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How Does Climate Change Affect USACE Mission Areas?

Climate change impacts affect water availability, water demand, water quality, stormwater and wastewater infrastructure, flood and coastal storm infrastructure, wildland fires, ecosystem functioning, coastal zone functioning, navigation, and energy production and demand. All of these factors affect the water resources projects operated by the Corps and its non-Federal sponsors. Many of these were designed and constructed before climate change was recognized as a potential influence. The entire portfolio of USACE Civil Works water resources infrastructure and programs, existing and proposed, could be affected by climate change and adaptation to climate change. This affects design and operational assumptions about resource supplies, system demands or performance requirements, and operational constraints. Both droughts and floods can affect the operations of these projects. Numerous regulatory decisions made by USACE will need to be informed by climate change impacts and adaptation considerations throughout the U.S., especially in western states.

Mission Statement

The mission of the Responses to Climate Change Program is: To develop, implement, and assess adjustments or changes in operations and decision environments to enhance resilience or reduce vulnerability of USACE projects, systems, and programs to observed or expected changes in climate.

Current Projects: POC's: Dr. Kate White 603-646-4187, Dr. Rolf Olsen 703-428-6314

1. **Regional Climate Impact Assessments**: The team will compile existing information to develop regional climate impact assessments for Alaska, the Pacific Islands, eastern regions and the Caribbean Basin. These regional assessments will be a cornerstone of policy, processes, methods and technologies used in the adaptation framework, pilots and demonstrations.
2. **Adaptation Challenges and Opportunities**: The primary goal of this team will be to identify climate change adaptation opportunities. The state of the science and engineering of climate change adaptation related to USACE missions will be compiled based on the experiences of others, both nationally and internationally.
3. **Vulnerability Assessments and Reporting**: A peer-reviewed vulnerability assessment methodology will be developed based on input from the other teams and applied to pilot projects in river basins, coastal regions and ecosystem projects.
4. **Climate Change Adaptation Communication**: The need for carefully developed, timely and effective communication of climate change information is especially important in the development and implementation of Federally-sponsored climate change adaptation projects. Therefore, a sophisticated communications plan that relies on social science advances and innovations in risk communication will be a foundation not only for policies and processes, but for actual adaptation implementation.
5. **Sea-Level Change Adaptation**: USACE recently released guidance on how to incorporate sea-level change in Civil Works projects (Engineering Circular (EC) 1165-2-211, 1 July 2009). This EC will be updated by July 2011 with new information, and will then be incorporated in an Engineer Manual (EM).
6. **Coastal Storm Adaptation**: This team will compile an interagency report on coastal storm science, which will drive a climate change and coastal storms design gap analysis. The results will be used to develop costal storm vulnerability assessment methods. The results will be incorporated into a Climate Change Engineer Manual.
7. **Hydrology to Support Adaptation**: The team will develop processes, methods and guidance for hydrology used in climate change impact assessments and adaptation planning and design. Initial focus will be on hydrological methods for nonstationary cases, evaluation of evapotranspiration impacts to water management and sedimentation impacts due to climate change.

8. **Snow, Glacial and Ice impacts and Adaptation**: This team will compile existing literature on sea-ice coastal vulnerabilities, changing glacial conditions, altered river and lake ice regimes and climate impacts to snowmelt in the context of USACE operations. This information will be provided in the form of processes, methods and guidance to be included in the Climate Change Engineer Manual.
9. **Water Management Adaptation**: This team will treat water management holistically through a gap analysis that builds on an interagency effort by USACE, Bureau of Reclamation, USGS, and NOAA. An implementation plan for filling gaps will be developed. Training for water managers will be developed and provided where necessary.
10. **Regulatory Aspects of Climate Change and Adaptation:** This team will address sea-level change and coastal and inland wetland issues from the regulatory perspective. A supporting framework for regulatory actions impacted by climate change will be developed to assist both decision makers and permit applicants. The framework will include tools to visualize climate change impacts and vulnerabilities, building on the vulnerability assessments and the results of the Sea-Level Change Adaptation, Coastal Storm Adaptation, Hydrology Adaptation, and Ecosystem Adaptation teams.
11. **Ecosystem Adaptation**: This team will compile an interagency report on ecosystem-related climate impacts and responses, which will drive a climate change and ecosystem gap analysis pertinent to USACE projects and regulatory actions. The results will be used to develop and test a framework for ecosystem climate vulnerability assessment, including policy, processes and methods.
12. **Adaptation Implementation Framework**: This interdisciplinary team will continue external collaboration to assist in developing a strategic plan for climate change adaptation designed for USACE missions. Innovative economic, sociological and technological solutions will be required to meet the challenges of effective climate change adaptation. The adaptation implementation framework will be developed, tested and improved through an iterative process that incorporates new knowledge gained through pilots and demonstrations.
13. **Greenhouse Gas Accounting**: This team will develop a holistic approach to carbon budgeting, using both top-down and bottom-up accounting methods, automating them where possible, and developing a greenhouse gas wedge analysis. The accounting will build on existing efforts performed for the Army and will be automated as much as possible to obtain data from existing USACE databases. The wedge analysis will assist reduction prioritization through improvements to multi-criteria decision-making already used in USACE planning.
14. **Pilots and Demonstrations**: Pilot tests and demonstration of adaptation processes, methods and technologies will allow us to explore the intended and unintended consequences of our adaptation strategies and are a foundation of this program. Our initial program includes two pilots addressing climate change impacts to river sedimentation, to be conducted in coordination with two projects underway by Bureau of Reclamation in different parts of the same basins.

Missouri Basin Related Projects:

1. **Climate Change Impacts on Garrison Reservoir.** This is a pilot project to develop and test methods to evaluate climate change impacts on reservoir sedimentation and operations at Garrison Reservoir in North Dakota. POC: Doug Clemetson, Omaha District, 402-995-2340
2. **Missouri River Ecosystem Restoration Plan (MRERP).** The study will identify actions required to mitigate losses of aquatic and terrestrial habitat, recover federally listed species under the Endangered Species Act, and restore the ecosystem to prevent further declines among other native species. Results the study will be a plan that guides the U.S. Army Corps of Engineers' mitigation, restoration, and recovery efforts for the Missouri River for the next 30 to 50 years. Climate change will be incorporated into the study in order to ensure compliance with evolving Corps and federal policy and regulations. POC: Jennifer Switzer, Kansas City District, 816-389-3062. www.mrerp.org
3. **Missouri River Authorized Purposes Study (MRAPS).** The Missouri River Authorized Purposes Study (MRAPS) is a broad-based, Congressionally authorized study to review the project purposes established by the Flood Control Act of 1944. The Study will analyze the eight authorized purposes in view of the current Basin values and priorities to determine if changes to the existing purposes and existing Federal water resource infrastructure may be warranted. Future climate change will be incorporated into the study to evaluate vulnerabilities. POC: Trisha Dorsey, Kansas City District, 816-389-3075, mraps@usace.army.mil. www.mraps.org