Department of Commerce
Climate Change Adaptation Strategy
Updated June 2014

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I. Background

On October 5, 2009, President Obama signed Executive Order (EO) 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, to establish an integrated strategy for sustainability in the Federal Government. The EO calls on Federal agencies to develop and implement Strategic Sustainability Performance Plans (Sustainability Plans). As part of their Sustainability Planning process, agencies are to "evaluate agency climate change risks and vulnerabilities to manage both the short- and long-term effects of climate change on the agency's mission and operations" (EO 13514 Section 8(i)).

Building on the efforts of EO 13514, E.O. 13653 (November 1, 2013), *Preparing the United States for the Impacts of Climate Change*, requires that each Federal agency develop or continue to develop, implement, and update comprehensive plans that integrate consideration of climate change into agency operations and overall mission objectives.

In 2011and 2012, pursuant to E.O. 13514[1], CEQ issued *Implementing Instructions for Federal Agency Climate Change Adaptation Planning (Implementing Instructions)*, followed by further guidance on *Preparing Federal Agency Climate Change Adaptation Plans.* Most recently CEQ issued *Preparing Federal Agency Climate Change Adaptation Plans in Accordance with Executive Order 13653 (December 19, 2013).* These documents provide useful guidance on considerations critical to Federal agency climate change adaptation planning, particularly as it applies to operations. The 2011 *Implementing Instructions* required each agency to include an agency climate change adaptation plan as an appendix to the June 2012 Sustainability Plan submission. Initial adaptation plans generally demonstrated a basic understanding of the challenges and risks posed by climate change to agencies' missions, programs, and operations. The plans included commitments to take specific actions in FY 2013 and beyond to better understand and address those risks and opportunities.

To respond to EO 13514, the Task Force's October 2010 recommendations, and CEQ's implementing instructions, the Department of Commerce (Department) issued a Departmental Administrative Order (DAO) 216-18, "Addressing Climate Change Impacts at the Department of Commerce in Operations and Programs" on August 31, 2011.[2] In addition, the Department included its climate change adaptation plan in its Sustainability Plan in June 2012.[3]

The 2011 *Implementing Instructions* emphasized that Federal agency adaptation plans should be "living documents," and should be improved over time to reflect new information, ongoing agency performance against existing goals and targets, and emerging strategic priorities. Since 2012, agencies have continued to pursue a number of actions to address climate adaptation and resilience needs.

[1] Federal Leadership in Environmental, Energy and Economic Performance - EXECUTIVE ORDER 13514
http://www.whitehouse.gov/administration/eop/ceq/initiatives/sustainability

[2] Department of Commerce Climate Change Adaptation Planning (DAO 216-18), August 31, 2011.
http://www.osec.doc.gov/opog/dmp/daos/dao216_18.html

[3] United States Department of Commerce Strategic Sustainability Performance Plan. June 2013.
http://www.osec.doc.gov/ofeq/Documents/OSEEP/Docs%20&%20Newsltrs/Documents/2013_SSPP_FINAL_Public_Version.pdf

The Department's updated adaptation plan reflects lessons learned in the preparation and subsequent implementation of adaptation plans submitted under E.O. 13514 and incorporates new considerations and elements included in E.O. 13653 and the December 2013 Guidance.

II. Why is Adaptation Planning Important for the Department of Commerce?

The Department has a longstanding role in the protection of life and property from environmental hazards and in the stewardship of natural resources. This traditional role is now augmented by a robust agenda focused on providing communities and businesses with the information, products, and services they need to prepare for and prosper in a changing environment.

As social and economic systems evolve and become more complex, it becomes even more critical to have timely, actionable environmental intelligence. That intelligence can preserve and improve human and environmental health, help develop and maintain a viable national infrastructure, and promote growth. Recent events, such as the Deepwater Horizon oil spill in 2010, the historical tornado outbreaks of 2011 and Superstorm Sandy in 2012, demonstrate the need for better environmental intelligence to ensure that communities and businesses have the tools and information they need to address these challenges. The Department's Strategic Plan will positively impact the lives of all Americans, from coast-to-coast and everywhere in between, every day.

Across the United States and the globe, we are already experiencing, and will continue to experience, the impacts of climate change. Climate change impacts include extreme heat and precipitation events, more frequent and intense wildfires, reduced snowpack, increasing ocean temperatures, loss of sea ice, and rising sea levels, among others.[4] Climate variability and climate change will affect a range of Departmental services, operations, programs, and assets. A changing climate will also result in financial, operational, social, and environmental risks and opportunities across diverse industries and sectors at local, regional, national, and international levels, impacting the Department's partners and the customers it serves.

Some of the Department's infrastructure and facilities may be directly affected by climate change. For example, higher temperatures will increase cooling loads on building HVAC systems. More severe and frequent precipitation, and storms, as well as sea level rise will increase potential risks of flooding and inundation. By accounting for the effects of a changing climate through a more comprehensive approach to facilities planning, the Department can reduce, and in some cases avoid, impacts to property which could also translate to future cost-savings since expensive repairs or replacement of facilities would be minimized. In addition, smart facilities planning will reduce potential impacts on the health and safety of the Department's employees.

With regards to the Department's clients and stakeholders, climate change will provide additional challenges and opportunities as the Department attempts to advance U.S.

[4] Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: *Climate Change Impacts in the United States*: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2. *See also* National Research Council. 2011. *America's Climate Choices*. The National Academies Press. Washington, DC.

competitiveness in the global market place, promote job creation, and enhance economic growth and standards of living for all Americans. Depending on their location and their industry, some U.S. businesses and workers will be negatively affected and others positively affected by climate change. For example, rising seas and more extreme weather events disrupt transportation and energy infrastructure, including ports, roads, airports, electricity, and oil and gas production. A 2008 multi-agency report on transportation infrastructure in the Gulf of Mexico region noted that depending on the emissions scenarios used and geographic location, by 2100, sea levels in the region could rise by two to four feet as a mid-range projection, inundating a vast portion of the region's major roads and other critical transportation infrastructure.[5] For example, if sea levels rise two feet, 64 percent of the region's port facilities would be impacted. Even more transportation infrastructure would be vulnerable to storm surge; more than half of the region's major highways, one third of its rail miles, 22 airports, and all ports would be impacted by an 18 foot storm surge. Damage to this critical commerce infrastructure could increase the cost and time needed to transport and deliver goods, making economic growth more challenging. However, climate change may positively impact our nation's competitiveness as well by increasing the demand for sustainable, green products that can assist businesses and communities adapt to a changing climate. The recently released National Climate Assessment explores this, and other, similar impacts at the regional scale for regions around the nation, making it easier for the Department to assist its clients and stakeholders in anticipating critical challenges – and exploring emerging opportunities.[6]

The negative impact of climate change on domestic and overseas markets could affect U.S. exports of goods and services, and diminish the competitiveness of U.S. businesses and workers in the global economy. Impacts could also affect both the domestic supply chain and the supply of imports to the United States, which the nation needs to fuel continued economic growth. Rising sea levels and increased storm activity could greatly disrupt, or even close, some of the Nation's seaports and airports. The International Trade Administration determined that such seaport disruptions would threaten economic growth by disrupting supply chains that U.S. companies rely on to produce and export their products to the world.

Concerns about the effects of climate change may increase consumer demand for sustainable products, adoption of more sustainable and environmentally-friendly business practices, and increased demand for clean energy. The Department can help turn this demand for clean energy and sustainable products and production pathways into a competitive advantage for U.S. manufacturers.

Climate change could affect supply chains that are dependent on natural resources such as water, timber, fishery, and agricultural products. For example, ocean acidification can lead to degradation of shellfish and shellfish industries. The Pacific Northwest experiences seasonal upwelling of deep ocean water with low oxygen and increased acidity in some of the coastal bays that are the nation's largest shellfish producers. In the past, two of the West Coast's major shellfish hatcheries experienced 80 percent declines in oyster larvae production. Larvae

[5] CCSP, 2008: *Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I.* A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research [Savonis, M. J., V.R. Burkett, and J.R. Potter (eds.)]. Department of Transportation, Washington, DC.

[6] Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp.doi:10.7930/J0Z31WJ2.

production in the largest oyster-producing bay on the West Coast, where many growers rely on natural recruitment of oyster seed, failed to occur for six years. The interaction of these impacts on hatchery and natural seed recruitment resulted in about a 20 percent decline in West Coast oyster production over the past five years. [7]

Climate change will also reduce the Department's ability to foster and sustain healthy and resilient coastal communities and ecosystems, another key aspect of its mission. Climate-related changes on coasts and oceans include increasing ocean temperatures, changes in ocean circulation, changes in ocean productivity, loss of sea ice, rising sea levels, and increasing ocean acidification.[8] In addition, climate change impacts often exacerbate existing ecosystem stressors, such as overfishing, pollution, or habitat destruction.[9] These impacts threaten the National Oceanic and Atmospheric Administration's (NOAA) ability to manage the Nation's coastal and ocean resources and sustain the many important ecosystem services, jobs, and economic activity that these resources provide the Nation. For example, ecosystem services, such as seafood production and habitat-based tourism and recreation generate millions of jobs and billions of dollars in economic activity each year.[10] Healthy coral reefs, wetlands, mangroves, and other coastal habitats provide ecosystem services such as flood attenuation and buffering against storms and waves, playing a critical role in reducing costly storm and flood damage and protecting lives and property.[11] Low-lying coastal communities and infrastructure are vulnerable to the impacts of sea level rise and storm surge, including flooding, coastal erosion, and saltwater intrusion, among other impacts.

With a substantial portion of the U.S. gross domestic product directly influenced by weather and climate, managing weather- and climate-related risks and opportunities requires access to reliable, authoritative, and timely environmental information and services, as well as the capacity to apply this information in decision-making. The demand for climate information and services is increasing as individuals from diverse sectors (e.g., agriculture, water resource management, transportation) work to enhance resilience to climate variability and change. The Department, through its scientific and economic bureaus, is uniquely situated to develop and deliver these services to help the private sector, local, regional, tribal and state governments, and resource managers better prepare for and reduce their vulnerabilities to climate variability and change. For example, NOAA issues weather, water, and climate forecasts and warnings that provide accurate and timely information to local communities, reducing the loss of life, property damage, and disruptions to businesses and everyday life. The nation will rely even more on NOAA, and the Department, to provide climate information and services to prepare for extreme events, climate variability, and climate change.

The Department must prepare for potential climate risks and opportunities for it to have the capacity and expertise to execute its missions and maintain important services in the face of climate variability and change. To do so, the Department will integrate climate change

[7] Bill Dewey. 2011. "Potential Impact of Ocean Acidification on West Coast Shellfish Aquaculture." American Fisheries Society presentation, Seattle, WA.
[8] National Research Council. 2011. *America's Climate Choices*. The National Academies Press. Washington, DC.
[9] Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: *Climate Change Impacts in the United States*: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.
[10] National Ocean Economics Program. 2014. *State of the U.S. Ocean and Coastal Economies*. http://www.OceanEconomics.org/nationalreport
[11] Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

adaptation planning and actions into its operations, policies, and programs and adjust its business and governmental practices and processes, as appropriate. Adaptation is responsible risk management; it is good business practice for the Department to identify, manage, and plan for risks, including those related to climate change, in order to achieve its strategic goals, minimize future costs, avoid disruption, and continue providing the critical products and services on which our Nation's citizens depend.

III. Key Findings from Climate Change Vulnerability Assessment

A. Background on Climate Change Vulnerability Assessment

As directed by the DAO, the Department conducted an assessment of its vulnerability to climate change during Summer 2011. The assessment helped the Department understand how it may be impacted by climate change and which impacts may cause the greatest challenges to its ability to achieve its mission and operational goals. Updates to this climate change vulnerability assessment are found below.

DAO: Addressing the Impacts of Climate Change at the Department of Commerce in Operations and Programs

The Order lays out six areas in which the Department is working to promote a more climate-resilient economy, society, and environment:

- Providing climate science and services to the Federal Government and other stakeholders, including the business community, the non-profit sector, and local, state, and tribal governments.
- Assisting other Federal agencies, local governments, regional entities, states, and Indian tribes in integrating climate information and resiliency into their near-term and long-term strategies and actions, including economic development and natural resources stewardship.
- Promoting the advancement of green growth to create market opportunities (both domestically and abroad), new businesses, advanced technologies, and quality jobs.
- Working with industry to develop areas of expertise that facilitate climate change management and adaptation services and create economic opportunities.
- Ensuring that Departmental policies, plans, and decisions anticipate and respond to current and projected climate impacts on our society, economies, and ecosystems.
- Strengthening scientific understanding of climate variability and change and developing advanced measurements, tools, and standards for environmental monitoring and decision support.

B. Key Climate Change Vulnerabilities

The key findings from the vulnerability assessment are summarized below. This is not an exhaustive examination of all of the Department's vulnerabilities to climate change, but rather highlights some of its most significant vulnerabilities. The climate change vulnerabilities have been updated as part of this current Adaptation Plan revision.

i. *Economic Growth*

Climate change will affect the Department's ability to foster U.S. competitiveness that drives new business development and creates quality jobs. As the Department develops tools, systems, policies, and technologies critical to transforming our economy, it will need to consider climate change so that these products and services will continue to promote a strong, resilient economy in a changing climate.

Sea level rise and extreme weather events caused by climate change could affect communication and transportation infrastructure, including ports, roads, and airports, as well as energy infrastructure such as oil and gas production. These impacts to infrastructure could increase the cost and time needed to manufacture, transport, and deliver goods. Negative climate change impacts on domestic and overseas markets could, in turn, affect U.S. exports of goods and services, and diminish the competitiveness of U.S. businesses and workers in the global economy. Both the domestic supply chain and the supply of imports to the United States, which the nation needs to fuel continued economic growth would also be affected by impaired infrastructure. In addition, industries, markets, and supply chains dependent on natural resources such as water, timber, fisheries, and agricultural products would be directly affected by changes in the availability of these resources due to climate change. For example, climate driven changes in marine ecosystems will present major challenges for sustaining and promoting U.S. fisheries, tourism, recreation and other marine resource-dependent industries and economies that contribute over $200 billion annually to US economic activity, and affect international trade in a wide variety of seafood and marine products.

Climate change could also present several opportunities for U.S. companies and workers as the demand for clean energy and climate-friend technologies increases. Many businesses in the United States and around the world and will be impacted by climate change. They will be challenged to employ new technologies and processes to help them adapt as well as develop new and innovative products to help others adapt, save energy, and be more sustainable.

The assessment noted that:

- Disruptions in ports, other transportation infrastructure, and supply chains would greatly impact the Department's ability to promote U.S. exports and drive economic growth.
- Climate change impacts on the Department's primary customer base, U.S. businesses, workers, and communities, would affect the Department's ability to foster business and economic development.
- Climate change impacts on U.S. businesses and communities will increase the interest in climate-friendly and green technologies to help them minimize their economic and business risks and to capitalize on new, entrepreneurial opportunities in a changing climate. The Department will need to be positioned to turn this interest in innovative, climate-friendly and green technologies into a competitive advantage for U.S. manufacturers and businesses.
- The increased demand for climate change adaptation-related technologies and the associated increase in patent application filings would impact the Department's ability to process such applications in a timely manner, having a direct impact on U.S. competiveness and economic growth.

In order to continue to drive economic growth and ensure that U.S. businesses remain competitive, the Department will need to promote trade, economic and business development, innovation, entrepreneurship, accurate supply change information, best practices, standards, and performance metrics that consider climate change. The Department will also need to ensure it is positioned to help companies turn the emerging demand for climate-friendly technologies into a competitive advantage for U.S. manufactures and entrepreneurs.

ii. Science and Information

The Department is home to three of the Nation's premier science and information agencies: the National Oceanic and Atmospheric Administration (NOAA), the National Institute for Science and Technology (NIST), and the Economics and Statistics Administration (ESA). The Nation relies on accurate and reliable scientific, economic, and demographic information provided by these agencies to make informed decisions and manage risk.

The Department has several main vulnerabilities regarding its ability to continue to generate and communicate new, cutting edge, scientific understanding of technical, economic, social, and environmental systems in a changing climate. Climate change will increase demand for the climate, weather, economic, ecological, and demographic data, as well as the information and services the Department provides. Specifically, the assessment noted:

- Governmental and nongovernmental entities and the private sector will look to the Department to provide a better understanding of climate variability and change and to develop advanced measurements and standards for environmental monitoring to assess how physical and biological processes may be altered by climate change to enhance weather, water, and climate reporting and forecasting.
- Government and nongovernmental entities and the private sector will need accurate ecological, economic, social, and demographic data from the Department that considers potential effects of climate change so that they can effectively assess their own vulnerabilities and be prepared for the changes that climate change may bring to improve our understanding of the U.S. economy, society, and environment in order to make informed decisions.
- The demand for Department-produced tools to help governmental and nongovernmental entities and the private sector transform this science and data into effective decision making that minimizes their risks to climate change will increase as more climate and other science and data becomes available.
- U.S. buildings, infrastructure, and communities have the potential to suffer catastrophic loss due to extreme climatic events such as hurricanes, tornadoes, wildfires, earthquakes, and flooding. At present, the necessary metrics, tools, and standards needed to ensure structural and community resilience do not exist to enable communities to recover rapidly from these disasters with minimal loss of life, damage to buildings and infrastructure lifelines, and disruption to commerce. The Department's measurement science work that underpins the development of standards, technology, codes and practices necessary for cost-effective improvements to the safety and security of buildings during natural disasters will address this gap through enhanced scientific knowledge that promotes innovation and technology, supports economic growth, and improves public safety.

NOAA, NIST, and ESA will need to continue to support and enhance their science, information, and services capabilities to meet the needs of Federal and non-Federal partners in a changing climate.

iii. Environmental Stewardship

Environmental stewardship is a major mission of the Department which works to support climate change adaptation, develop sustainable and resilient fisheries, habitat and species, and support coastal communities that are environmentally and economically sustainable, among other stewardship objectives. Climate change will present new challenges to the Department's stewardship mission to ensure that our ocean and coastal species, habitat, ecosystems, maritime cultural resources, and communities are resilient and sustainable.

The Department has several key vulnerabilities regarding its ability to achieve its environmental stewardship mission. The assessment noted:

- Many climate change impacts such as rising sea levels, increased flooding, higher average air and water temperatures, increased droughts, storms, and ocean acidification, will transform and/or result in the direct loss of coastal habitats and directly affect coastal and marine ecosystems challenging the ability of the Department's existing natural resource management systems that are designed for relatively static conditions.
- Climate change may allow pathogens, parasites, and invasive species to flourish in new areas and spread more rapidly with possible cascading effects through marine and coastal ecosystems, also challenging the Department's existing natural resource management systems.
- Climate-driven changes in ocean and coastal conditions will impact the distribution and abundance of fish stocks and fisheries, increasing the demand for information, tools and actions that promote adaptation of marine resources and the industries/communities that depend on them. Many climate change impacts such as rising sea levels and increased extreme storm events will threaten coastal communities, placing lives and properties at risk, increasing the need for the Department to help these communities adapt to climate change so that they will be economically and environmentally sustainable.
- Climate-driven changes in ocean and coastal conditions will increase the demand for NOAA action for the protection and recovery of threatened and endangered species under the Endangered Species Act, Marine Mammal Protection Act, and other NOAA mandates.
- Climate-driven changes (such as in precipitation and temperature) will affect water supply and availability for communities and natural resources. These changes will have major impacts on the Department's environmental stewardship mandates and will significantly increase the demand for NOAA products and services needed by government and nongovernmental entities to prepare for and respond to changing water conditions (quantity and quality).

Clearly, the Department's ability to foster and sustain healthy and resilient coastal communities and ecosystems and manage the Nation's coastal and ocean resources to sustain jobs and economic activities will be challenged. The Department will need to adjust how it manages species, habitat, and ecosystems in a changing climate to achieve its environmental stewardship mission goals.

iv. Infrastructure, Facilities, and Operations Management

The Department and its twelve bureaus control facilities and infrastructure (personal and real property) across all fifty states, the territories, and overseas to facilitate the execution of its missions and operations. As a result of this geographical diversity, the Department's facilities and infrastructure could be vulnerable to the full range of climate change impacts. The assessment found that:

- All of the Department's facilities could be vulnerable to extreme weather events, including increased precipitation and extreme heat, which would increase the risk of flooding and increase cooling loads on building HVAC systems. The Department's coastal facilities could be vulnerable to rising sea levels as well as stronger and more frequent storms (e.g., hurricanes), while facilities in the Southwest could be vulnerable to increased wildfire risk. The Department's coastal facilities and infrastructure such as piers and warehouses could become inaccessible or unusable due to sea level rise, inundation, increased storms, and shoreline erosion.
- The availability of water, fuel, and other utilities needed at land-based facilities in support of NOAA ships and aircraft could be jeopardized due to increased demand caused by extreme weather events. Functionality of systems and equipment, e.g., cooling and heating, and electronics on NOAA platforms is at risk due to the potential for exceeding operating parameters and capacities designed for current weather conditions.

Six of the Department's bureaus own and operate their own facilities while the other bureaus use leased space managed by the General Services Administration (GSA). Therefore, while the Department will need to take steps to minimize the risk to its facilities and operations from climate variability and change, it will also need to coordinate closely with GSA to ensure all of the Department's facilities and infrastructure are resilient in a changing climate.

The Department has used existing funds and resources to identify and study the potential impacts of a changing climate on its real property inventory to the maximum extent practicable. Managing the effects of climate change and mitigation analysis and implementation can be expensive undertakings and funding is a key issue. Mitigation, for example, could involve relocation or extensive retrofit of a building that would require funding beyond that currently available.

V. Five Year Strategic Goals for Adaptation Planning

Over the next five years, the Department seeks to:

- Strengthen scientific understanding of climate variability and change and its impacts on physical, ecological, and socio-economic processes.
- Develop advanced measurements, tools, and standards for environmental monitoring, socio-economic statistics, and building design that consider climate change to ensure risk-management and other decisions are based on the best available science.
- Enhance tools and services for governmental and nongovernmental entities that will help them integrate climate information and resiliency into their near- and long-term strategies and actions, including those for economic development and natural resources stewardship.

- Promote the advancement of green growth to create market opportunities domestically and abroad, new businesses, advanced technologies, and quality jobs, that will increase our Nation's resilience.
- Work with the private sector to develop areas of expertise that facilitate climate change management and adaptation services and create economic opportunities.
- Ensure that the Department's resource management programs and policies incorporate climate change information and take action to reduce vulnerabilities and increase resilience of marine and coastal natural resources and the communities that depend on them.
- Ensure that the Department's policies, plans, and decisions anticipate and respond to current and projected climate impacts on our society, economies, and ecosystems.

VI. FY 2014 Adaptation Actions

The Department has identified the following priority adaptation actions to implement in FY 2014.

A. Economic Growth

Key Vulnerability/Opportunity: *Climate change impacts on the Department's primary customer base, U.S. businesses, workers, and communities, would affect the Department's ability to foster business and economic development.*

ACTION 1: Factor resiliency (including resiliency to the effects of climate change) into economic development investments.

Lead Office/Bureau: EDA **Scale:** National

Implementation Method: Leveraging the Comprehensive Strategy Content Guidelines and its leadership of the Economic Recovery Support Function of the National Disaster Recovery Framework (NDRF), the Economic Development Administration (EDA) will finalize internal guidance on how to factor resiliency (including resiliency to the effects of climate change) into its grant-making investment decisions.

Key Milestones:

- Finalize and disseminate Guidelines in conjunction with the release of new regulations. (Q4)
- Internal training to EDA's regional offices on final guidance completed. (Q4)

Metric: Internal guidance on how to factor resiliency into its grant-making investment decisions is complete and EDA grant staff trained in its contents.

Discussion: EDA provides grant-based investments to units of state and local government and non-profits in communities and regions suffering from economic distress. These locally-driven economic development investments foster vibrant, regional economic ecosystems that promote collaboration, innovation, and job creation. EDA's investments range from upfront strategic

economic development planning to public infrastructure construction. To ensure its funds are invested wisely and provide the greatest long-term benefit to communities, economic development plans or public infrastructure projects should be developed with future climate change projections in mind.

As an internal guidance document, there is no need for cross-agency coordination. However EDA does plan to leverage the experiences garnered through its engagement with the NDRF, which relied heavily upon interagency Federal collaboration. In addition, development of the Comprehensive Economic Development Strategy content guidelines, which will also inform the internal guidance, relied upon the engagement of a key segment of EDA's stakeholders (i.e., Economic Development Districts). No challenges are anticipated in the implementation of the guidance.

Key Vulnerability/Opportunity: *Climate change impacts on U.S. businesses and communities will increase the interest in climate-friendly and green technologies to help them minimize their economic and business risks and to capitalize on new, entrepreneurial opportunities in a changing climate. The Department will need to be positioned to turn this interest in innovative climate-friendly and green technologies into a competitive advantage for U.S. manufacturers and businesses.*

ACTION 2: Help businesses capitalize on an increased demand for green technologies sparked by a changing climate.

Lead Office/Bureau: ITA **Scale:** International

Implementation Method: The International Trade Administration (ITA) will continue to work closely with the Secretary's Renewable Energy and Energy Efficiency Advisory Committee, the Civil Nuclear Trade Advisory Committee, the Environmental Technologies Trade Advisory Committee, other industry stakeholders and U.S. Government trade agencies to implement the Renewable Energy and Energy Efficiency Export Initiative and the Civil Nuclear Trade Initiative to (1) accelerate interagency efforts to expand and improve the types of services and programs supporting these industries, (2) enhance market access overseas and intellectual property rights enforcement, (3) strengthen and tailor trade promotion efforts in these sectors, and (4) develop export markets for U.S. companies by helping trade partners establish policies and regulations that create optimal conditions for deployment of these technologies.

Key Milestones:

- Recharter the Secretary's Renewable Energy and Energy Efficiency Advisory Committee, the Civil Nuclear Trade Advisory Committee, and the Environmental Technologies Trade Advisory Committee. (Q4)

Metric: Increase both the value of U.S. exports of climate-friendly technologies and the market shares U.S. firms in that sector have in foreign markets.

Discussion: Promoting the development, production, and deployment of green technologies, including ones that promote renewable energy and energy efficiency and environmental stewardship, that will enable businesses to capitalize on new entrepreneurial opportunities in a changing climate, is a high priority for the Department. As the lead export promotion agency for the Federal Government, ITA developed two major interagency initiatives to support U.S. exporters of clean energy without any additional resources: The Civil Nuclear Trade Initiative, the Environmental Export Initiative and the Renewable Energy and Energy Efficiency Initiative. ITA worked with interagency groups to ensure Federal programs designed to promote clean energy and environmental technologies are efficient and effective, as well as help U.S.-based firms become increasingly competitive in the global market. These programs are already helping ITA and the Department, as well as other USG agencies, help businesses take advantage of economic opportunities in clean energy and ITA will continue to promote these programs in FY 2014. As global opportunities for renewable energy continue to grow around the world, an increasing number of governments are putting distorting policies in place to favor domestic

production and to develop their own renewable energy domestic industry as a hub for the region. One of the key factors in whether or not the U.S. renewable energy industry will be globally competitive depends on the extent to which there is a U.S. market for such technologies.

Key Vulnerability/Opportunity: *The increased demand for climate change adaptation-related technologies and the associated increase in patent application filings would impact the Department's ability to process such applications in a timely manner, having a direct impact on U.S. competiveness and economic growth.*

ACTION 3: Improve the ability to process patent application filings for climate change adaptation-related technologies in a timely manner.

Lead Office/Bureau: USPTO **Scale:** National

Implementation Method: The U.S. Patent and Trademark Office (USPTO) continues to implement its Patent Prosecution Highway (PPH) and "Track 1" prioritized examination programs to provide opportunities for fast-tracked examination of patent applications for adaptation-related and other green technologies. Each of these programs is available upon request from applicants, provided they meet the prescribed requirements, follow the prescribed procedures, and pay any necessary fees. The programs are administered through existing fast-track examination processes at the USPTO.

Metric: The "Track 1" goal is to receive 10,000 applications per year; the PPH goal for CY 2014 is to receive 32,000 cumulative requests by end of year.

Discussion: The PPH permits an applicant to fast track examination of a patent application at the USPTO when a partner office that is examining a patent application determines that the claims in a corresponding foreign patent application are patentable. Through the PPH, applicants can substantially reduce the amount of time they ordinarily must wait to obtain a patent. The PPH also allows the USPTO to leverage work already done by another office in examining the same invention, thus helping to reduce duplication of work and to increase USPTO processing efficiency. To date, the PPH has produced efficiency gains of approximately a full production unit (a reflection of the efficiency of patent examiners) per application. In addition, the PPH allowance rate, the percentage of applications determined to be patentable, is approximately double the overall USPTO allowance rate. Both metrics translate into thousands of dollars of potential cost savings for applicants from using the PPH. In 2014, the USPTO launched updated PPH pilots with 17 global partners to further streamline the PPH process for users of the program in applicable countries. The USPTO currently has PPH programs in place with 28 other patent offices around the world, representing dozens of major U.S. trading partner countries.

The "Track 1" program expedites the examination of patent applications related to green and other technologies, within existing resources and processes, to reduce the time it takes to patent these technologies to an average of one year. As with the PPH, earlier patenting enables inventors to secure funding, create businesses, and bring vital green technologies into use much sooner.

B. Science and Information

Key Vulnerability/Opportunity: *Governmental and nongovernmental entities and the private sector will look to the Department to provide a better understanding of climate variability and change and to develop advanced measurements and standards for environmental monitoring to assess how physical and biological processes may be altered by climate change to enhance weather, water, and climate reporting and forecasting.*

Key Vulnerability/Opportunity: *Government and nongovernmental entities and the private sector will need accurate ecological, economic, social, and demographic data from the Department that considers potential effects of climate change so that they can effectively assess their own vulnerabilities and be prepared for the changes that climate change may bring to improve our understanding of the U.S. economy, society, and environment in order to make informed decisions.*

ACTION 4: Continue coordinating climate and related ecological research and services partnerships within the Department and with Department partners to better understand climate variability and change and how climate variability and change will affect communities and ecological processes.

Lead Office/Bureau: NOAA **Scale:** National

Implementation Method: NOAA will continue to coordinate climate and related ecological research and services partnerships within the Department and with Department partners to better understand how climate variability and change will affect communities, cultural resources, and ecological processes. As part of this effort, NOAA will continue to host regional outlook forums where useful and appropriate. These forums serve as processes to communicate what we know and understand about regional climate and the potential implications of extreme events such as floods and droughts. A central focus of the forums is to increase engagement emergency managers, natural resource managers and other interested practitioners and the public. The forums will also serve to help connect a range of other federal, state, tribal, and private interests in shared understanding of potential vulnerabilities and risks and options for response.

Key Milestones:

- Regional climate impacts and outlooks (products that describe recent and present conditions, impacts and projected climate events) will be produced on a quarterly basis for the Eastern, Western, Central, Great Lakes, Missouri River, Alaska, and Pacific (all Qs)
- Regional outlook forums will also be convened to supplement the regional outlooks and improve the network of partners that will contribute and use the information. The number and location of the forums will be contingent on emergent events (e.g., droughts, floods, wildfires) and where opportunities to improve regional collaboration exist. (all Qs)

Metric: Delivery of a Regional Climate Outlook product for each NOAA region on a quarterly basis.

Discussion: Effective coordination across federal, state, tribal, and local partners will be critical for this action. NOAA will use the National Integrated Drought Information System (NIDIS) Act of 2006 (P.L. 430-109), the NOAA-Western Governors' Association MOU, and the DOC-DOI MOU on climate-related activities as requirements to help establish critical links to other agencies.

The activities will be supported through existing programs and from leveraging existing partnerships with the NOAA RISAs, the Regional Climate Centers, the State Climatologists, National Weather Service Regional offices and Weather Forecast Offices in addition to existing partnerships with federal, tribal, state, and local agencies.

Ongoing projects consistent with action four include NIDIS and the development of regional drought early warning information systems and the networks and partnerships the NOAA Regional Climate Services Directors are developing. Regional outlook forums are only one mechanism NOAA may use to facilitate regional engagement; webinars and feedback sessions are other types.

Key Vulnerability/Opportunity: *The demand for Department-produced tools to help governmental and nongovernmental entities and the private sector transform this science and data into effective decision making that minimizes their risks to climate change will increase as more climate and other science and data becomes available.*

ACTION 5: Develop frameworks and tools to help local coral reef managers incorporate climate change information into effective decision making that minimizes their risks to climate change.

Lead Office/Bureau: NOAA **Scale:** Regional

Implementation Method: NOAA is working to provide coral reef managers with frameworks and tools to incorporate climate change into decision making through two projects. An exploration of frameworks and methodologies for climate change adaptation planning for coral reef management has begun as a collaborative project through the Climate Change Working Group of the US Coral Reef Task Force. The project will: review recent advances in assessment and planning for climate change by coral reef practitioners, and use this information to tailor recent theoretical adaptation methods into a form that is more useful for coral reef management. This effort is co-led by NOAA and EPA and taps into the expertise of the 14 federal agency members of the USCRTF, the Nature Conservancy, the Australia Great Barrier Reef Marine Park Authority, academic partners and local natural resource agencies in the US States, Territories and Jurisdictions with coral reef resources. The NOAA Coral Reef Conservation Program is funding and leveraging activities to advance field and desktop methodologies for assessing resilience and develop the analytical and legal frameworks that can ensure resilience to climate change is increasingly included in coral reef management and conservation decisions. The work focuses on informing resilience assessments with data and products, refining frameworks for assessing resilience, employing these methods in different geographies and at different scales. The goal is

to provide information to management partners on how to quantify the relative resilience of their coral reefs, understand what non-climate stressors are increasing reef vulnerability and then use that information to identify and prioritize management actions that can increase or maintain resilience. The portfolio of work involves many NOAA Offices and Programs, The Nature Conservancy, USGS, state and territorial governments and agencies, the Australia Great Barrier Reef Marine Park Authority, academic institutions, the Stockholm Resilience Center and the Oceans Tipping Point Project. The outcomes and lessons learned from this work will be communicated to not only our management partners but to the larger global community working on these questions.

Key Milestones:

- Develop component of the new Climate Smart Conservation framework tailored to coral reef adaptation planning in the Pacific. (Q4)
- Test methodology at a stakeholder workshop in the Pacific and apply lessons learned to transfer the framework to other regions. (Q4)
- Resilience assessments have already been completed around Saipan, and will be completed for Rota and Tinian. (Q3)
- Support partnerships and grants to complete assessments in the US Virgin Islands and potentially in West Maui. (Q3)
- Develop data and information products to inform assessments. (FY15)

Discussion: Providing frameworks and tools to incorporate climate change into coral reef management is one example of how NOAA is supporting local decision makers minimize their risk from climate change. The management implications of this body of work have great potential – the ability to quickly prioritize areas of reef for action, to target actions to decrease the vulnerability of reefs, and to incorporate adaptation planning into management planning.

Key Vulnerability/Opportunity: *U.S. buildings, infrastructure, and communities have the potential to suffer catastrophic loss due to extreme climatic events . . . [T]he necessary metrics, tools, and standards needed to ensure structural and community resilience do not exist to enable communities to recover rapidly from these disasters with minimal loss of life, damage to buildings and infrastructure lifelines, and disruption to commerce. The Department's measurement science work underpins the development of standards, technology, and practices needed for cost-effective improvements to the safety and security of buildings during natural disasters will address this gap by enhancing scientific knowledge to improve innovation and technology, support economic growth and improve public safety.*

ACTION 6: Develop performance-based standards and tools for new and retrofit building designs resistant to extremes of wind, storm surge, and fire that prevent or mitigate collapse.

Lead Office/Bureau: NIST **Scale:** National

Implementation Method: The National Institute for Standards and Technology (NIST) will continue its program in measurement science to: (1) predict structural performance to failure under extreme loading conditions; (2) predict disaster resilience at the building and community

scale; (3) assess and evaluate the ability of existing structures to withstand extreme loads; (4) design new buildings and retrofit existing buildings using cost-effective, performance-based methods; and (5) derive lessons learned from disasters and failures involving structures.

Key Milestones:

- NIST will convene stakeholders from other Federal Agencies, State and local governments, the building industry, insurance providers, code councils, etc. to develop a comprehensive, community-based resilience framework and provide guidelines for consistently safe buildings and infrastructure. (Q3 and Q4) (Q4)

Metric: Completed resilience framework and guidelines for consistently safe buildings and infrastructure.

Discussion: Natural and manmade disasters currently cause an estimated $57B in average annual costs. Increased extreme weather events due to climate change have the potential to cause losses exceeding $100 billion. NIST is at the forefront of developing measurement tools and standards to help scientists monitor the environment, as well as for industry to create and implement climate friendly technologies and standards. NIST programs focused on disaster resilient structures are developing the measurement science that underpins the development of standards, technology, and practices needed for cost-effective improvements to the safety and security of buildings. These programs will help to mitigate structural failures that arise from earthquakes, fires, windstorms (hurricanes, tornadoes, storm surge), blast, and impact. Knowledge from these efforts can improve next generation construction standards, codes, and practices to substantially improve the resilience of structures to changes in the frequency of windstorms associated with multi-hazard events forecast to occur with increasing frequency due to climate changes.

There are a number of key stakeholder groups with interest in the outcomes of this program. At-risk communities and the American public are key stakeholders and beneficiaries. Government at all levels, responsible for pre-disaster mitigation and for response, recovery, and rebuilding in the aftermath of catastrophic disasters, will also have a keen interest in the products of this research. Design and construction practitioners, facility owners and operators, standards and codes developers, state and local building officials, and property risk insurers will all benefit. Impacts already achieved by the program include the 40 model building and fire code changes made to be consistent with the NIST World Trade Center (WTC) investigation recommendations now required by the International Code Council's (ICC) I-Codes. Similarly, the National Fire Protection Association (NFPA) has adopted 15 changes responsive to the WTC Recommendations for inclusion in the 2009 Editions of the NFPA 5000 Building Code, NFPA 1 Fire Code, and NFPA 101 Life Safety Code.

Key Vulnerabilities/Opportunities: *Government and nongovernmental entities and the private sector will need accurate ecological, economic, social, and demographic data from the Department that considers potential effects of climate change so that they can effectively assess their own vulnerabilities and be prepared for the changes that climate change may bring to improve our understanding of the U.S. economy, society, and environment in order to make informed decisions.*

ACTION 7: Understand and prepare for ocean acidification

Lead Office/Bureau: NOAA **Scale:** National

Implementation Method: NOAA will continue to lead inter-governmental efforts to design and implement ocean acidification monitoring and research programs to track and project impacts on shellfish, fish stocks and other marine resources. With the Interagency Working Group on Ocean Acidification, (NOAA, BOEM, EPA, FWS, NASA, NSF, Navy, State, USDA, USGS), NOAA will develop and implement new monitoring technology, new experimental facilities and research to study the biological impacts of ocean acidification. NOAA also will continue to work with state and tribal governments, industry, academic institutions, museums, aquariums, and non-governmental organizations to raise awareness about ocean acidification and establish feasible solutions for resilience, adaptation and mitigation.

Key Milestones:

- With the Interagency Working Group on Ocean Acidification, NOAA will develop and implement one new monitoring technology, one new experimental facility and one research project to study the biological impacts of ocean acidification. (Q4)
- NOAA will continue to work with state and tribal governments, industry, academic institutions, museums, aquariums, and non-governmental organizations to raise awareness about ocean acidification and establish feasible solutions for resilience, adaptation and mitigation. (All Q)

Metric: Complete one research project.

Discussion: Ocean acidification is a major threat to marine resources and the people, industries and economies that depend on them. Information is needed on where and when acidification currently is happening, what impacts it is having now, and what the future impacts might be on fisheries, coral reef systems, and coastal ecosystem productivity and resource-dependent communities.

Key Vulnerabilities/Opportunities: *Government and nongovernmental entities and the private sector will need accurate ecological, economic, social, and demographic data from the Department that considers potential effects of climate change so that they can effectively assess their own vulnerabilities and be prepared for the changes that climate change may bring to improve our understanding of the U.S. economy, society, and environment in order to make informed decisions.*

The demand for Department-produced tools to help governmental and nongovernmental entities and the private sector transform this science and data into effective decision making that minimizes their risks to climate change will increase as more climate and other science and data becomes available.

ACTION 8: Supporting Decisions through the National Integrated Drought Information System (NIDIS)

Lead Office/Bureau: NOAA **Scale:** National, Regional

Implementation Method: NOAA will continue to lead the implementation of NIDIS, an interagency partnership (USDA, DoE, DHS, DoI, DoT, EPA, USACE, FCA, FERC, IRS, USITC, NASA, SBA, HHS, and CDC) that works toward collaboration on monitoring, research, data, and communication of drought related information. The drought related tools and resources produced through NIDIS inform decision-makers at the federal, state, tribal, and local levels.

Key Milestones:

- Participate in the development of the cross-agency National Drought Resilience Partnership (NDRP) (co-lead by NOAA and USDA under the PCAP) through the provision of relevant resources and tools (e.g. outlooks, soil moisture network, drought.gov, etc.) (Q4)
- Develop the Regional Drought Early Warning System (RDEWS) for the Pacific Northwest, the Midwest Agricultural belt, the Southern Plains states, and the Carolinas, as well as enhance drought planning in California.

Metric: The number of states, and territories working with NIDIS to incorporate drought early warning information into their drought adaptation and mitigation plans.

Discussion: The National Drought Resilience Partnership, part of the President's Climate Action Plan (PCAP), aims to foster interagency collaboration and help communities better prepare for the impacts of drought through increased access to federal drought related resources and information. In its first year the NDRP will focus on several key activities to improve decision maker access to drought tools and resources and NIDIS will partner in these efforts.

Key Vulnerability/Opportunity: *The demand for Department-produced tools to help governmental and nongovernmental entities and the private sector integrate this science and data into effective decision making that minimizes their risks to climate change will increase as more climate and other science and data become available.*

Key Vulnerability/Opportunity: *Government and nongovernmental entities and the private sector will need accurate ecological, economic, social, and demographic data from the Department that considers potential effects of climate change so that they can effectively assess their own vulnerabilities and be prepared for the changes that climate change may bring to improve our understanding of the U.S. economy, society, and environment in order to make informed decisions.*

ACTION 9: Support adaptation decisions with climate data, forecasts, and tools in order for the Nation to better respond to extreme weather and water events.

Lead Office/Bureau: NOAA **Scale:** National

Implementation Method: NOAA will continue to provide "actionable science" to support climate change adaptation decisions. NOAA will engage the Department and Department partners to discuss, assess, and act on improving products and services that (a) communicate risks of extreme weather and water events; (b) provide timely information for climate adaptation planning; (c) increase usability of products and services; and (d) provide easy access to data, maps, and analyses.

Key Milestones:

- Develop an operational National Multi-Model Ensemble (NMME) (FY15 Q4)
- Develop NMME-based US Drought Outlook guidance (Q1)
- Migrate the Climate Prediction Center (CPC) GIS operational services to the National Centers for Environmental Prediction (NCEP) Central Processing (Q4)
- Develop user-friendly NWS climate web interface and tools (FY15 Q4)
- Develop common communication approaches for extreme temperature warning, enhanced data exchange opportunities, and experimental products (FY15 Q4)
- Develop decision support training activities (FY15 Q4)

Metric: Deliver enhanced climate products and services

Discussion: The President's Climate Action Plan, released in June 2013, calls for "actionable science" – that is, the type of scientific information that people can use to take the appropriate actions to reduce their vulnerability to climate change and to enable them to participate in those that reduce the emissions (CO_2) that drive climate change around the world. This actionable scientific information is especially important to the Nation's resiliency and the connections or links that can have a ripple effect across climate change impact areas.

Reports, such as the recently-released National Climate Assessment, are indicating that climate change a) impacts to our Nation are happening now (especially evident in the area of public health); b) is "not a distant threat"; and c) "is not the same everywhere" – there are regional effects with different impacts in different parts of the country. In order for the Nation to face such concerns and to make the best climate change adaptation decisions, NOAA is suited to provide scientific guidance that is meaningful, understandable, available, and reliable, so that the resulting impacts/risks can be the least risky and costly while, at the same time, offering the biggest "bang for the buck" into the future.

Key Vulnerability/Opportunity: *Governmental and nongovernmental entities and the private sector will look to the Department to provide a better understanding of climate variability and change and to develop advanced measurements and standards for environmental monitoring to assess how physical and biological processes may be altered by climate change to enhance weather, water, and climate reporting and forecasting.*

Key Vulnerability/Opportunity: *Government and nongovernmental entities and the private sector will need accurate ecological, economic, social, and demographic data from the Department that considers potential effects of climate change so that they can effectively assess their own vulnerabilities and be prepared for the changes that climate change may bring to improve our understanding of the U.S. economy, society, and environment in order to make informed decisions.*

ACTION 10: Develop climate change adaptation decision-support information for the Arctic region.

Lead Office/Bureau: NOAA **Scale:** National

Implementation Method: NOAA will provide climate data and forecasts to those making climate change adaptation decisions related to the Arctic region.

Key Milestones:

- Provide enhanced availability to Arctic products through the CPC website (Q3)
- Incorporate capability to access Arctic climate-related data into the Local Climate Analysis Tool (LCAT) for regional analysis (FY15 Q4)
- Explore opportunities for an experimental combined Weeks 3-4 Temperature and Precipitation Outlook (FY15 Q4)
- Upgrade Climate Forecast System Reanalysis sea ice initial conditions with Panarctic Ice Ocean Modeling and Assimilation System (PIOMAS) data from the University of Washington (Q4)

Metric: Produce new and enhanced Arctic regional climate products and services.

Discussion: Impacts of climate change in the Arctic region are manifested through events such as significant sea ice reduction, lessening coastal sea-ice accumulations, and increased melting of the permafrost. Various sectors of the Nation will need the best available climate guidance, including forecasts and data analysis tools, in order to address such climate change adaptation issues. NOAA, as a primary source of climate expertise and information, would be the logical choice to provide this information for users in Alaska including government (at Federal, state, local, and tribal levels), industry, fisheries, and others.

C. Environmental Stewardship

Key Vulnerability/Opportunity: *Many climate change impacts such as rising sea levels, increased flooding, higher average air and water temperatures, increased droughts, and ocean acidification, will transform and/or result in the direct loss of coastal habitats and directly affect the coastal and marine ecosystems challenging the ability of the Department's existing natural resource management systems that are designed for relatively static conditions.*

ACTION 11: Continue developing networks of sentinel sites to coordinate assets and efforts to increase understanding of, and better respond to, sea level change impacts on coastal ecosystems and surrounding communities.

Lead Office/Bureau: NOAA

Scale: Regional (San Francisco, Hawaii, North Carolina, Chesapeake Bay, and northern Gulf of Mexico)

Implementation Method: NOAA will continue to develop networks of sentinel sites to better understand and respond to sea level change. NOAA will continue to work with local area partners in San Francisco, Hawaii, North Carolina, Chesapeake Bay, and northern Gulf of Mexico, leveraging existing NOAA assets, programs and resources, to develop five Sentinel Site Cooperatives. NOAA will also work with the cooperatives to develop sea-level rise decision-making tools, products, and services, leveraging existing assets, programs and resources.

Key Milestones:

- Contribute 3-5 products to each Sentinel Site Cooperative's efforts as identified in the Cooperative implementation plans. (Q4)

Metric: Forty-three percent of U.S. coastal states and territories demonstrating 20% or more annual improvement in resilience capacity to weather and climate hazards.

Discussion: Sentinel Site Cooperatives are fundamentally places where integrated observations lead to greater understanding that allows NOAA to predict the types and magnitude of consequences of different phenomena. That data and information is then transferred to decision makers through models, predictions, visualization tools, education, outreach, and training. This full range of integrated science, service, and stewardship activities informs decisions related to NOAA Trust Resources, protection of coastal infrastructure, community planning, or event response. In this way, NOAA can more fully meet the expectations and needs of populations that depend on, live near, or care about the ocean. Close collaboration with Federal partners, state agencies, NGOs and academia will be paramount to the success of this program.

Key Vulnerability/Opportunity: *Climate-driven changes in ocean and coastal conditions will impact the distribution and abundance of fish stocks and fisheries, increasing the demand for information, tools and actions that promote adaptation of marine resources and the industries/communities that depend on them.*

ACTION 12: Track and assess climate-related impacts on U.S. marine ecosystems and the distribution of major fish stocks.

Lead Office/Bureau: NOAA **Scale:** Regional

Implementation Method: NOAA will continue efforts to monitor key indicators of marine ecosystem conditions and assess climate-related impacts on ecosystem conditions and the distribution of fish stocks to provide resource managers and resource-dependent industries/communities with early warnings of changing conditions. This effort depends on a variety of observation systems and monitoring efforts (e.g., in-situ monitoring stations, ship/aerial surveys, satellite-derived data) to collect information on key indicators of ecosystem condition. This information is then synthesized into ecosystem status reports that provide annual assessments of ecosystem conditions and climate-related impacts. This information needed/used to improve fish stock assessments, harvest levels, and recovery plans.

Key Milestones:

- Monitor key indicators of ecosystem condition and complete ecosystem status reports in three regions (Northeast, Alaska, Pacific Coast) (Q4).
- Complete prototype system for assessing climate-related shifts in the distribution of major fish stocks in U.S. marine ecosystems (Q4)

Metric: 50% of US marine ecosystems have operational systems for tracking and assessing status of key ecosystem indicators annually.

Discussion: NOAA and partners will continue to develop and implement systems to monitor, track and assess climate-related impacts on the conditions of 3 US marine regions. These systems provide managers with early warnings of climate-related changes in marine ecosystem conditions for use in marine resource management decisions. It is also useful for planning by resource-dependent industries (e.g., fisheries, recreation, tourism). This information is essential for developing management actions that promote resilience and adaptation of marine and coastal fisheries, protected species and the communities that depend on them. This effort includes identification and monitoring of core indicators of climate impacts on marine ecosystem condition, and using this information to deliver regular status reports on ecosystem conditions for use in marine resource management.

Key Vulnerability/Opportunity: *Climate-driven changes in ocean and coastal conditions will impact the distribution and abundance of fish stocks and fisheries, increasing the demand for information, tools and actions that promote adaptation of marine resources and the industries/communities that depend on them.*

ACTION 13: Assess the climate vulnerability and resilience of fish stocks and fishing communities.

Lead Office/Bureau: NOAA **Scale:** Regional

Implementation Method: The first step in climate adaptation is understanding the vulnerability to climate impacts. NOAA Fisheries will complete the first methodology for rapid assessment of the vulnerability of the nation's major fish stocks in a changing climate, and launch assessment of fish stock climate vulnerability US marine regions. NOAA Fisheries will also continue development of social indicators of vulnerability and resilience of resource-dependent coastal communities along the US East and Gulf coasts. These indicators identify vulnerable populations and communities reliant and engaged in fisheries for use in fishery management plans. If resources are available, planned expansion of these indicators in FY15 will include new indices that measure risks from coastal hazards, projected climate-related changes in fish stocks, as well as factors.

Key Milestones:

- Complete assessment of climate vulnerability of major fish stocks in the Northeast region. (Q3)
- Complete development of social indicators of vulnerability of fishing communities for all US regions. (Q4)

Metric: Complete 1 of 5 regional rapid assessments of fish stock climate vulnerability; Complete social vulnerability indicators for fishing communities in all regions.

Discussion: These efforts will significantly advance the ability to evaluate the vulnerability of US fish stocks and fishing communities in all U.S. regions to help resource managers and resource-dependent communities design and implement action to reduce risks and increase resilience.

Key Vulnerability/Opportunity: *Climate-driven changes in ocean and coastal conditions will impact the distribution and abundance of fish stocks and fisheries, increasing the demand for information, tools and actions that promote adaptation of marine resources and the industries/communities that depend on them.*

ACTION 14: Increase understanding of current and future climate impacts on living marine resources

Lead Office/Bureau: NOAA **Scale:** Regional

Implementation Method: Working with a variety of partners, NOAA will implement five key projects that increase understanding of current and future climate impacts on ocean and coastal resources (fish stocks, protected species) to help resource managers and the people that depend on them take action to increase resilience and adaptation in a changing climate.

Key Milestones:

- Launch new initiative to better understand current and future climate impacts on groundfish of the Northeast Atlantic marine ecosystem. (Q4)
- Continue efforts to understand current and future climate impacts on the California Current Large Marine Ecosystem and its important marine resources. (Q4)
- Continue efforts to understand current and future climate impacts on the Bering Sea Marine Ecosystem and its important marine resources.
- Launch new initiative to develop and test shorter-term forecasts of climate-related impacts on marine ecosystems. (Q4)
- Complete initial results of study to assess current and future climate impacts on Bluefin Tuna and other pelagic fish stocks in the Gulf of Mexico. (Q4)

Metric: Successful implementation of all five projects.

Discussion: By advancing understanding of current and possible future climate impacts on these marine ecosystems/resources, these efforts will enable marine resource managers to better design and implement actions that increase resiliency and adaptation of important marine resources and the communities that depend on them.

Key Vulnerability/Opportunity: *Many climate change impacts such as rising sea levels and increased extreme storm events will threaten coastal communities, placing lives and properties at risk, increasing the need for the Department to help these communities adapt to climate change so that they will be economically and environmentally sustainable.*

ACTION 15: Provide training to coastal communities to build their capacity to adapt to climate change.

Lead Office/Bureau: NOAA **Scale:** National

Implementation Method: NOAA will provide "Roadmap for Adapting to Coastal Risk," "Climate Adaptation for Coastal Communities," "Coastal Inundation Mapping," and "Introducing Green Infrastructure for Coastal Resilience" trainings. NOAA will partner with the Federal Emergency Management Agency's National Disaster Preparedness Training Center to deliver trainings on Tsunami Awareness and Coastal Community Resilience. NOAA will offer climate adaptation and resilience-related webinars and support for user meetings. Webinar examples include "Mapping and Visualizing Sea Level Rise," "Marshes on the Move: a Manager's Guide to Understanding ad Using Model results Depicting Potential Sea Level Rise Impacts on Coastal Wetlands," and "Coastal County Snapshots." User meetings include regional climate communities of practice and resilience planning groups. Through these activities, communities are made aware of, and gain skill with the resources that can help them assess and plan for hazard and climate change impacts.

Key Milestones:

- Develop, enhance or expand resilience assessment and planning data and tools and notify local users of availability for 50 coastal counties. (all Qs)

- Continued execution of the National Estuarine Research Reserve System (NERRS) Climate Adaptation Training. (all Qs)
- Develop data maps for 32 coastal counties for the coastal flood risk mapper. (Q4)
- Provide 100 coastal counties with tech assistance in the use of resilience assessment and planning data and tools. (all Qs)

Metric: Forty-three percent of U.S. coastal states and territories demonstrating 20% or more annual improvement in resilience capacity to weather and climate hazards; 75 counties benefiting from climate adaptation and resilience-related training; 150 coastal counties benefiting from climate adaptation and resilience learning opportunities.

Discussion: NOAA will work with partners to identify relevant communities in need of training to allow them to assess and plan for hazard and climate change impacts. Training needs assessments are often conducted prior to developing new trainings. When technical assistance is provided alongside a product or training, a community is more likely to use what they learn. Technical assistance will help identify resources that are most relevant to assessment and planning activities. Some trainings may be provided by webinar to accommodate constrained travel budgets.

Key Vulnerability/Opportunity: *Climate-driven changes in ocean and coastal conditions will increase the demand for NOAA action for the protection and recovery of threatened and endangered species and the conservation of ocean and coastal protected areas.*

ACTION 16: Enhance climate resilience of endangered corals

Lead Office/Bureau: NOAA **Scale:** Regional (SE, Caribbean)

Implementation Method: This program will advance innovative coral propagation activities to help increase the recovery and resiliency of endangered coral species in the SE and Caribbean. The goal is to establish a network of climate resilient coral populations that are physically connected and able to aid in natural species recovery through successful reproduction. This effort will help coordinate and advance a variety of disparate coral propagation and conservation activities into more effective coral population enhancement efforts. By promoting successful reproduction of resilient and genetically diverse coral colonies, the program will help increase the overall abundance and climate resilience of coral species and valuable reef habitats. The major product will be a comprehensive Management Plan for Coral Population Enhancement Activities due in FY15. The Management Plan will integrate population enhancement efforts with resilience planning, regional priorities, marine protected area planning/zoning, recovery actions, demographic monitoring, and core species science. Planning will help identification, prioritization, and funding of new sites, research gaps, and methods development.

Key Milestones:

- Complete draft content for the comprehensive Management Plan for Coral Population Enhancement Activities (Q4)

Metric: Complete the comprehensive Management Plan for Coral Population Enhancement Activities (FY15).

Discussion: ESA-listed corals are essential to recovery of Caribbean reefs and provide many services including shoreline protection and structurally complex habitat for commercially harvested seafood. High abundance and genetic diversity contribute to coral resilience because they increase the likelihood of successful reproduction, which is important for adaptation to changing environmental conditions. By advancing the resilience of ESA-listed coral species, this program will also help increase the resilience of many other species that depend on coral reefs, (including 50 percent of federally managed US fisheries that depend on coral reefs as part of their life cycle), and the communities that depend on coral reefs for jobs, food and protection from storms.

Key Vulnerability/Opportunity: *Climate-driven changes in ocean and coastal conditions will increase the demand for NOAA action for the protection and recovery of threatened and endangered species and the conservation of ocean and coastal protected areas.*

Key Vulnerability/Opportunity: *Climate-driven changes (such as in precipitation and temperature) will affect water supply and availability for communities and natural resources. These changes will have major impacts on the Department's environmental stewardship mandates and will significantly increase the demand for NOAA products and services needed by government and nongovernmental entities to prepare for and respond to changing water conditions (quantity and quality).*

ACTION 17: Climate-ready protection and recovery of Pacific Northwest salmon and other riverine-dependent species - Projecting Climate Impacts and Designing Resilient Salmon Restoration Projects

Lead Office/Bureau: NOAA **Scale:** Regional (PacNW)

Implementation Method: This is a program of action involving a variety of research, modeling, assessment and decision-support activities by NOAA's Northwest Fisheries Science Center to produce and deliver better information on the vulnerabilities of salmon and other protected species to climate change, and use this information in planning for recovery of endangered species. This program of action will provide a variety of research and decision support products including (1) state-of-the-art projections of future climate impacts on salmon in both their river and ocean habitats, (2) synthesis of how climate change will affect habitat restoration efforts for protected salmon and other NOAA trust resources, (3) guidance on adapting river restoration plans and project designs to accommodate climate change, and (4) expert assistance to help NOAA constituents implement climate-smart restoration of riverine habitats for these river-dependent species.

Key Milestones:

- Complete designs for resilient salmon habitat restoration projects (Q4)

- Provide expert guidance to Washington Department of Natural Resources and other partners on climate adaptation strategies and actions protected species and riverine habitats (Q4)
- Launch development of climate-impact models for Snake River spring/summer Chinook salmon exploring 20 freshwater climate change scenarios, five ocean climate change scenarios, and two hydrosystem scenarios needed to design and implement management actions that build resilience and adaptation of these riverine-dependent protected species (Q4).
- Evaluate climate change and hydrosystem scenarios for the Columbia River system to inform the Federal Columbia River Power System (FCRPS) Biological Opinion 2014 Supplement and Adaptive Management Implementation Plan (Q4)

Metric: 100% completion of major products and services listed above.

Discussion: This program of action will significantly advance efforts to design and implement climate-ready conservation efforts for salmon and other riverine-dependent protected species in the Pacific Northwest. It will improve the resilience and adaptation of salmon, other riverine species and the people/economies that depend on them. The key elements of this work are (1) identifying habitat restoration actions that are robust to climate variation and alternative climate scenarios, (2) identifying habitat restoration actions that increase ecosystem resilience (3) a decision support framework that guides restoration practitioners through a planning process for adapting endangered species recovery plans for climate change, and (4) outreach efforts to communicate these products and assist in their implementation

Key Vulnerabilities/Opportunities: *Many climate change impacts such as rising sea levels, increased flooding, higher average air and water temperatures, increased droughts, and ocean acidification, will transform and/or result in the direct loss of coastal habitats and directly affect the coastal and marine ecosystems challenging the ability of the Department's existing natural resource management systems that are designed for relatively static conditions.*

ACTION 18: Inform and advance the use of natural and nature-based infrastructure for coastal resilience, including through increased understanding of the value of the ecosystem services and benefits provided.

Lead Office/Bureau: NOAA

Scale: National, Regional (Great Lakes and Mid-North Atlantic Coast)

Implementation Method: Individual efforts are currently underway across NOAA and with our partners to identify decision-maker needs and frame science and research agendas to advance the use of natural and nature-based infrastructure for coastal resilience. Post-Sandy, many coastal decision-makers have been requesting information on the benefits that natural infrastructure options provide in place of, or integrated with, other methods of urban infrastructure and coastal defenses. NOAA has begun to focus some funding opportunities on research that advances our understanding of the benefits of natural infrastructure for coastal protection using ecosystem service valuation techniques, as well as on the application of natural infrastructure in planning for coastal resilience. NOAA is also engaged in partnership efforts, such as the SAGE (Systems

Approach to Geomorphic Engineering) community of practice, the Climate and Natural Resources Working Group, and interagency efforts focused on implementing the Hurricane Sandy Rebuilding Strategy recommendations, which are providing valuable venues for information exchange and the leveraging of resources to advance this issue.

Key Milestones:

- Finalize literature review on the use of ecosystem services valuation and natural infrastructure (Q3)
- Support research programs and projects that advance our understanding of the benefits provided by natural and nature-based infrastructure and that increase its application in coastal planning (all Q)
- Update the Introducing Green Infrastructure for Coastal Resilience training to include both landscape- and site-scale green infrastructure techniques; deliver 4-6 trainings on Introducing Green Infrastructure for Coastal Resilience (Q3)
- Develop a natural infrastructure online tutorial to guide users in creating a spatial analysis workplan for identifying priority natural infrastructure for resilience to coastal hazards and sea level rise. (Q3)
- Provide technical assistance to help Great Lake's coastal communities (Duluth, MN and Toledo, OH) implement the results of a recent study on the costs and benefits of green infrastructure options for flood reduction and provide these methods to be used in other areas around the U.S. (Q4)

Metric: Forty-three percent of U.S. coastal states and territories demonstrating 20% or more annual improvement in resilience capacity to weather and climate hazards.

Discussion: Natural infrastructure provides a variety of benefits including habitat for commercial and recreational fish species, opportunities for recreation and commerce, and shoreline protection. Over the past year, particularly post-Sandy, NOAA leadership has been asked to discuss and provide science and information that supports the use of natural infrastructure for coastal protection and resilience, particularly the valuation (monetary) of this particular ecosystem service. By advancing the state of knowledge around ecosystem services valuation in a changing climate, we will be able to provide coastal communities with information needed to make decisions that support both the resilience of natural resources and the communities that depend on them.

D. Infrastructure, Facilities, and Operations Management

Key Vulnerability/Opportunity: *Climate change could negatively impact the Department's infrastructure, facilities, and operations unless potential climate change impacts, such as more extreme storm events, higher average air temperatures, increased drought, and sea level rise, are proactively addressed.*

ACTION 19: Assess the vulnerability of the Department's leased facilities to climate change.

Lead Office/Bureau: CFO/ASA **Scale:** National

Implementation Method: The Department will review its direct leased portfolio and complete a Vulnerability Analysis to identify properties with the highest vulnerability to the threats of climate change.

Key Milestones:

- Complete a study that will identify Department- leased properties with the highest risk(s) of threat(s) caused by a changing climate. (Q3)
- Create a table that identifies the most vulnerable leased properties and defines the risk(s) associated with the geographic location of the leased asset.

Metric: Provide a narrative analysis addressing Climate Change vulnerabilities with the potential to threaten the Department's direct-leased asset inventory. The analysis is supported by a summary table identifying those assets most as risk, by risk type.

Discussion: The Department has completed a preliminary analysis of its owned assets identifying those assets at highest risk by risk type, risk level and likelihood and severity of occurrence. This action proposes the same process for the Department's direct leased assets. The goal is to use the analysis to support locational decisions particularly when leases approach the end of their term and the Department can relocate without penalty or when long term leases have termination rights or potentially require mitigation plans.

ACTION 20: Continue to work with GSA to assess and analyze climate change vulnerabilities for real property assets GSA has assigned to the Department of Commerce.

Lead Office/Bureau: CFO/ASA **Scale:** National

Implementation Method: Continue to work with GSA as they identify GSA-owned and leased assets with vulnerabilities to climate change. As an occupant in GSA-leased and owned facilities support their efforts to adapt to incremental climate change and variability.

Key Milestones: TBD

Metric: Provide GSA with a list of GSA real property assignments with more than five (5) years remaining on the lease term and in facilities owned by GSA where Commerce occupies space. Integrate GSA's vulnerabilities and risks analyses into the Department's planning and mitigation strategy.

Discussion: The Department previously provided GSA with a listing of its mission critical GSA assignments. The methodology was to alert GSA to those assets most critical to the Department's various missions. The Department will incorporate the criteria GSA develops for, "assessing the criticality of facilities to mission and thereby assess vulnerability to climate

changes risks over time" into its vulnerability screening analyses. The Department's emphasis is on its GSA long term lease assignments and assignments in GSA-owned facilities.

VII. Interagency Coordination on Climate Change Adaptation

Below is a description of how the Department will contribute to coordinated interagency efforts to support climate preparedness and resilience at all levels of government, including collaborative work across agencies' regional offices and hubs, and through coordinated development of information, data, and tools.

1. **Building climate resilient fish stocks and fisheries in US marine ecosystems -** NOAA Fisheries Service has collaborative efforts underway in several US marine regions to assess climate related risks to fish stocks and fisheries to help resource managers and resource-dependent communities reduce risks and increase resilience. These efforts involve collaborations with variety of partners including state agencies, industry, academia, tribes and nongovernmental organizations. The goal is to increase understanding, awareness, preparedness and response to climate-driven changes in marine ecosystems, resources and communities that depend on them. Milestones include rapid assessment of all major fish stocks in each region, delivery of regional ecosystem status reports, and production of regional climate-ocean projections for use in forecasting climate impacts on marine resources.

2. **Building climate resilient coasts -** NOAA has extensive collaborations with state and local governments, private sector and nongovernment organizations to support climate preparedness and resilience of coastal communities facing a variety of climate-related changes including rising seas, extreme events, and increasing inundation and erosion. NOAA provides a range of products and services from technical information and tools to training, for assessing risks, adaptation planning, and implementation of actions to increase climate preparedness. NOAA also provides funding for implementation of habitat conservation and coastal zone management efforts, which are designed to increase coastal ecosystem and community resilience.

3. **Regional Climate Services -** NOAA/ National Environmental Satellite Data and Information Service (NESDIS)/National Climatic Data Center's (NCDC's) six Regional Climate Services Directors (RCSDs) support the development and delivery of a wide range of place-based climate science and information products and services to help people make informed decisions. Regions include the Alaskan, Pacific, Western, Central, Southern, and Eastern U.S. regions. The RCSDs are a part of NCDC's Regional Climate Services Program, which also includes the six Regional Climate Centers and the Association of State Climatologists. RSCDs support and coordinate with a number of other agency efforts, including Department of Interior (Climate Science Centers and Landscape Conservation Cooperatives) and recently announced US Department of Agricultural Climate Hubs. Per the table for FY13 actions, RCSDs support "Action 4: Continue coordinating climate and related ecological research and services partnerships within the Department and with Department partners to better understand climate variability and change and how climate variability and change will affect communities

and ecological processes." The milestones and metrics listed remain the same. Regional outlooks can be found at http://drought.gov/drought/content/resources/reports.

4. **Coral Reef Adaptation –** The NOAA Coral Reef Conservation Program (CRCP) is involved in three interagency efforts. The audience is coral reef managers.
   - **The Climate Change Working Group of the U.S. Coral Reef Task Force** has begun a collaborative project to explore frameworks and methodologies for climate change adaptation planning for coral reef management. The project is engaging federal and regional experts to review recent advances in assessment and planning for climate change by coral reef practitioners, and use this information to tailor recent theoretical adaptation methods into a form that is more useful for coral reef management. The resulting coral adaptation planning framework will be piloted, critiqued and revised at a stakeholder meeting in the Pacific Region in 2014. This effort is co-led by NOAA and EPA and taps into the expertise of the 14 federal agency members of the US Coral Reef Task Force, The Nature Conservancy, the Australia Great Barrier Reef Marine Park Authority, academic partners and local natural resource agencies in the US States, Territories and Jurisdictions with coral reef resources. In FY 14, the existing Climate Smart Conservation framework is being tailored to coral reef adaptation planning, and will be presented, tested and critiqued at a stakeholder workshop in the Pacific. A case-study on the framework and lessons learned will be written. Based on this work, there are plans in FY 15 to repeat the process in a second region and work on guidance for the coral reef management community.
   - **Coral Reef Resilience Assessments -** The NOAA CRCP is funding and leveraging activities to advance field and desktop methodologies for assessing resilience and developing the analytical frameworks to ensure resilience to climate change is included in coral reef management and conservation decisions. The work focuses on providing data and products to inform resilience assessments, developing frameworks for assessing resilience, and employing these methods in different geographies and at different scales. The work involves many NOAA Offices and Programs, The Nature Conservancy, US Geological Survey, state and territorial governments/agencies, Australia Great Barrier Reef Marine Park Authority, academic institutions, Stockholm Resilience Center, and Oceans Tipping Point Project. The outcomes and lessons learned will be communicated to NOAA management partners and the larger global coral conservation community. The goal is to provide guidance to coral management partners on how to quantify the relative resilience of coral reefs and how to incorporate that information into management decisions to reduce the vulnerability of reefs to climate and non-climate stressors. In FY 14, resilience assessments will be completed for Rota and Tinian, Northern Mariana Islands, and additional assessments are planned for the US Virgin Islands and potentially West Maui. There is a project to build a framework for incorporating resilience information into permitting in US Virgin Islands (FY14/FY15). Data and information products to inform assessments are currently in development. A meeting of the NOAA investigators and partners will be held in FY14/FY15 to share approaches, challenges, assumptions and learn from one another and ensure that products and data are being developed in formats that maximize use.

- **US Coral Triangle Initiative (USCTI) Support Partnership Climate Change Adaptation Tools** -Through NOAA's work in the USCTI Support Program, a series of tools were developed to support coastal communities and natural resource managers understand the impacts of climate change and proactively plan for these impacts. The work was accomplished by multiple NOAA offices working with US Agency for International Development, The Nature Conservancy, World Wildlife Federation and Conservation International, the CTI Secretariat, the national and local government agencies and academic institutions of the six Coral Triangle countries. NOAA with the Department of the Interior is building on this body of work through a new USAID program in the Asia Pacific Region. The goal of the CTI work is to increase the resilience of coral reef and fisheries resources and improve the resilience of communities who are highly dependent on these resources. Based on numerous publications released in FY13, NOAA is working with partners to deliver training associated with the community-based vulnerability assessment guidance in the US Pacific Islands and investigating adapting it for the Caribbean. Communities in all six Coral Triangle countries have used the guidance and integrated the adaptation activities into natural resource and disaster risk reduction plans.

5. **Development of NOAA's National Fish Wildlife and Plant Climate Adaptation Strategy (Strategy) Implementation Plan -** NOAA is co-leading an intergovernmental effort of federal, state and tribal governments to design and implement coordinated actions that safeguard the nation's fish, wildlife and plants and the people that depend on them. The Joint Implementation Working Group was established to promote implementation of the Strategy. Additionally, NOAA is working to advance a cross-agency conversation about natural resource adaptation and to demonstrate how the Agency is implementing the Strategy. The Implementation Plan will include existing NOAA activities that address the goals of the Strategy, and identify opportunities for NOAA to implement the Strategy and advance natural resource adaptation in a changing climate. NOAA will continue to provide leadership and support for Strategy implementation by federal agencies, states, and tribes and to communicate accomplishments and lessons learned though the JIWG. The goal is to document and enhance NOAA's natural resource adaptation activities that advance the Strategy. The NOAA Implementation Plan has been completed. The JIWG will conduct a survey of current activities occurring at all governmental levels and will write a final Implementation Plan once it has been completed. NOAA leadership of and participation in the JIWG is an ongoing responsibility. The audience is internal (NOAA) initially. Once the plan is complete, summary communication products will be useful for other federal agencies and external partners. The work of the JIWG is external and fosters Strategy implementation by governmental agencies and nongovernmental partners.

6. **Presidential Policy Directive 8 on National Preparedness (PPD-8) -** NOAA is actively engaged in PPD-8, which was established to strengthen United States security and resilience through systematic preparation for the threats that pose the greatest risk, including catastrophic natural disasters. PPD-8 outlines the development of a National Preparedness Goal, National Preparedness System, and five National Planning Frameworks. NOAA has a defined role in three of these Frameworks, on Mitigation,

Response and Recovery, and participants in ongoing interagency workgroups that continue to guide mitigation, response and recovery planning, including to climate hazards, at all levels of government, and are pursuing various programs of work. For example, the Mitigation Framework Leadership Group, tasked by National Security Staff under the Climate Action Plan and Hurricane Sandy Rebuilding Strategy, is currently working on developing a revised federal flood risk reduction standard. These interagency workgroups also oversee ongoing Sandy recovery.

7. **Hurricane Sandy Rebuilding Strategy (HSRS) -** NOAA engages with a large number of agencies under the HSRS, which set forth a number of recommendations related to building infrastructure resilience to climate change in the Sandy-affected area, as well as on community planning and capacity building. NOAA also leads an interagency workgroup formed to lead on HSRS recommendations related to Green Infrastructure. Through this engagement, NOAA is helping to identify ways that agencies can encourage the integration of green infrastructure approaches in infrastructure investments and research or monitoring to inform decisions. Interagency sharing through this group will help to identify critical information and decision support tools needed and will limit duplication of effort. This activity involves several NOAA line offices, programs and cross-NOAA teams, and dovetails with other intergovernmental efforts (e.g., SAGE, USACE North Atlantic Coast Comprehensive Study, National Fish Wildlife and Plant Climate Adaptation Strategy). The goal is to identify and support ways that agencies can encourage the integration of green infrastructure approaches in infrastructure investments and projects. The audience is federal and state agencies involved in post-Sandy efforts.

8. **National Ocean Policy (NOP) -** Through the NOP, NOAA works with the 27 agencies representing the National Ocean Council (NOC), which is charged with overseeing implementation of the NOP but also includes convening authority to address a wide array of issues. One of the major areas of focus for this interagency work is on coastal and ocean resilience. Through NOP actions, Federal agencies are working together to support the various national, State, tribal, and local efforts to prepare for, respond to, and mitigate or avoid the degradation and loss of ocean and coastal habitats, water quality, and ecosystems through improved capabilities, proactive stewardship, strengthened research, and enhanced collaboration. Agencies are also enabling and supporting efforts to understand, minimize, and adapt to the impacts of climate change, ocean acidification, sea-level rise, and extreme weather events to strengthen the resilience of coastal communities. Some ongoing actions include to: strengthen and integrate observations into a coordinated network of sentinel sites to enhance the Nation's ability to provide early warnings, risk assessments, and forecasts for impacts; determine the impacts of interacting stressors on ecological systems, economies, and communities; and assess the vulnerability of coastal communities and ocean environments to climate change and ocean acidification and, in partnership with tribes, coastal communities and States, design and implement adaptation strategies to reduce vulnerabilities.

VIII. Modernizing Federal Programs and Policies to Support Climate Resilience Investment

Below is a description of barriers and ways to address these barriers that discourage investments or other actions to increase the Nation's resilience to climate change while ensuring continued protection of public health and the environment.

1. **Science-based Protocols for Estimating Carbon Storage** – The lack of science and science-based protocols for estimating carbon storage services of coastal habitats is a barrier to valuing coastal carbon sequestration and investment in coastal habitat restoration. There is a need conduct the science necessary to value the carbon services of the many relevant coastal habitats (e.g., tidal marshes, mangroves, submerged aquatic vegetation) to promote consideration and investment in these services through coastal habitat restoration and conservation.
2. **Coordinated US Ocean Observing System to Track Climate Change** - The lack of a coordinated US ocean observing system to track and provide early warning of key climate and ocean indicators for US marine ecosystems significantly affects DOC ability to prepare for and respond to climate impacts on fisheries and other trust resources. Effective fulfillment of the Department's stewardship mandates for fisheries and protected species requires up to date information on the status and trends of marine ecosystem conditions. The gap in observing system capability could be addressed with increased coordination and resources to bring together the multiple ocean observation efforts to effectively provide ocean status reports and early warnings of climate-related changes in ocean and coastal ecosystems.
3. **National Environmental Policy Act (NEPA) Guidance –** A lack of consistent guidance and approaches for incorporating climate information into federal planning and evaluation under NEPA and other cross agency planning guidance. The draft revised NEPA guidance developed through the Council on Environmental Quality may address this barrier, rather than the Department needing to address this in its own NEPA guidance.

IX. Opportunities to Support Climate Resilient Investments by States, Local Communities, and Tribes

Below are opportunities to support and encourage smarter, more climate-resilient investments by States, local communities, and tribes, including by providing incentives through agency guidance, grants, technical assistance, performance measures, safety considerations, and other programs.

NOAA/NOS:

1. **Coastal Zone Management Act (CZMA) -** NOAA is working through the CZMA to support and encourage smarter, more climate-resilient investments of federal, state and local resources. NOAA has been developing guidance regarding when and how to incorporate climate information into coastal planning for and implementation of CZMA activities. States are beginning to use these guidance documents and grant opportunities to address climate change and increase coastal resilience. These efforts will continue to be advanced through

NOAA's partnerships at the state and local level and under the auspices of the CZMA (and related funding). Examples include:

- **Voluntary Step-by-Step Guide for Considering Potential Climate Change Effects on Coastal and Estuarine Land Conservation (CELCP) Projects** was developed as part of NOAA's multi-phased effort to more systematically consider climate change impacts in the implementation of programmatic activities including restoration, land acquisition, and facilities development. The guide provides a clear approach for coastal management partners to consider how climate impacts might affect conservation projects and how to incorporate climate change considerations into the planning processes. Though the Guide focuses on the implementation of the CELCP, the methodology has broad application for conservation planning and land acquisition in a changing climate.
- **National Estuarine Research Reserve System (NERRS) Management Plan Guidelines** incorporate consideration of climate change impacts to help individual reserves consider climate change in strategic planning and management efforts. NOAA management planning guidance helps to reserves incorporate climate adaptation and mitigation into all aspects of planning and programming. NOAA's guidance influences future reserve-based decisions regarding infrastructure investments, land acquisition, and habitat restoration. **NERRS Procurement, Acquisition and Construction Guidance** also incorporates climate change adaptation and resilience considerations. Priority is given to support acquisition projects that enable reserves to adapt to climate and for sustainable facilities that incorporate green building principles to reduce emissions and incorporated storm resilient features. **NERRS Sustainability Plan and Carbon Footprint Assessment** aims to pilot the development of a methodology for carbon footprint assessment and a template for sustainability plans that would demonstrate proof of concept at Great Lakes reserve facilities and have potential transferability to other reserve facilities across the nation.
- **Coastal Resilience Networks (CRest) Grant Program** - NOAA held a special competition of the CRest grant program for communities impacted by Hurricane Sandy (funded by the Sandy Supplemental). Eligible organizations were encouraged to submit projects that would help their communities or region recover from the storm, as well as increase preparedness and resilience for future hazard events. Projects were submitted for one of two focus areas, Hazard Resilient Communities or Resilient Coastlines. Projects are expected to provide beneficial public outcomes for coastal communities to address existing and future risks to the natural environment, infrastructure, local economies, and vulnerable populations. The Resilient Coastlines focus area includes projects that "enhance the resilience of coastal areas by providing decision makers with baseline information and technical assistance that support the identification and implementation of natural shoreline restoration."
- **CZMA Section 309 Assessments and Strategy** is required for each state receiving funding under the CZMA. NOAA and state partners are working collaboratively to update the Section 309 Program Enhancement Guidance in advance of the next round of 309 assessments and strategy (2016-2020). The guidance is currently being reviewed at the state level, and it proposes to further focus the competitive portion of Section 309 funding on hazards/resilience related efforts for the next 5 year assessment cycle.

2. **NOAA/OAR -** Recognizing the linkage between hazard resilience and climate adaptation, Sea Grant has also been investing in a two-part Community Climate Adaptation Initiative since 2010. The first component focuses on building the adaptation capacity of each Sea Grant program and its partners through small institutional awards. The second component focuses on competitively funded demonstration projects that can highlight partnerships between Sea Grant programs and communities working on adaptation issues, and can serve as examples for other communities nationally.

3. **Development of NOAA's National Fish Wildlife and Plant Climate Adaptation Strategy (Strategy) Implementation Plan -** NOAA is working to advance a cross-agency conversation about the natural resource adaptation portfolio and demonstrate how the Agency is implementing the Strategy. The Implementation Plan will include existing NOAA activities that address the goals of the Strategy, and identify opportunities for NOAA to implement the Strategy and advance natural resource adaptation in a changing climate. In addition, NOAA participates on the intergovernmental Joint Implementation Work Group for the Strategy. NOAA will continue to provide leadership and support for Strategy implementation by federal agencies, states, and tribes and to communicate accomplishments and lessons learned though the JIWG. The goal is to document and enhance NOAA's natural resource adaptation activities that advance the Strategy. The NOAA Implementation Plan has been completed. The JIWG will conduct a survey of current activities occurring at all governmental levels and will write a final Implementation Plan once it has been completed. The current audience is internal (NOAA), but once the plan is complete, summary communication products will be useful for other federal agencies and external partners.

4. **Hurricane Sandy Rebuilding Strategy (HSRS) -** Through its engagement with the HSRS, NOAA is helping to identify ways that agencies can encourage the integration of green infrastructure approaches in infrastructure investments and projects that can support green infrastructure implementation directly and research or monitoring to inform green infrastructure decisions. For example, NOAA is working with six other agencies and CEQ on valuation and cost benefit analyses for green infrastructure in order to promote and incentivize the use of green infrastructure approaches by State and local governments and other project proponents.

5. **National Ocean Policy (NOP) -** Under the NOP, NOAA is working to assess the vulnerability of coastal communities and ocean environments to climate change and ocean acidification and, in partnership with tribes, coastal communities, and states, design and implement adaptation strategies to reduce vulnerabilities. Through this work, and with sister agencies, NOAA is working to initiate a framework for identifying, documenting, and communicating coastal and ocean adaptation strategies and related activities; develop national syntheses and assessments of coastal and ocean vulnerability to climate change, ocean acidification, and sea-level change in cooperation with relevant stakeholders (communities, ecosystem managers, etc.) and tribes; develop and disseminate methods, best practices, and standards for assessing the resiliency of natural resources, cultural resources, populations, and infrastructure in a changing climate; and foster and apply ecosystem-based approaches to adaptation, using the adaptive services of natural systems to help reduce vulnerabilities and risks to people and the built environment. NOAA is also conducting

targeted research to disseminate findings to address valuable information needs related to the direct and indirect impacts of climate change, ocean acidification, and other stressors on coastal communities, infrastructure and economies, and is developing tools (e.g., climate change models) and water quality protection measures (e.g., BMPs) aimed at assessing and mitigating the impact of future climate change and ocean acidification within existing ocean and coastal programs

6. **Promoting Climate Resilient State Marine Resources and Resource-dependent Communities -** NOAA (Fisheries Service) works with state agencies and interstate fishery management commissions to help promote sustainable marine resources, fisheries and resource-dependent communities. This partnership provides the foundation for helping state agencies better understand, prepare for and respond to the impacts of changing climate on coastal marine ecosystems. This effort would improve the production and delivery of the information they need on current and possible future conditions to design and implement management actions that promote resilient fisheries, habitats and the fishing, tourism, recreation industries and communities that depend on them. There is high and increasing need for NOAA assistance to help these key partners acquire the capacity and tools to better assess risks and take action to increase resilience of marine resources, industries and coastal communities nation-wide.

7. **Assist State, Industry and Community Efforts to Increase Resilience of Protected Species -** NOAA (Fisheries Service) has strong partnerships with state and tribal agencies, industries and communities to help protect and recover federally and state protected species. These collaborative efforts help NOAA and the state/tribal agencies fulfill their legal mandates in collaboration with affected/interested industries, communities and other organizations. There is a high and expanding need to increase the production, delivery and use of climate-related information and tools to design and implement climate-ready actions that promote the resilience and recovery of these state and federally protected species. These collaborations are the foundation for increased efforts to help states/tribes and other partners take action to increase the resilience/recovery of these protected species in a changing climate.

8. **Assist State, Industry and Community Efforts to Increase Resilience of Coastal Habitats -** NOAA has strong partnerships with state and tribal agencies, industries and communities to help protect and restore coastal habitats vital to fisheries, protected species and coastal communities. These collaborative efforts help NOAA and state/tribal agencies fulfill their legal mandates for conservation and management of fisheries, protected species, and habitats, while also promoting the near and long term economic vitality and resilience of coastal communities by providing the foundation for major economic activity (e.g., fisheries, tourism and recreation) and other important services (protection from storms/erosion, improved water quality, etc.). NOAA works closely with many organizations at local to regional and national levels to support protection and restoration of coastal habitats, rivers and watersheds. There is a high and expanding need to increase the production, delivery and use of climate-related information and tools to design and implement climate-ready habitat conservation that promotes the resilience and recovery of vital marine and coastal resources (e.g., fisheries, protected species) and the many industries, communities and economies that

depend on them nation-wide. These collaborations are the foundation for increased efforts to help government and nongovernmental entities at local and state levels increase the protection and restoration of coastal habitats that provide resilience to coastal resources and communities in a changing climate.

9. **Assess Vulnerability of Fish Stocks and Fishing Communities in a Changing Climate -** NOAA (Fisheries Service) has developed a method for rapid assessment of marine and coastal fish stocks in a changing climate to help federal, state, tribal fishery managers and partners better understand and begin preparing for possible impacts and risks to the nation's valuable marine fisheries and the industries and communities that depend on them. NMFS will work with these partners over the next two years to complete assessments of marine and coastal fish stocks in all US marine ecosystems. NOAA Fisheries has also launched a new effort to assess and track the vulnerability and resilience of US fisheries-dependent coastal communities. This effort uses a suite of key indicators to assess and track risks/vulnerability of marine resource-dependent communities over time, and can be used to help these communities assess their risks and management options under a variety of possible future climate and ocean scenarios. Additional effort is needed to fully implement the climate vulnerability aspects of this fishing community vulnerability/resilience indicator system nation-wide.

10. **Climate/Ocean Scenarios for Resilience for Marine Resources and Resource-dependent Communities -** State and tribal agencies, industries and nongovernmental entities involved in the use and conservation of marine resources (e.g., fisheries, protected species, habitats) need information on possible future climate and ocean conditions to evaluate risks and options for resilience and adaptation. NOAA (OAR/ESRL in partnership with NMFS) will help meet this need by providing the first web-based portal for easy access to state-of-the-art projections of future climate and ocean conditions for all U.S. marine regions. The portal will also provide a variety of tools/resources to assist using the projections in assessing risks and adaptation options. This effort is expected to significantly advance the assessment of risks and development of options for resilience action by federal, state and tribal governments, affected industries and other organizations.

X. Next Steps

The 2011 *Implementing Instructions* emphasized that Federal agency adaptation plans should be "living documents," and should be improved over time to reflect new information, ongoing agency performance against existing goals and targets, and emerging strategic priorities. Since 2012, agencies have continued to pursue a number of actions to address climate adaptation and resilience needs.

The Department will continue to update its adaptation plan to reflect lessons learned in the implementation of its adaptation plan submitted under E.O. 13514 and to incorporate new considerations and elements included in E.O. 13653.