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U.S. ARMY CORPS OF ENGINEERS RESILIENCE INITIATIVE ROADMAP

2016

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Anacostia River

Douglass Bridge

Suitland Parkway

Fort Stanton & Fort



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
441 G STREET, NW
WASHINGTON, DC 20314-1000

13 May 2016

Team,

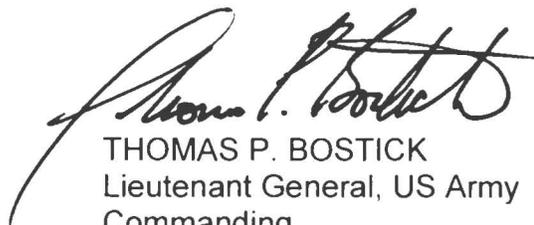
In April 2015, the U.S. Army Corps of Engineers published its initial USACE Resilience Roadmap, and with this release, the roadmap for 2016 is presented. This version of the roadmap represents further progress on USACE's approach to resilience in accordance with Executive Order, 13653 (Preparing the U.S. for the Impacts of Climate Change), in which the President defines resilience as, "the ability to anticipate, prepare for and adapt to changing conditions and withstand and recover from disruptions." The Corps of Engineers supports this definition of resilience and has further developed four principles – prepare, absorb, recover, and adapt – to convey the elements of the President's definition as a step-wise framework for action.

Within this definition and framework, the Corps of Engineers has developed two main strategies for bringing resilience practices forward: 1) Evolve Corps' Standards and Criteria, and 2) Support Community Resilience. The Corps of Engineers has long-incorporated resilience into our projects and worked in communities across the Nation and around the world for the more than 200 years, but these strategies acknowledge that there is more that can be done and outline the way ahead for continued improvement.

With lessons learned from disasters such as Katrina and Sandy, and the necessity for military readiness, we know that the Corps of Engineers has a lot to share in the resilience field. We can lead in so many ways, and we can learn from and with our fellow agencies, academia, industry, and non-governmental organizations to better support our stakeholders. This roadmap continues to define how we can evolve and better support the Nation in its resilience efforts, as we more fully articulate resilience across our mission sets.

I encourage personnel across the Corps of Engineers to review the roadmap and to begin to follow the resilience principles. Over the coming months, the Resilience Initiative team will provide more direction and guidance on specific actions. There is much we can do to help lead and support others in their endeavors, and I am confident that our efforts will make a real difference in the quality of lives of so many nationally and internationally.

Thank you for your support of this important initiative. I look forward to seeing how the Corps embraces the principles and these strategies to bring more resilient project and systems to bear in the years to come.



THOMAS P. BOSTICK
Lieutenant General, US Army
Commanding



Table of Contents

DOCUMENT PURPOSE1

THE USACE RESILIENCE INITIATIVE.....1

PROJECT, SYSTEM, & COMMUNITY RESILIENCE2

STRATEGIES TO EVOLVE RESILIENCE IN USACE3

STRATEGY 1 – EVOLVE USACE RESILIENCE PRACTICES.....4

- *Identify/Develop USACE Standards and Best Practices for Resilience*.....4
- *Reflect Standards and Best Resilience Practices in Relevant Documents*.....4
- *Foster Resilience Thinking*.....5
- *Align the Resilience Initiative with other USACE Initiatives and Programs*5

STRATEGY 2 – SUPPORT COMMUNITY RESILIENCE6

- *Articulate USACE Community Resilience Contributions*.....6
- *Support Partner Resilience Initiatives*.....6
- *Engage in Meaningful Partnering*.....7
- *Provide Consistent Messaging on the USACE Resilience Initiative*7
- *Engage with External Audiences*7

STRATEGY 3 – FOCUS ON PRIORITY AREAS.....7

- *Catalog of USACE Resilience Activities*7
- *Develop Nonstructural Strategies for Improved Community Resilience*.....7
- *Identify and Develop Community Resilience Assessment Tools*8
- *Develop Resilience Considerations for Military Installations*.....8
- *Develop Resilience Considerations in Coastal Areas*.....8
- *Update Resilience Considerations for Inland Areas Subject to Flooding*9
- *Clarify Resilience in USACE Civil Works Planning Process*.....9
- *Support Drought Contingency Efforts*.....9
- *Develop Resilience in Conjunction with Civil Works Sustainability*.....9

WAY AHEAD FOR RESILIENCE IN USACE9



EP 1100-1-2 USACE Resilience Initiative Roadmap 2016 16 OCT 17 (original publication date: 16 MAY 16)

RESILIENCE has developed at national, state, regional, and local levels as the concept to convey a holistic approach to addressing threats and uncertainty from acute hazards such as more frequent and/or stronger natural disasters, man-made threats, changing conditions from population shifts and climate change. Resilience represents a comprehensive, systems-based, lifecycle approach to both acute hazards and changes over time, and the concept of resilience is used to convey a broad-based, collaborative approach to finding creative solutions to such challenges. Executive Order (EO) 13653, "Preparing the United States for the Impacts of Climate Change" (November 2013), describes resilience as "the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions." To help organize resilience activities and describe how resilience measures can be applied, the U.S. Army Corps of Engineers (USACE) has divided resilience into four key principles: prepare, absorb, recover, and adapt. These principles provide a lifecycle perspective for resilience-related actions in recognition of the fact that adverse events happen and conditions change over time.

DOCUMENT PURPOSE

This document provides the context and the way ahead for USACE on resilience and serves as a roadmap to implement a number of key resilience-related strategies. This roadmap provides the general concepts for resilience and describes strategies and overarching activities to update resilience practices within USACE. The roadmap applies to the whole of the USACE organization, with activities particularly relevant to processes within its Civil Works (CW) and Military Program (MP) directorates. Additionally, the strategies and actions described in the roadmap either explicitly or implicitly include USACE partnering with academia, other governmental agencies, non-governmental organizations, industry, stakeholders, and others to continue to gain understanding of resilience challenges and opportunities; share lessons learned and best practices; develop tools; and deliver improved project, system, and community resilience.

This roadmap is an update of the draft roadmap provided internally to USACE in 2015 and applies to 2016. Following the 2016 roadmap's release, USACE will provide specific guidance, further articulate goals, responsibilities, actions, timelines, and key performance indicators in support of its strategies. Subsequent roadmaps will be updated annually to reflect accomplishments, future deliverables, and overall progress on the strategies.

THE USACE RESILIENCE INITIATIVE

Resilience is not a new concept for USACE as it has long designed projects to support community resilience and applying resilience principles in project planning, design, and construction. However, the recent collective reconceptualization of resilience as a process, a framework, or an ability for addressing





and prioritizing actions to mitigate threats of all types requires that USACE takes a look at its processes and practices to ensure that USACE is up to date and appropriately supportive of national objectives. In 2015, USACE established a Resilience Initiative to guide how the agency can improve its support of community resilience and provide a framework for improving the contributions to resilience that USACE delivers. It is important to recognize that by instituting the Resilience Initiative, it does not mean that the projects USACE provided in the past do not provide resilience nor does it imply that communities are not already resilient to an extent; USACE projects are and communities are resilient. Yet, it does mean that as a learning organization, USACE is taking a look at its processes and procedures to determine what changes are needed to ensure its products and services continue to be relevant and meet current and future needs.

In this vein, USACE is seeking to articulate and define its contribution to resilience in support of community resilience goals, as communities look to improve their resilience. The goal of the USACE Resilience Initiative is to enhance resilience through USACE’s diverse civil works and military mission sets and abilities. USACE is engaging with other federal agencies, partners, and stakeholders to define how to support communities in making complex system-wide decisions and support them through its actions.

PROJECT, SYSTEM, & COMMUNITY RESILIENCE

The intent is for the Resilience Initiative to make long-lasting advances to USACE contribution at three levels of applied resilience: (1) project, (2) system, and (3) community. These three levels of resilience are interdependent, and actions taken at any level will ultimately affect the others. While these levels are interdependent, efforts at the three levels require different approaches and considerations. USACE seeks to advance its understanding and ability to apply resilience to each of these three levels.

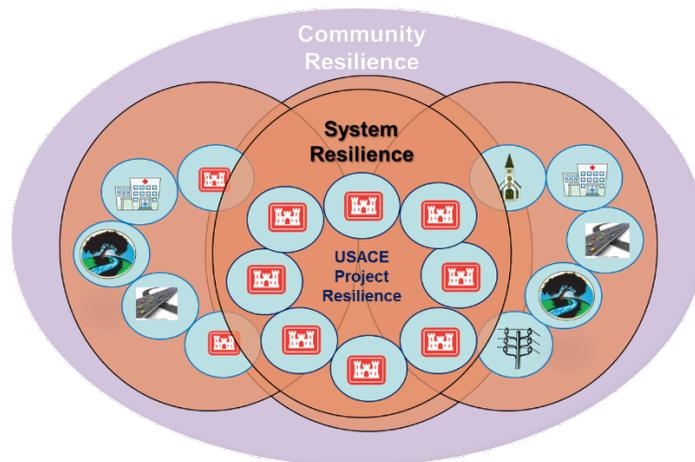


Figure 1. The spheres of resilience representing project, system, and community resilience.

This figure is a simple representation of the concept that projects comprise systems and communities are comprised of systems. As shown, USACE projects sometimes comprise a complete system (center), are a part of a shared external system (left), or are not part of an external system (right). These systems comprise a community and constitute its resilience.

USACE contributes directly to project and system resilience through delivery on projects and through a wide range of mission activities. USACE can also contribute directly to community resilience through technical or planning assistance.

The word ‘community’ can have a variety of meanings. The USACE Resilience Initiative considers a community to be a unified group of people who share goals, values, or purposes. Communities may exist



within geographic boundaries or unite geographically dispersed individuals. In this context, military installations are communities, too. Communities generally function under the authority of a specific governance structure (town, city, county, Tribal entity, etc.), or state/regional governance and typically seek to strengthen their resilience by working together with numerous partners.

Federal, state, local governmental agencies and communities, academia, the private sector, and stakeholder groups are emphasizing resilience as the way for communities to self-organize in order to reduce risks, save lives, reduce damage to natural features and built infrastructure, and conserve limited resources. This emphasis on resilience is inducing transformations within the broad spectrum of community risk reduction activities. Community resilience, as the name implies, is driven by the community. Communities are identifying what is most important for them to be resilient to and making decisions as to how to balance the benefits and risks, identify additional actions to further buy-down risk, and increase resilience and sustainability overall. USACE has a role as a valuable contributor to community resilience through its diverse Civil Works and Military Programs mission areas, and USACE is making greater support to community resilience an enterprise-wide priority with this initiative.

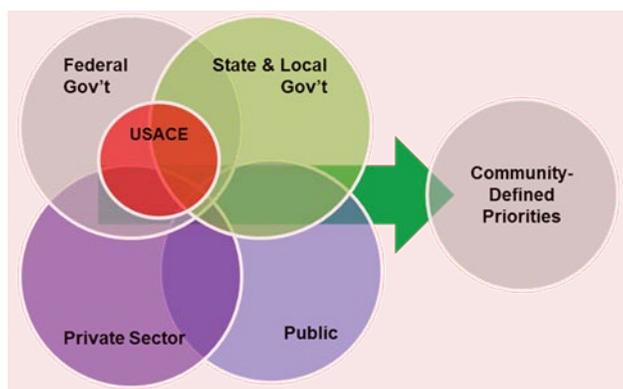


Figure 2. USACE's Role in Supporting Resilience Stakeholders

As part of the federal government, USACE is “at the table” with other federal agencies, state and local governments, the private sector, and the public (including regional organizations, academia, other non-governmental organizations, and individuals) to support communities in identifying their priorities for risk-reduction and recovery and determining the broad suite of actions these groups can take to meet communities’ needs through a shared responsibility for increased overall resilience.

STRATEGIES TO EVOLVE RESILIENCE IN USACE

Below are the strategies USACE will take to further evolve resilience:

- Resilience Strategy 1 – Evolve USACE Resilience Practices
- Resilience Strategy 2 – Support Community Resilience
- Resilience Strategy 3 – Areas of Focused Activities

Strategies 1 and 2 are comprised of internal process changes and partnering actions that meet goals for improved project, system, and community resilience. Resilience Strategy 3 puts added organizational focus on a number of actions identified as the most urgent for 2016. Further, the actions in the roadmap are not intended to limit or constrain the current resilience work being conducted every day within USACE. Rather, the strategies provide the framework and context for all USACE resilience actions, show the interconnections among these actions, provide a forum for improvement, and better inform the various resilience spheres as shown previously in Figure 1.



Strategy 1 – Evolve USACE Resilience Practices

The goal of Strategy 1 – Evolve USACE Resilience Practices is to establish USACE processes and practices to deliver projects and systems that provide the appropriate level of resilience for the risks identified. This strategy focuses on USACE internal processes across the organization, and the following sub-sections describe the actions to be taken.

- **Identify/Develop USACE Standards and Best Practices for Resilience**

As an engineering organization, USACE must identify needs and solutions for providing minimum and optimal levels of resilience for projects and systems USACE plans, designs, and constructs. The concept of the minimum standard for resilience is to provide inherent project and system resilience based on risk-informed decisions. Resilience is inherently considered in all aspects of risk-informed decisions (e.g., through hazard classification/identification, system performance and related consequences). USACE projects and systems have traditionally been designed to incorporate resilience to an extent. The new goal for resilience in projects is to increase performance reliability in anticipated use, reduce the risk of failure during extreme events, maintain primary function during changing conditions, and/or help meet specific community resilience goals. This action will identify guidelines and best practices to meet this goal within USACE projects and systems.

PROJECT RESILIENCE GOALS

The goal of project resilience is to ensure that each USACE project includes the minimum standard for resilience, or a baseline resilience, as applicable for the project type and within USACE authorities given the assessed risks. To reach this goal, USACE will have to define the range of projects, the possible standards, steps required to reach the desired standard, and formalization of the standard. In 2016, initial steps will be undertaken to reach this goal in support of Strategy 1 – Evolve USACE Resilience in Practice. As the work in all three strategies gets underway, USACE will continue with its current processes to execute resilience in projects to the extent possible today.

- **Reflect Standards and Best Resilience Practices in Relevant Documents**

Once identified, new standards and resilience practices will be reflected in relevant documentation, as one of the key elements of the overall strategy to evolve resilience practices throughout USACE. This action includes updating all documents that relate to USACE application of resilience to articulate how, through each document's subject area, USACE will better support community resilience through both Civil Works and Military missions, as described in the activities below.

- **Reflect Resilience Goals in Internal Strategic Documents**

USACE's current approach to resilience needs to be articulated and accurately reflected in internal strategic documents. Resilience considerations exist within the USACE Campaign Plan currently, and efforts are underway to further articulate resilience specifics in Campaign Plan updates. Further, resilience considerations will be added or updated in other strategic documents, such as the Civil Works Strategic Plan.

- **Reflect Best Resilience Practices in USACE Guidance Documents, Policies, and Regulations**

This goal will result in changes to USACE internal documents so that USACE is able to better support community resilience. This goal is divided into several actions as described below.



- Determine Required Changes to USACE Guidance Documents, Policies, and Regulations. Initiation of this effort is beginning in earnest in 2016. The team will work to update a prioritized list of existing guidance, policies, and regulations in accordance with the determined changes.
- Update Existing USACE Guidance Documents, Policies, and Regulations. Once changes are identified, existing guidance documents will be updated according to the prioritized list of guidance update. Interim guidance will be issued to bridge the gap between identifying the changes and getting them incorporated into the appropriate guidance.
- Include Resilience Practices in Guidance, Policies, and Regulations Currently Being Developed. Identified resilience practices will be included in guidance, policies, and regulations currently being newly developed to ensure they reflect the appropriate resilience guidance.

- **Foster Resilience Thinking**

The goal of the strategy to evolve resilience is to ensure that resilience considerations are integrated into USACE planning, design, construction and operational processes, and not be considered as an afterthought or add-on. Actions to inculcate the internal changes include training and education; consistent, high-quality internal communications; and pilots and demonstrations.

- ***Ensure High-Quality Internal Communications***

The goal of ensuring high-quality, clear and consistent internal USACE communications is so that USACE personnel understand the strategic aims and specific actions being taken within the Resilience Initiative. This roadmap, a program management plan, and other tools such as memoranda, teleconferences, presentations, webinars, and white papers will provide information, elicit feedback, and serve as platforms to collaborate on the USACE Resilience Initiative.

- ***Provide Training***

Training must be provided for personnel to understand the changes to the planning and design process, and any new requirements that are outcomes of the actions presented in this roadmap. This goal incorporates both new training opportunities as well as ensuring that existing training courses are updated to include the resilience strategy, as appropriate.

- ***Measure Understanding and Resilience in Practice***

A baseline assessment of the present understanding of resilience and metrics is needed to measure the effectiveness of the education and training actions. In 2016, the team will conduct an initial relative resilience assessment screening to assess resilience related to the key concepts of resilience: prepare, absorb, recover, adapt. This assessment will provide the baseline to help measure success in this strategy, and the screening will be conducted each year to measure improvements.

- **Align the Resilience Initiative with other USACE Initiatives and Programs**

USACE needs to ensure that the actions being taken by the Resilience Initiative are aligned with other existing or emerging USACE programs and initiatives. It is important that the work in USACE across various programs and initiatives are aligned to achieve overall organizational goals.

- ***Ensure Research and Development Support to Resilience***

The U.S. Army Engineer Research and Development Center (ERDC) is a vital contributor to USACE's overall success. The purpose of ensuring research and development support to resilience is to engage



researchers and develop technology from ERDC to support CW and Military Missions actions laid out in this roadmap.

- **Clarify Risk-Informed and Resilience-Based Decision-Making**

Risk-informed decision making within USACE has been continuously improved upon, especially since Hurricane Katrina. The goal of clarifying risk-informed and resilience-based decision making is to bring these two important initiatives together to better enable project, system, and community resilience.

- **Develop Resilience Practices in Other Areas of Interest**

The Resilience Initiative will seek alignment and synergy with other USACE initiatives.

Strategy 2 – Support Community Resilience

This strategy lays out the ways in which USACE will work with others and seek to improve its contribution to increase overall community resilience. It is critical that USACE maintains meaningful external collaboration and communication in resilience as an emerging field of study and articulates its varied contributions in a broader context.

- **Articulate USACE Community Resilience Contributions**

USACE is an important contributor to many activities contributing to community resilience; and, therefore, must have an expressed understanding of how USACE mission areas contribute to community resilience independently and collectively. USACE will develop a common operating picture of its contributions to community resilience, and USACE will also work directly with communities to enhance support to their resilience-related activities. Many communities are seeking to use community resilience frameworks to help them assess risk, identify mitigation and resilience actions, set priorities, and make decisions to support the most critical actions. USACE will continue to improve its understanding of these emerging frameworks and how to best support communities in the process.

- **Support Partner Resilience Initiatives**

USACE is an important contributor to many activities contributing to resilience; and, therefore, USACE's support of others' initiatives is an important partner activity. USACE is committed to supporting efforts from the Administration or other federal agencies or groups. USACE will consistently engage and lead where appropriate in these forums. As resilience is addressed at a higher/national level through legislation, EOs and Presidential Policy Directives (PPD), and other means, USACE will continue to track and strive to meet the documents' larger intent. Prevailing documents such as EO 13653 (referenced in the introduction), the PPD8, and the Army's Energy Security and Sustainability Strategy, all reference resilience-related activities that USACE is already undertaking to inform future strategies.

SYSTEM RESILIENCE GOAL

The goal for USACE regarding system resilience is to ensure that USACE considers and provides system resilience to the greatest extent possible within its authorities and abilities. System resilience is the overall resilience of the collection of interdependent projects. One of the foundational lessons learned for the comprehensive systems approach is a direct outcome of post-Hurricane Katrina analyses. These analyses made clear the New Orleans "protection system" in place prior to Hurricane Katrina was a system in name only. This lesson continues to compel USACE to employ a true systems approach rather than trying to use a project-by-project individual approach.



- **Engage in Meaningful Partnering**

In addition to supporting other resilience-related initiatives, USACE will engage in meaningful partnering with external stakeholders in other governmental agencies, other military services, academia, non-governmental organizations, industry, and others. USACE will collaborate with these groups to drive internal and external change in support of improved community resilience.

- **Provide Consistent Messaging on the USACE Resilience Initiative**

Clear and consistent messaging on resilience across USACE is critical to enhancing resilience throughout the organization and better supporting community resilience. USACE will develop and regularly update resilience communication tools, provide materials internally and externally, and collaborate on shared messaging with other federal and governmental agencies to the extent practicable.

- **Engage with External Audiences**

External engagements provide critical forums in which new ideas can be fostered, best practices can be shared, and techniques, tactics, and procedures can be taught and learned. This roadmap encourages USACE engagement in resilience-related public meetings and participation in forums such as technical conferences and partnering meetings to share, learn, and advance resilience.

Strategy 3 – Focus on Priority Areas

There are many steps that need to be taken to fully evolve resilience within the broad scope of USACE mission sets. These priority areas are those foundational activities that address critical needs, provide key communication, and/or ensure proper coordination to reach strategic goals of evolving USACE resilience practices and better support of community resilience. Activities herein include internal and external products, activities with stakeholders and partners, and internal organizational activities.

- **Catalog of USACE Resilience Activities**

One priority area for USACE is to produce a catalog of USACE Resilience Efforts. This catalog will provide an up-to-date picture of current USACE resilience activities to help ensure a shared, comprehensive understanding of USACE's specific contributions to resilience and identify best practices. The document will catalog definitions of resilience; the full scope of resilience-related activities USACE conducts; known resilience indicators, metrics, tools (whether existing or under development); USACE resilience-related guidance, policies, and regulations; higher-level governing and/or influential documents; and describe the connections of resilience to other important initiatives, such as climate change preparedness, risk-informed decision making, and the informational environment. Internally, the catalog will be a frequently updated, living document that reflects USACE current understanding of resilience. An external version will be published annually. The initial internal publication of the catalog was completed in August 2015, and the 2016 update for internal and external publication is currently being prepared.

- **Develop Nonstructural Strategies for Improved Community Resilience**

USACE contributes to community resilience using a variety of programs and activities. One priority area focuses on providing technical and planning services through the Floodplain Management Services (FPMS) and Planning Assistance to States (PAS) programs. In recent years, the FPMS program has placed emphasis on providing information to support nonstructural flood mitigation and preparedness efforts by non-federal partners. Nonstructural technical and planning assistance programs such as FPMS directly support community resilience by providing expertise in engineering and planning consultation on



nonstructural approaches to manage and reduce flood risk. This expertise is provided either directly to a community, or in collaboration with non-governmental organizations, other governmental agencies, and/or private entities.

Continuing in 2016, USACE will continue to support efforts to inform nonstructural flood and coastal risk management measures implemented by non-federal partners by using the FPMS and PAS programs, and partnering with states with Silver Jackets or similar state level teams. USACE will also highlight key resources that improve community resilience, such as models, tools, databases, guidance, and other USACE technical resources.

- **Identify and Develop Community Resilience Assessment Tools**

Identifying, updating, and developing, as necessary, community resilience assessment tools and participating in interagency resilience indicators, metrics, and tool development are priority actions. The end goal is for USACE to have a suite of available guides, and/or tools that can be used internally as resilience indicators, which can also be shared with communities. Since community resilience is driven by the community, it is important that communities have a number of options to choose from to meet their particular needs. The tools in the suite of available guides and/or tools are likely to range from simple to complex and cover a large number of topics within the resilience sphere.

The current field of resilience assessment tools, indicators, and metrics is broad and continuing to develop. USACE actions taken in this priority area will be to identify, vet, and validate existing and newly developed tools, including USACE-created tools. USACE actions will support federal goals, in conjunction with efforts by those in academia, partner agencies, non-governmental organizations (NGOs), the private sector, and others.

COMMUNITY RESILIENCE GOAL

The USACE goal for community resilience is to provide direct and indirect support to community resilience wherever and whenever USACE engages with a particular community. USACE seeks to integrate improvements to community resilience into all of its mission areas across Military Programs and Civil Works. While USACE already supports community resilience, the USACE Resilience Initiative provides a framework to align, improve, and adapt USACE support to better meet the articulated resiliency goals of a community.

- **Develop Resilience Considerations for Military Installations**

Given the critical support USACE provides to installations, understanding the requirements to develop more resilient military installations is a USACE priority. As the Services determine the range of actions to be taken to increase installation resilience and readiness in conjunction with their strategic goals, USACE will be prepared to support service needs. In 2016, USACE will evaluate how to improve the services it provides to better support installation resilience initiatives and overall support to those strategies.

- **Develop Resilience Considerations in Coastal Areas**

USACE has identified coastal resilience as a priority area. A large body of work is being developed to identify coastal resilience considerations and requirements, of which USACE is a major contributor. Examples efforts that show great promise include the North Atlantic Coast Comprehensive Study (NACCS), the New Orleans Hurricane and Storm Surge Damage Reduction System (HSSDRS), and the Systems Approach to Geomorphic Engineering (SAGE). USACE will continue to work on coastal resilience considerations and requirements in collaboration with other federal agencies, academia, non-governmental organizations, and the private sector; with the expectation that pilots, demonstrations, and



feasibility studies will be carried out in 2016-17. Coastal resilience will also consistently and proactively consider nonstructural, natural and nature-based actions.

- **Update Resilience Considerations for Inland Areas Subject to Flooding**

Updating resilience considerations for inland areas subject to flooding is a USACE priority area. USACE will identify updates/improvements to inland flooding resilience analysis procedures and collaborate with other federal agencies, academies, non-governmental organizations, and the private sector on initiatives and on future pilots, demonstrations, and/or feasibility studies so that tools for increased community resilience are available and more widely considered and regularly employed.

- **Clarify Resilience in USACE Civil Works Planning Process**

USACE CW planning process is one of the primary ways in which USACE engages with and provides planning expertise to communities. Clarifying ways to improve community resilience through the planning process is a priority area. Currently, USACE engages communities at varying levels to support building community resilience. In the future, USACE seeks to have this expression of community resilience as an inherent part of the planning process. In 2016, USACE will also begin to require explicit documentation of community resilience considerations in planning documents brought before CW project review boards.

- **Support Drought Contingency Efforts**

USACE has long addressed national drought concerns, but recent severe droughts in California and other states have brought this hazard forward as a priority for USACE. USACE Engineer Regulation (ER) 1110-2-1941 provides the organizational guidance to address drought while still meeting the authorized uses and purposes for USACE water control and/or storage projects. Each USACE project or system that has controlled reservoir storage must have a Drought Contingency Plan (DCP). Recent work in the Responses to Climate Change (RCC) program has been to update or recommend updates to USACE drought-related policies, range of actions, and communication tools to ensure their relevancy and to make sure that they incorporate the latest science and technology. USACE will continue with these efforts in collaboration with others to look at additional options for supporting drought contingency efforts.

- **Develop Resilience in Conjunction with Civil Works Sustainability**

USACE has implemented sustainability by reducing ecological and environmental footprints, reducing energy waste and waste streams, and promoting independence from non-renewable fuel and water sources. Future efforts in sustainability, particularly in CW, will take on a more holistic, future-focused approach to planning and design. USACE will align its developments in resilience and sustainability together for successful support to community resilience and sustainability efforts.

WAY AHEAD FOR RESILIENCE IN USACE

This roadmap is presented as informational to USACE at large to begin sharing the way ahead for resilience as a relatively new initiative within USACE. To implement the specific elements of this roadmap, the USACE Resilience Initiative team will continue to develop and publish guidance, information papers, memoranda, and other informative products in support of the activities reflected herein. Overseeing the development and execution of the roadmap and its products are the Resilience Initiative points of contact: USACE lead for resilience, Mr. James Dalton, Chief of Engineering and Construction; and Ms. Sheri Moore, USACE Resilience Initiative Program Manager. More information will continue to be published internally, and externally to the extent possible, in support of this effort.