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Mitigation Planning

Under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended, State, Tribal, and local governments are required to develop a hazard mitigation plan as a condition for receiving certain types of non-emergency disaster assistance, including funding for mitigation projects.

Mitigation Planning Process

The planning process promoted by the Federal Emergency Management Agency (FEMA) is as important as the resulting plan because it creates a framework for governments to reduce the negative impacts from future disasters on lives, property, and the economy. Mitigation planning includes the following elements:

Public Involvement – Planning creates a way to solicit and consider input from diverse interests. Involving stakeholders is essential to building community-wide support for the plan. In addition to emergency managers, the planning process involves other government agencies (e.g., zoning, floodplain management, public works, community and economic development), businesses, civic groups, environmental groups, and schools.

Risk Assessment – Mitigation plans identify natural hazards and risks based on history, estimate the potential frequency and magnitude of disasters, and assess the potential losses of life and property. The assessment considers the built environment, including the type and numbers of existing and future buildings, infrastructure, and critical facilities located in or near identified hazard areas.

Mitigation Strategy – Based on the risk assessment, communities develop mitigation goals and objectives, as part of a strategy for mitigating disaster losses. The strategy is a community's approach for implementing mitigation activities that are cost-effective, technically feasible, and environmentally sound as well as allowing strategic investment of limited resources.

Hazard Mitigation

Hazard mitigation is sustained action taken to reduce or eliminate long-term risk to people and their property from hazards. Hazard mitigation planning is the process State, Tribal, and local governments use to identify risks and vulnerabilities associated with natural disasters, and to develop long-term strategies for protecting people and property from future hazard events.

http://www.fema.gov/multi-hazard-mitigation-planning

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Benefits of Mitigation Planning

- Increases public awareness and understanding of vulnerabilities as well as support for specific actions to reduce losses from future natural disasters.
- Builds partnerships with diverse stakeholders, thereby maximizing opportunities to leverage data and resources, which can help reduce workloads and achieve shared community objectives. For example, managing floodplain development may not only reduce flood losses, but also protect water quality by restoring natural functions.
- Expands understanding of potential risk reduction measures to include structural and regulatory tools, where available, such as ordinances and building codes. Implementation of local floodplain ordinances prevents an estimated $1.1 billion in flood damages annually.

Informs development, prioritization, and implementation of mitigation projects. Benefits accrue over the life of the project as losses are avoided from each subsequent hazard event.

Planning Guidance, Tools, and Training

To assist with mitigation planning, FEMA and its partners offer a variety of guidance, training, and informative publications, such as:

- Multi-Hazard Mitigation Planning Guidance, or "Blue Books," designed to increase State, Tribal, and local governments' understanding of the requirements for developing new or updated mitigation plans. They also help Federal and State reviewers fairly and consistently evaluate mitigation plans from different jurisdictions.
- Training sessions, including the following courses: Mitigation Planning Workshop for Local Governments (G318), HAZUS Multi-Hazard/DMA 2000 Risk Assessment (E296), and Protecting Tribal Communities and Acquiring Resources (E344).
- A series of "How-To" guides with information beyond FEMA's basic requirements. The guides focus on initiating and maintaining a planning process that will result in safer communities and are applicable to jurisdictions of all size, resource, and capability levels.

Hazard Mitigation Planning Results

History shows that the physical, financial, and emotional losses caused by disasters can be reduced significantly through hazard mitigation planning. A broad range of activities designed to reduce risk can result from the mitigation planning process. The examples listed below illustrate a range of possible long-term mitigation actions; however, they are not necessarily intended to serve as examples of eligible activities under the FEMA Hazard Mitigation Assistance programs:

- Consider adopting and enforcing regulatory tools, including ordinances, regulations, and building codes, to guide and inform land use, development, and construction decisions in areas affected by hazards. Where authorized, adopt more stringent criteria to provide greater protection for citizens, as conditions may change over time. For example, consider:
    - Exceeding the National Flood Insurance Program (NFIP) floodplain management regulations by elevating structures above the Base Flood Elevation (BFE) in high-risk areas.
    - Creating a buffer area by protecting natural resources, such as floodplains, wetlands, or sensitive habitats. Additional benefits to the community may include improved water quality and recreational opportunities.
- Develop mitigation projects to acquire and demolish flood damaged structures, such as homes or businesses, or to retrofit public buildings, schools, and critical facilities to withstand extreme wind events or ground shaking from earthquakes.

Hazard Mitigation Assistance (HMA)

FEMA's HMA programs fund eligible mitigation activities that reduce future disaster losses and protect life and property. Funding is available for mitigation plan development and updates as well as mitigation projects. For more information on FEMA's HMA programs, visit http://www.fema.gov/hazard-mitigation-assistance.

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Fact Sheet

Federal Insurance and Mitigation Administration

Climate Resilient Mitigation Activities
Aquifer Storage and Recovery

Purpose

The President's 2015 Opportunity, Growth, and Security Initiative (OGSI), Executive Order 13653 Preparing the United States for the Impacts of Climate Change, the President's 2013 Climate Action Plan, FEMA's Climate Change Adaptation Policy, and the 2014-2018 FEMA Strategic Plan, all identify the risks and impacts associated with climate change on community resilience to natural hazards, and direct Federal agencies to support climate resilient infrastructure.

FEMA is encouraging communities to incorporate methods to mitigate the impacts of climate change into eligible Hazard Mitigation Assistance (HMA) funded risk reduction activities by providing guidance on Climate Resilient Mitigation Activities. FEMA has developed initial guidance on Climate Resilient Mitigation Activities including green infrastructure methods, expanded ecosystem service benefits, and three flood reduction and drought mitigation activities: Aquifer Storage and Recovery (ASR), Floodplain and Stream Restoration (FSR), and Flood Diversion and Storage (FDS).

FEMA encourages communities to use this information in developing eligible HMA project applications that leverage risk reduction actions and increase resilience to the impacts of climate change.

Project Description

Aquifer Storage and Recovery is capturing water when it is abundant such as a rainy season or during spring snow melts, storing the water in the subsurface in brackish aquifers, and recovering the water when needed. There are two types of aquifers, confined and unconfined. A confined aquifer is a closed system and, for these projects, can only be recharged using an injection well. Project design includes a "mixing zone" which is created between the injected water and native groundwater to ensure variations in water quality are managed safely and effectively.

An unconfined aquifer can be recharged either by using an injection well or by allowing surface water to infiltrate and seep into the aquifer. Through infiltration, the surface water helps replenish groundwater supplies; the surface water mixes with native groundwater, and slowly flows through the aquifer. The appropriate method of recharge, and source and treatment of water added to the aquifer should be based on specific site conditions and may include drinking water, raw and/or partially treated surface water, and, infrequently, raw groundwater or reclaimed water. Communities can recover the stored water from the aquifer by using a well and use the water as a freshwater supply.

Project Design and Implementation Considerations

ASR projects provide several advantages as a method to increase water supply for drought mitigation. Since ASR is a subsurface storage technology, it is more resilient and protected than alternative and more traditional storage technologies such as reservoirs or surface impoundment. The stored water in an ASR system is

protected from evaporation, pollutants, and extreme weather events. Unlike reservoirs or other surface storage, there is no potential for levee failure and downstream flooding. ASR also can be used to protect freshwater supplies along coastal areas as a barrier or protection for saltwater intrusion driven by sea level rise.

Appropriate site selection and the availability of an aquifer to a community are key items to evaluate when considering an ASR project for drought mitigation. Appropriate siting of the project and the specific site conditions will impact the project design, source of water for re-charge, method of injecting/infiltrating the water, and efficiencies in recovering the water. Advances in hydro-geologic assessment techniques have made it easier to ensure proper selection of the project site and water storage zones in the aquifer.

Another challenge to address during the project identification and planning phase, is to identify potential contaminants to the underground water supply. Contaminants found in the aquifer walls such as arsenic can leach into the stored water. The community should have a plan for managing potential leaching or contamination. For example, when extracted the recovered water may be mixed with another water source such as treated, potable water to reduce the contaminant ratio to safe drinking water standards. Please note that the project application must address all potential impacts to environmental resources, including water quality, and provide the information necessary for FEMA to ensure compliance with environmental requirements. FEMA recommends that communities consult with technical experts in developing an ASR project to ensure the project is in an appropriate site and necessary methods and measure are in place to preserve water quality standards.

Project Benefits and Cost Effectiveness

The primary benefit of an ASR project is to enhance or increase water supply for drought mitigation. The stored water can be pumped out of the aquifer (recovered), treated, and utilized as a freshwater supply when additional water supply is needed such as during periods of drought. Communities may use aquifers for both annual water resource management or longer term water supply for more extreme needs. For example, they can recover only a portion of the stored water for use during high demand times or seasonal dry periods and preserve a significant quantity of water in the aquifer for using during a drought. ASR systems can take advantage of the flexibility in using multiple types of source water and be designed and operated to help mitigate the effects of increased demand and drought in a variety of communities with differing water resources.

At a minimum, the project application would need to identify the increased water supply capacity the ASR project would provide in relation to the population that will be supported in a drought and during the project's useful life. A recurrence interval for drought periods will need to be identified to use the FEMA BCA Tool. Estimating the probability of a drought can be difficult due to historical data gaps and variance in annual weather patterns/precipitation. There is not currently a single methodology to establish a recurrence interval for drought. Rather, FEMA encourages communities to use the best available data to document a recurrence interval. In addition to regional or local sources of historical drought periods, federal agency resources that provide drought related resources with information that could support a recurrence interval are listed in the Climate Change, Drought Information, and HMA Resources section.

An ASR project may be designed in a way that also provides flood risk reduction. If a flood mitigation component can be demonstrated, the methodologies in the current FEMA BCA Tool can be used to evaluate the cost effectiveness of the overall project. There may be additional benefits provided by an ASR project if it can demonstrate a reduction in subsidence and reduce structural damage to homes and properties in the vicinity.

Ecosystem services are beneficial goods and services provided by nature for people. Every landscape yields a variety of ecosystem services, presenting an opportunity for mitigation actions that provide multiple ecosystem services benefits. FEMA is building on the existing ecosystem services that can be used for acquisition/open space projects to allow more ecosystem service benefits for climate resilient activities. FEMA will be providing more guidance on the ecosystem service benefits that can be used in evaluating the cost effectiveness of these mitigation projects in 2016.

Environmental and Historic Preservation Considerations

As part of eligibility review, FEMA is required to ensure that all HMA projects are compliant with environmental and historic preservation (EHP) requirements. This includes, but is not limited to, the processes and requirements established by the National Environmental Policy Act, Endangered Species Act, National Historic Preservation Act, Coastal Barrier Resources Act, and any other applicable laws, Executive Orders, Federal regulations or requirements. More detailed information on the EHP review process and requirements can be found in the HMA Guidance in the FEMA Library.

Project applications must include the necessary data and information for FEMA to conduct the appropriate EHP review. Due to the underground storage nature of ASR projects, the project application should addresses issues and methods to monitor and protect the stored water from potential contaminants. This includes consideration of the impacts, if any, of the injected water on native water quality, and potential sources of contamination from the injected water or leaching from the aquifer walls into the underground water supply. FEMA, in consultation with appropriate Federal and State agencies, will use the information provided in the application to ensure compliance with EHP requirements. This may include demonstrating methods to incorporate public participation in the review process and/or mitigate any EHP impacts resulting from the mitigation action.

ASR projects will need to be considered for compliance with the Underground Injection Control (UIC) Program regulated by the Environmental Protection Agency (EPA). The UIC Program is "responsible for regulating the construction, operation, permitting, and closure of injection wells that place fluids underground for storage or disposal." More information on the UIC standards and processes can be found on the EPA website at http://water.epa.gov/type/groundwater/uic/index.cfm.

Climate Change, Drought Information, and HMA Resources

U.S. Drought Portal which includes the National Integrated Drought Information System (NIDIS)
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Information Requests and Questions

FEMA encourages communities to work with their State or Tribal Hazard Mitigation Office in identifying and developing Climate Resilient Mitigation Activity projects. States and federally-recognized tribes should contact their FEMA Region Office with questions. Questions can also be submitted by email to FEMA-HMA-Grants-Policy@fema.dhs.gov.

FEMA

Fact Sheet

Federal Insurance and Mitigation Administration

Climate Resilient Mitigation Activities
Flood Diversion and Storage

Purpose

The President's 2015 Opportunity, Growth, and Security Initiative (OGSI); Executive Order 13653 Preparing the United States for the Impacts of Climate Change; the President's 2013 Climate Action Plan; FEMA's Climate Change Adaptation Policy; and the 2014-2018 FEMA Strategic Plan, all identify the risks and impacts associated with climate change on community resilience to natural hazards, and direct Federal agencies to support climate resilient infrastructure.

FEMA is encouraging communities to incorporate methods to mitigate the impacts of climate change into eligible Hazard Mitigation Assistance (HMA) funded risk reduction activities by providing guidance on Climate Resilient Mitigation Activities. FEMA has developed initial guidance on Climate Resilient Mitigation Activities including green infrastructure methods, expanded ecosystem service benefits, and three flood reduction and drought mitigation activities: Aquifer Storage and Recovery (ASR), Floodplain and Stream Restoration (FSR), and Flood Diversion and Storage (FDS).

FEMA encourages communities to use this information in developing eligible HMA project applications that leverage risk reduction actions and increase resilience to the impacts of climate change.

Project Description

Flood Diversion and Storage projects involve diverting floodwaters from a stream, river, or other body of water into a wetland, floodplain, canal, pipe, or other conduit (e.g., tunnels, wells) and storing them in above-ground reservoirs, floodplains, wetlands, green infrastructure elements, or other storage facilities. Many FDS projects are currently eligible for HMA funding as flood risk reduction activities. This guidance focuses on FDS projects implemented using green infrastructure methods as much as possible to address drought mitigation and climate change resilience in addition to reducing flood risk. FDS projects can be used to retain water to allow infiltration to ground water supplies. This allows for a controlled baseflow release and tempers peak flows, stages, and velocities to mitigate flooding.

Actively managing floodwaters by diversion, storage, and infiltration can replenish water supply through groundwater recharge, increasing base flows, and enhancing usable water supply to mitigate the effects of drought. FDS projects can also help maintain healthy ecosystems. The concept of floodwater diversion and storage can be scaled for the project area and/or site. FDS projects can range from large scale municipal or regional projects to localized, small scale neighborhood flood control projects. FDS projects lend themselves readily to design and implementation using green infrastructure methods.

Project Design and Implementation Considerations

Depending on the scope, scale, and location of potential sites, floodwater diversion and storage projects can vary in complexity. Proper planning, siting, sizing, and construction are required to implement successful

floodwater diversion and storage systems. Online storage allows for water to be temporarily stored within the river channel and its floodplain and can include elements such as an impounding structure, flow control structure, or spillway. Offline storage diverts water from the river channel to be stored in a separate area (which may be part of the floodplain such as a marsh) and is then subsequently released back to the river or to another channel. In general, flood storage areas can be categorized into five different categories:

Type of Flood Storage Area/Reservoir	Description
Online	Both dry and wet weather flows pass through the flood storage area
Offline	Dry and first-flush wet weather flows pass through the flood storage area. Larger flows bypass the facility
Dry	The flood storage system is kept essentially dry due to infiltration and evapotranspiration
Wet	The flood storage area contains water under all flow conditions
Wet/Dry	Part of the flood storage area contains water and part is dry during various flow conditions

Green infrastructure methods can be used for larger scale FDS projects by diverting the water into appropriately sized bio-retention or bio-detention basins. Smaller projects can provide localized flood reduction by channeling the diverted water into a bio-swale, raingarden, storm water tree trench, or smaller bio-retention or bio-detention basin. The diverted water can then be allowed to infiltrate to re-charge ground water supply.

Project Benefits and Cost Effectiveness

An FDS project provides flood risk reduction benefits that can be calculated using the existing FEMA BCA Tool. In some cases, the flood risk reduction benefits may even be sufficient to demonstrate the project is cost effective before considering benefits for drought mitigation and ecosystem services. However, any additional benefits for ecosystem services provided by green infrastructure methods can be included when appropriate.

FDS projects can also provide drought mitigation by facilitating groundwater re-charge and increasing water supply. At a minimum, the project application would need to identify the increased water supply capacity the FDS project would provide in relation to the population that will be supported in a drought and during the project's useful life. A recurrence interval for drought periods will need to be identified to use the FEMA BCA Tool. Estimating the probability of a drought can be difficult due to historical data gaps and variance in annual weather patterns/precipitation. There is not currently a single methodology to establish a recurrence interval for drought. Rather, FEMA encourages communities to use the best available data to document a recurrence interval. In addition to regional or local sources of historical drought periods, federal agency resources that

provide drought related resources with information that could support a recurrence interval are listed in the Climate Change, Drought Information, and HMA Resources section.

An FDS project that results in new or restored wetlands, estuaries, riparian or green, open space, may consider the total annual benefits for these categories in the cost effectiveness evaluation. For these benefits, it would be necessary to quantify the total restored ecosystem area (in acres), define the land use type, and quantify the additional water supply provided by the project in relation to the population that will be supported in a drought, and identify the project's useful life.

Ecosystem services are beneficial goods and services provided by nature for people. Every landscape yields a variety of ecosystem services, presenting an opportunity for mitigation actions that provide multiple ecosystem services benefits. FEMA is building on the existing ecosystem services that can be used for acquisition/open space projects to allow more ecosystem service benefits for climate resilient activities. FDS projects can make extensive use of green infrastructure methods and are likely to provide several or more ecosystem services. FEMA will be providing more guidance on the ecosystem service benefits that can be used in evaluating the cost effectiveness of these mitigation projects in 2016.

Environmental and Historic Preservation Considerations

As part of eligibility review, FEMA is required to ensure that all HMA projects are compliant with environmental and historic preservation (EHP) requirements. This includes, but is not limited to, the processes and requirements established by the National Environmental Policy Act, Endangered Species Act, National Historic Preservation Act, Coastal Barrier Resources Act, and any other applicable laws, Executive Orders, Federal regulations or requirements. More detailed information on the EHP review process and requirements can be found in the HMA Guidance in the FEMA Library.

The size and scale of the FDS project and presence of potentially sensitive environmental and/or cultural resources may impact the level of complexity of the EHP review. Neighborhood scale projects in urban areas may not require as complex an EHP review as a larger scale project impacting a floodplain. Projects larger than a neighborhood scale are more likely to affect wetlands, coastal zones, cultural resources, or habitat for plants and wildlife. These issues will need to be carefully evaluated during design and planning of the project. In particular, the impacts on downstream flow patterns will need to be considered to evaluate the effects on land use, the special flood hazard areas, stream functions, stream habitat, and erosion or sedimentation rates.

Project applications must include the necessary data and information for FEMA to conduct the appropriate EHP review. FEMA, in consultation with appropriate Federal and State agencies, will use the information provided in the application to ensure compliance with EHP requirements. This may include demonstrating methods to incorporate public participation in the review process and/or mitigate any EHP impacts resulting from the mitigation action.

Climate Change, Drought Information, and HMA Resources

U.S. Drought Portal which includes the National Integrated Drought Information System (NIDIS)
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FEMA

Fact Sheet

Federal Insurance and Mitigation Administration

Climate Resilient Mitigation Activities
Floodplain and Stream Restoration

Purpose

The President's 2015 Opportunity, Growth, and Security Initiative (OGSI); Executive Order 13653 Preparing the United States for the Impacts of Climate Change; the President's 2013 Climate Action Plan; FEMA's Climate Change Adaptation Policy; and the 2014-2018 FEMA Strategic Plan, all identify the risks and impacts associated with climate change on community resilience to natural hazards, and direct Federal agencies to support climate resilient infrastructure.

FEMA is encouraging communities to incorporate methods to mitigate the impacts of climate change into eligible Hazard Mitigation Assistance (HMA) funded risk reduction activities by providing guidance on Climate Resilient Mitigation Activities. FEMA has developed initial guidance on Climate Resilient Mitigation Activities including green infrastructure methods, expanded ecosystem service benefits, and three flood reduction and drought mitigation activities: Aquifer Storage and Recovery (ASR), Floodplain and Stream Restoration (FSR), and Flood Diversion and Storage (FDS).

FEMA encourages communities to use this information in developing eligible HMA project applications that leverage risk reduction actions and increase resilience to the impacts of climate change.

Project Description

Floodplain and Stream Restoration is the reestablishment of the structure and function of ecosystems and floodplains to return the ecosystem as closely as possible to its natural conditions and functions prior to being developed. Ecosystems are naturally dynamic and it would not be possible to replicate the system to the exact pre-development conditions. Rather, the restoration process reestablishes the general structure, function, and dynamic, self-sustaining behavior of the ecosystem. FSR projects are already eligible for HMA funding and typically mitigate erosion and flood risk. This guidance focuses on FSR projects implemented using green infrastructure methods as much as possible to address drought mitigation and climate change resilience, in addition to reducing flood risk. FSR projects lend themselves readily to design and implementation using green infrastructure methods.

Coastal and riverine floodplain and stream restoration (and stabilization) can be successful methods in providing benefits of flood risk reduction and improving water quality and habitat for fish and wildlife, recreational opportunities, and erosion control. Restoration of adversely impacted, flood prone river systems is accomplished by restoring floodplains and associated wetlands through connectivity and storage, and by modifying the physical stability, hydrology, and biological functions of the impaired river banks to that of a natural stable river with periodic overbank flow. The floodplain of a riverine or stream system provides capacity for storing storm water runoff, reducing the number and severity of floods, and minimizing non-point source pollution. Restoring floodplains and wetlands and their native vegetation are integral components of stream restoration efforts.

Project Design and Implementation Considerations

FSR projects can be scaled as needed to fit the site conditions and goals of the project. Typical goals and objectives include:

- Reduce peak velocities and stream bank erosion
- Reduce peak flood stages
- Protect bridge abutments, bridges, road crossings, and other infrastructure
- Protect valuable land and property
- Increase or improve water supply and capacity
- Restore ecological habitats for plants, aquatic species like fish, and other wildlife
- Restore or improve water quality

FSR projects readily lend themselves to green infrastructure methods to achieve the desired impact. Some potential projects that can emphasize the role of green infrastructure to maximize the ecosystem benefits in addition to risk reduction are:

- Flood setbacks: Removing structures from the floodplain and restoring the channel to its historic configuration. The stream is left to freely meander and flood its overbanks. This may include acquiring at-risk structures for removal.
- Two stage channels: Involves an upper channel section to provide flood conveyance with a natural low-flow channel within it to provide habitat enhancement and improved sediment transport capacity.
- Relief channels: This technique typically involves restoring the channel to its original configuration and constructing a high-flow channel or relief culvert to provide for additional flood conveyance. The restored channel provides habitat benefits while the high-flow channel can be designed to divert excess flows, providing wetland or lowland habitat or for recreational benefits.
- Addition of in-stream structures: Flow changing devices are a broad category of structures that can be used to divert flows away from eroding banks. They are often used to shield banks from eroding flows, build up the toe of the bank, and direct flows to create a stable alignment.
- Bank vegetation and seeding: Trees and shrubs can provide lowland habitat, channel shading, soil and bank stabilization, and aesthetic benefits. The use of native vegetation is strongly encouraged to support creation or restoration of habitat, and to maintain natural ecosystem conditions.

Project Benefits and Cost Effectiveness

An FSR project can provide flood risk reduction benefits that can be calculated using the existing FEMA BCA Tool. In some cases, the flood risk reduction benefits may even be sufficient to demonstrate the project is cost effective before considering benefits for drought mitigation and ecosystem services. However, any additional benefits for ecosystem services provided by green infrastructure methods can be included when appropriate.

FSR projects can provide drought mitigation by facilitating groundwater re-charge and increasing water supply. At a minimum, the project application would need to identify the increased water supply capacity the FSR project would provide in relation to the population that will be supported in a drought and during the project's useful life. A recurrence interval for drought periods will need to be identified to use the FEMA BCA Tool. Estimating the probability of a drought can be difficult due to historical data gaps and variance in annual weather patterns/precipitation. There is not currently a single methodology to establish a recurrence interval for drought. Rather, FEMA encourages communities to use the best available data to document a recurrence interval. In addition to regional or local sources of historical drought periods, federal agency resources that

provide drought related resources with information that could support a recurrence interval are listed in the Climate Change, Drought Information, and HMA Resources section.

An FSR project that results in new or restored wetlands, estuaries, riparian or green, open space, may consider the total annual benefits for these categories in the cost effectiveness evaluation. For these benefits, it would be necessary to quantify the total restored ecosystem area (in acres), define the land use type, and quantify the additional water supply provided by the project in relation to the population that will be supported in a drought, and identify the project's useful life.

Ecosystem services are beneficial goods and services provided by nature for people. Every landscape yields a variety of ecosystem services, presenting an opportunity for mitigation actions that provide multiple ecosystem services benefits. FEMA is building on the existing ecosystem services that can be used for acquisition/open space projects to allow more ecosystem service benefits for climate resilient activities. FSR projects can make extensive use of green infrastructure methods and are likely to provide several or more ecosystem services. FEMA will be providing more guidance on the ecosystem service benefits that can be used in evaluating the cost effectiveness of these mitigation projects in 2016.

Environmental and Historic Preservation Considerations

As part of eligibility review, FEMA is required to ensure that all HMA projects are compliant with environmental and historic preservation (EHP) requirements. This includes, but is not limited to, the processes and requirements established by the National Environmental Policy Act, Endangered Species Act, National Historic Preservation Act, Coastal Barrier Resources Act, and any other applicable laws, Executive Orders, Federal regulations or requirements. More detailed information on the EHP review process and requirements can be found in the HMA Guidance in the FEMA Library.

The size and scale of the FSR project and presence of potentially sensitive environmental and/or cultural resources may impact the level of complexity of the EHP review. A small scale floodplain restoration project that involves removal of at-risk structures, and planting native vegetation for bank stabilization may not require as complex EHP review as a large scale project. Extremely large projects such as at the overall watershed scale will likely require a complex and lengthy EHP review.

Project applications must include the necessary data and information for FEMA to conduct the appropriate EHP review. FEMA, in consultation with appropriate Federal and State agencies, will use the information provided in the application to ensure compliance with EHP requirements. This may include demonstrating methods to incorporate public participation in the review process and/or mitigate any EHP impacts resulting from the mitigation action.

Climate Change, Drought Information, and HMA Resources

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FEMA

Fact Sheet

Federal Insurance and Mitigation Administration

Climate Resilient Mitigation Activities
Green Infrastructure Methods

Purpose

The President's 2015 Opportunity, Growth, and Security Initiative (OGSI); Executive Order 13653 Preparing the United States for the Impacts of Climate Change; the President's 2013 Climate Action Plan; FEMA's Climate Change Adaptation Policy; and the 2014-2018 FEMA Strategic Plan, all identify the risks and impacts associated with climate change on community resilience to natural hazards, and direct Federal agencies to support climate resilient infrastructure.

FEMA is encouraging communities to incorporate methods to mitigate the impacts of climate change into eligible Hazard Mitigation Assistance (HMA) funded risk reduction activities by providing guidance on Climate Resilient Mitigation Activities. FEMA has developed initial guidance on Climate Resilient Mitigation Activities including green infrastructure methods, expanded ecosystem service benefits, and three flood reduction and drought mitigation activities: Aquifer Storage and Recovery (ASR), Floodplain and Stream Restoration (FSR), and Flood Diversion and Storage (FDS).

FEMA encourages communities to use this information in developing eligible HMA project applications that leverage risk reduction actions and increase resilience to the impacts of climate change.

Green Infrastructure Methodology

Green infrastructure is a sustainable approach to natural landscape preservation and storm water management that can be used for hazard mitigation activities as well as provide additional ecosystem benefits. Green infrastructure provides a framework and methodology for implementing flood risk reduction and drought mitigation actions in a manner that also incorporates ecosystem benefits and helps build a community's resilience to the impacts of climate change.

Green infrastructure methods use an ecosystem-based approach to replicate a site's pre-development, natural hydrologic function. Traditional "Gray infrastructure" storm water management systems seek to move excess water as quickly as possible away from homes and properties into storm drains and the storm water system. Green infrastructure seeks to do the opposite by safely capturing as much water as possible on site to facilitate storage, absorption, and infiltration. Using green infrastructure, storm water is typically channeled into in a basin or ditch designed to allow the water to seep or infiltrate the ground and re-charge groundwater supplies, or to slow its passage into the storm drain during peak flow periods to avoid overwhelming the storm water system.

Green Infrastructure Methods in HMA Projects

Climate Resilient Mitigation Activities focus on green infrastructure methods for storm water management and flood control especially in higher-density developed areas such as urban and suburban communities. In particular, green infrastructure methods lend themselves readily to designing and implementing soil

stabilization, flood reduction, and drought mitigation projects that provide additional ecosystem benefits. Examples of green infrastructure methods are presented in the Fact Sheets for Floodwater Storage and Diversion and Floodplain and Stream Restoration.

Many U.S. communities are using green infrastructure methods to manage or reduce storm water runoff and mitigate events leading to a Combined Sewer Overflow (CSO). A CSO occurs in cities with Combined Sewer Systems (CSS) where wastewater (e.g. sanitary sewage), storm water, and urban runoff water are collected in the same pipe network and routed to a treatment plant. If the capacity of the downstream treatment plant cannot handle the amount of water collected, the excess, including sanitary sewage, is often routed directly to the nearest body of water. Green infrastructure storm water management projects that provides flood risk reduction may also alleviate a CSO by capturing the storm water, and reducing and/or slowing the volume and rate of water entering the storm drain to avoid overwhelming the storm water system.

Projects implemented using green infrastructure methods will need to meet all HMA eligibility criteria including demonstrating the project is cost effective and provides risk reduction benefits. The project applications must include the necessary data and information for FEMA to conduct the appropriate EHP review and ensure the activity is compliant with all applicable environmental and historic preservation (EHP) requirements. More detailed information on the project eligibility and the EHP review process and requirements can be found in the HMA Guidance in the FEMA Library.

Benefits of Green Infrastructure

Green infrastructure emphasizes local, decentralized solutions that leverage the beneficial services that natural ecosystem functions can provide. Green infrastructure projects can be scaled to address site specific needs and conditions. Green infrastructure principles can be used in projects to mitigate flood risk to homes and property, filter pollutants from water, and capture and store water for use at a later time. The diversion, storage, and infiltration of the storm or flood water can replenish ground water supply and increase or enhance usable water supply to mitigate the effects of drought.

Since green infrastructure projects focus on smaller scale, localized water storage, they tend to be most effective for higher frequency, lower impact events. Green infrastructure projects can be considered for implementation in a connected system to scale the overall system capacity (e.g. a series of bio-detention sites along the natural water body or storm water flow path). A benefit of the green infrastructure approach for urban settings is that the project design may include dual-use as green space or recreation areas when not submerged or locate the project between roadways or underneath existing sidewalks so it does not reduce the area used for vehicle or pedestrian traffic.

Green infrastructure projects can also provide additional ecosystem services to address climate change resilience by improving air and water quality, reducing urban heat island effects, and providing or restoring native plant and wildlife conservation and habitat.

Climate Change, Drought Information, and HMA Resources

U.S. Drought Portal which includes the National Integrated Drought Information System (NIDIS)
http://www.drought.gov/drought

NASA Gravity Recovery and Climate Experiment (GRACE) provides satellite data on aquifer water levels
http://www.nasa.gov/mission_pages/Grace

U.S. Department of Agriculture Disaster and Drought Information
http://www.usda.gov/wps/portal/usda/usdahome?navid=DISASTER_ASSISTANCE

Hazard Mitigation Assistance Guidance and Addendum (February 27, 2015)
https://www.fema.gov/media-library/assets/documents/103279

U.S. Global Change Research Program conducts a National Climate Assessment every four year
http://www.globalchange.gov

NOAA Climate.gov provides science and information for a climate-smart nation and houses the National Drought Monitor
https://www.climate.gov

Information Requests and Questions

FEMA encourages communities to work with their State or Tribal Hazard Mitigation Office in identifying and developing Climate Resilient Mitigation Activity projects. States and federally-recognized tribes should contact their FEMA Region Office with questions. Questions can also be submitted by email to FEMA-HMA-Grants-Policy@fema.dhs.gov.