, and any other food vouchers.
3. The local government and/or local partner organizations are actively working to improve physical access to food, establish acceptable food prices for all income levels, and/or eliminate food deserts within the community. Many food retailers in the community accept SNAP, WIC, and any other food vouchers.
4. Food deserts are measurably being reduced or eliminated and initiatives are in place to address physical and economic access to food. The local government and/or community organizations are actively working on initiatives to improve food access for vulnerable residents. SNAP, Disaster SNAP, and other food vouchers are accessible to vulnerable communities via appropriate education, office siting, and subsidized cost of EBT equipment for retailers.
5. Programs and projects are in place across the entire community to address issues related to physical access to food and to establish acceptable food prices for all income levels. These programs have led to the elimination or near elimination of food deserts in the community. Vulnerable residents within the community have the same, if not easier, access to food as other groups.
 - This question does not apply to my community. I have provided an explanation in the comments box.

E. Support efforts to protect pollinators

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

Crop species that produce food for human and animal consumption depend on pollinators, and more specifically plant-pollinator interactions. Pollinator populations are already declining due to changing and decreasing habitats and increases in disease due to rising temperatures and longer growing seasons. Some scientists suspect the increased use of pesticides (due to extended growing seasons) impacts pollinator health, as well. Supporting a high diversity of pollinators is important for food production even when managed bees are present in high numbers. Local governments can help insect (e.g., bees, butterflies, moths, wasps) and vertebrate (e.g., hummingbirds, bats) pollinators on publicly owned and managed land by selecting pollinator-friendly plants in landscaping and green



infrastructure installations, and through public education and planning policies and documents.¹ See the USEPA's resources on [best management practices to protect pollinators](#).

✓ Please select the description that best aligns with the status of this action in your community.

1. No programs or projects are in place to protect pollinators.
 2. The local government has planted one or more pollinator garden(s) and/or has conducted some public education and outreach on the importance of planting pollinator-friendly plants.
 3. The local government has planted more than one pollinator garden and/or has worked with other local landowners to plant pollinator-friendly habitat or landscaping. The local government or a local partner conducts public education and outreach on the importance of planting pollinator-friendly plants and using pollinator-friendly pest-management strategies.
 4. The local government has planted several pollinator gardens and/or has worked with several local landowners to plant pollinator-friendly habitat or landscaping. The local government is considering a pollinator-friendly policy for publicly owned and managed land requiring staff to manage for improved foraging, reproduction, nesting, and overwintering habitat; prioritize the selection of pollinator-friendly plants in landscaping and green infrastructure installations; and use pollinator-friendly pest-management strategies.
 5. The local government has adopted a pollinator-friendly policy for publicly owned and managed land requiring staff to manage for improved foraging, reproduction, nesting, and overwintering habitat; prioritize the selection of pollinator-friendly plants in landscaping and green infrastructure installations; and use pollinator-friendly pest-management strategies. The local government and/or a local partner conducts regular outreach and education on the importance of protecting pollinators.
- This question does not apply to my community. I have provided an explanation in the comments box.

F. Reduce food waste and increase organic matter composting

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

Food that goes to waste, from any point along the supply chain from farm to table, represents a major and unnecessary loss of food and organic matter. Uneaten food could instead be captured and repurposed to feed people and/or enrich ecosystems as compost. The US Department of Agriculture tracks food waste according to two levels: (1) Consumer-level losses are discarded after they reach the home, restaurant, or other institution that serves prepared meals (including schools, universities, hospitals, nursing homes, jails, and company and other cafeterias). (2) Primary/retail-level losses due to spoilage, expiration, trimming, and culling as food



travels through the farm gate, on to processing, transport, and distribution, to arrive in warehouses and grocery stores.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. Neither the local government nor a designated partner has any mechanisms in place for tracking or mapping food waste or efforts to divert and recapture.
 2. The government has no formal tracking/mapping procedures, but has some awareness of local sources of food waste and local efforts to divert/recapture primary-level and consumer-level food waste.
 3. The local government or a designated partner is developing a formal plan to track, map, divert, and recapture local sources of primary/consumer food waste.
 4. The local government or a designated partner has and regularly updates a formal plan to track, map, divert, and recapture local sources of primary/consumer food waste.
 5. The local government has adopted one or more ordinances, resolutions, or policies that supports tracking, mapping, diverting, and recapturing food waste. Programs and projects are in place across the entire community to reduce food waste and divert and recapture wasted food as livestock feed, compost, or other product that adds value to the local food, farming, and ecological system. These programs have led to the elimination or near elimination of food waste going into the landfill or other permanent waste deposit. Food waste recapture provides an enterprise and a livelihood for citizens. The locality is a closed system for food waste, and recaptures nearly all food waste matter for its own enrichment.
- This question does not apply to my community. I have provided an explanation in the comments box.



Natural Resources

Natural ecosystems consist of networks of plants, animals, and microbes that have adapted to the existing climate. Ecosystems provide humans with many benefits, including pollination of crops, regulation of pests and disease, and water and air purification. These are known as “ecosystem services.” Anticipated changes in average annual temperatures and shifting seasons will cause changes in the timing of species growth and migration. These changes will lead to disruptions in how species rely on one another, shifts in species ranges, and/or loss or gain of species, including increased invasions of exotic species. Such disruptions will threaten the natural biological diversity of ecosystems and the many services that flow from ecosystems. Local governments can help protect sensitive habitat and the quality of water and land-based ecosystems by learning more about their jurisdiction’s natural resources, educating the public about the importance of biodiversity and how their land management choices matter to it, increasing land and water protection activities, protecting and expanding green infrastructure installations that provide temperature and flood mitigation services, and managing land and aquatic environments for specific climate change impacts. Redundancy and equitability are key principals in this section.

Suggested Department(s): Parks, Forestry, Planning, Sustainability

Impact 12: Increased likelihood of impacts on the health and beneficial functionality of inland wetlands and waterways

A. Maintain, restore, and protect wetlands

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Climate changes such as drought, warmer temperatures, and changing precipitation patterns can all affect the health and beneficial functionality of wetlands. Climate changes in combination with other stressors, such as land development, may further exacerbate the loss of wetlands. Healthy wetlands support exceptionally robust ecosystems that protect and improve water quality, provide fish and wildlife habitats, store floodwaters, and maintain surface water flow during dry periods. Seasonal ponds, or areas that temporarily hold water after heavy rains and periodically dry up, are especially important in the Midwest. Taking steps to understand your community’s existing wetlands and expand or improve their functionality provides multiple community benefits.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government is not actively maintaining, restoring, or protecting wetlands or seasonal ponds.
 2. The local government is actively researching strategies to maintain, restore, and protect wetlands and seasonal ponds.



3. The local government has identified and mapped its wetlands and seasonal ponds and is making a plan to maintain, restore, and protect them.
4. The local government has identified and mapped its wetlands and seasonal ponds and is starting to implement strategies to maintain, restore, and protect them. The local government is considering locations for new wetland installations.
5. The local government has implemented ongoing strategies to maintain, restore, and protect the community's wetlands and seasonal ponds. At least one of the following strategies has been implemented: zoning is in place to protect wetlands and seasonal ponds; the local government has adopted an environmental protection overlay district that includes wetlands and seasonal ponds; or the local government requires that the elimination of a wetland must prompt the construction or reconstruction of another wetland within the same watershed. The local government is considering or has installed new wetlands.
 - This question does not apply to my community. I have provided an explanation in the comments box.

B. Identify waterways available for improved ecological management

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

As climate change progresses, it will likely become increasingly difficult to maintain the health of Indiana's lakes, wetlands, creeks, and streams. The Indiana Department of Environmental Management (IDEM) develops [Indiana's 303\(d\) List of Impaired Waters](#) (the "303(d) list") as part of the state's Integrated Water Monitoring and Assessment Report (IR), which is submitted to the USEPA every two years in accordance with the Clean Water Act (CWA). Local governments can support the removal of stream segments from the 303(d) list by identifying and contributing to restoration and protection initiatives and plans. [Find impaired waters in your jurisdiction.](#)

- ✓ Please select the description that best aligns with the status of this action in your community.
1. The local government has not considered any efforts to support the removal of stream segments from the 303(d) list.
 2. The local government, or a community partner, has identified the stream segments within its jurisdiction that are listed on the 303(d) list, but has not started researching ways to contribute to their improved ecological management.
 3. The local government, or a community partner, has identified the stream segments within its jurisdiction that are listed on the 303(d) list, and has started researching ways to contribute to their improved ecological management.



4. The local government, or a community partner, has identified the stream segments within its jurisdiction that are listed on the 303(d) list, has identified strategies to contribute to their improved ecological management, and is leading or participating in a near-term plan with a schedule and milestones.
5. Either the local government monitors 303(d) list submissions every two years and does not have any impaired waterways within its jurisdiction, or, the local government, or a community partner, has completed efforts successful enough to submit for the removal of one or more waterways from the 303(d) list.
 - This question does not apply to my community. I have provided an explanation in the comments box.

C. Develop a watershed-wide approach to water quality management with neighboring jurisdictions

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

As air temperatures rise, so will water temperatures in freshwater systems. Warmer water temperatures in deep lakes slow processes that add oxygen to the water, contributing to dead zones (areas with less oxygen that are unable to support life). These dead zones can produce large-scale fish mortality and toxic algal blooms. In addition, earlier snowmelt caused by rising temperatures, higher precipitation amounts, and more severe weather and flooding will impact the reproduction abilities of aquatic species. Healthy water quality is good for ecosystems, human health, and recreation and tourism. Governments can help improve and protect local water quality by bringing together monitoring groups, natural recreation entities, farming organizations, industries and other relevant agencies, organizations, and individuals that make regular decisions that impact or help the area's water quality. These groups can help change existing harmful practices and address barriers presented by different regulations, budget limitations, and expectations for growth.

- ✓ Please select the description that best aligns with the status of this action in your community.
1. The local government has not met with other local governments within its watershed to discuss water quality management issues.
 2. The local government will soon attend or is in the process of planning a watershed-wide meeting of local governments to discuss water quality management issues.
 3. The local government is working with other local governments within its watershed to identify problem areas and solutions to maintain, restore, and protect its local water quality.
 4. The local government and other local governments within its watershed are implementing a plan to maintain, restore, and protect its water quality.



5. The local government and other local governments within its watershed have implemented joint solutions to maintain, restore, and protect its water quality. These communities meet regularly to evaluate the results of the implemented solutions and tweak them as needed.
 - This question does not apply to my community. I have provided an explanation in the comments box.

D. Implement an educational campaign for farmers and landowners to promote responsible use of fertilizers and pesticides (e.g., herbicides, insecticides)

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

A key element of maintaining water quality is to reduce excess nutrient and pesticide pollution and the resulting adverse impacts, including harmful algal blooms. [Harmful algal blooms](#) are overgrowths of algae in water. Some produce dangerous toxins in fresh water, but even nontoxic blooms hurt the environment and local economies. One of the primary sources of excess nutrient pollution is animal manure and chemical fertilizers applied to farm fields and lawns. The over-application of these treatments can result in runoff that carries excessive nutrients into lakes, streams, and groundwater. Likewise, the over-application of pesticides can result in runoff of chemicals that harm wildlife and human health. [See an example educational fact sheet about lawn chemicals](#). Consult with your local [Soil and Water Conservation District](#) for assistance with helping local farmers and landowners use fertilizers and pesticides efficiently and safely.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. Neither the local government nor partner organizations offer educational programming or materials on the correct application of fertilizers and pesticides.
 2. The local government, or a partner organization, offers some community education on the correct application of fertilizers and pesticides, but the education is not widespread.
 3. The local government or a partner organization is in the process of developing a more comprehensive community education program on the correct application of fertilizers and pesticides.
 4. The local government or a partner organization actively offers community education on the correct application of fertilizers and pesticides. The education includes information on preventing polluted runoff, such as maintaining rainwater on properties via native plants' deeper root system and other water-retention mechanisms. The program works in partnership with local lawn-care companies and other groups to distribute information.^m
 5. The local government or a partner organization actively offers community education on the correct application of fertilizers and pesticides. The education includes information on preventing polluted runoff by



maintaining rainwater on properties via landscaping with native plants and other water-retention mechanisms. The program works in partnership with local lawn-care companies and community groups to distribute information, and includes specific outreach to farmer networks.

- This question does not apply to my community. I have provided an explanation in the comments box.

Impact 13: Threatened habitat, breeding, and survival of sensitive species

A. Promote habitat restoration through native landscaping and conservation on public and private property

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Sensitive species rely on native plants and specific habitats for survival. Human development has reduced native habitat availability, and what's left is particularly at risk due to climate change. For example, as the climate changes, non-native, invasive plants are increasingly crowding out natives, reducing habitat and food availability for reliant animals and other species.ⁿ Promoting and planting more native plants increases the likelihood of sensitive species' survival. Co-benefits of native landscaping and habitat restoration include increased flood storage, better water quality, and habitat for pollinators.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not planted native landscaping or completed habitat restoration projects on public-owned property. Neither the local government nor community partners offer educational materials or programming to promote such efforts.
 2. The local government has completed a few native plantings on public property, but has not considered a more comprehensive commitment to natural habitat promotion and restoration to support sensitive species.
 3. The local government has completed a few native plantings on public property and it, or a local partner, conducts educational outreach on the importance of native landscaping and healthy habitats to support sensitive species. The local government is researching ways to support a community-wide commitment to habitat restoration.
 4. The local government has made a formal commitment to using native plants in new public landscaping projects and it, or a local partner, conducts educational outreach on the importance of native landscaping and healthy habitats to support sensitive species. The local government has supported private-sector or residential habitat restoration and native landscaping projects, either financially or through partnerships.
 5. The local government has made a formal commitment to using native plants in new public or publicly-supported landscaping projects and it has



converted a few existing landscapes on public property. The local government, or a local partner, conducts educational outreach on the importance of native landscaping and healthy habitats to support sensitive species. The local government has supported private-sector or residential habitat restoration and native landscaping projects, either financially or through partnerships.

- This question does not apply to my community. I have provided an explanation in the comments box.

B. Promote and support efforts to control and eradicate invasive plants

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

As the climate changes, invasive plants are outpacing native species at an increasing rate. Although invasive species can be tricky, if not impossible, to eradicate, minimizing their spread can be achieved to support habitat for sensitive plant and animal species. In early 2019, the State of Indiana [passed a rule that bans the sale of 44 species of invasive plants](#). Local governments can further support the control of invasive species through monitoring, management, proper removal strategies, and public education programs. Because invasive species are seldom eradicated and species' habitat is shifting as the climate changes, an important part of management includes initiating conversations about the social, economic, and ecological values a community places on different native and non-native species. These community conversations help navigate management tradeoffs. [Learn more about invasive species present in Indiana](#).

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not launched any initiatives to address the spread of invasive species, nor has it identified areas laden with invasive plants within its jurisdiction.
 2. The local government knows of some areas with invasive plants within its jurisdiction, but it has not taken steps to monitor, manage or remove them.
 3. The local government, or a community partner, knows of some areas with invasive plants within its jurisdiction, has started to monitor their spread, and has begun planning or implementing removal or control strategies.
 4. The local government, or a community partner, has begun to comprehensively locate and monitor areas with invasive plants within its jurisdiction. Staff and/or community groups are testing effective removal and control strategies. The local government, or a community partner, has an invasive species education program.
 5. The local government, or a community partner, monitors known locations of invasive plants within its jurisdiction. The local government is considering or has adopted an invasive plant management strategy or



plan that discusses the tradeoffs associated with managing different native and non-native species. The local government or partner is actively applying these strategies to remove and control non-native plants. The local government, or a community partner, has an invasive species education program.

- This question does not apply to my community. I have provided an explanation in the comments box.

C. Encourage continuous blocks of forests and avoid fragmentation

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Forest fragmentation, driven primarily by human development, occurs when habitats are broken apart into smaller and more isolated fragments.^o As the climate changes, there are increased stresses on sensitive species that can cause them to need to relocate as their traditional habitat is no longer suited to them. If forests are fragmented, however, sensitive species might not be able to effectively relocate to a new area and instead be stuck in their old habitat where they cannot survive. By encouraging continuous blocks of forests, avoiding fragmentation, and promoting native landscaping, sensitive species will be able to transverse areas and stay connected to productive habitats where they can survive and reproduce. Consulting with wildlife officials can help determine the corridor size needed based on the species in the area.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not considered policies and practices to encourage continuous blocks of forests and limit the fragmentation of habitats.
 2. The local government has continuous blocks of forests within its jurisdiction. While the local government recognizes the forest's value, it is not actively taking steps to protect continuous blocks of forest from development.
 3. The local government has started working on a habitat connectivity plan or initiatives or programs that support the protection and/or expansion of continuous blocks of forests.
 4. Either the local government has adopted a habitat connectivity plan and is not actively working on it, or the local government has launched programs or has practices that support the protection and/or expansion of continuous blocks of forests.
 5. The local government has adopted a habitat connectivity plan, and has implemented zoning ordinances to support its goals. The local government runs programs and/or has integrated into existing practices projects that support the protection and/or expansion of continuous blocks of forests.



- This question does not apply to my community. I have provided an explanation in the comments box.

D. Identify and protect ecologically significant (“critical”) areas such as nursery grounds, spawning grounds, and areas of high species diversity

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

As climate change continues, certain species will not be able to survive increasing average temperatures and other impacts. Areas high in biodiversity and healthy habitats suitable for species to reproduce may fall into decline, causing species’ numbers to decrease or even disappear. The following resources are available to help local governments achieve this action.

- Determining which areas are ecologically significant - Local governments can identify ecologically significant areas by talking to the State Department of Natural Resources about which of the species listed in the [Indiana Species of Greatest Conservation Need list](#) are located within their jurisdiction. [The Nature Conservancy in Indiana](#) or a local biologist may also be available to consult on this issue.
 - Determine how to protect sensitive species - Local governments can refer to the [State Wildlife Action Plan](#) to learn actions they can take to protect habitats of sensitive species. View the [IDNR’s map that shows areas of greatest need of conservation within the state](#). Protecting and expanding critical habitats will make the overall ecosystem more resilient to environmental changes.
- ✓ Please select the description that best aligns with the status of this action in your community.
1. The local government has not identified ecologically significant habitats within its jurisdiction.
 2. The local government has an idea of where a few ecologically significant habitats are located within its jurisdiction, but it has not comprehensively identified these locations.
 3. The local government is starting to research how to comprehensively identify ecologically habitat within its jurisdiction.
 4. The local government has identified ecologically significant habitats within its jurisdiction and is developing policies to protect and maintain their existence.
 5. The local government has identified ecologically significant habitats within its jurisdiction, has adopted policies to protect and maintain their existence, and is developing plans to expand these locations or replicate these habitat types.
- This question does not apply to my community. I have provided an explanation in the comments box.



Impact 14: Affected health and beneficial functionality of rural and urban forests, and other natural green spaces

A. Measure, maintain, protect, and expand the jurisdiction's tree canopy

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Climate change has already impacted the types of trees suitable for urban areas and rural forests in Indiana, and will continue to affect the tree species that are able to survive in the region. Depending on the region, changes in temperatures and precipitation are expected to reduce habitat suitability for some species and increase habitat suitability for others. See [Indiana's Future Forests: A Report from the Indiana Climate Change Impacts Assessment](#) for further discussion on this topic and a list of tree habitat suitability by Indiana region. City, town, and county governments can take steps to protect and expand the area's tree canopy.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not considered any initiatives to measure, maintain, protect, or expand its tree canopy.
 2. The local government regularly plants new trees or supports community efforts to do so, but it does not have a comprehensive approach to tree canopy protection and growth.
 3. The local government has started researching or is in the process of conducting a tree canopy assessment. The local government, or a community partner, supports canopy protection and/or expansion through tree plantings, maintenance, and protection efforts.
 4. The local government has conducted a tree canopy assessment and is developing a strategy or formal plan to continue or fortify measurement, maintenance, and planting initiatives. The strategy or plan gives attention to the diversity, composition, age structure, and equitable distribution of its tree canopy and the various stewardship groups that help to care for it. The local government is starting to identify reforestation opportunities.
 5. The local government has conducted a tree canopy assessment and has completed a strategy or formal plan to continue or fortify measurement, maintenance, and planting initiatives. The strategy or plan gives attention to the diversity, composition, age structure, and equitable distribution of its tree canopy and the various stewardship groups that help to care for it. The local government is practicing pest and pathogen monitoring and management initiatives, is selecting and recommending tree plantings based on native species listed as appropriate for anticipated climatic changes, and has identified one or more reforestation opportunities. The local government is considering or has adopted tree and/or forest protection policies and is starting to work with developers to lessen tree removal during new construction.



- This question does not apply to my community. I have provided an explanation in the comments box.

B. Measure, maintain, protect, and expand green spaces, and identify public land available for improved ecological management

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

- ✓ Please select the description that best aligns with the status of this action in your community.

1. The local government has not considered any initiatives to measure, maintain, protect, or expand its green space.
 2. The local government regularly maintains its public parks and forests (if present), but it does not have a comprehensive approach to green space protection and expansion.
 3. The local government has started to identify and map its green spaces, including public and private parks and forests, green infrastructure (e.g., rain gardens and bioswales), undeveloped green spaces, and urban gardens.
 4. The local government has completed or nearly completed a map of its green spaces, and is developing a strategy or formal plan to continue or fortify ongoing tracking, maintenance, and protection initiatives. The strategy or plan gives attention to the diversity, composition, connectivity, and equitable distribution of its green spaces and the various stewardship groups that help to care for them. The local government is starting to identify public property that has a high potential for improved ecological management. The local government or other public entities, such as school districts, transit authorities, and others, own the land under consideration.
 5. The local government has completed a map of its green spaces, and has completed a strategy or formal plan to continue or fortify ongoing tracking, maintenance, and protection initiatives. The strategy or plan gives attention to the diversity, composition, connectivity, and equitable distribution of its green spaces and the various stewardship groups that help to care for them. The local government has identified public land that has a high potential for improved ecological management and is developing a strategy to support its improvement, either by acquiring the land or supporting community partners' efforts to do so.
- This question does not apply to my community. I have provided an explanation in the comments box.

C. Identify and protect erosion-prone areas

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

As heavy precipitation events become more intense, erosion is becoming more common along rivers, lakes, and streams. The Indiana Department of Natural



Resources provides [a map of approximate areas of stream migration](#). Local governments can take erosion and stream and river migration into account when determining setback requirements.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not identified erosion-prone areas within its jurisdiction.
 2. The local government has an idea of where erosion-prone land is located within its jurisdiction, but it has not started researching solutions.
 3. The local government has an idea of where erosion-prone land is located within its jurisdiction, and it has started researching how current zoning codes, ordinances, and other policies may interact with erosion-prone land.
 4. The local government has comprehensively listed or mapped its erosion-prone land, and is developing a plan to restore two or more locations. The local government is starting to revise current zoning codes, ordinances, and other policies that could protect erosion-prone land.
 5. The local government either does not have any erosion-prone land, or has comprehensively listed or mapped its erosion-prone land, actively monitors it during and after heavy rain events, has a strategy or plan to restore the land, and is starting to implement those strategies, or work with community partners to do so. The local government has assessed its zoning codes, ordinances, and other policies, and has either revised them or ensured that they are written to protect erosion-prone land.
- This question does not apply to my community. I have provided an explanation in the comments box.



Planning and Land Use

Local governments can integrate readiness initiatives into their everyday activities and create voluntary programs to try to encourage the private sector to prepare for climate change impacts. While these initiatives help a community start to think about the gravity of more frequent heat waves and floods as well as their downstream impacts, it often takes regulatory mechanisms and long-term planning to truly address local climate vulnerabilities. This section discusses many of the same issues covered under previous categories, but focuses on ways to integrate preparedness into a community's comprehensive plan, land use codes, and ordinances. Many local governments around the country are starting to integrate climate preparedness into long-range planning and policies. Diversity, redundancy, modularity, connectivity, regenerative ability, and equitability are key principals in this section.

Suggested Department(s): Planning, Codes and Regulations, Community Services, Sustainability

Impact 15: More frequent floodplain inundations and surface flooding

A. Complete the USEPA's Flood Resilience Checklist

Relevant Vulnerabilities: Floodplain Land Use

Relevant To: All Communities

The USEPA has developed the "[Flood Resilience Checklist](#)" to help local governments understand their preparedness for flood events. The checklist includes overall strategies to improve flood resilience as well as specific strategies to conserve land and discourage development in river corridors; to protect people, businesses, and facilities in vulnerable settlements; to direct development to safer areas; and to implement and coordinate stormwater management practices throughout the whole watershed. This checklist can help communities identify opportunities to improve their resilience to future floods through policy and regulatory tools, including comprehensive plans, Hazard Mitigation Plans, local land use codes and regulations, and non-regulatory programs implemented at the local level.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not completed the USEPA's Flood Resilience Checklist.
 2. The local government has completed the USEPA's Flood Resilience Checklist, and has checked "Yes" for 15 or fewer questions.
 3. The local government has completed the USEPA's Flood Resilience Checklist, and has checked "Yes" for between 16 and 25 questions.
 4. The local government has completed the USEPA's Flood Resilience Checklist, and has checked "Yes" for between 26 and 40 questions.
 5. The local government has completed the USEPA's Flood Resilience Checklist, and has checked "Yes" for 41 or more questions. The total number of questions on the checklist is 55.



- This question does not apply to my community. I have provided an explanation in the comments box.

B. Participate in the National Flood Insurance Program Community Rating System

Relevant Vulnerabilities: Floodplain Land Use

Relevant To: All Communities

As waterway flood events become more frequent, flood insurance will likely become more expensive for home and building owners. The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program offered by the Federal Emergency Management Agency (FEMA) that recognizes and encourages community floodplain management activities that exceed the minimum National Flood Insurance Program requirements.^p Local governments participating in the CRS can access discounted flood insurance premium rates for property owners to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS:

- Reduce flood damage to insurance property;
- Strengthen and support the insurance aspects of the NFIP; and
- Encourage a comprehensive approach to floodplain management.

By participating, a community accrues points to improve its CRS Class rating and receive increasingly higher discounts. Points are awarded for engaging in any of the 19 creditable activities organized under four categories: public information, mapping and regulations, flood damage reduction, and warning and response.^q

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government does not participate in the NFIP.
 2. The local government participates in the NFIP and has adopted a floodplain ordinance that has been reviewed and approved by the Indiana Department of Natural Resources (Indiana DNR) and FEMA. The ordinance meets the minimum Federal and State requirements for floodplain management.
 3. The local government participates in the NFIP and has adopted a floodplain ordinance that meets the minimum Federal and State requirements for floodplain management and has been reviewed and approved by the Indiana DNR and FEMA. The local government is effectively enforcing the floodplain regulations. The local government has adopted higher standards and is conducting activities to lower the flood risk within the community.
 4. The local government, which is actively participating in the NFIP, has been awarded a CRS Class rating of either 8 or 9, and verifies that it is continuing to perform the activities that are being credited by the CRS by submitting an annual recertification. The local government is working to improve its Class rating by undertaking new mitigation and floodplain management activities that earn even more points.

5. The local government, which is actively participating in the NFIP, has been awarded a CRS Class rating between 1 and 7 and verifies that it is continuing to perform the activities that are being credited by the CRS by submitting an annual recertification. The local government is working to improve its Class rating by undertaking new mitigation and floodplain management activities that earn even more points.
 - This question does not apply to my community. I have provided an explanation in the comments box.

C. Integrate stormwater retention into zoning codes, comprehensive plans, and ordinances

Relevant Vulnerabilities: Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Green stormwater infrastructure, or the installation of plants and other natural vegetation to manage stormwater on-site, helps keep rainwater out of the stormwater system, which can reduce the impact or the chance of surface or river flooding. To comprehensively increase the amount of stormwater being managed on-site throughout the community, local governments can:

- Integrate green stormwater infrastructure into government processes and plans such as street design standards, capital planning, public investment guidelines, and the construction of public buildings and on public land.
- Develop a community-scale stormwater retention plan, such as a green infrastructure plan, or integrate these practices in a local government’s comprehensive plan.
- Create zoning codes with stormwater retention requirements for new construction and substantial renovations. Zoning codes can either specify retention requirements for property owners installing green stormwater infrastructure or can enumerate several practices that can be used to meet the requirement, such as open space minimums.
- Stormwater ordinances can directly require green infrastructure or open space practices. Additionally, stormwater ordinances can serve as a foundational regulation to encourage green infrastructure or open space as a method of meeting retention requirements. Stormwater ordinances can link on-site stormwater management to reductions in stormwater fees, or can simply require retention and/or green infrastructure practices.
- Financial incentives such as subsidies, grants, and rebates can make the initial capital costs needed to install green stormwater infrastructure seem less daunting, while tax incentives can reduce costs to the property owners over time.

Read more about regulatory tools and sample language for on-site stormwater retention on the [Georgetown Climate Center website](#).

- ✓ Please select the description that best aligns with the status of this action in your community.



1. The local government has not integrated stormwater retention into its internal practices or into any planning documents, regulations, or incentives.
2. The local government has installed a few pilot on-site stormwater retention practices, but has not adopted a policy requiring on-site stormwater retention on all new and renovated public properties.
3. The local government has adopted a policy requiring staff to use green infrastructure, open space minimums, or other on-site stormwater retention practices in renovations and new construction on public land.
4. The local government has adopted a policy or passed an ordinance requiring staff to use green infrastructure, open space minimums, or other on-site stormwater retention practices in renovations and new construction on public land. The local government is either in the process of developing a community-scale green infrastructure plan, or is in the process of integrating green infrastructure into its comprehensive plan. The local government is looking into ways it can increase green infrastructure on private lands.
5. The local government has passed an ordinance requiring staff to use green infrastructure, open space minimums, or other on-site stormwater retention practices in renovations and new construction on public land. The local government has either developed a community-scale green infrastructure plan, or has integrated green infrastructure or other on-site stormwater retention into its comprehensive plan. The local government has adopted at least one mechanism (planning-based, regulatory, or incentive-based) for increasing on-site stormwater retention on private property.
 - This question does not apply to my community. I have provided an explanation in the comments box.

D. Set pervious cover minimums or impervious cover maximums, or offer incentives

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Permeable cover is a paving or other land cover treatment that provides a usable hard, yet porous, surface that allows for water infiltration. Local governments can create incentives, set requirements, or do a combination of both to encourage the use of permeable cover instead of impermeable cover such as asphalt and concrete.^r Permeable, or porous, land cover can help divert run-off from entering stormwater management systems or bodies of water, reducing treatment costs, water pollution, flooding, and energy use for water treatment. Permeable cover also has the potential to reduce the urban heat island effect because it does not absorb and release as much heat as its impervious counterpart. Although permeable land cover options can be expensive and maintenance requirements are high, the technology is improving and decreasing in cost. With proper maintenance, this product offers multiple benefits in any environment. Low-traffic areas, such as parking lots, are an



excellent location for pervious cover. Learn more about [pervious pavement](#) on the U.S. Environmental Protection Agency website, and about [pervious pavement incentives and requirements](#) on the Sustainable Development Code website.

✓ Please select the description that best aligns with the status of this action in your community.

1. The local government has not set a pervious cover minimum or an impervious cover maximum, and does not offer incentives for using pervious cover.
 2. The local government has tested a pervious cover in a few locations, but has not adopted any incentives, ordinances, or zoning codes that promote their use.
 3. The local government has adopted a policy or passed an ordinance requiring staff to use pervious cover in renovations and new construction on public land. The local government is researching possible incentives, or ordinances and zoning codes that would set a pervious cover minimum or an impervious cover maximum. The local government is researching pervious cover best practices that could be used by developers.
 4. The local government has passed an ordinance requiring staff to use pervious cover or vegetation in renovations and new construction on public land. The local government either offers a pervious cover incentive or has proposed an ordinance or zoning code requiring a pervious cover minimum or impervious cover maximum on private land. The ordinance or zoning code has yet to pass.
 5. The local government has passed an ordinance requiring staff to use pervious cover or vegetation in renovations and new construction on public land. The local government either offers a pervious cover incentive or has adopted an ordinance or zoning code requiring a pervious cover minimum or impervious cover maximum on private land.
- This question does not apply to my community. I have provided an explanation in the comments box.

Impact 16: Increased warm season temperatures in developed areas

A. Pass a tree canopy ordinance

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

The presence of an extensive tree canopy is associated with measurable decreases in air temperature, compared to areas without dense tree cover. Trees that shade impervious surfaces, such as streets and parking lots, contribute significantly to lowering urban temperatures. In addition, trees can help absorb rainwater, keeping it out of stormwater systems. A tree canopy ordinance can facilitate the protection and growth of trees within a jurisdiction by requiring minimum canopy coverage per site, setting tree replacement standards, and/or distributing credits to developers that plant more trees than required. Local governments have a variety of options



when it comes to drafting these ordinances.^s [More information about tree canopy cover ordinances and sample language](#) is available on the Sustainable Development Code website.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not attempted to pass a tree canopy protection ordinance.
 2. The local government has attempted to pass a tree canopy protection ordinance, but has not yet succeeded.
 3. The local government has passed a tree canopy protection ordinance that covers trees on public property, but has not attempted or succeeded in passing an ordinance that covers trees on private property.
 4. The local government has passed a tree canopy protection ordinance that covers trees on public property, and has either passed an ordinance that covers trees on private property or offers incentives for private property development that exceeds an established minimum tree canopy.
 5. The local government has passed a tree canopy protection ordinance that covers trees on public and private property, and offers incentives for private property development that exceeds an established minimum tree canopy.
- This question does not apply to my community. I have provided an explanation in the comments box.

B. Designate vegetation protection areas

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Local governments can adopt vegetation protection areas or zones to designate sections of land to be restored or kept for plants. Using land development codes, comprehensive plans, standalone ordinances, overlay districts, or zoning regulations, local governments can limit development and require the area to only have plant life and introduce diverse, native vegetation (robust biodiversity keeps invasive species at bay). Local governments have a variety of options when it comes to drafting these policies, including creating primary and secondary protection designations. Protection zones are often located near wetlands or preserves to limit development in areas that are essential for wildlife habitats, but they are also useful for maintaining greenery in developed areas to provide cooling benefits during summer months.^t [Find more information about vegetation protection zones and sample ordinance and zoning language](#) on the Sustainable Development Code website.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not designated any vegetation protection areas.



2. The local government has designated one or more vegetation protection areas within its jurisdiction, but the practice is not integrated into an ordinance, zoning code, or overlay.
3. The local government has designated vegetation protection areas with at least one overlay zone that has minimum development in the designated area, with few exceptions for development.
4. The local government has designated vegetation protection areas and they have a natural vegetation zone and a transition zone. The natural vegetation zone has minimum development in the area, with few exceptions for development, while the transition zone extends beyond the natural vegetation zone to provide distance from developed land.
5. The local government has designated vegetation protection areas and is offering incentives for meeting or exceeding the requirements. The vegetation protection areas have at least one zone that is fully protected from development.
 - This question does not apply to my community. I have provided an explanation in the comments box.

C. Promote energy efficiency and waste heat reduction

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

As buildings and vehicles operate, they release waste heat, which contributes to nearby temperatures. The promotion of electric vehicles and other transportation options can help reduce the heat coming out of tailpipes, and these initiatives are covered in another question. In addition to reducing the amount of waste heat coming from buildings, energy efficiency initiatives reduce energy costs and greenhouse gas emissions, which contribute to the severity of climate change. To encourage energy efficiency efforts, local governments can use policy tools such as voluntary and mandated energy benchmarking. These policy tools encourage owners of buildings larger than a stated square footage to report energy use publicly. Building owners can track energy use voluntarily using the USEPA’s [Portfolio Manager](#), a free, publicly available software. ⁴ [Learn more about energy benchmarking and energy tracking options](#) on the Sustainable Development Code website.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not promoted voluntary or implemented regulatory or incentive-based building energy efficiency requirements that reduce waste heat.
 2. The local government has started implementing energy efficiency initiatives in its own facilities and is looking into how to encourage private building owners to implement energy efficiency initiatives and/or track facility energy use.



3. The local government encourages building owners to track energy use, and is starting to draft an energy benchmarking ordinance, which would require owners of buildings above a certain size to track and report their building's energy use. The local government is researching how it would collect and publicly disclose the collected energy data. The local government is also considering a benchmark level that building owners need to hit to be exempt from auditing.
4. The local government has drafted and is proposing an energy benchmarking ordinance to its county, city, or town council. The ordinance would require energy audits by a third-party auditor at least every five years on buildings that do not achieve stated benchmarks.
5. The local government has passed an energy benchmarking ordinance. The ordinance requires energy audits by a third-party auditor at least every five years on buildings that do not achieve stated benchmarks.
 - This question does not apply to my community. I have provided an explanation in the comments box.

D. Establish green roof incentives or requirements

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use
Relevant To: Cities and Towns

A green roof is a roof that is covered in plants such as grasses, sedums, wildflowers, small trees, or even agricultural products. Green roofs absorb small and sometimes moderate amounts of rainwater, make the building more energy efficient, reduce urban heat, and can provide open space for building residents and the public. Green roof installations can be encouraged through pilot programs, providing direct or indirect financial incentives, or passing regulation.^v

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not established green roof incentives or requirements.
 2. The local government is looking at the structures in its jurisdiction to determine which types of buildings would be suitable for green roof incentives or requirements.
 3. The local government is implementing a pilot incentive program and/or has constructed a green roof on at least one local government building to market the positive benefits.
 4. The local government offers incentives for green roof construction on privately-owned buildings. Incentives can be in the form of grants, tax credits, or fee waivers. Alternative incentives could include granting developers a variance, additional floor area ratio, or expedited permits subject to the structure having a green roof of a specified size.
 5. The local government has an ordinance in place requiring a certain percentage of a roof to be green space based on the size of the building.



The local government offers incentives for a higher percentage of the roof being green space than is required.

- This question does not apply to my community. I have provided an explanation in the comments box.

Impact 17: Threatened habitat for sensitive species

A. Integrate habitat protection strategies into zoning codes, comprehensive plans, and ordinances

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

As the climate changes, healthy habitats and natural areas with high biodiversity may fall into decline, causing species' numbers to decrease or even disappear. Local governments can use incentives, community planning documents, zoning codes, and other regulatory requirements to protect critical habitats. The following list includes example strategies described in more detail on the Sustainable Development Code website.

- [Require new developments to complete a habitat impact analysis](#) if the proposed site is located close to a wetland.
- [Require new developments to protect, restore, or construct off-site habitat](#) if the project eliminates habitat for critical species.
- [Limit Planned Unit Developments](#) (PUDs) near sensitive natural areas. PUDs are negotiated exemptions that allow more flexibility in design than would typically be allowed in traditional zoning. Policies or regulations could ban PUDs near sensitive areas or stipulate that any project located near a sensitive area be required to mitigate risks to wildlife and reintroduce native plant species.
- [Restrict septic systems near areas with high biodiversity or critical habitat](#). Example septic system restrictions include minimizing the number of septic systems by combining systems from multiple properties, requiring government approval, and prohibiting septic systems depending on the need and habitat sensitivity of the proposed area.
- [Use setbacks to protect sensitive habitats](#). A setback is an on-site building restriction that sets the minimum distance a building may be from a designated area, such as a sidewalk or street. Local governments can incorporate setback requirements in their zoning ordinances, create incentives to encourage developers to leave sensitive areas untouched, or a combination of both. The setback can be designed to protect environmentally sensitive areas or areas with high biodiversity, including wetlands, forests, habitat for certain species, river corridors, and shorelines.
- [Allow landowners to sell their development rights to the local government](#) to permanently protect the land. If properly designed, this "purchase of development rights" program can increase the amount of privately owned land that cannot be developed in a way that is harmful to wildlife. The



agreement holds even if the current owner sells the property, and it financially compensates the landowner.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government does not use any regulatory or planning-based mechanisms to protect critical habitat or areas with high biodiversity within its jurisdiction.
 2. The local government has begun to research regulatory and planning-based mechanisms to protect critical habitat or areas with high biodiversity within its jurisdiction.
 3. The local government is in the process of identifying and mapping critical habitat and areas with high biodiversity within its jurisdiction, and is planning to integrate habitat protection into its comprehensive plan when it is updated. The local government is considering one or more specific regulatory mechanism to protect critical habitat within its jurisdiction.
 4. The local government is in the process of identifying and mapping critical habitat and areas with high biodiversity within its jurisdiction, and is planning to integrate habitat protection into its comprehensive plan when it is updated. The local government has adopted at least one regulatory mechanism to protect critical habitat within its jurisdiction.
 5. The local government has identified and mapped local critical habitats and areas with high biodiversity, and has integrated protection language into its comprehensive plan. The local governments has adopted two or more regulatory mechanisms to protect critical habitat within its jurisdiction.
- This question does not apply to my community. I have provided an explanation in the comments box.

Impact 18: Increased likelihood of anticipated and unanticipated impacts of climate change

- A. Understand how climate change impacts your community and take steps to prepare**
Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use
Relevant To: All Communities

The HRI's vulnerability score provides information on the current and future climate change impacts specific to your city, town, or county. However, this information does not tell you how those impacts will affect your community's infrastructure, services, and people. Conducting a vulnerability assessment will help your local government think through these impacts. Watch the January 2019 [Prepared for Environmental Change webinar on identifying your community's vulnerabilities to environmental change](#) to learn how Ann Arbor, Michigan, completed a community-wide vulnerability assessment.



- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not assessed how the community is being impacted by its current vulnerabilities, nor how the community will be impacted by increasing vulnerabilities.
 2. The local government has started working internally across departments to understand how the community is being impacted by its current vulnerabilities, and how the community will be impacted by increasing vulnerabilities.
 3. The local government has established a working group with representatives from local departments and agencies, businesses, and from community organizations to develop a vulnerability assessment – an inventory of potentially impacted infrastructure, services, and residents. The group is compiling a written report or other way of communicating the information to the public.
 4. The local government, with participation from residents, businesses, and community organizations has released a vulnerability assessment and has released findings to the public. The assessment includes the local government’s acknowledgement of climate risks and identifies the risks specific to the community’s most vulnerable residents. The group is starting to think about a climate adaption plan, which is a list of retrofits that would accommodate impacts, and/or has begun identifying zoning codes, ordinances, programs, or other initiatives that would reduce impacts.
 5. The local government, with participation from residents, businesses, and community organizations, has released a vulnerability assessment and a climate adaptation plan. These documents contain an acknowledgement by the local government of known climate risks and describe the impacts and adaptation actions relevant to protecting the community’s most vulnerable residents. The local government is beginning to integrate adaptation actions into long-term plans and implement some adaptation actions.
 - This question does not apply to my community. I have provided an explanation in the comments box.

B. Conduct a greenhouse gas inventory and develop a plan to reduce emissions

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

A greenhouse gas inventory is a fundamental first step to becoming a more resilient community. The process provides data on the amount of energy consumed, the diversity of energy supplied to the grid, a community's vehicle type and fuel usage distribution, and more. Communities completing inventories can use the data to set a reduction target and develop a plan for reducing those emissions. As communities around the globe measure and monitor their emissions and implement strategies to



achieve emissions reductions goals, the total amount of emissions contributing to global warming will decrease. The anticipated impacts of increased average annual temperatures, flooding, and extreme weather will still occur, but they will not be as bad as they could have been.

✓ Please select the description that best aligns with the status of this action in your community.

1. The local government has not completed a greenhouse gas emissions inventory.
2. The local government has not completed a greenhouse gas emissions inventory, but it is working on a few initiatives that are helping to decrease emissions.
3. The local government has completed or nearly completed a community-wide or local government operations inventory, but it has not set a greenhouse gas emissions reduction goal.
4. The local government has completed a community-wide or local government operations inventory and has set either a community-wide or local government operations greenhouse gas emissions reduction goal. The local government has started to identify specific actions it plans to take to achieve that goal.
5. The local government has completed a community-wide and a local government operations inventory and has set a community-wide greenhouse gas emissions reduction goal. The local government has identified specific actions it plans to take to achieve that goal, thereby reducing its internal operations emissions, and the emissions occurring community-wide. The local government is developing education resources and/or a communications strategy to encourage residents to take personal responsibility for reducing their own emissions footprints.
 - This question does not apply to my community. I have provided an explanation in the comments box.

C. Integrate funding for readiness actions into the local government's financial planning

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Preparing for the impacts of climate change is expensive, but responding to events made worse by climate change will likely be pricier. As local governments take steps to avoid or lessen impacts when they hit, they need to consider how they will pay for their resilience initiatives. Financing can draw from public and private sources, including state and federal grant funding, working through public-private partnerships, private foundations, and local taxes and fees, among other options. See a list of [funding opportunities available to Indiana local governments](#) in the [ERI Toolkit](#), publications on [national funding opportunities](#) in the U.S. Climate Resilience Toolkit, and see an example [open space impact fee](#) on the Sustainable Development Code website.



- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not considered integrating funding for readiness actions into its financial planning.
 2. The local government has applied for one or two resilience grants, but has not formally integrated funding for readiness actions into its financial planning.
 3. The local government has started making a list of readiness actions it would like to complete and is in the process of identifying cost estimates.
 4. The local government has a list of readiness actions it would like to complete and has cost estimates and funding options for each item.
 5. The local government has a list of readiness actions it would like to complete and has cost estimates and funding options for each item. The local government has assigned these funding opportunities to a timeline and has a detailed plan for accessing these funds and integrating them into their budgeting process.
 - This question does not apply to my community. I have provided an explanation in the comments box.

D. Adopt ordinances and policies that promote diverse transportation options

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: Cities and Towns

As the frequency and severity of extreme weather events and other climate impacts increase, a community with a diverse set of transportation options will likely fair better. Additionally, offering and encouraging transportation options that release fewer greenhouse gas emissions will contribute to less intense climate impacts in the long run. Many policy options exist to promote a diverse array of transportation options.

- Complete streets ordinance – A street design policy that promotes various types of transportation, including walking, bicycling, taking public transit, and driving. See the [Indiana Department of Transportation website](#) for more information.
- Pedestrian friendly mobility – The Sustainable Development Code offers a list of incentives and zoning- and ordinance-based best practices for supporting and improving sidewalks and other [pedestrian-friendly infrastructure](#).
- Bicycle mobility – The Sustainable Development Code offers a list of incentives and zoning- and ordinance-based best practices for supporting and improving [bicycle infrastructure](#).
- Electric vehicles – The Sustainable Development Code is developing a list of incentives and zoning- and ordinance-based best practices for encouraging the use of [electric vehicles](#).
- Public transit – The Sustainable Development Code is developing a list of incentives and zoning- and ordinance-based best practices for encouraging the use [public transit](#).



- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not conducted a review of its ordinances, zoning codes, and policies to ensure they do not discourage diverse transportation options. The local governments has not created incentives or adopted zoning codes or ordinances to promote a diverse array of transportation options in its community.
 2. The local government has a vague idea of a few ordinances, zoning codes, or policies that discourage diverse transportation options, but no steps have been taken to address the issue. The local government has not adopted any policy mechanisms to encourage the use of diverse transportation options.
 3. The local government has started a comprehensive review of its ordinances, zoning codes, and other policies that discourage diverse transportation options. The local governments is starting to research and consider one or more policy mechanisms to encourage the use of diverse transportation options.
 4. The local government has completed a comprehensive review of its ordinances, zoning codes, and other policies that discourage diverse transportation options, and is starting to draft revisions. The local government has proposed one or more policy mechanisms to encourage the use of diverse transportation options.
 5. The local government has completed a comprehensive review of its ordinances, zoning codes, and other policies that discourage diverse transportation options, and has adopted revisions to address the issues. The local government has adopted one or more policy mechanisms to encourage the use of diverse transportation options in its community.
- This question does not apply to my community. I have provided an explanation in the comments box.

E. Remove policy barriers for energy efficiency and clean energy

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

Fossil-fueled energy production is a major driver of climate change. Increased investment in renewable energy will reduce emissions that contribute to climate change impacts. Local governments can review their ordinances, zoning codes, and other local policies to ensure that they do not discourage residential or private section adoption of solar, wind, geothermal, or more energy efficient systems such as decentralized power. District energy systems, for example, place energy plants closer to populated areas, reducing the amount of energy lost during distribution from distant centralized utilities. Learn more about [district heating and cooling systems](#) on the Sustainable Development Code website and about the [U.S. Department of Energy's Solsmart program](#) which helps communities reduce barriers to installing solar.



- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government has not considered conducting a review of its ordinances, zoning codes, and policies to ensure they do not discourage residential or private section adoption of energy efficiency and clean energy.
 2. The local government knows of a few ordinances, zoning codes, or other regulatory mechanisms that introduce barriers to residential or private section adoption of energy efficiency and clean energy, but it has not conducted a thorough review.
 3. The local government has started a thorough review of its ordinances, zoning codes, and policies to identify discouraging language for residential or private section adoption of energy efficiency and clean energy.
 4. The local government has completed a thorough review of its ordinances, zoning codes, and policies to identify discouraging language for residential or private section adoption of energy efficiency and clean energy. The local government has started the process of removing these barriers.
 5. The local government has completed a thorough review of its ordinances, zoning codes, and policies to identify discouraging language for residential or private section adoption of energy efficiency and clean energy. Either no barriers exist, or the local government has removed these barriers.
- This question does not apply to my community. I have provided an explanation in the comments box.



Public Health and Safety

As higher temperatures and heat waves become more common in Indiana, and these and other climate changes lead to improved habitat for disease carrying vectors such as mosquitoes and ticks, hospitals, doctor’s offices, public health departments, local governments, and partner organizations will see an increased need for public education and health services. More frequent flood and extreme weather events will lead to more indoor air pollution issues, and predicted temperature increases will lead to more incidences of heat illness and more days with unhealthy outdoor air quality. To alleviate the corresponding physical impacts of human health, local governments—often through the county’s public health department—and other organizations can increase public education, take steps to better understand the threats, and design strategies and plans to, for example, reduce the sources of pollution that lead to poor air quality days in the first place. The Centers for Disease Control and Prevention’s [Building Resilience Against Climate Effects \(BRACE\)](#) framework is a five-step process that can be used by local health officials to develop strategies and programs to help communities prepare for the health effects of climate change. Completing this framework addresses many of the actions suggested below. Connectivity, regenerative ability, and equitability are key principals in this section.

Suggested Departments: Public Health, Community Services, Sustainability

Impact 19: Increased likelihood of illnesses from increased outdoor air pollution

A. Educate residents about the health impacts of poor air quality and provide an effective advance warning program for elevated pollution days

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

As temperatures continue to rise and precipitation patterns change, Indiana will likely experience more days with unhealthy levels of air pollution. Of particular concern are ground-level ozone and particulate matter, which increase with higher temperatures and dry, dusty conditions. Both pollutants can have significant public health impacts, most notably respiratory and heart issues. Children, active people, older adults, and those with heart or lung disease have higher levels of risk to air pollution. Educating residents about the health risks of poor air quality and having an effective air pollution warning system in place can reduce the adverse health impacts of air pollution. Several air quality alerts systems are currently available, such as USEPA’s [AirNow](#) and [Enviroflash](#), Indiana’s [Smogwatch](#), and the [Air Quality Index](#), and many local media outlets provide air quality information as part of their weather reports.^w

- ✓ Please select the description that best aligns with the status of this action in your community.



1. No entity in the community offers programming to educate the public about the impacts of poor air quality on human health or uses an air quality alert system.
2. The local government or other organization is using the Air Quality Index or other air quality predictor to monitor the air quality in their area. The local government or a local partner organization offers a small amount of programming to educate the public about the impacts of poor air quality on human health.
3. The local government or other organization is distributing air quality information on a daily basis across multiple forms of media (e.g. television, radio, social media, and newspaper) to reach as many residents as possible with an air quality forecast that include the level of air pollution and what that means in terms of exposure and avoidance. Some local health care providers are helping spread this information. The local government or partner organization is tracking the number of people reached by the information.
4. The local government or other organization announces poor air quality days through a wide range of communication channels. The local government is working with community-based organizations and local health care providers to distribute the information to vulnerable communities that are most at risk from poor air quality and might not see the information from traditional channels. The air quality information is provided in multiple languages. The local government or partner organization is tracking the number of people reached and updating the plan accordingly.
5. The local government or other organization has conducted the above activities, has established comprehensive programming to educate the public about the impacts of poor air quality on human health and has a robust air quality announcement program that reaches vulnerable communities effectively. Programming is being conducted to reach adults and children through media and in their workplace and schools. Programming is conducted in multiple languages with a special emphasis on reaching vulnerable residents.
 - This question does not apply to my community. I have provided an explanation in the comments box.

B. Develop and implement a plan for high air pollution days that calls for both public and private action

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

On certain days there will be poor air quality in the area. It is important to advise residents of things they can do on high air pollution days to limit local emissions and to encourage residents to take action to protect their health and the health of the community. It is also important for local government to have policies in place to



curtail their own high-emitting activities on “bad air” days (for example, postponing the use of gasoline-powered landscaping equipment, refueling, or painting until after peak air pollution hours).

- ✓ Please select the description that best aligns with the status of this action in your community.
1. The local government or other organization does not provide information to residents about actions they can take to reduce emissions on “bad air” days (“public action plan”), and has no policies in place to curtail its own high emitting activities (“local government plan”).
 2. The local government or other organization is developing either a public action plan or a local government plan.
 3. The local government or other organization has a public action plan or strategies in place and is compiling a set of actions for its local government plan.
 4. The local government or other organization has a public action plan or strategies in place and is actively implementing it. The local government also has a local government plan in place and is implementing it actively.
 5. The local government or other organization has a public action plan or strategies in place and is actively implementing it, including regular public surveys to determine its effectiveness that inform updates to the plan. The local government is implementing its local government plan, auditing compliance by various city departments, assessing effectiveness and updating as appropriate.
- This question does not apply to my community. I have provided an explanation in the comments box.

C. Develop local air pollution reduction programs

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

The best way to reduce the risk of illness from poor air quality is to prevent poor air quality in the first place. While much air pollution is regional, local sources of dust, soot, and smog-forming pollutants do contribute to local air quality, some quite significantly. Reducing those local emissions will improve local air quality. Some strategies to prevent air pollution are listed below. Note that some are less feasible for smaller communities.

Transportation

- Public transportation – Public transportation reduces the number of cars on the streets to cut down on emissions.
- Sidewalk network – In areas where there are no sidewalks, people are forced to drive, even over short distances. Having sidewalks in place can reduce the number of trips people need to make by car to curtail emissions.
- Bicycle infrastructure – Establishing infrastructure for bicycles (e.g. bikeways, bike racks, bike shares, and more) can allow for more people to bike instead of drive. This will reduce the emissions coming from cars.



- Encourage electric and alternative fuel vehicles – These vehicles emit no pollution and the air pollution from the electricity they use has less impact on local neighborhoods. Offering incentives for the purchase and use of EVs, installing charging stations, and purchasing electric vehicles for government operations will reduce air pollution.
- Traffic flow efforts – Traffic congestion increases emissions and degrades air quality. Putting systems in place to reduce congestion will increase air quality.
- Engine idling reductions – Idling cars, busses, and trucks wastes fuel and emits unnecessary pollution. Creating ordinances and programs to reduce idling, especially near sensitive areas such as schools, daycares, hospitals, etc., will cut down on emissions.

Wind-blown Dust and Open Burning

- Ordinances or other programs to reduce wind-blown dust and open burning – Cutting down on the amount of wind-blown dust from construction sites, industrial sites, unpaved roads, open burning, and more will reduce the amount of pollution emitted in the area.
- Public Reporting Hotline - Maintaining an action line where residents can report air pollution problems such as excessive dust, vehicle idling, or industrial emissions events.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government or other organization is not engaged in any air pollution reduction initiatives.
 2. The local government or other organization has engaged in one or more air pollution reduction initiatives.
 3. The local government or other organization has implemented and is researching, developing, and/or piloting multiple initiatives to reduce air pollution.
 4. The local government or other organization has implemented multiple air pollution reduction initiatives, is tracking their success, and has looked into the impacts on the most vulnerable communities.
 5. The local government or other organization has implemented multiple comprehensive air pollution reduction initiatives, is tracking their success, and evaluating their impacts on the most vulnerable residents. Pollution reduction strategies are common-place in governmental operations and decisions.
 - This question does not apply to my community. I have provided an explanation in the comments box.

Impact 20: Increased likelihood of illnesses from increased indoor air pollution

A. Implement a public education plan for health impacts of indoor air pollution

Relevant Vulnerabilities: Extreme Heat



Relevant To: All Communities

Climate change can have multiple effects on indoor air quality that residents might not be aware of. Power outages from more frequent extreme weather events can cause heating, ventilation, and air conditioning systems to fail resulting in indoor air pollution buildup. The use of backup generators can result in excess emissions of carbon monoxide. Floods can quickly lead to indoor mold growth. Educating people about the causes and prevention of indoor air pollution can help reduce illnesses.^x

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. Neither the local government nor a local partner has an education plan or educational materials on indoor air quality issues.
 2. The local government or partner is starting to develop an education plan around indoor air quality issues.
 3. The local government or local partner has developed an education plan around indoor air quality issues, using various forms of media, e.g., fact sheets distributed through various channels.
 4. The local government or local partner has implemented its education plan. The educational materials are being included in other outreach efforts the local government is conducting concerning public health, air quality, flood recovery and power outages. The local government is also providing educational materials to stores in the area selling devices such as portable backup generators regarding proper ventilation.
 5. The local government or local partner is gathering data and assessing its outreach efforts and updating the plan accordingly. The programming is made available in multiple languages and the local government is working with community partners to reach vulnerable communities.
 - This question does not apply to my community. I have provided an explanation in the comments box.

Impact 21: Increased likelihood of heat related illnesses

A. Educate about heat related illness and prevention

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

Hot and humid summer weather can cause heat illness and even death.^y As climate change causes increasing temperatures around the world, our area can expect to experience more extreme heat events with multiple days of temperatures over 90 degrees and nights that do not cool down below 68 degrees. More Americans die from heat waves than all other natural disasters combined.^z Communicating to the public can help people understand the risk factors and symptoms of heat-related illnesses to reduce their exposure and know how to act when a situation occurs.

- ✓ Please select the description that best aligns with the status of this action in your community.



1. The local government or other organization is not offering programming to the public about heat related illnesses.
2. The local government or other organization is starting to look into how they would conduct community outreach programs to educate the public about heat related illnesses.
3. The local government or other organization is implementing programs to educate residents about heat related illnesses. Programs can include in-person sessions as well as information distributed through multiple forms of media. The local government is assessing locations with vulnerable residents and looking for community-based organizations to help with outreach to those individuals.
4. The local government or other organization is meeting with community partners (e.g. community-based organizations, businesses, religious organizations, etc.) to further expand the reach of the programming, especially to vulnerable residents. The local government is educating local clinicians on the health impacts of heat and how they can protect patients and community health during extreme heat, and providing materials in patient waiting rooms. Residents are informed about medications that increase the risk of heat illness and whether prescribed medication may lose effectiveness if exposed to high temperature.^{aa}
5. The local government or other organization is implementing programs across the community with the help of its community partners. Programming is available in multiple languages and is accommodating traditionally underserved communities. Assessments are conducted annually and the plan is modified accordingly.
 - This question does not apply to my community. I have provided an explanation in the comments box.

B. Conduct a heat vulnerability assessment and develop a heat management plan

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

Climate change increases extreme heat events, which include higher daytime temperatures, warmer overnight temperatures, or both. Extreme heat can have significant adverse health impacts (cramps, heat stroke, dehydration) and can be especially dangerous for the very young and very old, people who work outside, and people without air conditioning or ready access to air conditioning. A heat vulnerability assessment uses available data to quantify and map the heat risk throughout a community. A heat response plan includes strategies and procedures to respond to extreme health related emergencies. Some communities integrate a heat response plan into their Multi-hazard Mitigation Plan. A key element of a response plan is to establish cooling centers where the public can go for refuge in response to extreme heat conditions, along with public outreach and transportation support. Another key element is public outreach and education on adverse health impacts and medical facilities available to provide assistance. Plans could also



include other “non-emergency measures” such as increasing the availability and affordability of air conditioning, encouraging or requiring heat sensitive building techniques such as green or white roofs, increasing tree coverage, and addressing urban heat islands.

✓ Please select the description that best aligns with the status of this action in your community.

1. The local government or other organization has not done a heat vulnerability assessment and does not have a heat response plan.
 2. The local government or other organization is working with local health care providers, emergency management agencies, and social services agencies to gather data for a heat vulnerability assessment and a heat response plan.
 3. The local government or other organization has completed a heat vulnerability assessment and has used it to show the community’s areas of risk and inform the development of a heat response plan. The local government or other organization has some programs in place to address high heat (tree canopy program, for example), but does not have a comprehensive heat response plan.
 4. The local government or other organization has completed a heat vulnerability assessment and has a heat response plan. The plan, which may or may not be integrated into the county’s Multi-hazard Mitigation Plan, focuses on extreme heat response activities such as providing cooling centers, and does not include non-emergency type measures to reduce the impacts of extreme heat in the community.
 5. The local government or other organization has completed a heat vulnerability assessment and has a robust heat response plan. The plan, parts or all of which are integrated into the county’s Multi-hazard Mitigation Plan, focuses on areas of the greatest vulnerability and identified existing partnerships with community organizations that can help with effective implementation. The plan includes non-emergency steps to reduce the risk of extreme heat.
- This question does not apply to my community. I have provided an explanation in the comments box.

C. Implement programs or activities that reduce heat impacts in the built environment

Relevant Vulnerabilities: Extreme Heat

Relevant To: All Communities

Buildings, paved areas, and other impervious surfaces absorb heat from the sun and release it throughout the day and into the evening. This makes it difficult for residents to avoid the heat during extreme heat events and can even increase ambient air temperatures. Implementing green infrastructure projects and putting in place building codes requiring or incentivizing green and cool infrastructure (examples are green roofs, cool coatings on pavement, pervious pavement, trees, parking lot shading requirements, providing incentives and/or recognition for



development that uses green/cool approaches) can reduce ambient temperatures and provide access to cooler spaces, as well as improve quality of life generally.

- ✓ Please select the description that best aligns with the status of this action in your community.
 1. The local government or other organization has not looked into built environment approaches to reducing heat.
 2. The local government or other organization is looking into green infrastructure and cooling technologies it can implement in the community.
 3. The local government or other organization has implemented several green infrastructure or cooling technology projects in the community and is planning for others
 4. The local government or other organization has developed a plan for addressing heat island and other heat impacts, including zoning code or ordinance changes and is integrating these approaches into local government operations.
 5. The local government or other organization is implementing a plan to address heat island and other heat impacts, has made changes to local zoning requirements or ordinances, and has integrated these approaches fully into local government operations. The local government is creating heat mitigation strategies (e.g. parking lot shading requirements) and is creating incentives and/or awards for individual heat island reduction actions. Incentives can include, below-market loans, tax breaks, product rebates, grants, and giveaways. Awards can reward exemplary work, highlight innovation, and promote solutions across the private and public sectors. The local government is assessing the progress and updating their strategy accordingly.
- This question does not apply to my community. I have provided an explanation in the comments box.

Impact 22: Increased likelihood of illnesses from disease carrying vectors (such as mosquitoes and ticks)

A. Create a public education plan for vector awareness

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Climate change is causing warmer temperatures and precipitation changes that impact the habitat, geographical range, and mating cycles of disease-carrying vectors such as mosquitoes and ticks. The ticks and mosquitoes are entering areas where people may not know how to protect themselves and prevent large populations from breeding. To decrease the risk of vector-borne diseases in humans, local health departments can inform the public on the increasing presence of disease-carrying vectors and on the testing, treatment, vaccination, and other public health measures available, including the safe use of repellents. Empowering the



public through education is especially critical for community-wide vector management.^{bb}

✓ Please select the description that best aligns with the status of this action in your community.

1. The local government or other organization does not have an education plan in place for informing the public on disease-carrying vectors.
2. The local government is looking into creating a plan to educate residents on the risk factors, breeding areas, and management actions that can be taken to reduce vectors, as well as on the public health measures available to support prevention, testing, and treatment, if necessary.
3. The local government or other organization has a plan in place to educate the public. The plan includes information on what types of vectors are of concern, what areas are likely to contain vectors, what residents can do to protect themselves in those areas, how they can minimize their risk of exposure, disease symptoms, and steps to take if they contract a vector-borne illness.
4. The local government or other organization is working with multiple departments (e.g. public health, parks and recreation) and local health practitioners to distribute the information to the public. The information is being distributed in multiple formats (e.g. print, radio, television, social media) and outlets (community events, local parks, health offices) to reach as many people as possible. Special emphasis is placed on vulnerable communities. Information is provided in all languages relevant to the community and is culturally appropriate.
5. The local government or other organization is working with local partners to reach as many people as they can and is conducting assessments on the outreach to determine its effectiveness. The plan is updated accordingly.
 - This question does not apply to my community. I have provided an explanation in the comments box.

B. Implement a program to reduce exposure to vectors

Relevant Vulnerabilities: Extreme Heat, Extreme Precipitation, Floodplain Land Use

Relevant To: All Communities

Vectors can often be difficult to deal with in a safe and effective way, without or with minimal use of chemicals. Integrated pest management uses a variety of management techniques that focus on prevention, reduction, and the elimination of conditions that lead to infestations of vectors.

✓ Please select the description that best aligns with the status of this action in your community.

1. The local government or other organization has not implemented an integrated pest management program or other vector control program.
2. The local government or other organization is working to develop a vector control plan.



3. The local government or other organization has developed and is implementing a vector control plan. The plan includes monitoring and identifying vectors. The local government or other organization is working with its relevant agencies and other vector control groups to determine approximately how many are in the area and/or the amount of habitat available for vectors.
4. In addition to having completed the steps in No. 3, above, the local government or other organization is starting to include projections of how many vectors could be in the area as the climate changes. The local government or other organization is managing the areas in the community to prevent vectors from becoming a threat and is implementing preventative measures. This can include removing habitats where vectors breed, installing structural barriers in homes and buildings, and other strategies.
5. In addition to having completed the items in No. 3 and No. 4 above, the local government or other organization is communicating with residents, especially landowners with habitat for vectors, to implement integrated pest management on their land. The local government is assessing how the management program is working and updating it accordingly.
 - This question does not apply to my community. I have provided an explanation in the comments box.

^a Whittmeyer, “10 Years Later, Some Katrina Survivors Remain in Indiana.”

^b U.S. Climate Resilience Toolkit, “Communications.”

^c U.S. Department of Homeland Security, “Infrastructure Security.”

^d Ibid.

^e Cervenec, Wilson, Dipre, Shockey, and Celebrezze, “Columbus Climate Adaptation Plan.”

^f Ibid.

^g Environmental Resilience Institute Toolkit, “Climate Implications – Disaster Debris Management.”

^h U.S. Department of Homeland Security, “A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action.”

ⁱ Cervenec, Wilson, Dipre, Shockey, and Celebrezze, “Columbus Climate Adaptation Plan.”

^j Major *et al.*, “Climate Change, Water, and Wastewater in Cities.”

^k Kenward *et al.*, “Overflow: Climate Change, Heavy Rain, and Sewage.”

^l IPBES, “The Assessment Report on Pollinators, Pollination and Food Production.”

^m Cervenec, Wilson, Dipre, Shockey, and Celebrezze, “Columbus Climate Adaptation Plan.”

ⁿ Michigan State University, “Shifting Landscape: Native Plant Species May be at Greater Risk from Climate Change than Non-natives.”

^o McMahon, J., “The Environmental Consequences of Forest Fragmentation in the Western Maine Mountains.”



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- ^p FEMA, “National Flood Insurance Program Community Rating System.”
- ^q FEMA, “Community Rating System.” (Fact Sheet)
- ^r Sustainable Development Code, “Pervious Cover Minimums and Incentives.”
- ^s Sustainable Development Code, “Tree Canopy Cover.”
- ^t Sustainable Development Code, “Vegetation Protection Areas.”
- ^u Sustainable Development Code, “Energy Benchmarking, Auditing, and Upgrading.”
- ^v Sustainable Development Code, “Green Roofing.”
- ^w North Carolina Department of Environmental Quality, “N.C. Air Awareness.”
- ^x U.S. Global Change Research Program, “3.4 Climate Impacts on Indoor Air Quality and Health, An Emerging Issue.”
- ^y American Public Health Association, Public Health Institute, and Center for Climate Change and Health, “Climate Change, Health, and Equity: A Guide for Local Health Departments.”
- ^z Noonan, Velasco-Mondragon, and Wagner, “Improving the Health of African Americans in the USA.”
- ^{aa} Polk County Health Department, “Keep Your Medications Away from Summer Heat.”
- ^{bb} Purdue University Extension, Department of Entomology, “Household and Structural: Community-wide Mosquito Management.”

