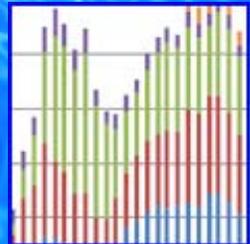


**INSTITUTE FOR WATER RESOURCES  
FY 2012 ANNUAL REPORT**

*CHAPTER 43, REPORT OF THE SECRETARY OF THE ARMY ON  
CIVIL WORKS ACTIVITIES FOR FY 2012*



# INSTITUTE FOR WATER RESOURCES

## FY 2012 Annual Report

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## BACKGROUND

The U.S. Army Corps of Engineers (USACE) Institute for Water Resources (hereafter referred to as the Institute or “IWR”) is a Field Operating Activity (FOA) under the supervision of the Deputy Commanding General for Civil and Emergency Operations (DCG-CEO) and the Director of Civil Works, Headquarters, U.S. Army Corps of Engineers (HQUSACE). The Institute is the USACE knowledge center for integrated water resources management (IWRM), and is recognized as a national center of expertise in water resources planning methods, risk analysis, hydrologic engineering, conflict resolution and public participation, international water resources, global climate change science, and the collection, management and dissemination of Civil Works program information and navigation related infrastructure performance information, including the Nation’s waterborne commerce data.

IWR was established by the USACE Chief of Engineers in 1969 with the approval of the House of Representatives and Senate Appropriations Committees and the Subcommittees on Public Works in order “to enhance the capability of the Corps of Engineers to develop and manage the Nation’s water resources, within the scope of the Corps’ responsibilities, by developing [mission] essential improvements responsive to the changing concerns of our society.”

The Institute’s mission is to facilitate the adaptation of the Civil Works program to future needs by providing USACE with the capability for developing forward-looking analysis and state-of-the-art methodologies. IWR fulfills this mission by supporting the Civil Works (CW) Directorate, the Office of the Assistant Secretary of the Army for Civil Works (OASA(CW)) and USACE Major Subordinate Commands (MSCs) and District offices by providing: (a) analysis of emerging trends and issues in anticipation of changing water resources management conditions to inform the strategic direction of the CW program and the corporate development of policies, programs and investment decision strategies; (b) state-of-the-art planning, hydrologic and hydraulic engineering, and risk assessment methods, models and management systems, training, and customized applications; (c) leadership of the Corps Economics Community of Practice, with a focus on project level, regional and national economic analysis, multi-criteria and risk-analysis, economic and socio-economic assessments, and capacity development; (d) development of results-oriented CW program and project information through the management of national data systems, and application for investment decision support to the USACE CW program on an enterprise level; (e) expertise on diagnosing and minimizing water conflicts and ensuring the interests of the public are addressed in Corps decision-making; (f) a focus on water security through integrated water resources management (IWRM) as a component to theater security around the globe, working via partnerships with USACE MSC’s and DoD’s geographic COCOM’s, the State Department, United Nations and other international institutions and non-government organizations; and, (g) advanced engineering risk management expertise for dam, levee and infrastructure safety for the development, application and stewardship of the engineering practice involving contemporary risk methods and models.

The Institute is a member of the Federal Laboratory Consortium for Technology Transfer (FLC), a nationwide network of over 250 federal institutions chartered by the Federal Technology Transfer Act of 1986. IWR also has a cooperative relationship with the National Institutes for Water Resources (NIWR), which represents fifty-four State and U.S. territorial university-based water centers through the U.S. Department of the Interior, U.S. Geological Survey (USGS). The FLC and NIWR provide USACE with the framework for developing technology transfer strategies and opportunities by promoting and facilitating technical cooperation with Corps District offices and Planning Centers of Expertise and among federal laboratories, industry, academia, and state and local governments.

## IWR CENTERS

IWR has offices at five locations, each of which is a USACE designated center of expertise (CX). The National Capital Region (NCR) office, which includes the Institute’s executive office and the critical mass of its planning methodologies, socio-economic and strategic planning expertise, also houses three of its centers – the Navigation and Civil Works Decision Support Center (NDC), the International Center for Integrated Water Resources Management (ICIWaRM), and the Conflict Resolution and Citizen Participation Center (CPC), all located in the Casey Building at the Humphreys Engineer Center in Alexandria, Virginia. The Hydrologic Engineering Center (HEC) is located in Davis, California. The Waterborne Commerce Statistics Center (WCSC), a unit of the Navigation and Decision

Support Center, is located in New Orleans, Louisiana. The Risk Management Center (RMC) has offices in Golden, Colorado and Pittsburgh, Pennsylvania.

### **National Capital Region Office**

The IWR NCR office is the Corps designated center of expertise for the development of methods, models, and analytical tools used for water resources and water systems planning, investment decision support, conflict resolution and public participation, and international water resources. IWR fulfills this mission through a synergy of water resources planning and socio-economic expertise that blends practice with research, policy development and information.

IWR planners, economists, social scientists, civil engineers and specialists in the physical sciences: conduct national and focused policy development studies; lead Civil Works strategic planning efforts and technology transfer initiatives; develop a broad range of investment decision support techniques, methods and models for integrated water resources management and navigation system applications; interact with national and international members of the water resources community; and partner with the HQUSACE, Corps district offices and laboratories in solving complex technical water resources planning and evaluation problems. In particular, the Institute provides a critical mass of socio-economic expertise within the Corps and serves as the residence for the USACE Chief Economist, who is responsible for the leadership of the Corps Economics Community of Practice (CoP).

IWR also provides a cadre of international water specialists who lead the USACE's engagement in water resources partnerships around the globe. In 2007 IWR expanded its collaborative partnerships when it established the International Center for Integrated Water Resources Management (ICIWaRM). ICIWaRM is a consortium of U.S. government (USG) agencies, university departments and non-Governmental organizations committed to working together in support of the strategic program objectives of UNESCO's International Hydrologic Program (IHP) under an agreement between the U.S. and the U.N.

### **Navigation and Decision Support Center**

The Navigation and Civil Works Decision Support Center (CEIWR-NDC), located at the National Capital Region headquarters of IWR at Alexandria, VA., is the USACE designated center of expertise for the collection, management and dissemination of infrastructure utilization and program performance information for Civil Works business lines including navigation, hydropower, recreation, environmental stewardship, water supply and regulatory.

These program data directly support the USACE annual Civil Works performance-based budgeting program. NDC is responsible for national level executive oversight and management responsibilities, including the development of Federal and USACE Engineer Regulations (ER's) and Code of Federal Regulations pertaining to Corps navigation data reporting requirements by industry and the associated enforcement of those regulations. The Office of Management and Budget (OMB), acting on legislative mandates, recognizes USACE, acting through NDC, as the Federal collection agent for waterborne commerce, vessel activities and waterway infrastructure data and statistics. Going beyond the data itself, NDC analyses and organizes information in new and innovative ways in direct support of USACE Headquarters, the Major Subordinate Commands, and the District offices.

The primary operational arm of CEIWR-NDC is the Waterborne Commerce Statistics Center (WCSC), which provides one-stop capability for national navigation information systems. NDC also provides integrated business information in support of Corps decision making including financial output, performance measurement and performance-based budgeting processes. Information about NDC is available on-line at: [www.ndc.iwr.usace.army.mil](http://www.ndc.iwr.usace.army.mil).

### **Conflict Resolution and Public Participation Center of Expertise**

HQUSACE created the Conflict Resolution and Public Participation Center (CEIWR-CPC) to assist USACE staff across the organization to anticipate, prevent, and better manage water conflicts and to help ensure that the interests of the public are addressed in Civil Works decision making processes. The CPC achieves this mission by developing and expanding the application of collaborative tools to improve water resources decision making.

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The Institute has pioneered the development and advancement of one such approach known as “Shared Vision Planning” (or SVP), and is actively involved in supporting USACE MSC’s and district offices, the International Joint Commission, and other levels of government in the application of SVP as a means to address water resources problems across the nation.

The CPC is organized with a core matrix-managed, interdisciplinary team at IWR supplemented by designated Corps personnel in each MSC, working to enable USACE to engage in effective public participation, collaboration, and conflict resolution. The Center relies on an internal Public Participation Community of Practice comprised of approximately 350 professionals, and supplements internal Corps resources through contracts with the private sector and close interaction with specialists from other federal agencies. The work of the CPC covers five areas: (1) building the capacity of the USACE in the field of public participation, collaboration, and conflict resolution; (2) providing support in the area of public policy with respect to public participation, collaboration and conflict resolution; (3) providing consultative services to USACE MSC and District offices as well as other agencies with which the CPC engages; (4) conducting studies in the field of public participation, collaboration, and conflict resolution; and (5) capacity development through technology transfer, information exchange, and sharing “lessons learned” and “best practices” in the areas of dispute resolution, collaboration, and public participation.

Technical areas addressed by the CPC include: collaborative process design; conflict assessment, prevention and management techniques; and decision-making methods. Collaborative modeling support is developed through the CPC’s SVP program (<http://www.SharedVisionPlanning.us>) and includes applications of collaborative simulation and visualization to water planning issues, development of best practices for collaborative modeling, and the use of new technologies in environmental conflict resolution. Additional information about the CPC and its services is available on its web site at: [www.iwr.usace.army.mil/cpc](http://www.iwr.usace.army.mil/cpc).

### **International Center for Integrated Water Resources Management**

The mission of the International Center for Integrated Water Resources Management (CEIWR-ICIWaRM) is to advance the science and practice of integrated water resources management (IWRM) to address water security and other water related challenges, including disaster risk management, by regional and global action, the development of new knowledge, innovative technologies, collaborative interdisciplinary scientific research, networking, and training and education. Since 2009, ICIWaRM has also been affiliated with the UNESCO International Hydrological Program (IHP) in accordance with a U.S. Government (USG) – UNESCO agreement designating USACE IWR-ICIWaRM as a UNESCO “Category 2” global water center. Category 2 centers are institutions financed and operated by the host government, but functioning “under the auspices of UNESCO”.

The objectives of the ICIWaRM are focused on its principal purpose to develop, promote and infuse sound practices for integrated water resources management around the globe. They include:

- To contribute to the development and application of IWRM principles and best management practices, focusing on institutional frameworks, engineering, planning, and evaluation issues;
- To foster research, technological development, and technology transfer, as appropriate, of models and methods that enhance IWRM, and to effectively disseminate “toolkits”; and
- To undertake capacity building efforts in accordance with the priorities of USACE and the USG through the U.S. National Commission for UNESCO and U.S. National Committee for UNESCO’s IHP program, focusing on training for implementing IWRM at both watershed and national levels, particularly in Latin America and the Caribbean, Africa, the Asia-Pacific regions.

An important aspect of ICWaRM’s engagement is to enhance collaboration between itself and other IHP centers towards joint problem solving.

The scope of activities undertaken includes:

- Focusing on practical science, applied research and technology development embodied in the IHP program that can be readily transferred to improve IWRM through USACE Civil Works activities for developing countries;

- Partnering with, and providing or exchanging technical support for existing UNESCO programs which serve to implement IHP objectives related to attaining IWRM objectives; and
- Collaborating on joint, applied research, capacity building and training and education programs with other UNESCO-IHP water centers and established IHP initiatives and programs.

Additional information about ICIWaRM and its services is available at: <http://www.iciwarm.org>.

### **Hydrologic Engineering Center**

From its inception in 1964, the primary goal of the Hydrologic Engineering Center (CEIWR-HEC) has been to support the Nation in its water resources management responsibilities by increasing USACE technical capability in hydrologic engineering and water resources planning and management. An additional goal is to provide leadership by bringing state-of-the-art models and technology into the state-of-the-practice for hydrologic engineering and water resources planning.

Efforts in research, training, software development and support, and technical assistance help to tackle the problems and address the needs of USACE and the Nation. CEIWR-HEC is committed to keeping abreast of the latest developments throughout the water resources engineering profession and making use of this information in a manner best suited to the needs of USACE nationally and internationally. CEIWR-HEC increases the effectiveness of USACE and the profession by bridging the gap between the academic community and practicing hydrologic engineers and planning professionals. CEIWR-HEC ground-tests and incorporates state-of-the-art procedures and techniques into manuals and comprehensive software. The procedures are made available to USACE, U.S. government agencies, and international professionals through an effective technology transfer system of technical assistance, publications and training.

Technical specialty areas addressed by CEIWR-HEC include: precipitation runoff processes; reservoir regulation; reservoir systems analysis; hydrologic statistics and risk analysis; river hydraulics and sediment transport; environmental flows; groundwater hydrology; water quality; and analytical aspects of water resources planning. Application areas include: flood risk management; real-time water control; water control management; hydroelectric power; navigation; erosion control; water supply; watershed studies; and ecosystem restoration. Additional information about CEIWR-HEC and its software is available at its website, <http://www.hec.usace.army.mil>.

### **Risk Management Center**

The Risk Management Center (CEIWR-RMC) is a USACE national center of expertise (CX) designed to: improve the technical and policy oversight of infrastructure decisions; serve as an independent advisor to USACE leadership; maintain and develop risk competencies; and ensure consistency in methods, application of criteria and decision making. The RMC is headquartered in Golden, Colorado, with an eastern office located in Pittsburgh, Pennsylvania.

The mission of CEIWR-RMC is to support the Civil Works program by providing a nationally consistent context for managing and assessing risks for dams and levee systems across the USACE, to support dam and levee safety activities throughout the agency, and to develop risk-informed policies, methods, tools, and systems to enhance those activities.

The goals of the Center are to: (1) assure that risks are managed corporately and addressed in the most efficient matter practicable; (2) ensure that consistent risk-informed dam and levee decisions are made across USACE; (3) infuse the consistent application of risk analysis processes, policies and methods; and (4) lead risk management strategic planning efforts.

The RMC serves as a USACE-wide resource for risk-related tools, assessments, knowledge and methods. The Center offers a national perspective, while still supporting routine District and MSC dam and levee safety activities. The RMC offers services to support dam safety, levee safety and the Mapping, Modeling and Consequence (MMC) Center of Expertise.

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The roles of CEIWR-RMC include: serving as a Corps-wide resource for risk related tools, assessments, knowledge, and methods; serving as a technical center of expertise for infrastructure risk management and dam and levee engineering; providing a national perspective while working with USACE Communities of Practices, MSC's and District offices; supporting routine district and MSC dam safety activities; and supporting technical activities relating to dam and levee safety.

Information about the services provided by the Center, including the interaction between the Center and other partnering organizations, such as the [U.S. Bureau of Reclamation](#) (USBR), the [Federal Energy Regulatory Commission](#) (FERC), the [Association of State Dam Safety Officials](#) (ASDSO), the [U.S. Society of Dams](#) (USSD), and the Association of Engineering Geologists (AEG), is available online at: <http://www.iwr.usace.army.mil/rmc/>

## FY 2012 SUMMARY

The Institute's FY 2012 program continued to underscore IWR's status as an essential institutional asset to USACE, serving as the intellectual foundation of the future direction of the Corps' Civil Works program and the overarching Civil Works missions, including: (1) the response and adaptation of USACE Civil Works programs to climate change; (2) the need to recapitalize USACE physical assets and to communicate the value and contribution of USACE infrastructure assets to the economic and social well being of the Nation; (3) the streamlining and modernization of the Civil Works planning and budget processes; and (4) the importance of international water security, water resources management, environmental sustainability, and disaster preparedness issues and the role they play in shaping U.S. government foreign policy.

FY 2012 was an exceptionally productive year, with significant progress on a wide range of projects and products supporting HQUSACE, the MSC's, district offices, the OASA(CW), Department of Defense (DOD), Department of the Army (DA), other federal and state agencies, the Executive Office of the President (EOP) interagency committees, and international organizations and institutions.

Overall, in FY 2012 the Institute executed a record program of approximately \$130 million with 242 authorized in-house employees, primarily in professional scientific and engineering disciplines, with most possessing advanced degrees. IWR's in-house staff was supplemented by experts detailed from USACE field offices, laboratories and visiting scholars via the Intergovernmental Personnel Act (IPA) from universities, state and local governments, public policy research organizations, and through contract vehicles with private sector consulting firms.

Key activities at IWR in FY 2012 were in support of the Civil Works Transformation, a USACE initiative designed to: improve program performance and responsiveness; increase customer satisfaction, public trust and confidence; and improve its readiness to address the Nation's current and emerging water challenges.

The Civil Works Transformation initiative encompasses four target areas:

- Planning Modernization. A new and modernized Civil Works Planning paradigm which streamlines the project planning process, reinforces the linkage of project planning with USACE functions and organizational elements vertically and horizontally, builds risk into the assumptions used in project planning and targets reducing or managing risk associated with decision options and levels of service, upgrades planning expertise through continual training and updated project planning guidance, and the use of more sophisticated tools and methods to prioritize water resources solutions. *IWR support included updated guidance & models (HEC-WAT, FRM, IWR SimSuite), improved planning capacity (PA program, training), and leadership in implementation of 3x3x3 (charrettes, risk assessment).*
- New Budget Paradigm. A Civil Works budget development process which: integrates programmatic goals and priorities across national, regional, and local levels; allocates resources and makes tradeoffs to balance Civil Works outcomes; links program performance to national priorities through a holistic systems approach to integrated water resources management; budgets for a full project life-cycle; and seeks to identify alternative funding sources and innovative financing options. *IWR support included Watershed Pilots, Value to the Nation Metrics, and tools WISDM and iBET.*
- USACE Infrastructure Strategy. A long-term infrastructure strategy which includes: establishing clear decision points for making investment decisions including the planning, construction and recapitalization (or divesture) of an asset; defining and evaluating the value of "critical" infrastructure; setting a strategy to sustain, rehabilitate, divest, or repurpose USACE's portfolio of water resources assets; managing assets through their full life cycle; integrating and balancing priorities across program areas; and seeking innovative financing opportunities. *IWR support included leadership of the UIS as well as asset management recapitalization, life cycle processes, and innovative business models for financing and contracting.*
- Methods of Delivery. An enhanced method of delivery of USACE services including processes to: identify and retain organizational core competencies to ensure the highest technical quality; streamline internal business process and organizational structures; ensure consistent approaches across the organization; improve the

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operational management of water infrastructure assets; assess how well methods of delivery meet organizational strategic goals and national objectives; and enhance and maintain technical skills and competencies to meet current and future demands. *IWR support included dam safety MCX and regional production centers, technical support to planning, navigation, and economics CX's.*

Beyond the tenants of the Civil Works Transformation initiative, the Institute's planning, policy, and technical engineering activities were strategically targeted towards, aligned with, and influenced by the following overarching themes:

- Awareness of and adaptation to climate change;
- A systems context which takes into account the interconnected nature of hydrologic systems (e.g., watersheds) and the economic and ecological systems which they support;
- A collaborative environment, built upon strong ties between Federal, state and local governments and other stakeholders;
- Using an appropriately sized geographic scale to address water resources issues;
- Risk-informed decision making and communication and reliability-based approaches; and
- Addressing the challenge of recapitalizing the Corps' portfolio of Civil Works infrastructure assets in an era of limited Federal financial resources.

Among the many diverse activities undertaken across the Institute during FY 2012, the following is a representative cross-section.

### **USACE Infrastructure Strategy**

One of the most complex tasks facing the USACE in the future will be the wise management of its portfolio of infrastructure assets while simultaneously working to fulfill its various mission requirements within an era of limited Federal financial resources. USACE has the critical responsibility of planning, constructing, operating, and maintaining a significant portion of the Nation's water resources infrastructure. The current approach to, and strategy for, maintaining the Corps water resources infrastructure portfolio is not sustainable and a new approach and strategy to develop and manage the Corps water resource infrastructure portfolio is needed.

The USACE Infrastructure Strategy (UIS) is designed to address these complex issues and modernize the USACE approach to water resources infrastructure portfolio management. One of the four pillars of the USACE [Civil Works Transformation](#), the UIS establishes a foundation for the future USACE water resources capital stock through effective lifecycle portfolio management. The goal of the UIS is to develop a Corps infrastructure portfolio that is resilient and reliable, meeting the management responsibilities of the entire USACE portfolio through integrated water resources management in a watershed/system context. The end state is one which enables the achievement of National objectives for healthy communities, national energy independence, and economic growth with job creation.

The four major components of the USACE Infrastructure Strategy are:

- A comprehensive watershed approach
- Life cycle portfolio management
- Alternative financing opportunities
- Strategic communications

The initiation of the UIS program at IWR began in August of 2011 with both acquisition of funds and specific direction by the Director of Civil Works and a Senior Advisory Group, comprised of HQUSACE senior staff. In FY 2012, the UIS program: completed the first draft of a national inventory of Corps assets and projects; initiated an analysis of alternative financing options for Civil Works projects; developed decision support software; and

established a strategic communications group responsible for the development of the strategic communication package supporting the FY 2014 budget.

### **Adaptation to Climate Change**

During FY 2012, the Institute continued to make significant contributions to incorporate adaptation to climate change within USACE organizational thinking. On a broader scale, the Institute was heavily engaged in the federal government's efforts to advance global climate change scientific research and the development of public policy to address adaptation to climate change. The objectives of the Institute's [Climate Change Program](#) are to understand how the global climate is changing, describe and characterize the impact of climate change to USACE missions, operations, programs, and projects, and to develop consistent water resources management adaptation policies and approaches throughout USACE Civil Works and in partnership with other Federal water resources agencies.

IWR leads USACE efforts to integrate climate change policy and direction with that of other Federal agencies and non-federal partners, where possible and appropriate, including the Office of the President's Council on Environmental Quality (CEQ), the U.S. Global Change Research Program (USGCRP), and the Office of the President's Office of Science Technology and Policy, Subcommittee on Water Availability and Quality (SWAQ).

During FY 2012, the Institute supported the Office of the Assistant Secretary of the Army (Civil Works) in developing the USACE Climate Change Adaptation Policy, entitled "[USACE 2012 Climate Change Adaptation Plan and Report](#)", dated June 2012. This landmark policy calls for integrating climate change adaptation into all activities of the USACE. The Policy establishes the USACE Climate Change Adaptation Steering Committee to oversee and coordinate agency-wide climate change adaptation planning and implementation.

Throughout FY 2012, IWR staff continued to support the [White House Interagency Climate Change Adaptation Task Force](#) in developing federal recommendations for adapting to climate change impacts, both domestically and internationally. The Institute supports several task force efforts including providing representatives on working groups on Adaptation Science Inputs for Policy; Agency Adaptation Processes; and Water Resources.

A major effort of IWR staff participating on the Water Resources and Climate Change Adaptation Working Group was the development of a report entitled "[National Action Plan \(NAP\): Priorities for Managing Freshwater Resources in a Changing Climate](#)", dated October 2011. Members of the Institute contributed to the development of the plan and led the team that developed the Plan's recommendations concerning integrated water resources management.

As part of the [Climate Change and Water Working Group \(CCAWWG\)](#) effort, USACE represented by the Institute, the Bureau of Reclamation, and NOAA prepared a report entitled "[Short Term Water Management Decisions: Users Needs for Improved Climate, Weather and Hydrologic Information](#)." This report examines how Federal agencies, along with state, local, tribal and non-governmental organizations and agencies are working together to identify and respond to the needs of water resource managers and improve decision-making in the face of a changing climate.

IWR staff also participated in the drafting of a [National Ocean Policy Implementation Plan](#), which will include a series of actions to address the issue of resilience and adaptation to climate change, one of nine priority objectives identified by the National Ocean Policy.

Another example of the Institute's influence in the area of climate change is the Director's participation as co-chair of the interagency team responsible for the development of the inter-agency water sector technical report to be included as part of the 2013 [National Climate Assessment](#). The National Climate Assessment (NCA) is an important resource document for understanding and communicating climate change science and impacts in the United States. The NCA informs the nation about already observed changes, the current status of the climate, and anticipated trends for the future. The NCA report preparation process integrates scientific information from multiple sources and sectors to highlight key findings and gaps in current research and knowledge. The NCA establishes consistent methods for evaluating climate impacts in the U.S. within the context of broader global change. The findings from the NCA provide input to Federal science priorities and are used by citizens, communities, and businesses in their planning and design of future activities.

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In FY 2012, the Institute staff, in close coordination and collaboration with HQUSACE completed and issued [EC 1165-2- 212, “Sea Level Change Considerations for Civil Works Programs.”](#) This Engineer Circular provides guidance for incorporating the direct and indirect physical effects of projected future sea-level change across the project life cycle (i.e., planning, engineering, design, construction, operation and maintenance) of USACE projects and systems of projects. The EC will be followed by an Engineer Technical Letter which will describe the procedures to evaluate the measures for USACE projects in response to future sea-level change.

### **Risk Management**

IWR’s risk management activities provide substantial support to the development and implementation of the USACE Risk Management programs in the areas of flood risk and dam and levee safety.

National Flood Risk Management Program (NFRMP). In FY 2012, the National Flood Risk Management Program, led by IWR staff, continued to provide support to the [Interagency Recovery Task Force \(IRTF\)](#) which allows for the continued regional coordination for post-flood recovery decision-making. The IRTF was established in May 2011 following the Mississippi River Basin flood event of 2011 with an initial focus on intergovernmental coordination for purposes of post-flood recovery. Throughout FY 2012, the IRTF engaged in multiple aspects of recovery, including damage assessments, regional prioritizations, system performance evaluations, regional flood preparedness and initiation of interim and permanent repairs.

The NFRMP also improved national coordination through its participation in the Federal Interagency Floodplain Management Task Force (FIFM-TF) by identifying opportunities to enhance floodplain management efforts at various levels of government and helping agencies to become better stewards of public resources. In FY 2012, IWR provided specific technical assistance to the Task Force by describing the current status of Federal programs and policies that impact floodplain development and flood risk management in order to develop recommendations for the Task Force to improve Federal flood risk management activities. These recommended activities were incorporated into a revised Work Plan. The Task Force also finalized a definition of unwise use of the floodplain, in response to requests from the OASA (CW) and the Council on Environmental Quality (CEQ).

Silver Jackets Program. The Silver Jackets Program continued to facilitate the delivery of the Corps’ authorities for providing flood risk management services to state and local agencies through state inter-governmental partnerships. These partnerships make the most of existing Federal agency programs and funding to assist states and communities in identifying and addressing flood risks by leveraging agency resources, identifying opportunities to jointly implement complementary programs, sharing data and knowledge, and eliminating duplicative or conflicting activities or policies.

Currently there are 35 states with an active interagency flood risk management team. Efforts to offer a team in the remaining 15 states are ongoing, with the ultimate goal of supporting an interagency team in every state. Team focal areas vary, as state priorities vary.

Beginning in Fiscal Year 2011, USACE initiated inter-agency projects through Silver Jackets teams. Thirty-three interagency projects were initiated in 24 states through Fiscal Year 2012, with approximately \$1.90 leveraged for every \$1.00 in USACE program investment. Projects cover a wide range of flood risk management strategies, including integrated flood response planning and flood warning systems, inundation mapping, unified flood risk communication, and emergency action planning.

Risk Management Center. The mission of the Risk Management Center is to support USACE Civil Works by managing and assessing risks to dams and levee systems across the USACE, to support dam and levee safety activities throughout the USACE, and to develop policies, methods, tools, and systems to enhance those activities.

Dam Safety. During FY 2012, the Risk Management Center (RMC) continued to support the USACE Dam Safety program. HQUSACE published Engineer Regulation [ER 1110-2-1156, “Engineering and Design: Safety of Dams Policy and Procedures”](#) to transition USACE to a nationally-led and managed dam safety program. The RMC continued to be instrumental towards implementing the guiding principles of this regulation. In FY 2012, the RMC (working in conjunction with the Kansas City and St. Louis District offices) was responsible for managing non-

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routine dam safety activities including managing more than 65 dam safety studies undertaken by various Districts in support of dam safety activities.

The RMC helped support the establishment of the regional Dam Safety Production Centers and the Dam Safety Modification Mandatory Center of Expertise (DSMMCX). To enhance Corps capacity in the area of risk assessment, the RMC selected and began training eight regional risk assessment cadres. As part of that effort, the RMC trained more than 200 individuals to complete Potential Failure Mode Assessments.

Working with the U.S. Bureau of Reclamation and the Federal Energy Regulatory Commission, the RMC hosted monthly webinars describing case histories of dam and levee failures to help risk assessment teams gain historical perspectives. These webinars were available to Corps dam safety staff.

The RMC led training efforts for dam safety and risk management throughout FY 2012. More than 80 USACE staff attended Periodic Assessment training and Best Practices in Dam Safety Risk Analysis training which was jointly taught by USACE, the Bureau of Reclamation, and the Federal Energy Regulatory Commission.

To improve the quality and consistency of dam safety products, the RMC worked with various Agency Technical Review (ATR) teams to support their reviews of dam safety products. The RMC also continued efforts to augment reviews with national experts in dam safety specifically related to risk analysis.

In FY 2012, the RMC continued to provide at least two dedicated senior technical specialists to each dam safety construction project, projects that were in Planning, Engineering, and Design (PED), and critical Dam Safety Modification Studies. This was part of HQUSACE's overall effort to provide more consistent and recurring guidance and advice for projects moving through the non-routine dam safety processes. This activity was instrumental in ensuring safety activities were accomplished at USACE's high risk structures and that cost effective solutions were planned or implemented. Along with the Quality, Control and Consistency (QCC) reviews, this led to more than \$700 Million in cost savings versus originally-planned activities.

Levee Safety. Throughout FY 2012, the Risk Management Center continued to support the USACE Levee Safety program in a number of ways. The RMC was heavily engaged in a HQUSACE led effort to develop a comprehensive levee safety policy document. Also, the RMC and the Mapping, Modeling and Consequences (MMC) Production Center continued to lead the development of the National Levee Database in conjunction with HQUSACE and the Cold Regions Research and Engineering Laboratory (CRREL).

The RMC piloted a methodology to assess risks posed by levee systems in 2012 in conjunction with the team developing the new levee safety policy and the USACE Planning Community of Practice. The RMC worked on ten levee systems in various stages of completion to demonstrate the procedures for risk assessments that consider life safety.

The RMC, working in conjunction with HQUSACE and CRREL, continued to lead the development of the Levee Screening Tool (LST), and 292 levee systems were screened using the LST. The RMC funded 166 Periodic Inspections at Corps levee systems in 2012. Of these, 76 levee system Periodic Inspections were completed in 2012.

National Inventory of Dams. During FY 2012, the Risk Management Center administered the National Inventory of Dams (NID) program for HQUSACE. The RMC funds the Army Geospatial Center (AGC) to manage the technical aspects of the program as well as maintain the NID web site. The NID includes all high and significant hazard potential classification dams and all low hazard potential classification dams which meet specific height and reservoir storage requirements.

Asset Management: The RMC supported the HQUSACE Asset Management team during FY 2012 and developed the Maintenance Management Improvement Plan. Maintenance Management examines the critical components and systems on USACE projects and develops a maintenance strategy tailored around required levels of service.

## Planning Program

SMART Planning. One of the four elements of the USACE Civil Works Transformation is a new and modernized planning process. The objective is to streamline project planning and produce concise decision documents in a more timely fashion, at a lower cost and in a manner that incorporates assumptions of risk and the management of risk associated with decision options.

IWR staff provided support to HQUSACE on developing a decision framework that incorporates risk management by leading the process across the country in planning charrettes and pilot studies. In addition, IWR continued to update key doctrine that assists field planning staff in conducting their analyses.

National Economic Development (NED) Manuals. IWR is continuing to update the National Economic Development (NED) Manuals series, originally published between 1987 and 1991. The manuals are important basic reference documents for economists and others involved in the planning and analysis of Federal water resource projects. They discuss the principles and concepts associated with NED benefits and provide detailed procedures to measure and calculate benefits. In FY 2012, IWR published a Deep Draft Vessel Operating Costs (DDVOCs) Handbook and a [Coastal Storm Risk Management Manual](#).

Guide to Constructing the Without Project Scenario (Condition). This handbook provides USACE planners with easy-to-follow descriptions and methods of defining the without project condition(s). The without project condition forms the basis of comparison of every alternative and is key in all evaluation and selection tasks. The handbook also provides a detailed look at scenario-based planning as a means of addressing future uncertainties. The [“Guide to Constructing the Without Project Scenario \(Condition\)”](#) was published in 2012 and is available at the IWR website as IWR publication, [2012-R-03](#).

Planning Excellence Program. Throughout FY 2012, IWR provided managerial and technical support to the USACE Planning Community of Practice (CoP) in the execution of the Planning Excellence Program. This included the management of the Planning Associates (PA) program and conduct of the three-week *“Washington DC Experience”* module. The goal of the PA program is to develop planning leaders who can manage complex planning studies that lead to quality decision documents and who will provide water resources technical and professional leadership in the future.

Planning Models Improvement Program. The USACE Planning Models Improvement Program (PMIP) was established in 2003 to assess the state of planning models in the Corps and to make recommendations to assure that high quality methods and tools are available to District offices to apply towards investment decisions at the project and programmatic levels. IWR serves as a member of the HQUSACE Model Certification Panel.

Two IWR models were certified as corporate models by USACE Headquarters in FY 2012, the HarborSym Deepening Model and the Regional Economic System (RECONS) model. HarborSym measures the economic effects of modifications to deep draft harbors as overall reductions in transit times and associated changes in total vessel operating costs. The latest HarborSym release is designed to assist analysts in evaluating channel widening and deepening projects. HarborSym Deepening is oriented towards general cargo, bulk, container and other commodity and vessel movements with simplified loading and transit behaviors. The simulation results can be used in a comparative analysis of alternative harbor improvements and to support a benefit-cost analysis of proposed navigation improvements.

The Regional Economic System (RECONS) model was certified as a national model by HQUSACE for estimation of regional employment impacts and associated secondary economic impacts associated with USACE Civil Works projects. RECONS is the only USACE certified Regional Economic Development (RED) model for agency wide use.

## Navigation

Throughout FY 2012, the Institute continued to provide support to HQUSACE, MSCs and District offices for project and system studies of navigation improvements. The Institute also conducts national and special studies, as was the case in which the Institute conducted a congressionally directed study of the need for port and inland waterway modernization associated with the future use of Post-Panamax sized vessels. The Institute also performs recurring national level analyses, such as the update of vessel operating costs and the development of harbor and waterway commodity traffic and fleet forecasts. The Institute also provides program management and technical support for the Inland Waterways Users Board, manages the U.S. Section of the World Association for Waterborne Transport Infrastructure (PIANC), and supports overall Corps coordination with the Transportation Research Board.

Report to Congress on U.S. Port and Inland Waterways Modernization. In December 2011, the Congress, in its Conference Report for the Consolidated Appropriations Act of 2012 (Public Law 112-74, House Report 112-331, page 834) requested report from the USACE IWR “on how the Congress should address the critical need for additional port and inland waterway modernization to accommodate post-Panamax vessels.” The Congress required USACE to submit a report to the Senate and House Committees on Appropriations within 180 days of enactment of the Act.

In June 2012, the Institute published a report entitled “*U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels*” which identified capacity maintenance and expansion issues associated with the deployment of post-Panamax vessels to trade routes serving U.S. ports. This analysis was accomplished through an evaluation of the future demand for capacity in terms of freight forecasts and vessel size expectations, and an evaluation of the current capacity of the nation’s inland waterways and coastal ports.

The report concluded that maintaining the capacity of the nation’s major ports and waterways and expanding port capacity when, where, and in a way that best serves the nation will require leadership at all levels of government, and be carried out in partnership with ports and the private sector. The main challenges are to continue to maintain the key features of our current infrastructure, to identify when and where to expand coastal port capacity, and to determine how to finance its development.

Inland Waterways Users Board. The Inland Waterways Users Board (IWUB) was established by Section 302 of the Water Resources Development Act of 1986 (P.L. 99-662) and pursuant to the Board’s charter, approved by the Secretary of the Army on March 3, 1987. The principal responsibility of the Board is to recommend to the Congress, the Secretary of the Army, and the U.S. Army Corps of Engineers, the prioritization of new and replacement navigation construction and major rehabilitation projects. The Board is a Federal advisory committee and as such subject to the requirements of the Federal Advisory Committee Act (P.L. 92-463, as amended).

During FY 2012, IWR continued to provide technical and administrative support of the Board, including: the analysis of, and reporting on, the financial status and capability of the Inland Waterway Trust Fund; evaluation of potential candidates nominated for Board membership; and the administration of meeting No. 66 in Pittsburgh, Pennsylvania on June 6, 2012 and meeting No. 67 in St. Louis, Missouri on August 29, 2012.

### **National Ocean Policy and Coastal Program**

Our nation’s coastlines are a vital national resource which is subject to a number of socioeconomic, demographic and natural forces including increasing population living along coastal areas, increasing economic activity and rising sea levels and intensity of storms. The Institute supports USACE Civil Works in addressing these risks to our coastal communities through a variety of programs, initiatives, tools, and reports.

IWR works with HQUSACE, MSC’s, District offices, and the Engineer Research and Development Center to enhance coastal resilience and sustain the environmental and economic resources of our nation’s coastlines. The Institute also works with other Federal agencies such as the National Oceanic and Atmospheric Administration (NOAA) and the Federal Emergency Management Agency (FEMA), among others, in order to accomplish and coordinate its coastal missions. States, academia, and other non-Federal partners are also essential collaborators in many of IWR’s coastal activities.

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National Ocean Policy. During FY 2012, IWR staff continued to support the OASA(CW) and HQUSACE participation in National Ocean Policy (NOP) initiatives, which are integral to the implementation of Executive Order 13547 establishing a *National Policy for the Stewardship of the Oceans, Our Coasts and the Great Lakes*. The Executive Order adopted the final recommendations of the Interagency Ocean Policy Task Force and created a National Ocean Council (NOC) to strengthen ocean governance and coordination.

During FY 2012, IWR staff represented the OASA (CW) on the Ocean Resource Management Interagency Policy Committee (ORM-IPC) and the Ocean Science and Technology Interagency Policy Committee (OST-IPC). In this capacity, IWR staff represented and coordinated diverse Civil Works interests in many NOP efforts, including participating in drafting of strategic implementation documents for coastal and marine spatial planning, coastal resiliency and adaptation to climate change effects, ecosystem protection and restoration, and ocean observation, data and mapping.

Coastal Engineering Research Board. During FY 2012, the Institute continued to support the Coastal Engineering Research Board (CERB). The CERB functions as an advisory board to the Chief of Engineers. The Board reviews business line activities involving coastal engineering and develops recommendations for the conduct of research and development in support of coastal engineering and the objectives of the Chief of Engineers. IWR provides staff support to the Deputy Commanding General of Civil and Emergency Operations (DCG-CEO), who serves as the President of the Board for the Chief.

IWR organized the Executive Session of the Board held in Alexandria, VA in February 2012. The Board held its 89<sup>th</sup> meeting in September in Jacksonville, Florida. The theme of the meeting was “Regional Sediment Management – Uniting Navigation, Beaches and the Ecosystem.” The purpose of the meeting was to review the coastal engineering challenges within the southeast Atlantic coastal system, focusing on how regional sediment management can help bridge multi-purpose and multi-agency missions and to identify the research and technology that is needed to help USACE District offices and the Nation meet those challenges.

### **Conflict Resolution and Public Participation Center**

The Institute is the home of the USACE Conflict Resolution and Public Participation Center (CPC) of Expertise. During FY 2012 the Center provided technical assistance to Districts, Divisions and other stakeholders on collaborative processes, including Shared Vision Planning, facilitation services, and training. CPC staff also produced various references to serve USACE in the areas of Environmental Conflict Resolution and collaborative processes.

Among the main accomplishments of the CPC in FY 2012 were ; the design of a SVP and Public Involvement process for the Iowa and Cedar Rivers Basin Watershed Plan “Responses to Climate Change” pilot project; the coordination of the Missouri River Flood Task Force (MRFTF), an organization stood up by Northwestern Division (NWD) to carry out recovery efforts after the Missouri River Flood of summer 2011; and a public involvement assessment for the Great Lakes and Mississippi River Basin Interbasin Study for the USACE Chicago District.

### **Regulatory Support**

During FY 2012, the Institute continued to support the Regulatory Community of Practice (CoP) through policy analysis and training. The most notable activity was IWR’s support for the HQUSACE implementation of the 2008 Mitigation Rule (“Compensatory Mitigation for Losses of Aquatic Resources”: Final Rule, *Federal Register*, April 10, 2008, p. 19594). Two new handbooks related to this effort were developed. The Institute also provided to HQUSACE a final draft white paper on the watershed approach, continued to conduct the Corps’ Regulatory Mitigation Workshops focusing on rule implementation, and developed a draft handbook on implementing the watershed approach for compensatory mitigation.

IWR led and participated in various workshops and training sessions in support of the Regulatory Program. Topics addressed included mitigation banking, Regulatory In-lieu Fee and Bank Information Tracking System (RIBITS), compensatory mitigation and other regulatory topics of interest.

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Throughout the year IWR provided technical assistance to Districts in addressing aspects of compensatory mitigation including review of draft bank and In-Lieu Fee (ILF) instruments (8 districts), financial assurances (5 districts), site protection documents (2 districts) as well as other mitigation, banking, and ILF program issues (15 districts). Districts supported included Buffalo, Detroit, Honolulu, Huntington, Jacksonville, Los Angeles, Louisville, Memphis, Mobile, Nashville, New England, Norfolk, Omaha, Portland, Sacramento, Savannah, St. Louis, and Seattle.

IWR oversaw the management and maintenance of the Corps regulatory database — ORM 2.0 — the second version of the OMBIL (Operations and Maintenance Business Information Link) Regulatory Module. In addition, IWR continued to actively manage RIBITS, a compensatory mitigation bank data program, including providing training and district support. Important information regarding mitigation banks and in-lieu fee programs from a majority of USACE District offices is now available on-line in RIBITS.

During FY 2012 IWR, in collaboration with ERDC, provided support for technical and scientific initiatives such as the publication of regional supplements to the 1987 Corps Wetlands Delineation Manual, and a draft National Wetlands Plant List.

IWR oversaw the development of a cumulative effects analysis (CEA) prototype using GIS data for the Appalachia region associated with surface mining activities. Regional CEA tools and corresponding manuals were developed for southern West Virginia and Eastern Kentucky and are currently being used by regulators from the Huntington, Louisville, and Nashville District offices. IWR also provided training workshops in October 2011 to regulators in West Virginia and Kentucky and on a final CEA handbook for eastern Kentucky in December 2011. Regional CEA tools are being developed for Texas, Virginia, and Washington. IWR also provided a draft version of the National Tool to HQUSACE and three Districts (Los Angeles, Baltimore and Wilmington) for pilot review.

IWR supported the EPA economic analysis for proposed Clean Water Act (CWA) Waters of the U.S. jurisdiction guidance by providing information on potential costs to permit applicants associated with the proposed guidance, including compensatory mitigation costs. IWR also collaborated with EPA on development of the cost analysis for an upcoming proposed CWA Waters of the U.S. jurisdiction rule.

### **Water Supply**

The Institute serves as the HQUSACE national program manager for the Water Supply business line, and is responsible for the development and maintenance of the USACE database of Municipal and Industrial (M&I) water supply projects. This database includes 134 Corps multipurpose projects which contain storage space for M&I water supply. The storage space is capable of providing about 6.5 billion gallons of water per day for use by municipalities and industrial firms which have signed repayment agreements. The [2011 M&I Water Supply Database Report](#) was published as IWR Report 2012-R-02 (dated April 2012).

### **Hydrologic Engineering and Water Resources Management**

Software Development - During FY 2012 IWR, through the staff of the Hydrologic Engineering Center, continued to provide critical support to USACE and the Nation in the areas of hydrologic engineering and water resources planning and management. Major efforts to enhance software products and introduce new products culminated with the release of several software packages that addressed priority technical needs in the areas of reservoir systems operations optimization and analysis of consequences of flood events and to incorporate state-of-the-art technology advances or new analytical approaches into existing software.

Corps Water Management System (CWMS). The Corps Water Management System (CWMS) is a comprehensive data acquisition and hydrologic modeling system developed by IWR-HEC for short-term decision support of water control operations in real time. CWMS supports field-level decision making within USACE water management mission. The software embodies data acquisition, validation, transformation and management; forecasting, simulation and decision support analysis through real-time modeling; and information dissemination.

The first version of CWMS was released by CEIWR-HEC in 2002. Since then, CWMS has been updated at roughly annual intervals at the thirty-six USACE offices with water management responsibilities. CEIWR-HEC

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improvements to the system continue via a field-prioritized betterments program. Version 2.1 was released in July 2012 and is the current production system being used by USACE offices. Improvements incorporated into CWMS Version 2.1 include the CWMS Computational Processor (CCP). CCP provides users math functions within the Oracle® database and will replace the existing system for validation/transformation.

### International Engagements

During FY 2012, the Institute continued to provide leadership on behalf of the USACE and the U.S. government to international partnerships concerning water resources related activities.

International Joint Commission (IJC) Activities. During FY 2012, senior IWR staff was instrumental in the completion of two IJC studies, the “*International Upper Great Lakes Study*” and the “*International Lake of the Woods and Rainy River Watershed Study*.”

International Upper Great Lakes Study. Throughout FY 2012, IWR continued to play a major role in directing and managing the completion and final report writing activities and ministerial, agency and Congressional briefings of the final recommendations of the [International Upper Great Lakes Study](#). Senior IWR professional staff served as the U.S. co-Director and co-Manager of the IUGLS Study, respectively. IWR directed all U.S. contributions to the study, as was the case with the previous related IJC Great Lakes Study, the *International Lake Ontario-St. Lawrence River Study*, which was completed in 2006.

During FY 2012, the study team’s focus was on developing an alternative to replace the existing Plan 1977-A, the outflow regulation plan used by the International Lake Superior Board of Control since 1990. The recommended alternative, *Lake Superior Regulation Plan 2012*, provides modest environmental and economic improvements over Plan 1977-A, but is especially ‘robust’ during extreme dry climatic conditions that may occur in the future. The robustness of this plan was tested under numerous hydrologic futures including those developed by the Intergovernmental Panel on Climate Change (IPCC) and stochastically generated supplies simulating 50,000 years of wet and dry scenarios.

The Study was successfully completed on March 31, 2012, with the final report and documentation provided to the IJC Commissioners prior to that date. An information management strategy has been developed to ensure that the Study’s extensive data and models remain available after the completion of the study, and all the documents appear on the Study [website](#).

International Lake of the Woods and Rainy River Watershed Study. On July 13, 2010, the International Joint Commission (IJC) created the International Lake of the Woods and Rainy River Watershed Task Force (Task Force) to examine and report to the IJC on matters raised by the U.S. and Canadian governments, with senior IWR staff serving on the Task Force. The Task Force reviewed the ways that the countries work together to manage water quality, water quantity and related issues in the watershed, and recommended governance mechanisms to help address future needs.

In 2012, the IJC submitted its report entitled “*Report to the Governments of the United States and Canada on Binational Water Management of the Lake of the Woods and Rainy River Watershed*” to the U.S. and Canadian governments constituting a final response to the governments’ 2010 requests. The IJC report commended the Task Force for its work and included the Task Force final report as an annex to its report.

In September 2011, IWR assisted the IJC by providing an initial draft of a directive for the proposed International Lake of the Woods and Rainy River Watershed Board. The proposed Board incorporates the responsibilities assigned to two existing IJC boards in the watershed and implements recommendations made in the IJC’s 2012 report, as supported by U.S. and Canadian Governments letters dated June 20, 2012 and July 25, 2012, respectively.

International Capacity Development Programs. During FY 2012, the Institute managed and executed International Capacity Programs in support of the USACE IWR and Pacific Ocean Division (POD) partnership established to carry out the U.S. Pacific Command (USPACOM) and U.S. Army Pacific (USARPAC) goals and in support of the HQUSACE Civil-Military Emergency Preparedness (CMEP) program.

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In support of USPACOM and USARPAC and many pertinent Embassies, IWR staff interacted and collaborated with various humanitarian assistance and disaster relief stakeholders in the Pacific Ocean region to develop strategies to achieve theater security cooperation objectives. These activities involved civil-military integration on events, workshop and activities that increased capability, shared best practices and promoted benefits to the civilian population. Specific activities included: the development of an earthquake Response Plan for Tribhuvan International Airport (Nepal); HEC-RAS Workshop for Mekong River Commission; Pacific Resilience Disaster Response Exercise and Exchange 2012; Asia-Pacific Resilience and Sustainability Workshop in support of USACE-POD and USPACOM; and Pacific Environmental Security Forum 2013.

In support of the USACE Headquarters CMEP program, and under the auspices of the U.S. Africa Command (AFRICOM), a member of the IWR staff participated in two regional environmental and water security workshops in Africa. Both of these engagements were sponsored by the Defense Environmental International Cooperation (DEIC) program within AFRICOM.

During FY 2012 members of the Institute were engaged in other strategic initiatives within the context of the International Capacity Development Program. In support of the geographic Combat Commands, IWR worked with ERDC's Construction Engineering Research Laboratory (CERL), the OASA (Installation, Energy and Environment), and the Office of the Secretary of Defense (Policy), to develop an approach addressing the effects of extreme weather and a variable climate in the disaster planning process of partner nations. The "*Enhancing Disaster Preparedness with Multiple Stressor Scenarios*" initiative helps strengthen the planning process in nations and within regions, raising the threshold at which international aid will be required in the form of Humanitarian Assistance and Disaster Response.

A number of IWR staff members are engaged on the development of a Strategic Framework for IWR support to POD, USARPAC, PACOM, and the nations of the Asia Pacific. The intent of the framework is to develop an ongoing approach to integrate water resource management and development where needs are identified in the Asia-Pacific region, and the expertise of POD can be supplemented by IWR staff, drawing on a broad range of water management related expertise.

World Water Council and the 6<sup>th</sup> World Water Forum. The World Water Council (WWC) is an international association of over 400 public and private organizations involved in water-related activities. Established in 1996, the WWC includes the principal United Nations water agencies and international banks as its founding organizations. The main activity of the WWC is the [World Water Forum](#), which is held every three years. As the main international event on water, it seeks to enable multi-stakeholder participation and dialogue to influence water policy making on a global scale, thus assuring better living standards for people all over the world and more responsible social behavior towards water issues in line with the pursuit of sustainable development.

IWR's engagement with the WWC included participating in organizational and thematic meetings leading up to the 6<sup>th</sup> World Water Forum (WWF6), which took place March 12-17, 2012 in Marseilles, France. More than 173 countries were represented at the World Water Forum.

The theme of the 6<sup>th</sup> World Water Forum was "Time for Solutions." WWF6 focused on identifying and developing solutions to water issues and creating a worldwide platform for solutions. The World Water Forum included ten High Level Panels and three Special Focus Sessions, which brought together dozens of ministers, heads of non-governmental organizations, Presidents of research institutes, and eminent scholars to discuss some of the most complex challenges water resources managers face today.

Among the Special Focus Sessions was a discussion of "Water In the American West: 150 Years of Adaptive Strategies", which included a panel of senior U.S. Government officials including the Honorable Ms. Jo-Ellen Darcy, Assistant Secretary of the Army (Civil Works), and which was moderated by Dr Jerry Delli Priscoli of the Institute. The panel discussion examined the U.S. approach to water resources development and the evolution of 150 years of solutions to using water in arid areas to generate socio/economic growth.

During FY 2012, Dr. Delli Priscoli was elected to the Board of Governors of the World Water Council (WWC) and he continues to serve as a representative on the WWC Executive Bureau. Other ongoing WWC activities involve close liaison with the U.S. State Department, in particular, the Bureau of Near Eastern Affairs and the Bureau of Oceans and

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International Environmental and Scientific Affairs, on the dialogues and content of the WWF, so as to assist U.S. interests.

### **International Center for Integrated Water Resources Management (ICIWaRM) and UNESCO Related Activities**

During FY 2012, the Institute and ICIWaRM signed a Memoranda of Understanding (MoU) with the University of Dundee (Scotland), Graduate School of Natural Resources, Law, Policy and Management, home to the UNESCO “[Hydrology for the Environment, Life and Policy \(HELP\) Centre for Water Law, Policy and Science](#).” This brings the number of MoUs which the Institute and ICIWaRM have signed with UNESCO or its affiliated centers to eight.

During FY 2012, members of the Institute continued to support UNESCO sponsored activities through appointments to various leadership and advisory positions. Mr. Robert A. Pietrowsky, Director of the Institute and ICIWaRM continued his service as one of six permanent Federal agency members of the U.S. National Committee for UNESCO’s International Hydrological Program (IHP), and has been a member of the U.S. Government delegation to UNESCO at the IHP Intergovernmental Council (IGC) meetings in 2004, 2006, 2008, 2010 and 2012.

Dr. Eugene Stakhiv, Technical Director of ICIWaRM, completed service as chairperson of the Advisory Board of ICHARM and continued to serve on the Steering Committee of the Global Water Partnership (GWP).

Dr. Stakhiv also continued to co-chair a UNESCO Sponsored Steering Committee tasked with preparing [IWRM Guidelines at the River Basin Level](#) to assist water resources practitioners find better and more efficient solutions to water resource problems.

During FY 2012, the IWRM Guidelines series was translated into Spanish. The translation of Part 1 (Principles), Part 2.1 (Guidelines for IWRM Coordination), Part 2.2 (Flood Management), and Part 2.3 (Invitation to IWRM for Irrigation Practitioners) of the series was a collaborative effort of ICIWaRM, the Inter-American Development Bank and UNESCO’s Regional Office of Science and Technology for Latin America and the Caribbean.

During FY 2012, the staff of ICIWaRM developed the “International Center for Integrated Water Resources Management (ICIWaRM) Regional Analysis of Frequency Tool (ICI-RAFT).” ICI-RAFT was developed with user-friendly software that allows the user to estimate the intensity of a rainfall event of a particular frequency for a range of months each year. ICI-RAFT is especially useful in arid and semi-arid regions where rain gauge sites are few and far between and where measurements taken at those sites where rain gauges do exist may contain numerous and/or long periods of missing data.

During FY 2012, ICIWaRM staff began work with the Rwanda Integrated Water Security Program — a USAID-funded consortium led by Florida International University and includes UNESCO-IHE. In March, Dr. Will Logan, ICIWaRM’s Deputy Director, represented the U.S. Government at Rwanda’s World Water Day event and met with various Rwandan government and USAID officials to initiate contact. Subsequently, ICIWaRM staff spent three weeks in Rwanda assisting the Deputy Minister for Water in incorporating water management issues into a broader Rwandan government planning document, and began work to design a framework for decentralization of water management in Rwanda as part of the national effort to apply integrated water resources management principles at all levels of government.

During FY 2012, the Institute continued to provide support to the [World Water Assessment Program](#). The World Water Assessment Program (WWAP) is the flagship program of UN-Water. Hosted and led by UNESCO, the United Nations’ WWAP coordinates the work of 28 UN-Water members and partners in the World Water Development Report (WWDR). This triennial UN document provides an authoritative picture of the state, use and management of the world’s freshwater resources, with the 4th (2012) Edition of the WWDR focusing on “*Managing Water under Uncertainty and Risk*”. IWR-ICIWaRM’s collaborative support on the 4<sup>th</sup> Edition of the WWDR included participation in the core group for the report, serving on multiple review panels during report preparation, and continued development of consistent indicator sets for “Total Actual Renewable Water Resources” (TARWR).

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IWR also facilitated the work of Dr. Gerald Galloway of the University of Maryland, who served as co-chair of the WWAP Expert Group on Policy Relevance, and Dr. Charles Vorosmarty of the City College of New York, whose work focused on developing consistent sets of indicators for actual renewable water resources.

During FY 2012, ICIWaRM continued to intensify its focus on Africa water initiatives. These efforts included:

- Through a continuing collaboration between the University of Arizona (a core academic partner of ICIWaRM) and the International Senegal Basin Authority (Organization pour la Mise en Valeur du Fleuve Senegal), ICIWaRM is developing a near real-time stream flow forecasting system using satellite precipitation measurements in the International Senegal River Basin;
- A National Science Foundation-funded Planning Visit proposal to establish a new research collaboration between The University of Arizona and [AGRHYMET](#) (a regional center in Niamey, Niger), to improve the spatio-temporal characterization of precipitation in the African Monsoon Region. AGRHYMET is a regional institute specialized in the science and techniques applied to agricultural development, rural development and natural resource management.
- An Assessment of Satellite Precipitation Products and their use in Hydrologic Applications (IWR and University of Arizona);
- Development of an [Africa Drought Monitor](#) (Princeton University and UNESCO-IHP);
- A four-year grant from [SERVIR-Africa](#) to assist in developing various products related to water and climate (University of Arizona);
- A near real-time satellite precipitation product [PERSIANN](#) for application to floods and droughts (University of California, Irvine). This is one of the major tools developed and highlighted with the assistance of the semi-arid regions program ICIWaRM leads for UNESCO G-WADI ([www.g-wadi.org](http://www.g-wadi.org)).

During FY 2012, ICIWaRM continued to serve as the technical secretariat for its global network [Water and Development Information for Arid Lands](#) or G-WADI. The program aims to strengthen global capacity to manage water resources in arid and semi-arid regions by building an effective global community by integrating contributions from networks, organizations, individuals and other UNESCO IHP Category 2 water centers. ICIWaRM staff attended G-WADI meetings, such as the Regional Training Workshop on Drought Monitoring which was held at the offices of AGRHYMET in Niamey, Niger.

During FY 2012, in support of the U.S. Government's [Lower Mekong Initiative](#), USACE, through the Pacific Ocean Division, was requested by USAID's Regional Development Mission for Asia (RDMA) to support the Mekong River Commission (MRC) by developing a Regional Strategic Scenario Planning for the Lower Mekong Basin through a series of workshops in the MRC countries.

IWR and ICIWaRM Director, Mr. Robert Pietrowsky, Dr. Will Logan, and Dr. Eugene Stakhiv participated in the activities of the 6<sup>th</sup> World Water Forum, held March 12-17, 2012 in Marseilles, France.

In addition to organizing and leading technical sessions on a diverse array of subjects including integrated water resources management, disaster risk reduction, balancing multiple uses of water as part of an integrated water resources strategy, and coping with uncertainty related to climate and global change as part of an integrated water resources management strategy, ICIWaRM staff participated in the following keynote events.

- ICIWaRM Director, Robert Pietrowsky represented USACE and ICIWaRM at an event marking the official release of the [4<sup>th</sup> edition of World Water Development Report](#) (WWDR4). USACE and ICIWaRM staff and partners provided technical input to the WWDR4.
- ICIWaRM Director, Robert Pietrowsky represented USACE and ICIWaRM at the inaugural meeting of the core working group for the preparation of the 5<sup>th</sup> edition of the World Water Development Report.

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- Dr. Eugene Stakhiv met with the UNESCO Integrated River Basin Management (IRBM) Steering Committee to discuss two reports on IRBM that ICIWaRM is completing as part of the UNESCO series on IRBM.
- ICIWaRM staff held a technical meeting with the Japanese Ministry of Land, Infrastructure and Transportation and the International Center for Water Hazards and Risk Management (ICHARM).
- ICIWaRM staff held a partners meeting with its collaborating entities in attendance at the WWF6, including Colorado State University, Florida International University, Oregon State University, the American Water Resources Association, and the American Society of Civil Engineers.

During 2012, ICIWaRM staff members continued to collaborate on implementation of the [UN Secretary General's Advisory Board on Water and Sanitation/ High-Level Expert Panel on Water and Disaster](#) (UNSGAB/HLEP) action plan.

Support to the Government of Japan and the World Bank in Response to the Great East Japan Earthquake and Tsunami. IWR provided timely support to USACE Civil Works in its role as international advisor to the Government of Japan and the World Bank in documenting lessons learned from the Great East Japan Earthquake and tsunami. IWR reviewed and commented on a World Bank publication entitled [“The Great East Japan Earthquake: Learning from Mega Disasters.”](#)

“Learning from Mega Disasters” is a knowledge-sharing project sponsored by the [Government of Japan](#) and the [World Bank](#). The project is collecting and analyzing information, data, and evaluations performed by academic and research institutions, nongovernmental organizations, government agencies, and the private sector. The objective is to share Japan’s knowledge on [disaster risk management](#) (DRM) and post-disaster reconstruction with countries vulnerable to disasters.

U.S. Water Partnership. In March 2012, at an event held in conjunction with World Water Day, the Honorable Hillary Clinton, U.S. Secretary of State announced the establishment of the [U.S. Water Partnership](#) (USWP), a public-private partnership aimed at leveraging the vast capabilities of U.S. expertise, knowledge and resources in the field of water resources and applying these capabilities to water challenges around the globe, especially in the developing world.

With its focus on water resources issues in the developing world, the USWP is a natural partner of the Institute’s international programs. Beginning soon after the formation of the USWP, the Institute was the first government institution to contribute in-kind services. The Institute provided a senior expert on a part-time basis to assist and provide strategic advice to USWP as it was developing its plans, strategies and programs. In particular, IWR-ICIWaRM has assisted the USWP Secretariat in developing key start-up operational, thematic and content strategies, in particular regarding IWRM. It has also provided advice and assistance on developing USWP’s web portal and on generating “signature initiatives”.

USACE - Dutch Rijkswaterstaat (RWS) Exchange. During FY 2012, the USACE and Dutch Rijkswaterstaat (RWS) cooperative partnership continued to thrive. The two organizations are working in close cooperation and in alignment with the [Memorandum of Agreement](#) that was signed in May 2004. In a broad sense, this partnership aims to promote and facilitate collaborative efforts that benefit the range of water management activities for which both organizations are responsible. The USACE and RWS cooperate in applied research, policy analysis, model development and peer reviews.

The annual Executive Steering Committee (ESC) met on May 23, 2012 in The Hague. The purpose of this meeting was to bring senior representatives from both organizations together to discuss progress and agree upon the future direction of the MOA. The U.S. delegation was led by The Honorable Jo-Ellen Darcy, Assistant Secretary of the Army (Civil Works) and Major General Michael J. Walsh, USACE Deputy Commanding General for Civil and Emergency Operations. Several staff members from both organizations were also in attendance. Primary areas of discussion related to a proposed realignment of MOA activities, the Levee Safety Program, and the Dutch “Room for the River” program.

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At the request of RWS, the ASA(CW), Ms. Jo-Ellen Darcy and the HQUSACE DCG-CEO, MG Walsh conducted a “*Master Class*” at Delft University following the ESC meeting. The class is held periodically at the university as a means for students and professionals to interact with high-level officials.

Hydrologic Engineering Center - International Technical Activities. During FY 2012, the Hydrologic Engineering Center (CEIWR-HEC) was involved in a wide range of international activities including work in Cambodia, the Netherlands, and Thailand. Also, HEC staff members attended conferences in Morocco, Spain, and Taiwan, and HEC hosted visitors from Japan, Russia, and South Korea. HEC technical experts provided support to U.S. Pacific Command (USPACOM), the Columbia River Treaty 2014/2024 study team, the World Meteorological Organization (WMO), and the International Joint Commission (IJC).

Some of the activities in which HEC participated in support of the U.S. Pacific Command (USPACOM) included support of floodwater removal and drainage in Bangkok, Thailand; Shared Vision Planning Workshop in Bangkok, Thailand; HEC-RAS training class in Phnom Penh, Cambodia for the Mekong River Commission; and participation in an International Conference on Climate Change in Taiwan.

During FY 2012, in support of the second phase of the [“Strategy for Water and Land Resources of Iraq \(SWLRI\)” project](#), HEC provided technical assistance on the development and use of the reservoir simulation software HEC-ResSim through four Iraqi workshops that were conducted in Italy and Jordan. The focus of the workshops was using an HEC-ResSim model that was initially developed by HEC for the Tigris and Euphrates basins for real-time forecasting and water management operation. Training included updating the model and lessons on the new software features.

During FY 2012 HEC participated as a study team member for the Columbia River Treaty (CRT) 2014/2024 Study being conducted by the Treaty Entities. HEC supports the 2014/2024 study team as follows: serves on the Hydrology and Hydraulics, Plan Formulation and Integration sub-teams; provides technical guidance, coordination, and development of HEC-WAT and HEC-ResSim software features specific to CRT; and provides advice on risk analysis methods.

During FY 2012, technology transfer by the CRT project development team to the USACE Northwestern Division of the HEC-WAT model of the Columbia River Basin was completed. Work also began on building the HEC-WAT model for CRT that includes the FRA compute option. Also, the fully integrated suite of models (i.e., hydrologic sampling, fragility curve sampling, forecasting sampling, HEC-ResSim models, HEC-RAS models, HEC-FIA models) was completed, and initial simulations began.

### **PIANC - The World Association for Waterborne Transport Infrastructure**

The U.S. has been a national member of PIANC since 1902, and by law, USACE provides leadership and secretariat support to PIANC USA. PIANC USA organizes and holds technical conferences, an Annual Meeting, and participates in the PIANC International Annual General Assembly (AGA).

The United States National Commission constitutes the governing body of the U.S. Section. In 2012 the ex-officio officers of the National Commission were: Chair, The Honorable Jo-Ellen Darcy, ASA(CW); President, Major General Michael J. Walsh, USACE DCG-CEO; and Secretary, Ms. Anne Cann, IWR.

In March, PIANC USA participated in the Sixth World Water Forum held in Marseilles, France. IWR Director, Robert Pietrowsky and PIANC Secretary participated in a workshop entitled “Inland Waterway Transport in Times of Globalization.”

At the PIANC 2012 AGA, held in May in Valencia, Spain, the US Section was awarded the “Best Performing National Section” for 2011.

### **PROSPECT Program and Specialty Workshops**

IWR is committed to technology transfer and the dissemination of its tools, processes and procedures. The organization and staff are committed to provide assistance in using our tools, through workshops, telephone

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consultation or whatever may be necessary. During FY 2012 IWR continued to support technology transfer and capacity building throughout the Corps through its engagement with the USACE **Proponent Sponsored Engineer Corps Training (PROSPECT)** program. The National Capital Region office and the Hydrologic Engineering Center presented twenty three week-long courses (ten led by the IWR-NCR and thirteen by HEC). The PROSPECT courses covered a wide range of Civil Works water resources topics including plan formulation; collaborative planning; ecosystem restoration; flood risk management; hydrologic and hydraulic engineering; public involvement and team planning; public involvement and communications; environmental considerations in water resources planning; and regulatory issues.

### Partnerships and Boards

The USACE recognizes that its Civil Works mission must be carried out in collaboration with multiple partners and stakeholders with differing authorities, capabilities and perspectives. Thus a major IWR role has long been as the intellectual nexus for USACE expertise on collaboration, partnering and public participation. In FY 2012 the Institute collaborated with multiple federal and state agencies to address critical water resources issues. IWR serves as the USACE lead for national collaborative partnerships and is committed to developing new training instruments, technologies, processes and policies to further USACE's overall capability in collaborative planning and partnering.

U.S. Geological Survey. During FY 2012, significant activities associated with the U.S. Geological Survey (USGS) Memorandum of Agreement included quarterly senior level meetings addressing national stream-gage issues; climate change and related water management issues; the sharing of water data; coastal, geotechnical and biological research; and regional and international water studies, such as on the Great Lakes.

Natural Resources Conservation Service. An overview of the USACE/NRCS Partnership and the Partnership Handbook [\*The NRCS/USACE Partnership Handbook: A Field Guide to Working Together Toward Shared Goals\*](#) was presented at the 67<sup>th</sup> Annual Meeting Soil and Water Conservation Society meeting in Fort Worth, Texas, in July 2012. Continued outreach about the Partnership provides opportunity for sharing of success stories. The Partnership has featured several success stories including the repair work on the New Madrid Floodway which was completed ahead of schedule and with expressed satisfaction from local officials. The accomplishment of the repairs ahead of schedule was possible due to the expedited permitting from USACE and NRCS's technical expertise and strong relationships with the local community in the affected area. This is a fine example great teamwork between the two agencies with a strong spirit of cooperation and communication.

Environmental Advisory Board: IWR has led the USACE technical team supporting the Chief of Engineers' Environmental Advisory Board (EAB) since FY 2004 and an IWR staffer serves as the Alternate Designated Federal Officer. In FY 2012, the EAB continued to explore field level outreach, internal implementation of the Corps Environmental Operating Principles (EOP), and ecosystem restoration. The Board held two public meetings in FY 2012, on January 19, 2012 at Corps Headquarters in Washington, D.C. and on August 28, 2012 at the Metcalfe Federal Building in Chicago, Illinois.

The Nature Conservancy - In November 2011, USACE and The Nature Conservancy (TNC) expanded their decade-long partnership on improving the health of the large working rivers nationally and globally by amending their existing agreement. The addendum, which also included IWR-ICIWaRM as a signatory, fosters collaboration across the Mississippi River Basin and other great rivers in the U.S. under the TNC's Great Rivers Partnership (GRP) and recovery efforts along the Gulf Coast.

The collaboration was broadened to facilitate the effective and efficient management of important biological resources within the context of the USACE Civil Works and Regulatory missions. The addendum is focused around the concept of managing large, "working" rivers with a whole-basin approach – one that coordinates the management, development and conservation of water, land and related resources within a given river basin.

Another key component to the addendum is the recognition that collaboration among the many stakeholders along the Mississippi – and any other large river – is critical to achieving a truly whole-basin, sustainable approach to the management of rivers.

### **IWR Visiting Scholar Programs**

In order to infuse new ideas and concepts in its work, the Corps has established and the Institute supports a number of Visiting Scholar Programs (VSP) by which the Institute is able to support academicians who conduct research in areas related to the work of the Institute. These visiting scholar programs seek to bring the foremost water resources experts from academia, private industry and other agencies and laboratories to residence at the Institute for periods of six months to one year. Visiting scholars bring new energy, perspectives and ideas to the Institute's research agenda, while the practical work environment at the Institute provides a stimulating context for mutual exploration of potential advances in water resources planning and hydrologic engineering and analysis.

During FY 2012, Dr. Denise Reed, university research professor of Coastal Geomorphology in the Department of Earth and Environmental Sciences at the University of New Orleans served as the [Maass-White Visiting Scholar](#). Dr. Reed's interests include coastal marsh response to sea level rise and how this is affected by human activities, and she has researched and published widely on coastal issues on the Atlantic, Pacific, and Gulf coasts of the U.S., as well as other parts of the world. Dr. Reed supported USACE IWR initiatives including Response to Climate Change program, National Ocean Policy, National Shoreline Management Study, the Coastal Systems Portfolio initiative, the Systems Approach to Geomorphic Engineering (SAGE), the Environmental Advisory Board, and the Coastal Engineering Research Board.

In February 2012, Dr. Leonard Shabman, Former Maass-White Visiting Scholar, and Resident Scholar at the Resources for the Future, and Mr. Paul Scodari, Senior Economist at the Institute, published a research paper entitled ["Toward Integrated Water Resources Management: A Conceptual Framework for U.S. Army Corps of Engineers Water and Related Land Resources Implementation Studies"](#), IWR Publication 2012-VSP-01.

IWR's specific accomplishments during FY 2012 are described in the following sections, organized in accord with the Institute's major focus areas.

## FUTURE DIRECTIONS

The Institute's Future Directions activities include the identification of emerging water challenges and opportunities and the engagement of the Office of the Assistant Secretary of the Army (Civil Works) (OASA (CW)) and USACE senior leaders to stimulate "strategic thinking". Such critical thinking is an essential prerequisite in the formation of organizational strategic direction and the implementation of new initiatives.

IWR developed a team to analyze water resource implications of the 2012 Presidential election. The team analyzed and compared the Republican and Democrat Presidential nominee platforms in a report titled, "Interim Assessment of the 2012 Post-Election Landscape on the U.S. Army Corps of Engineers Missions, Services, and Functions".

During FY 2012, IWR continued to engage the National Institutes for Water Resources (NIWR) and the US Geological Survey (USGS) to solicit proposals on applied scholarly investigation related to critical water policy issues. A grant was awarded to the University of Nebraska entitled "Development of a National Database of Depreciated Structure Replacement Values for Inclusion with SimSuite/HAZUS and Flood Mitigation Reconnaissance Studies". This collaboration with NIWR is engaging some of the brightest and most talented individuals working in the water resources area while establishing working relationships on emerging topics of the future.

In a similar initiative, the Future Directions staff has taken a lead role in special topic support to the OASA(CW) with other Federal agencies in support of Administration initiatives such as climate change adaptation, energy and water sustainability, ecosystem markets development, floodplain management, and urban water renewal, and development of new concepts in critical infrastructure and infrastructure sustainability through non-governmental organizations such as the American Society of Civil Engineers (ASCE), The Infrastructure Security Partnership (TISP), and Domestic Preparedness (DomPrep).

### Strategic Planning

The USACE 2011 to 2014 Civil Works Strategic Plan is being implemented via the Civil Works Transformation Initiative, which encompasses four target areas:

- **Planning Modernization.** A new and modernized Civil Works Planning paradigm which streamlines the project planning process, reinforces the linkage of project planning with USACE functions and organizational elements vertically and horizontally, builds risk into the assumptions used in project planning and targets reducing or managing risk associated with decision options and levels of service, upgrades planning expertise through continual training and updated project planning guidance, and the use of more sophisticated tools and methods to prioritize water resources solutions.
- **New Budget Paradigm.** A Civil Works budget development process which: integrates programmatic goals and priorities across national, regional, and local levels; allocates resources and makes tradeoffs to balance Civil Works outcomes; links program performance to national priorities through a holistic systems approach to integrated water resources management; budgets for a full project life-cycle; and seeks to identify alternative funding sources and innovative financing options.
- **USACE Infrastructure Strategy.** A long-term infrastructure strategy which includes: establishing clear decision points for making investment decisions including the planning, construction and recapitalization (or divesture) of an asset; defining and evaluating the value of "critical" infrastructure; setting a strategy to sustain, rehabilitate, divest, or repurpose USACE's portfolio of water resources assets; managing assets through their full life cycle; integrating and balancing priorities across program areas; and seeking innovative financing opportunities.
- **Methods of Delivery.** An enhanced method of delivery of USACE services including processes to: identify and retain organizational core competencies to ensure the highest technical quality; streamline internal business process and organizational structures; ensure consistent approaches across the organization; improve the operational management of water infrastructure assets; assess how well methods of delivery meet organizational strategic goals and national objectives; and enhance and maintain technical skills and competencies to meet current and future demands.

IWR is deeply involved in all aspects of the Civil Works Transformation, as well as preparing for the next CW Strategic Plan. In this vein, IWR supported the efforts of HQUSACE through the development of a strategic war gaming exercise for senior leaders to better identify the strategic direction of the USACE Civil Works program. This effort will continue throughout FY 2013.

IWR Staff Detailees to the Office of the Secretary of the Army (Civil Works)

During FY 2012, IWR provided staff support to the Office of the Assistant Secretary of the Army for Civil Works as rotating detailees worked on a wide range of policy related initiatives.

**USACE Infrastructure Strategy**

One of the most complex and difficult tasks facing the USACE going forward is the wise management of its portfolio of aging Civil Works infrastructure assets while working hard to fulfill its various mission requirements within an era of limited Federal financial resources. The USACE is committed to maintaining a sustainable, 21<sup>st</sup> century infrastructure as a means to strengthen the Nation's economy, create jobs, reduce risks, and bolster our long-term global competitiveness. The USACE has the critical responsibility of planning, constructing, operating, and maintaining a significant portion of America's water resources infrastructure. Both traditional and natural "green" infrastructure enable the transportation of goods; protect communities from flood, hurricane and drought risks; provide food for people in the U.S. and abroad; restore significant aquatic ecosystems; and support water-based recreation. These assets provide critical value and services to the American people but are now aging rapidly (most are more than 50 years old). The current approach to and strategy for maintaining our degraded infrastructure is not sustainable and a new approach and strategy to develop and manage Civil Works water resource infrastructure systems is needed.

The USACE Infrastructure Strategy (UIS) is designed to address these complex issues and bring the Corps water resources infrastructure portfolio into the 21<sup>st</sup> century. The UIS is an integral part of the Civil Works Transformation (CWT) initiative, and follows the principles of the Civil Works Strategic Plan. One of the four pillars of CWT, the UIS sets the foundation for the future USACE Water Resources portfolio through effective lifecycle portfolio management. The goal of the USACE infrastructure strategy is to develop a Corps infrastructure portfolio that is resilient and reliable, meeting the management responsibilities of the entire USACE through integrated water resources management in a Watershed/System context. The end state is one that enables achievement of National objectives for healthy communities, national energy independence, and economic growth with job creation. There are four major components of the USACE Infrastructure strategy.

- Comprehensive Watershed Approach

The goal of the Comprehensive Watershed Approach is to adaptively develop watershed infrastructure requirements that meet today's needs as well as those of the future. This approach will inform infrastructure performance requirements (with associated metrics) and investment requirements and opportunities. It will ignite a dialog with watershed stakeholders providing an opportunity to multiply their investment power with that of governmental agencies toward a transparent common goal. Triggers which indicate changes in the watershed will be established as indicators that plans may need to adapt to changing needs or conditions. This approach does not eliminate the requirement for feasibility studies of major re-investments but should support and inform these efforts and new projects when applicable.

- Life Cycle Portfolio Management

The goal of this action, with the direction provided by the Comprehensive Watershed Approach as to what infrastructure will be required now and in the future, is to develop long and short term infrastructure sustainability requirements that focus on the performance of the infrastructure. This approach will also include efforts with Asset Management on development of condition indices, risk assessments, and maintenance management. This effort will inform the budgeting process and support alternative financing through the development of asset management plans.

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- Alternative Financing Opportunities

The goal of seeking alternative financing opportunities is driven by the USACE growing portfolio along with aging infrastructure needs that are unsustainable under current funding scenarios. This effort will strive to work within existing USACE authorities to expand available financing options, learn from the opportunities of other agencies as to the authorities that provide them the most benefit and work with our stakeholders to truly understand their investment interest and leverage that to assure reliable infrastructure to meet their needs.

- Strategic Communications

The goal of this effort will be to reconfigure the existing USACE communications strategy to communicate effectively the goals and objectives of the USACE infrastructure strategy, both internally and externally, using 21<sup>st</sup> century methods and technologies. USACE will develop internal and external strategic communications tools, messages, and opportunities to connect with existing and new partners/stakeholders in innovative ways.

The Institute has been given the responsibility to lead much of the UIS Program, ensure access to the capabilities needed for the logistical, financial and project management, and to provide technical and systems support for all four components. The UIS team at IWR has taken the lead for integrating much of the Corps project data, including corporate enterprise financial and performance information, results and project outcomes into an overall UIS plan linking all four components. IWR support also includes the analytical decision support, policy development, financing, and strategic communication aspects of UIS with the Corps' many partners, customers, and stakeholders. Overseeing the UIS efforts is a Senior Advisory Group (SAG) which has the responsibility for strategic oversight and integration of all four components and management of resources.

The initiation of the UIS (previously referred to as the Civil Works Infrastructure Recapitalization) program at IWR began in August of 2011 with both acquisition of funds and specific direction by the Director of Civil Works and the SAG. Several projects were quickly initiated to provide some base information for both programs. These projects are being integrated with several existing projects that the Institute has been developing over the past few years that will provide valuable knowledge needed to assist the strategic effort. Initiatives completed in the first two years include the following.

- Development of the first draft of a national inventory of Corps assets and projects, including information on status of studies underway.
- Began examination of alternative financing options:
  - Completed first White Paper on options;
  - Held three working meetings with private firms on investigations of options;
  - Completed a watershed pilot partnering with South Pacific Division on successful budget process;
  - Developed initial decision support software Water Infrastructure Systems Data Manager (WISDM) and Integrated Budget Evaluation Tool (iBET); and
  - Initiated collaborative processes for watershed budget process.
- Developed initial process to complete condition assessments of Corps assets:
  - Publication of an Op Order (Operational Order) initiating data collection for portfolio analysis and management;
  - Completed initial tools for the watershed budget process; the Integrated Budget Evaluation Tool (iBET) and the Water Infrastructure Systems Data Manager (WISDM) were field tested during the FY 2012 watershed pilots conducted in the summer of 2012; and
  - Completed a focused survey of the Best Practices with respect to Asset Portfolio Management. A survey of existing strategies and operations of asset portfolio management worldwide, including public and private sector organizations, was conducted.

Also, a Strategic Communications group was established to begin preparations for development of the strategic communication package supporting the FY 2014 budget.

The USACE Infrastructure Strategy will lay the foundation for long term sustainability of the Nation's USACE infrastructure assets. This effort will take advantage of economies of scale and leveraging of resources (where appropriate) and will be conducted as transparent, integrated efforts which encompass the full life-cycle of Civil Works projects, cutting across USACE business lines and functional areas towards the objective of ensuring the long term sustainability of the USACE Civil Works missions and programs.

### **National Ocean Policy**

In fiscal year 2012, IWR staff continued to support the OASA(CW) and HQUSACE participation in the National Ocean Policy (NOP) initiatives, which are integral to the implementation of Executive Order 13547 establishing a [\*National Ocean Policy for the Stewardship of the Oceans, Our Coasts and the Great Lakes\*](#) (July 19, 2010). The Executive Order adopted the final recommendations of the Interagency Ocean Policy Task Force and created a National Ocean Council (NOC) to pursue a flexible framework for coastal and marine spatial planning to address conservation, economic activity, user conflict, and sustainable use of the ocean, our coasts, and the Great Lakes.

During FY 2012, IWR staff participated in drafting the National Ocean Policy Implementation Plan, which will include a series of actions to address the Resilience and Adaptation to Climate Change, one of the nine priority objectives identified by the National Ocean Policy.

During FY 2012, IWR staff engaged in both the Ocean Resource Management (ORM) Interagency Policy Committee and the Ocean Science and Technology (OST) Interagency Policy Committee, attending monthly meetings and providing necessary edits and commentary to the National Ocean Policy Implementation Plan (NOP-IP). Throughout the numerous revisions, IWR staff provided comments which were incorporated into the evolving Implementation Plan. A final version of the implementation plan is expected to be released in the spring of 2013.

IWR staff also participates in the Interagency Working Group on Ocean Partnerships (IWGOP), as part of the National Oceanic Partnership Program (NOPP). This interagency group coordinates member agency coastal efforts, encourages interagency participation on proposals from the various agencies relevant to the National Ocean Policy, and advises and assists the Subcommittee on Ocean Science and Technology (SOST) on matters related to ocean partnership programs.

### **National Shoreline Management Study**

The National Shoreline Management Study, authorized by the Water Resources Development Act of 1999 (Public Law 106-53, Section 215(c)), remains a collaborative, inter-agency effort that is adapting to the recent surge in coastal and ocean initiatives. The study is intended to describe the extent and causes of erosion and accretion along the shores of the U.S., the economic and environmental effects caused by erosion and accretion, and the systematic movement of sand along the shores. The study focuses on the resources committed by federal, state and local governments to restore and nourish shores, recommend appropriate levels of federal and non-federal participation in shore protection, and serves to advance the use of systems approaches to sand management. Additionally, the study takes into account the Regional Sediment Management (RSM) approach, which uses principles of integrated water resources management, as well as a watershed perspective.

In fiscal year 2012, the study team engaged a broad community in reviewing the California Regional Assessment and began identifying the study team for the Great Lakes Regional assessment. Each of these regional assessments will provide a detailed description of state and local sediment processes and associated economic and environmental effects of shoreline change. The regional assessments highlight the diversity regarding shoreline management challenges and concerns across the nation. The California Assessment was done in coordination with the California Coastal Sediment Management Workgroup, and drew extensively from work done for the California Coastal Sediment Master Plan and coastal regional sediment management plans.

### **Regional Sediment Management**

USACE has adopted the Regional Sediment Management (RSM) approach in carrying out USACE programs and activities involving or affecting sediment. The RSM approach uses principles of integrated water resources management, as well as a watershed perspective. Sediment management spans the USACE navigation, flood and

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coastal storm damage reduction (flood risk management), and ecosystem restoration missions and responsibilities. The USACE applies this perspective and approach as a major stakeholder and collaborative partner in many of the Nation's inland and coastal watersheds.

In FY 2012, CEIWR staff continued working with HQUSACE staff, the Engineer Research and Development Center (ERDC) staff, and District office personnel on the integration of the RSM approach through initiatives that both involve and affect Civil Works water resource projects and activities. Members of the Institute staff participated as integral members of the HQUSACE Regional Sediment Management Project Delivery Team, and continued to support the sediment management strategies of the Gulf of Mexico Alliance, and related efforts of the inter-governmental Gulf Coast Ecosystem Restoration Task Force, established by Executive Order 13554. Members of the Institute staff also participated in National Ocean Policy (NOP) workgroups addressing integration of RSM approaches to accomplishing NOP priority objectives. These efforts contributed to continuity and prevented duplication among interrelated activities, as well as engaged Corps participation on topics relevant to a range of Civil Works interests.

Additionally, in FY 2012, CEIWR-HEC received funds through the RSM program to support the addition of sediment transport enhancements in HEC-RAS. These enhancements will be included in Version 4.2 tentatively scheduled for release in mid FY 2013.

### **Coastal System Portfolio Initiative**

The Coastal System Portfolio Initiative (CSPI) is an effort to examine and evaluate federal shore protection, navigation, and ecosystem restoration projects along the Nation's coastlines as a "system of systems", rather than as an individual project focus. The Institute continues to facilitate CSPI as those involved work to improve USACE planning, design, construction, and operation and maintenance of federal coastal risk reduction projects, as well as collaboration with other federal, state, and local agencies and levels of government in coastal water resources management.

The USACE Planning Center of Expertise for Coastal and Storm Damage Reduction, located at the North Atlantic Division of the Corps, is leading the technical review of coastal projects, providing a qualitative analysis of existing project conditions, estimated federal future costs (over a five year period), and opportunities for action. Two resources related to CSPI's examination of projects as a system of systems include a technical review document and web-based Geographic Information System (GIS) database. The database has been built for every coastal state except Oregon and Alaska. Both the database and technical review document present existing conditions for federal coastal projects, including current project phase and project type, an overview of project reliability where construction is either complete or under way, and the resources at risk, including structures, habitat, infrastructure, critical facilities, evacuation routes, and recreation.

In fiscal year 2012, CSPI completed the New Jersey Pilot Study, which aimed to evaluate and prioritize the network of USACE coastal projects in the state for shore protection, navigation and coastal ecosystem restoration. The study objective was to identify cost efficiencies in meeting project purposes, and to maximize both risk reduction and opportunities for regional sediment management (RSM).

The New Jersey Pilot Study conceptualized a five year program that uses a systems approach to better integrate and implement coastal risk reduction, navigation, and coastal ecosystem restoration. Two additional pilots began in 2012 that IWR will continue to support through CSPI.

### **Systems Approach to Geomorphic Engineering**

During 2012, the Institute continued to support the multi-agency Systems Approach to Geomorphic Engineering (SAGE) initiative, which is developing a community of practice composed of engineers, physical and environmental scientists, educators, and public policy specialists to advance the knowledge and application of hybrid coastal engineering solutions to advance coastal resilience. The SAGE initiative focuses on innovative approaches to coastal landscape transformation that advance a comprehensive view of shoreline change, and to integrate methodologies that utilize hybrid approaches of green and gray engineering solutions in coastal communities and shorelines to slow, prevent, mitigate, and adapt to the impacts and consequences of growing coastal population,

changing weather and climate patterns, and movement of the land mass. The SAGE principles recognize that natural systems are inextricably linked with and contribute to the resiliency of physical infrastructure, which provide protection to coastal communities. Partners in the SAGE initiative include the USACE, the National Oceanic and Atmospheric Administration, the Federal Emergency Management Agency, The Nature Conservancy, The Conservation Fund, the Virginia Institute for Marine Sciences, the University of Rhode Island and the University of New Orleans.

**Interagency Performance Evaluation Task Force/ Hurricane Protection Decision Chronology (IPET/HPDC) Lessons Learned Implementation Team (formerly Actions for Change)**

The Interagency Performance Evaluation Task Force/ Hurricane Protection Decision Chronology (IPET/HPDC) Lessons Learned Implementation Team was developed to address the lessons learned from the Hurricanes Katrina and Rita events of 2005. The goals of the effort are to improve public safety and the Nation's water resources infrastructure by providing expert and professional services to the Nation. The team is divided into four themes: (1) Comprehensive Systems Approach, (2) Risk Informed Decision Making, (3) Communication of Risk to the Public, and (4) Professional and Technical Expertise.

IWR actively participates on the core teams for the first three themes. The objective of Theme 1, Comprehensive Systems Approach, is to review the dynamic processes that potentially impact USACE projects and to develop guidelines and recommend policy and program changes to address the changes and their impacts. IWR personnel are leading the Temporal and Spatial System Changes project delivery team (PDT) and the Multi-Objective System Planning and Policy PDT. Members of the Institute's staff also contribute to the Vertical Control PDT and the Sustainable Solutions PDT.

During FY 2012, Theme 1 activities included the continued drafting of guidance on how USACE Civil Works projects are to adapt to changing sea levels; the development of an on-line web tool to calculate sea level change at NOAA tide gauge locations; continued progress towards compliance with the nationwide datum policy; the continued refinement of a Social Vulnerability Index as part of USACE planning pilot projects in support of the USACE Adaptation Steering Committee; the development of a pilot project to assess bio-sequestration potential at USACE projects; and providing training on vertical datums, sea-level change, and social vulnerability.

As part of Theme 1, the Temporal and Spatial System Changes Project Delivery Team supports work focused on developing USACE policy and guidance for water resources under changed climatic conditions. The work underway will ultimately help to streamline USACE planning and engineering activities to incorporate climate change adaptation in accordance with the [USACE Climate Change Adaptation Policy](#), the [Civil Works Transformation](#) and the [USACE Campaign Plan](#).

USACE has partnered with the National Oceanic and Atmospheric Administration's [Earth Systems Research Laboratory](#) in Boulder, Colorado to explore and test the reliability and relevance of new climate projection information which will become available in 2012 from the WMO Climate Model Intercomparison Project-5 (CMIP5) specifically for hydrological applications. One intended output from the project will be a new menu of projected climate variables relevant for USACE water resource missions, along with estimates of their reliability and relevance in various regions of the U.S. USACE and NOAA are partnering with the Bureau of Reclamation on this project, building on the close ties between the two chief Federal water management agencies and continuing the fruitful multi-agency work on climate.

USACE also partnered with the Climate Science and Applications Group in the [Research Applications Laboratory at the National Center for Atmospheric Research](#) in Boulder, Colorado on a project to characterize the effects that uncertainties in hydrologic monitoring and predictions can have on water management decisions given known uncertainties in water system operations. One outcome of this project will be a comprehensive predictability assessment to quantify and document the major sources of uncertainties in hydrologic monitoring and prediction products with the overall goal of quantifying the effect of different sources of uncertainty on different types of existing stream flow forecasts that can feed management decisions. USACE is partnering with the Bureau of Reclamation and the [National Center for Atmospheric Research](#) to enhance the understanding and cooperation of Federal water managers operating under similar authorizations and rules and often in the same watersheds.

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USACE has partnered with the U.S. Environmental Protection Agency and the multi-agency funded [Joint Institute for the Study of the Atmosphere and Ocean](#) (JISAO) at the University of Washington to develop, test, and make available several newly derived products from the CMIP3 and CMIP5 climate projection archives. The project will specifically depict the projected time to emergence and temporal development of several different climate-related effects on specific questions of water resources management in the Puget Sound Basin and greater Pacific Northwest region. One output from this work will be a user-accessible system for analyzing and visualizing a variety of climate change-related features shifting in space and time and having changing probabilities of effect across the Pacific Northwest domain for specific elements of water resources management there. This work builds on a history of very fruitful USACE collaborations, in this instance with JISAO and with the other Federal agencies including NOAA operating in the Pacific Northwest. It also lays a foundation for future work in other regions of the U.S. to help the USACE understand when various climate change effects may impact USACE projects and programs

Theme 2, Risk Informed Decision Making, includes tasks that collectively aim to infuse risk and reliability concepts into decision making through the lifecycle of USACE projects and related systems. The objective is to develop improved risk assessment and management processes to inform USACE, the public, and other stakeholders of infrastructure condition and critical needs for public safety. The USACE's Chief Economist is leading the Theme 2 team and other IWR personnel are members of various Theme 2 PDTs.

Activities in FY 2012 within Theme 2 included: continued development of a new flood risk analysis software tool, HEC-WAT with the FRA compute option; enhancements to the existing flood risk damage assessment software tool HEC-FDA; modernization of the CEIWR risk analysis overview manual; continued work on developing a USACE Civil Works risk management framework; the addition of an uncertainty module to the CEIWR Planning Suite; updating and expanding the USACE Risk Analysis Gateway and learning center website; and initial development of a second generation coastal hazards model.

Theme 3, Communication of Risk with the Public, emphasizes USACE needs in risk communication and public involvement and practices for flood risk management decision making. In FY 2012, IWR designed and led an interagency Risk Communication for Flood Risk training in conjunction with the National Flood Risk Management Program and began design of similar targeted Risk Communication for Project Managers training courses. Under Theme 3 the USACE Conflict Resolution and Public Participation Center of Expertise partnered with the National Flood Risk Management team to develop a pilot program to test recommendation from the Theme 3-developed "Framework for Public Involvement in Flood Risk Management Decision Making."

### **Responses to Climate Change**

The Institute continues to lead USACE work on climate change under the Responses to Climate Change (RCC) program, which is aimed at integration of climate change adaptation policies into regular USACE operations, planning, and execution. On a broader scale, IWR was heavily engaged in the federal government's efforts in the advancement of global climate change science and the development of policies to address adaptation to climate change.

The objectives of the initiative are to understand how climate is changing, describe and characterize climate impacts to USACE missions, operations, programs, and projects, and develop consistent water resources management adaptation policies and approaches throughout USACE Civil Works and in partnership with other Federal water resources agencies. The project will provide recommendations for policy and guidance to prepare for, and respond to, climate change and variability.

The RCC program supports USACE work to integrate climate change policy and direction with that of other Federal agencies and non-federal partners including the Council on Environmental Quality (CEQ), the United States Global Change Research Program (USGCRP), and the White House Office of Science Technology and Policy, Subcommittee on Water Availability and Quality (OSTP-SWAQ), among others.

RCC had three key priorities in FY 2012: 1) execute climate change adaptation pilot studies across USACE projects in order to generate increased understanding of climate change impacts and to build capacity in the field for future climate change actions; 2) complete the proof-of-concept nationwide climate change vulnerability analysis and begin the refined screening-level assessments, 3) continue the development of USACE climate change guidance

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supporting inland hydrology, including floods, droughts, reservoir sedimentation, and a knowledge and tool gap analysis.

Progress has been made in all three areas. A report, to be released in FY 2013, summarizes the knowledge gained and lessons learned from the pilot climate change studies. The proof-of-concept national-scope vulnerability assessment was completed, and the implementation phase has begun. Inland hydrology policy for climate change adaptation, planned for publication in FY 2013, builds upon all of the lessons learned to date. Also in FY 2012, work began to understand the status of drought contingency plans which supplied critical information to USACE during the 2012 drought period.

Finally, RCC also supports USACE involvement in the [Climate Change and Water Working Group \(CCAWWG\)](#). Working with our partner agencies, USACE established a web site to provide information about climate change and water resources management ([www.ccawwg.us](http://www.ccawwg.us)). In FY 2012, RCC co-sponsored development of the joint-agency report scheduled to be released in January 2013 entitled, "[Short-term Water Management Decisions: User Needs for Improved Climate, Weather, and Hydrologic Information](#)," in conjunction with the Bureau of Reclamation and the National Weather Service. The report identifies needs of the water management community to improve decision-making, motivated by potential climate change impacts to water resources.

### Agency Climate Change Adaptation Planning

In 2009, President Obama issued Executive Order 13514, which set sustainability goals for Federal agency operations and directed agencies to improve their environmental, energy and economic performance. Under this Executive Order, each Federal agency was to evaluate agency climate risks and vulnerabilities to manage both the short-term and the long-term effects of climate change on the agency's mission, programs, and operations.

In March 2011, the Council on Environmental Quality issued a set of implementing instructions for Federal Agency Adaptation Planning. The instructions informed agencies on how to integrate climate change adaptation into their planning, operations, policies and programs, as recommended by the Interagency Climate Change Adaptation Task Force in its October 2010 Progress Report to the President.

During FY 2012, the Institute supported the Office of the Assistant Secretary of the Army (Civil Works) in developing the USACE Climate Change Adaptation Policy, "[USACE 2012 Climate Change Adaptation Plan and Report](#)".

This policy calls for integrating climate change adaptation into all that the USACE does. It also discusses the need to take action now based on the best available and actionable science, and that the USACE should consider climate change impacts when undertaking long-term planning, setting priorities, and making decisions. The Policy Statement says that "Mainstreaming climate change adaptation means that it will be considered at every step in the project life cycle for all USACE projects, both existing and planned... to reduce vulnerabilities and enhance the resilience of our water-resource infrastructure."

The Policy Statement also establishes the Assistant Secretary of the Army for Civil Works as the Agency official responsible for ensuring implementation of all aspects of this policy. Through this Policy, USACE established the USACE Climate Change Adaptation Steering Committee to oversee and coordinate agency-wide climate change adaptation planning and implementation.

### National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate

Throughout FY 2012, IWR staff continued supporting the White House Interagency Climate Change Adaptation Task Force to develop federal recommendations for adapting to climate change impacts, both domestically and internationally. IWR supports several task force efforts including providing representatives on working groups on Adaptation Science Inputs for Policy, Agency Adaptation Processes, and Water Resources.

A major effort in FY 2012 was the report "[National Action Plan \(NAP\): Priorities for Managing Freshwater Resources in a Changing Climate](#)", available at ([http://www.whitehouse.gov/sites/default/files/microsites/ceq/2011\\_national\\_action\\_plan.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ceq/2011_national_action_plan.pdf)).

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The Institute is leading the implementation of three supporting actions assigned to USACE in the National Action Plan, all of which support the NAP recommendation to “Support Integrated Water Resources Management”. These actions include:

- Strengthen integrated water resources management practices to advance climate change adaptation;
- Work with States to review flood risk management and drought management planning and identify best practices; and
- Develop benchmarks for incorporating adaptive management into water project designs, operational procedures, and planning strategies.

### National Fish, Wildlife, and Plants Climate Adaptation Strategy

Federal agencies are partnering with state, tribal and local representatives to develop a National Fish, Wildlife, and Plants Climate Adaptation Strategy, to safeguard the Nation’s species and natural resources. A draft strategy will be released in January 2013.

### Updated Sea Level Change Guidance

During FY 2012, the Institute’s Responses to Climate Change team continued to work closely with the HQUSACE personnel from Planning, Operations and Maintenance, Hydrology and Hydraulics, and Engineering and Construction to develop updated guidance on incorporating sea level change considerations in Civil Works Programs. The new guidance, released in October 2011, is [EC 1165-2- 212, “Sea Level Change Considerations for Civil Works Programs.”](#) This Engineer Circular provides guidance for incorporating the direct and indirect physical effects of projected future sea-level change across the project life cycle in managing, planning, engineering, designing, constructing, operating and maintaining USACE projects and systems of projects.

### Procedures to Evaluate Sea Level Change Impacts, Responses, and Adaptation.

During FY 2012, Sea Level Change Adaptation Guidance Project Development Team drafted an Engineer Technical Letter which will describe the procedures to evaluate the measures for USACE projects in response to future sea-level change. This effort is being led by district staff (with the support of IWR planners, economists, engineers and scientists), and includes members of the USGS, NOAA, FEMA, the Bureau of Reclamation, Federal Highway Administration, the Navy, the U.S. Naval Academy, and others, including experts from the United Kingdom (HR Wallingford and the University of Southampton).

## **USACE Chief Economist**

Dr. David Moser of IWR is the USACE Chief Economist and leader of the Economics Community of Practice (CoP). During FY 2012, Dr. Moser also continued his involvement in developing tolerable risk guidelines for both dam safety and levee safety policy and procedures teams.

The Chief Economist’s leadership was engaged to build and advance the economic analysis capability across the USACE, holding one national meeting and regular teleconferences with senior economists. A subject matter expert (SME) database of all Corps economists was reviewed and updated by senior economists to maintain a directory identifying economists by experience and expertise for each economic activity conducted by the USACE. This SME database is used by MSC economists, Planning Centers of Expertise and others to identify resources for feasibility studies, independent technical reviews, and special purpose teams. The database was transformed to be web accessible to allow individual entry and update by field economists.

As lead technical economics expert for the USACE, Dr. Moser provided review and guidance to multiple economic analyses for both field practitioners and USACE Headquarters reviewers. The Chief Economist was also involved in issues relating to National Economic Development evaluation of navigation and other economic evaluation issues.

In FY 2012, the Chief Economist also continued as the National Team Lead for Theme 2 - Risk Informed Decision Making, as part of the IPET/HPDC Lessons Learned Implementation (formerly part of Actions for Change), which transitioned to the Civil Works Campaign Plan Goal 2a. As part of that effort, the Chief Economist led development of approaches and frameworks to articulate the value of risk analysis, with emphasis on risk management, to Civil Works decision making.

Additionally, he helped facilitate risk workshops as part of the USACE planning pilot programs. He also served as a risk register expert for five SMART planning charettes held during FY12. He served on the team developing and implementing tolerable risk as part of the transitioning of dam safety to a risk analysis approach. Additionally, he worked as part of a team developing tolerable risk notions to levee safety. In that role, he authored several chapters of the draft levee safety engineering circular including examples of economic calculations to aid decision making.

### **American Recovery and Reinvestment Act Funded Initiatives**

#### Regional Economic System (RECONS)

In FY 2009 the Institute received approximately \$10.0 million to carry out American Recovery and Reinvestment Act related activities. A portion of these funds was used to conduct a comprehensive study of the employment impacts and associated secondary economic impacts associated with Recovery Act expenditures. The Civil Works Regional Economic System (RECONS) Program is a modeling tool that was developed to provide accurate and defensible estimates of regional economic impacts associated with USACE spending. It can be utilized to track progress and justify continued operation, maintenance and construction work performed by the Corps. RECONS is the only USACE certified Regional Economic Development (RED) model for agency wide use.

This modeling tool automates calculations and generates estimates of jobs and other economic indicators such as income and sales associated with USACE's ARRA spending and annual Civil Works program spending, as well as that stemming from additional economic activities associated with USACE's core programs (such as water transportation, tourism spending, etc).

While RECONS incorporates impact area data, as well as multipliers, direct ratios (jobs to sales, income to sales, etc), and geographic capture rates that were extracted from the IMPLAN models performed for different USACE projects, RECONS provides a number of significant advantages over IMPLAN software. The greatest advantage is that it ensures that economic impact analyses are performed in a consistent and comparable fashion across the nation.

In FY 2012 activities associated with the RECONS project included the following.

- The RECONS model was certified in July 2012. Extensive technical and usability reviews of the model were accomplished by an independent external review team. The certification is based on the decision of the USACE Headquarters Model Certification Panel and reflects version RECONS 1.0. It meets the certification criteria contained in EC 1105-2-412.
- Completion of a web portal for accessing RECONS model and related documents and user's manual
- Provision of data and supporting materials to USACE senior leaders as part of briefings and other forms of communications and programmatic outreach
- Continuation of production of estimates of employment, income and sales for various proposed new projects for planning and communication purposes, including materials associated with the preparation and release of the FY 2013 budget request
- Continuation of technical support to Major Subordinate Commands and district offices in their use of the RECONS system.

### Climate Change Downscaling Projections Project

A second Recovery Act funded initiative, the “Climate Change Downscaling Projections Project” continued producing a comprehensive library of fine-resolution simulations of historical and future climate for use by decision-makers who need local to regional-scale climate information to evaluate climate impacts to water resources project performance and resilience. The project produced fine-resolution climate results spanning the period from 1950-2100 using two statistically-based methods that add spatial and temporal detail to the results of a full suite of climate models. This library of fine-resolution climate projections is distributed by the [Lawrence Livermore National Laboratory](#) through the same portal that distributes IPCC climate model results, and is freely available to other federal agencies, state and local governments, and the general public.

## **COLLABORATION AND PARTNERING**

The USACE recognizes that the Civil Works mission must be carried out in collaboration with multiple partners and stakeholders with differing authorities, capabilities and perspectives. Thus a major IWR role has long been as the intellectual nexus for USACE expertise on collaboration, partnering and public participation. IWR serves as the USACE lead for multiple national collaborative partnerships and is committed to developing new training instruments, technologies, processes and policies to further USACE’s overall capability in collaborative planning and partnering.

IWR represented USACE and the Office of the Secretary of Defense (OSD) through participation in the National Science and Technology Council’s interagency Subcommittee on Water Availability and Quality (SWAQ) and its Subcommittee on Disaster Reduction.

CEIWR’s collaborative efforts extend to the academic community through the Maass-White Visiting Scholars program, the Universities Council on Water Resources (UCOWR) Fellowship Visiting Scholars program, the National Research Council (NRC) Research Associates program, the American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellows program, and the Leo R. Beard Visiting Scholars program (resident at CEIWR-HEC).

Forming strategic alliances, both through formal agreements and informal working relationships, is becoming a way of doing business in the USACE, government agencies and non-governmental organizations (NGO’s). Driving this movement are the complexity and far-reaching impacts of today’s water resource problems, juxtaposed with the limited financial and intellectual resources of any single organization. The USACE is increasingly committed to partnerships as a means of accomplishing common goals.

### **USACE/Natural Resources Conservation Service National Partnership**

As part of the continued collaborative effort between the USACE and the U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS), a handbook developed by members of both organizations was published in April 2011. The handbook is entitled “[\*The NRCS/USACE Partnership Handbook: A Field Guide to Working Together Toward Shared Goals\*](#)”. The handbook serves as reference guide to be used at the field level to stimulate and facilitate active cooperation and collaboration between the two agencies. The handbook contains basic information about each agency’s missions, programs, capabilities, and mode of operations. Identifying and understanding each agency’s mutual interests can lead to developing shared goals and leveraging resources to implement joint solutions. Case studies and examples are included to illustrate what has worked in the past and where further collaboration and problem solving is needed to reach better results in the future.

An overview of the USACE/NRCS Partnership and the Partnership Handbook was presented at the 67<sup>th</sup> Annual Meeting Soil and Water Conservation Society meeting in Fort Worth, Texas, in July 2012. Continued outreach on the Partnership provides an opportunity for sharing of success stories. The Partnership has featured several success stories including the repair work on the New Madrid Floodway which was completed ahead of schedule and with expressed satisfaction from local officials. The acceleration of the repairs was possible due to the expedited permitting from USACE and NRCS’s technical expertise and strong relationships with the local community in the

affected area. This is a fine example great teamwork between the two agencies with a strong spirit of cooperation and communication.

Another example of close cooperation between the two agencies was the establishment of conservation easements on a 1,278-acre tract along the Caloosahatchee River in Glades County, Florida. These easements are located in a key natural landscape through which Florida panthers can disperse from habitats farther south. This acquisition required a sequence of events involving multiple agencies, and was accomplished in a timely fashion so as prevent the land from going to foreclosure auction. The NRCS purchased a conservation easement on 718 acres of this property. The USACE facilitated the real estate transactions necessary to relocate two 50-acre disposal easements, which was vital to acquisition of the land.

The USACE/NRCS Partnership has also worked closely on the regulatory side, beginning with the completion of the last 10 regional supplements to the National Wetland Plant List. Each supplement went through development, a one year interim period and the final version (referred to as version 2.0) after *Federal Register* notice. The final [2012 National Wetland Plant List](#) has been published; the result of almost six years of cooperative work between USACE, the NRCS, the U.S. Environmental Protection Agency, and the U.S. Fish and Wildlife Service. The list contains about 8,000 wetland plant species and is divided into 10 regions with these regional boundaries matching those of the regional supplements. The newly developed National Technical Committee for Wetland Vegetation will be responsible for annual updates to the National Wetland Plant List. This committee is also developing a “Challenge Study” which is an outlined process that allows anyone to submit the required information about a plant so it can be considered for addition or removal from the official Plant List.

The Action Plan for the USACE/NRCS partnership has been jointly updated by USACE and NRCS. This Plan identifies activities for the next 1-3 years and is intended to be dynamic and flexible. It is anticipated that new actions will be established as needs are identified by personnel within the two agencies. Issues identified will be reviewed by the Partnership Core Team, channeled through agency leadership, and when appropriate, added to the Partnership Action Plan. The Action Plan serves as a framework for agency leaders to annually review and concur with partnership accomplishments and activities.

The USACE/NRCS partnership also supports an annual MOA which provides national level technical support for several CEIWR-HEC (Hydrologic Engineering Center) programs. As a result of this agreement, 25 HEC-RAS training modules (including speaker notes) addressing various aspects of floodplain modeling were developed for the NRCS. These modules can be provided directly to NRCS state specialists. The MOA signed for this year broadened the area of focus to include any software in the HEC suite of programs. This provides the NRCS with much more flexibility in obtaining technical support or training material for any existing or new HEC program.

### **U.S. Institute for Environmental Conflict Resolution**

In FY 2012 the Institute made active use of its 2008 Memorandum of Understanding (MOU) with the U.S. Institute for Environmental Conflict Resolution (USIECR). The USIECR is an independent federal program of the Udall Foundation, which impartially assists in the resolution of federal environmental, natural resources and public land conflicts and controversies through facilitated negotiation, mediation, and collaborative problem solving. The most significant use of the USIECR MOU during FY 2012 was providing a contractual vehicle to enable the USACE Sacramento District to access USIECR facilitation support for the California Levees Round Table as part of the Central Valley Flood Protection Program. The Roundtable is a forum for high-level policy negotiation and resolution of cross-agency impediments to desirable flood management.

Other engagements with the USIECR during FY 2012 included IWR support for the USIECR hosted bi-annual conference on Environmental Conflict Resolution, partnering on training opportunities through USIECR’s Udall Certificate in Environmental Collaboration program, and joint leadership of the National Collaborative Modeling for Decision Support Steering Committee.

### **U.S. Geological Survey Partnership**

During FY 2012, significant activities associated with the U.S. Geological Survey (USGS) Memorandum of Agreement included quarterly senior level meetings addressing national stream-gage issues; climate change and

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related water management issues; the sharing of water data; coastal, geotechnical and biological research; and regional and international water studies.

The USACE, USGS, and NOAA signed a [MOU](#) in 2011 to support Collaborative Science, Services and Tools to Support Integrated and Adaptive Water Resources Management. The MOU will facilitate addressing water information needs and support the creation of a database portal to help stakeholders manage water resources. In FY 2012, the three agencies signed two charters to facilitate implementation of the MOU. One charter focuses on Flood Inundation Mapping. A team is developing a document on flood inundation mapping requirements. The second charter concerns Data Interoperability. Another team is working on establishing a data interoperability standard for the three agencies.

The USACE works with the USGS on the [Climate Change and Water Working Group \(CCAWWG\)](#), along with other Federal agencies including the U.S. Bureau of Reclamation, the National Oceanic and Atmospheric Administration (NOAA), the Federal Emergency Management Agency (FEMA), the Environmental Protection Agency (EPA), and the National Aeronautics and Space Administration (NASA). The Climate Change and Water Working Group's objectives are (1) to define the most critical gaps in our capability to forecast and adapt to climate change; (2) to conduct collaborative research to address those gaps; and (3) to develop mechanisms to provide training for infusing climate change science into water planning and technical studies.

In FY 2012, USACE and USGS agreed to begin interagency development assignments to foster a closer partnership. Dr. Rolf Olsen from IWR will begin a detail with USGS in 2013. The goal of the detail will be to improve interagency coordination on data sharing, water resources, climate change and structured decision making.

USACE also partners with the USGS on international water resources, as both agencies are core members of the U.S. National Committee for UNESCO's International Hydrological Programme (IHP). The Director of IWR is the designated USACE representative on the U.S. National IHP Committee.

### **National Climate Assessment – Water Sector Technical Report**

During FY 2012, Mr. Robert A. Pietrowsky, Director of the Institute, and Dr. Jerad Bales, Chief Hydrologist of the USGS, served as co-chairs for the development of the inter-agency water sector technical report for the 2013 [National Climate Assessment](#).

In March 2012, the Water Resources Sector Team produced a draft water sector technical input report that was submitted to National Climate Assessment (NCA) author team. Information provided in the report will be used in developing the water resources chapter of the 2013 NCA document. The Water Sector Technical input report also underwent internal and external review processes to be published as a stand-alone document.

The report is an assessment of recent, relevant information on the effects of climate change on freshwater resources. The focus of this report is primarily on information that is well-documented, peer-reviewed, and useful to assess impacts of climate change on freshwater resources, including key vulnerabilities, and the development of adaptation and mitigation strategies. The report is organized by six key issues: (1) Precipitation patterns and intensity; (2) Surface water, including stream flow, snowmelt, and floods; (3) Groundwater, including soil moisture; (4) Water Quality; (5) Water Resources Management Implications, and (6) Adaptation.

### **U.S. Bureau of Reclamation Partnership**

During FY 2012 USACE continued to work closely with the U.S. Bureau of Reclamation on the [Climate Change and Water Working Group \(CCAWWG\)](#), which also includes representatives of the U.S. Geological Survey, NOAA, FEMA, EPA, and NASA.

During FY 2012, Dr. David Raff of the Institute collaborated with staff from the Bureau of Reclamation and NOAA in preparing a report entitled "[Short Term Water Management Decisions: User Needs for Improved Climate, Weather and Hydrologic Information](#)." The report examines how Federal agencies, along with state, local, tribal and non-governmental organizations and agencies are working together to identify and respond to the needs of water resource managers in the face of a changing climate.

The Institute is also working closely with Bureau of Reclamation staff to leverage the Bureau's progress in the Western U.S. as a foundational element of the National Vulnerability Assessment which is underway as part of the Corps' Response to Climate Change Program.

### **National Flood Risk Management Program**

In May 2006, in an IWR-led effort, the USACE established the National Flood Risk Management Program (NFRMP) for the purpose of integrating and synchronizing USACE flood risk management programs and activities both internally and with counterpart activities of FEMA and other Federal, state, regional and local agencies. Its vision is to lead collaborative, comprehensive and sustainable national flood risk management by:

- Improving capabilities to collaboratively deliver and sustain flood risk management and mitigation services to the nation;
- Improving public awareness and understanding of flood related hazards and risks; and,
- Coordinating flood damage and flood risk reduction programs across Federal agencies and with local and state agencies and other non-Federal entities.

In FY 2012, the National Flood Risk Management Program supported the following activities:

- Continued support of the Interagency Recovery Task Force (IRTF) which allows for the continued regional coordination for post-flood recovery decision-making. The IRTF was established in May 2011 following the Mississippi River Basin flood event of 2011 with an initial focus on intergovernmental coordination for purposes of post-flood recovery. Throughout FY 2012, the IRTF engaged in multiple aspects of recovery, including damage assessments, regional prioritizations, system performance evaluations, regional flood preparedness and initiation of interim and permanent repairs. The IRTF will transition to a longer term coordination entity, meeting periodically, with a focus on mitigation and preparedness. Members of the IRTF include the states of Louisiana, Mississippi, Arkansas, Tennessee, Kentucky, Missouri and Illinois and the following agencies: the National Weather Service, FEMA, USDA, U.S. EPA, U.S. Fish and Wildlife Service, U.S. Coast Guard, and the Maritime Administration.
- Conduct of the [2012 USACE Flood Risk Management and Silver Jackets Workshop](#), held in Harrisburg, Pennsylvania on August 20-24, 2012. The theme of the workshop was "Integrating People and Programs." The workshop emphasized interagency activities in managing flood risk, including those of FEMA, the USACE Flood Risk Management and Silver Jackets programs, other Federal agencies, and state and local initiatives such as hazard mitigation plans. USACE District and Division flood risk managers, Silver Jackets team leads and representatives of multiple Federal, state, and local agencies came together for an opportunity to learn about the accomplishments, status and future goals of the National Flood Risk Management Program, as well as to share the experiences, successes and challenges encountered as part of field level implementation of the NFRMP coordination framework and the Silver Jackets Program. Additionally, the Workshop provided a number of technical training sessions providing participants access to a variety of flood risk management related information and skills.
- Improved national coordination through the Federal Interagency Floodplain Management Task Force (FIFM-TF). Beginning in November 2009, FEMA and USACE, through the NFRMP, made use of a standing authority provided by the 1968 National Flood Insurance Act (Public Law 90-448) to reconvene a Federal Interagency Floodplain Management Task Force (FIFM-TF), with the general intent of updating the Unified National Program for Floodplain Management; coordinating Federal agency policies for flood risk management; and identifying and recommending actions and policies by the Federal government necessary to reduce losses due to flooding and protect the safety of floodplain residents. In FY2012, the Task Force made use of available resources describing the current status of Federal programs and policies that impact floodplain and flood risk management to develop a number of recommendations for the Task Force to carry out to improve Federal flood risk management. These recommended activities were incorporated into a revised Work Plan. The Task Force also finalized a definition of unwise use of the floodplain, in response to requests from the Assistant Secretary of the Army (Civil Works) and the Council on Environmental Quality.

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- Initiation of Phase Three of a policy study to examine opportunities for improving public involvement in all USACE flood risk management related programs and activities. Phase Three involves conducting pilot projects to demonstrate and evaluate the recommendations and framework for improving public involvement that were put forth in Phases One and Two.
- Support to HQUSACE efforts to employ watershed-based budgeting by initiating work to develop a map-based tool that provides an interactive interface allowing users to display information about the drivers of flood risk and the potential adverse consequences associated with flooding nationwide.
- Policy work, through a study of the “Corps Contribution to Flood Risk Management” to examine the role of USACE programs and policies in supporting risk informed, cost responsible flood risk management decision making by individuals and local governments. The study is addressing both the question of how to evaluate the performance of programs and policies in addressing flood risk and how to approach the task of evaluating flood risk at a national scale.
- Support to USACE international collaborations, included the following.
  - Preparing a joint paper with flood risk management colleagues from Japan, the United Kingdom, and the Netherlands regarding flood risk management approaches in the four countries. The paper examines risk-informed approaches as being practiced and developed primarily in the four countries and offers specific examples.
  - Supporting the Director of Civil Works in his role as international advisor to the Government of Japan and the World Bank in documenting lessons learned from the Great East Japan Earthquake and tsunami. During FY 2012, IWR reviewed and commented on the development of "knowledge notes" that analyze and synthesize what worked, what did not, and why, and offer recommendations for developing countries that face similar risks and vulnerabilities. The Knowledge Notes constitute the first phase of a "Learning from Megadisasters" project and are available online through the World Bank.
- Redesign of the National Flood Risk Management Program Website. IWR led the redesign of the National Flood Risk Management Program website, which features updated content, more extensive links to program partners, and new audience-based navigation features that give users options on how they search for material.
- Published the National Flood Risk Management Program, Program Management Plan which provides specific guidance to Major Subordinate Commands and Districts for the implementation and management of the programs objectives and activities at the regional and State levels.

### **Silver Jackets Program**

Complementing the National Flood Risk Management Program (NFRMP), the Silver Jackets Program facilitates the delivery of the Corps’ authorities for providing flood risk management services to state and local agencies through state intergovernmental partnerships. These partnerships make the most of existing federal agency programs and funding to assist states and communities in identifying and addressing flood risks by leveraging agency resources, identifying opportunities to jointly implement complementary programs, sharing data and knowledge, and eliminating duplicative or conflicting activities or policies.

The Silver Jackets are collaborative state-led interagency teams, continuously working together to reduce flood risk at the state level. Through the Silver Jackets program, USACE, FEMA, additional federal, state and sometimes local and tribal agencies provide a unified approach to addressing a state’s priorities. Often, no single agency has the complete solution, but each may have one or more pieces to contribute. The Silver Jackets team is the forum where all relevant agencies come together with the state to collaboratively plan and implement that interagency solution. The primary goals of the Silver Jackets program are to:

- Facilitate strategic life-cycle flood risk reduction.

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- Create or supplement a continuous mechanism to collaboratively solve state-prioritized issues and implement or recommend solutions.
- Improve processes, identifying and resolving gaps and counteractive programs.
- Leverage and optimize resources.
- Improve and increase flood risk communication and present a unified interagency message.
- Establish close relationships to facilitate integrated post-disaster recovery solutions that increase resilience.

The Silver Jackets Program facilitates regular and sustained coordination among federal, regional, and state, and sometimes local and tribal partners. The intent is not to duplicate existing teams, but to supplement and strengthen current efforts, and establish relationships where they do not yet exist.

The Silver Jackets program has created the opportunity for optimized delivery of federal services as well as significant costs savings through leveraging information and resources, increased and improved public risk communication, and combined efforts to address flood risk management challenges. Specific interagency examples include: data sharing across agencies to support flood mapping studies; combined and coordinated use of models, stream gage data and databases housed in different agencies to create a flood inundation model allowing for more effective flood response and mitigation; synthesis of existing studies and knowledge from different agencies to develop a comprehensive flood risk mitigation plan for a community without requiring any new study effort; and community recovery through short- and long-term mitigation strategies focused on nonstructural approaches and planning assistance.

Currently there are 35 states with an active interagency flood risk management team. Efforts to form teams in the remaining 15 states are ongoing, with the ultimate goal of supporting an interagency team in every state. Team focal areas vary, as state priorities vary.

Beginning in Fiscal Year 2011, USACE initiated inter-agency projects through Silver Jackets teams. Thirty-three interagency projects were initiated in 24 states through Fiscal Year 2012, with approximately \$1.90 leveraged for every \$1.00 in USACE program investment. Projects cover a wide range of flood risk management strategies, including integrated flood response planning and flood warning systems, inundation mapping, unified flood risk communication, and emergency action planning.

The first inter-agency project was completed in Maine in August 2012. The project supported an ongoing multi-agency program to complete a hydraulic failure analysis for more than 600 stream crossing structures. The Maine State Hazard Mitigation Plan states that “the greatest amount of damage from flooding events occurs to the roadway system, both state and municipal roads, bridges, culverts and ditches”. Replacing priority undersized culverts before floods occur avoids significant impacts. The \$40,000 study investment leveraged \$80,800 from Maine agencies and the U.S. Department of Fish and Wildlife Service. The hydraulic analysis identified the expected capacity of each structure for various extreme weather events, providing 21 communities with the information required to prioritize culvert and bridge replacements. Assuming that providing for increased hydraulic capacity doubles culvert installation costs and that approximately 10 percent of the culverts are high-risk and warrant enlarging, the project investment can be roughly estimated to mitigate approximately \$700,000 of replacement value plus the extensive costs associated with reconstructing roads damaged from the effects of stream crossing failures. The data will also be integrated into the Federal Emergency Management Agency’s non-regulatory RiskMAP product as “other points of mitigation interest.”

In Pennsylvania, the Silver Jackets program supports an initiative to develop a flood inundation mapping tool to inform the general public, local officials, and emergency managers of flooding risks for the City of Harrisburg and adjacent communities. The stage inundation map library will be developed based on the river gage and will be displayed on various map viewer websites. Flood stage inundation maps will provide critical, timely information regarding the projected extent and depth of flooding on the web, and will allow local officials, emergency managers, and the general public to make informed decisions regarding how they can reduce flood risk. Local officials are committed to using maps to help make decisions. Access to the maps will allow the public and officials to elevate valuables, move vehicles, shut down power grids, and take other precautions to reduce flood damage.

More information about the Silver Jackets program can be found at its website: <http://www.nfrmp.us/state/>.

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### **National Ocean Service Partnership**

During FY 2012 the Institute continued to foster a close working relationship with the National Ocean Service in support of the partnership agreement between USACE and the National Oceanic and Atmospheric Administration's National Ocean Service (NOS) signed in 2008. IWR has been instrumental in developing and cultivating this partnership that recognizes the significance of leveraging each agency's programs and expertise through joint centers for coastal mapping, instrument testing, evaluation and training; integrating multiple coastal and ocean observing platforms and data networks; coordinating vertical datum systems and improving tidal measurement and information; and improving natural hazard risk communication that incorporates consideration of community resilience. Collaborative efforts have produced mutually beneficial advances and synergies.

During FY 2012, efforts continued to focus on collaboration in addressing water quality challenges and developing a plan through a technical working group which includes the U.S. Geological Survey on adopting NOAA Datum Standards, initially focusing along the coastline. Other efforts included continued collaboration to understand climate change and variability in the Pacific Ocean to understand how our coastline is changing, and how best to apply the principles of coastal engineering, planning and design of coastal structures, including the use of green infrastructure.

The National Ocean Service partnership continues to expand USACE's working relationship with the National Weather Service and NOAA's Office of Atmospheric Research in weather, water and climate services to leverage expertise and capacities in research and modeling that will improve decision-support and operations, which also includes focus on post-storm assessments and hurricane awareness efforts. During FY 2012 efforts continued to expand USACE and the Institute's working relationship with the National Weather Service.

### **Interagency Committee on the Marine Transportation System**

USACE participates as an integral member of the federal Interagency Committee on the Marine Transportation System (CMTS), a partnership of Federal departments and agencies with responsibility for the marine transportation system (MTS). The CMTS works to ensure the development and implementation of national MTS policies are consistent with national needs and reports to the President on its views and recommendations for improving the MTS. As a member of the CMTS, the USACE coordinates with the Maritime Administration (MARAD), the National Oceanic and Atmospheric Administration (NOAA), the U.S. Coast Guard and other Federal departments and agencies on the CMTS. The Institute provides logistical support and participates on CMTS interagency teams and working groups.

During FY 2012, IWR staff led an interagency team to examine the National Ocean Policy and priority objectives relative to the marine transportation system and prepared a CMTS response to the National Ocean Council. The CMTS is specifically referenced in the Final Report of the Ocean Policy Task Force to coordinate with the National Ocean Council, through the National Economic Council. The CMTS interagency team produced a white paper entitled, "*The U.S. Marine Transportation System in the National Ocean Policy: Response of the Committee on the Marine Transportation System.*" The response highlighted the importance of the marine transportation system to the nation's economy as an integral and critical component to the National Ocean Policy and its implementation. The response also offered the services of the CMTS as an established forum of collective high level expertise of over 25 Federal agencies, to assist the NOC with implementation of marine transportation-related provisions in National Ocean Policy implementation plans.

Also in FY 2012, IWR participated in the CMTS/Transportation Research Board/Marine Board MTS Research and Development Conference, "Diagnosing the Marine Transportation System: Measuring Performance and Targeting Improvement" held in June in Washington, D.C. The biennial conference highlighted performance indicators in marine transportation and waterways management to better determine the status and needs of the MTS. In addition, a newly-established Infrastructure Investment Integrated Action Team began work on improving alignment of transportation infrastructure investments between the U.S. Department of Transportation and USACE.

In 2012, a Department of the Army intern on the staff of IWR completed a detail to the CMTS Executive Secretariat on temporary assignment to assist with ocean policy, the Marine Transportation Compendium, and the Environmental Stewardship Discussion Group. Finally, IWR continued to oversee support of a Sea Grant Fellow.

### **Coastal Engineering Research Board**

The Coastal Engineering Research Board (CERB) functions as an advisory board to the Chief of Engineers and was established by Public Law in 1963. The Board provides broad review of business line activities involving coastal engineering understanding and develops recommendations for the conduct of research and development in support of coastal engineering and the objectives of the Chief of Engineers. IWR provides staff support to the Deputy Commanding General of Civil and Emergency Operations (DCG-CEO), who serves as the President of the Board for the Chief. In fiscal year 2012, IWR supported the DCG-CEO by organizing the Executive Session of the Board held in Alexandria, VA in February 2012. The Board held its 89<sup>th</sup> meeting on September 18-20<sup>th</sup> in Jacksonville, Florida. The theme of the meeting was “Regional Sediment Management – Uniting Navigation, Beaches and the Ecosystem.” The purpose of the meeting was to review the coastal engineering challenges within the southeast Atlantic coastal system, focusing on how regional sediment management can help bridge multi-purpose and multi-agency missions and to identify the research and technology that is needed to help USACE District offices and the Nation meet those challenges.

### **Environmental Advisory Board**

IWR has led the USACE technical team supporting the Chief of Engineers’ Environmental Advisory Board (EAB) since FY 2004 and an IWR staffer serves as the Alternate Designated Federal Officer. In FY 2012, the EAB continued to explore field level outreach, internal implementation of the Corps Environmental Operating Principles (EOP), and ecosystem restoration. The Board held two public meetings, one in January 2012 in Washington, D.C. and a second in August 2012 in Chicago, Illinois.

The work session preceding the public meeting in Chicago provided the Board an opportunity to meet with Chicago District staff to discuss the District’s environmental projects including the Asian Carp barrier and the Ecosystem Restoration projects associated with Great Lakes Fisheries and Ecosystem Restoration Initiative. In October, the Board had a work session in Omaha, Nebraska and discussed the prior summer flooding and toured the Lower Missouri River habitat restoration projects.

After discussion at the public meeting in January 2012, Major General Michael J. Walsh, USACE Deputy Commanding General for Civil Works and Emergency Operations, requested the Board to assess how the EOPs might address new ideas and changed conditions since their publication in 2001 and to provide input to the Greater Mississippi River Flood Recovery Assessment Team project. Subsequently, the Board members prepared a proposed outline of revitalized EOPs, which was submitted to HQUSACE, which have been used by the Corps as the basis for a revised EOPs released in summer 2012.

### **Inland Waterways Users Board**

The Inland Waterways Users Board (IWUB) was established by Section 302 of the Water Resources Development Act of 1986 (P.L. 99-662) and pursuant to the Board’s charter, approved by the Secretary of the Army on March 3, 1987. The principal responsibility of the Board is to recommend to the Congress, the Secretary of the Army, and the U.S. Army Corps of Engineers, the prioritization of new and replacement navigation construction and major rehabilitation projects. The Board is a Federal advisory committee and as such subject to the requirements of the Federal Advisory Committee Act (P.L. 92-463, as amended).

Support of the IWUB is a critical activity for the Corps. The Institute provides the Designated Federal Officer (DFO) and the Executive Secretary to the Board and all support activities. The Deputy Commanding General for Civil and Emergency Operations serves as the Executive Director of the Board, and the Assistant Secretary of the Army (Civil Works) serves as one of four Federal Observers to the Board. The other Federal observers include representatives from the U.S. Department of Agriculture, Agricultural Marketing Service; the National Oceanic and Atmospheric Administration, Office of Coast Survey; and the U.S. Maritime Administration.

During FY 2012, IWR continued to provide technical and administrative support of the Board, including: the analysis of, and reporting on, the financial status and capability of the Inland Waterways Trust Fund; evaluation of potential candidates nominated for Board membership; and the organization of IWUB meeting No. 66 in Pittsburgh, Pennsylvania in June 2012 and meeting No. 67 in St. Louis, Missouri in August 2012.

### **Mass Management System**

USACE Mass Management System (MMS) is a decision support system aiding evacuation management of vulnerable populations. IWR staff continued facilitation and support to improve emergency management response to cyclones affecting island communities through implementation of the MMS system. Studies of methods to protect U.S. populations from the effects of land falling tropical cyclones have largely been confined to the mainland, continental United States. These studies have emphasized evacuation of large populations from coastal areas as a primary mitigation measure against the effects of coastal storm surge and maximum cyclonic winds.

In contrast, deepwater island effects can include terrain enhanced winds, elevated coastal water levels caused by wave-induced ponding on reefs, and mudslides caused by heavy rains. The Surge and Wave Island Modeling Studies (SWIMS) model was developed to predict coastal inundation due to storm surge and wave interactions over reefs around deepwater islands. This research approach aims to develop, improve, link and validate the next generation models to realistically represent island and wave inundation processes, and is imbedded in MMS.

MMS is designed to help the emergency management community, islands in particular, plan and execute operational plans to protect lives and property during hurricane and tsunami events. In fiscal year 2012, implementation and delivery of the MMS was completed for Hawaii. The MMS was delivered to each of the four counties of Hawaii and Hawaii State Civil Defense. The deployment of MMS was preceded by studies, data collection efforts and prototypes over nearly a decade. The current deployment of MMS covers the State of Hawaii and includes high resolution inundation models, wind models and a relocation/sheltering model. IWR will continue working with the Asia Pacific on disaster risk reduction and creating a resilient network.

### **Conflict Resolution and Public Participation Center**

The Institute has a long history of both applying collaborative modeling tools through the [Shared Vision Planning \(SVP\) process](#), and in developing tools and providing technical assistance in conflict resolution and public participation. The Institute is the home of the [USACE Conflict Resolution and Public Participation Center of Expertise](#) whose mission is to help Corps staff anticipate, prevent, and manage water conflicts, ensuring that the interests of the public are addressed in Corps decision making. In its fourth year of existence (FY2012), the Center provided technical assistance to Districts, Divisions and other stakeholders on collaborative processes, including Shared Vision Planning, facilitation services, training, and courses on public involvement, risk communication and collaborative modeling. CPC staff also produced various references to serve USACE in the areas of Environmental Conflict Resolution and collaborative processes.

The CPC benefited from direction from the October 2012 Field Review group meeting of District, Division and HQUSACE representatives. CPC accomplishments in FY 2012 are listed below.

#### Capacity Building

- Expanded the Collaboration and Public Participation Community of Practice (CoP). The CoP expanded its membership to more than 340 members Corps wide and sponsored multiple webinars on: The Use of Social media during the 2011 Mississippi Flood Fight; Collaboration and Communication during the 2011 Missouri Flood fight; Collaboration and the Federal Advisory Committee Act; Environmental Conflict Resolution cases in USACE; and a panel of Collaboration Best Practices and Lessons Learned Cases in USACE.
- Built USACE Facilitation Capacity. CPC co-designed and taught three Fundamentals of Facilitation and Conflict Resolution Training courses between June and September 2012, reaching 75 individuals and growing the cadre of USACE staff trained in fundamental skills of facilitation. CPC expanded the Corps' Facilitator Network to better serve Divisions and Districts with facilitation needs. This network is supporting SMART Planning charettes.
- Led three PROSPECT courses on Public Involvement and Teaming Building for USACE South Pacific Division and the Honolulu District office reaching 62 individuals. This year we included a presentation on Civil Works Planning Transformation. Among the students at the Honolulu District Public Involvement course were project stakeholders (non-Corps personnel), which provided additional perspective to the course discussions.

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- Other Training. Delivered Risk Communication seminars for public affairs in SPD and for Flood Risk Managers at the Silver Jackets conference, and is developing project management-specific training to be delivered in FY 2013. In addition CPC conducted a Conflict Resolution webinar for the Mississippi Valley Division (MVD) Emerging Leaders, and delivered Shared Vision Planning trainings for international partners through both the Mekong River Commission and the Center for Water in the Humid Tropics of Latin America and the Caribbean.

### Consultation Services

- Designed a Shared Vision Planning and Public Involvement process in support of a “Responses to Climate Change” Pilot for the Iowa and Cedar Rivers Basin Watershed Plan.
- Coordinated the Missouri River Flood Task Force (MRFTF), an organization stood up by Northwestern Division (NWD) to carry out recovery efforts after the Missouri River Flood of summer 2011.
- Conducted a public involvement assessment for the Great Lakes and Mississippi River Basin Interbasin Study for the Chicago District (LRC).
- Led the communications and public engagement team for the Congressionally-mandated “U.S. Port and Inland Waterways Modernization Study”, including websites, press releases, multiple webinars, listening sessions and making presentations to different stakeholder groups.
- Provided public involvement support to POH including workshop design and facilitation and developing a Public Involvement Plan for the West Maui Ridge to Reef Initiative.
- Supported Tulsa District on Other Social Effects in an instream flow study with Choctaw Nation.
- Supported California Water Planning through assistance for the Central Valley Round Table for Flood Protection, State Water Plan Update 2013, and Shared Vision Planning for IRWM.

### Information Exchange

- Disseminated a flowchart for USACE field offices on when the Federal Advisory Committee Act applies to collaborative activities.
- Used SharePoint and the mailing list the Collaboration and Public Participation CoP to identify experts for District needs and to share information on collaborative process issues.
- Led the Collaborative Modeling Steering Committee in development of interagency initiatives to promote and advance the field of Collaborative Modeling Building.

### Policy Support

- Assembled the [6<sup>th</sup> Annual Report on the Use of Environmental Conflict Resolution \(ECR\)](#) in USACE for submission by ASA(CW) to the Council on Environmental Quality and the Office of Management and Budget. Provided agency review for the update of the CEQ memo on ECR.
- Supported the Planning CoP to implement SMART Planning by identifying facilitators across the Corps to assist with national priority charettes, and assisting with PCoP-led training.
- Collected and edited “Collaboration Vignettes” for HQUSACE submission to CEQ.
- Supported HQUSACE in refresh of the USACE Campaign Plan for actions related to Collaboration.

### Research

- Organized and served as Associate Editors for a Featured Collection on Collaborative Modeling for Decision Support in the Journal of American Water Resources Association.

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- Published article in *Conflict Resolution Quarterly* on the Assessment of Collaborative Capacity of the Corps.

### **The Nature Conservancy Sustainable Rivers Project**

The Sustainable Rivers Project is a nationwide partnership between the USACE and The Nature Conservancy (TNC) to restore the health and life of rivers across the United States. This effort to modify operations of USACE dams to improve ecosystems, while maintaining or enhancing project benefits, currently involves work on eight rivers systems: the Willamette in Oregon; the Bill Williams in Arizona; the Green in Kentucky; the Savannah in Georgia and South Carolina; the Roanoke in North Carolina and Virginia; the White, Black, and Little Red in Arkansas and Missouri; the Connecticut in New Hampshire, Vermont, Massachusetts and Connecticut; and Big Cypress Creek in Texas and Louisiana.

A senior engineer from CEIWR-HEC serves as the USACE Technical Liaison with TNC for Sustainable Rivers. In that capacity, he continues to foster the program by working with representatives from USACE and TNC on technical and modeling issues.

The Sustainable Rivers project continues working toward its goals through a combination of activities, including demonstration projects, training, software development, and staff exchanges via the Intergovernmental Personnel Act. Successes already achieved are attracting interest from other river management interests both within the United States and internationally, and methods used in Sustainable Rivers are now being applied in Asia, Africa, and South America.

The fifth USACE-TNC Partnership Conference was held in the fall of 2011 and celebrated more than a decade of collaboration between the two organizations. At this conference, USACE and The Nature Conservancy broadened their partnership by amending their existing agreement. The new agreement includes increased collaboration across the Mississippi River Basin and other great rivers in the U.S. under the Great Rivers Partnership (GRP) and expanded recovery efforts along the Gulf Coast. The mission of the Great Rivers Partnership is to use lessons learned on the Mississippi River as a foundation for exchanging knowledge with other managers of large rivers around the world.

The agreement was signed by the Honorable Ms. Jo-Ellen Darcy, Assistant Secretary of the Army for Civil Works; Mr. Robert A. Pietrowsky, Director of the Institute and the International Center for Integrated Water Resources Management (ICIWaRM) (a UNESCO Category 2 Water Center); Mr. William Ginn, Chief Conservation Officer of the Nature Conservancy; and Mr. Michael Reuter, Executive Director of the Great Rivers Partnership (Nature Conservancy).

The agreement is focused around the concept of managing large, "working" rivers with a whole-basin approach – one that coordinates the management, development and conservation of water, land and related resources within a given river basin. It builds on the Nature Conservancy's long history of working with the Corps of Engineers on more than 50 projects in the U.S. and globally to ensure great rivers work for people and nature.

Another example of the benefits of collaboration between the USACE and the Nature Conservancy is the exchange of technical information with Cormagdalena, the agency tasked with the management of Colombia's Magdalena River. During the exchange, researchers discussed sediment management issues, navigation needs and flood risk management.

### **Academic and Professional Practice Partnerships**

#### Academic Institutions

In FY 2012 the Institute continued to utilize the technical expertise and resources made available to it through its long established network of partnerships with academic institutions and professional practice organizations.

Since 2007, the Institute has entered into a number of Memoranda of Understanding (MoU) with various educational institutions, each of which has unique program features that compliment the strengths and talents of the Institute.

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The capabilities and expertise of each academic institution with which the Institute has an existing MoU are described below.

The University of Arizona (MoU signed September 7, 2007) is home to the National Science Foundation's Science and Technology Center for Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHARA), thus allowing the Institute and the University to focus on sustainable development and sound water management policies, particularly in arid and semi-arid climates.

The University of New Hampshire (MoU signed September 14, 2007) Institute for the Study of Earth, Oceans, and Space, Water Systems Analysis Group focuses on the understanding of water resources issues on a global scale and the application of technological improvements in water resources management, allowing for cooperation in the field of global water science, integrated water resources management, and interdisciplinary scientific research and capacity building, particularly in developing and emerging countries and post-disaster nations and regions.

The Oregon State University (MoU signed September 20, 2007) Institute for Water and Watersheds, focuses on integrated water resource management, sustainable development, ecological design, ecosystem restoration, and environmental conflict resolution, allowing for cooperation in numerous areas including infrastructure development, adaptive management and adaptation to global climate change, flood risk management, hydrologic analysis, risk analysis and systems modeling, environmental restoration, ecological design, consensus building, conflict resolution, alternative dispute resolution, and shared vision planning.

Colorado State University, Department of Civil and Environmental Engineering International School for Water Resources (MoU signed January 7, 2008). The partnership with Colorado State University will facilitate cooperation in research in a number of areas including integrated water resources management, scientific research in the adaptation to global climate change and its impacts on water resources, and methods for understanding and managing extreme hydrological events and related natural hazards and disaster preparedness.

Florida International University (FIU) (MoU signed January 12, 2010) is the lead institution of the Global Water for Sustainability (GLOWS) program, a consortium of U.S. and international organizations with extensive experience and expertise in integrated water resources management, financed by the United States Agency for International Development (USAID). FIU is also the home of the NASA sponsored WaterSCAPES University Research Center. Collaboration between the Institute and FIU will focus on pursuing opportunities in the field of integrated water resources management, scientific research and capacity building for developing countries and countries in transition.

The National Institutes for Water Resources (NIWR) (MoU signed October 17, 2009) is a 501(c)4 organization that represents the 54 state and territorial Water Resources Research Institutes and Centers in their collective activities to: (1) advance competent research that addresses water problems or expands the understanding of water and water-related phenomena; (2) aid the entry of new research scientists into the water resources field; (3) help train future water scientists and engineers; (4) infuse the results of sponsored research to water managers and the public; and (5) focus on applied research, including practical applications to improve water supply reliability and help resolve water issues, working under the general guidance of the Secretary of the Interior, through the U.S. Geological Survey (USGS). The Institute and the NIWR will use their best efforts to establish long-term cooperation and partnership in the development and practice of integrated water resources management through scientific research and joint activities or programs that support National, regional, and local water resources needs.

The Institute is also an affiliate member of the Universities Council on Water Resources (UCOWR), an organization comprised of over 90 member universities and organizations. UCOWR's main objectives are to facilitate water related education at all levels; promote meaningful research and technology transfer on contemporary and emerging water resources issues; compile and disseminate information on water problems and solutions; and inform the public about water issues with the objective of promoting informed decisions at all levels of society. To achieve these objectives, member institutions engage in education, research, public service, international activities, and information support for policy development related to water resources. UCOWR holds an annual conference that provides a forum to explore key and timely topics of interest to water resources researchers and educators. UCOWR also publishes the "Journal of Contemporary Water Research and Education", presenting both scholarly work and current water resources news.

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### Professional Practice Organizations

In FY 2012 the Institute continued to explore cooperative opportunities with various Professional Practice Organizations with which it has entered into Memoranda of Understanding, including the American Society of Civil Engineers' Environmental and Water Resources Institute (EWRI) (MoU signed August 4, 2007), the American Water Resources Association (AWRA) (MoU signed December 20, 2007), and the Global Water Partnership (GWP) (MoU signed October 9, 2007).

The Institute and these organizations have a common interest in integrated water resources management, environmentally sustainable development, engineering and scientific excellence, water resources education, technology transfer and capacity building. Partnering with these organizations will further the Institute's and their efforts towards developing procedures and methods for integrated water resources management in support of sustainable development, adaptation to global climate change and its impact on water resources; collaborative modeling and decision support in water resources planning, energy and water sustainability, ecosystem markets development, development of new concepts and practices in the area of critical infrastructure sustainability and recapitalization, and establishing a long term basis for cooperative efforts in areas including flood risk management, hydrologic analysis, risk analysis and systems modeling, environmental restoration, ecological design, eco-hydrologic analysis and water quality, and capacity building, training, and technology transfer.

### **IWR Visiting Scholar Programs**

In order to infuse new ideas and concepts in its work, the Corps has established and the Institute supports a number of visiting scholar programs by which the Institute is able to support academicians who conduct research in areas related to the work of the Institute. These visiting scholar programs seek to bring the foremost water resources experts from academia, private industry and other agencies and laboratories to residence at the Institute for periods of six months to one year. Visiting scholars bring new energy, perspectives and ideas to the Institute's research agenda, while the practical work environment at the Institute provides a stimulating context for mutual exploration of potential advances in water resources planning and hydrologic engineering and analysis.

#### Maass-White Visiting Scholar Program

FY 2012 marked the tenth year of the Institute's Maass - White Visiting Scholar program. This program recognizes the contributions of, and the Institute's intellectual alignment with, Professor Arthur Maass of Harvard University and Professional Gilbert White of the University of Colorado, two of the founders of modern water resources planning's theoretical underpinnings.

During FY 2012, Dr. Denise Reed, university research professor of Coastal Geomorphology in the Department of Earth and Environmental Sciences at the University of New Orleans served as the Maass-White Visiting Scholar. Dr. Reed's research interests include coastal marsh response to sea level rise and how this is affected by human activities. Dr. Reed has worked on coastal issues on the Atlantic, Pacific, and Gulf coasts of the United States, as well as other parts of the world, and has published the results in numerous papers and reports. Dr. Reed supported numerous Institute initiatives including Response to Climate Change program, the National Ocean Policy, the National Shoreline Management Study, the Coastal Systems Portfolio initiative, the Systems Approach to Geomorphic Engineering initiative, the Environmental Advisory Board, and the Coastal Engineering Research Board.

#### Frederick J. Clarke Visiting Scholar Program

FY 2012 marked the fourth year of this program, named in honor of Lieutenant General Frederick J. Clarke, Chief of Engineers from 1969-1973. Lieutenant General Clarke was instrumental in securing expert, independent advice on environmental issues facing the Corps by founding the Environmental Advisory Board. The program provides scholars the opportunity to advise the Corps on important policy issues related to the Corps environmental mission.

During FY 2012 Dr. Todd BenDor, Assistant Professor of Environmental and Land Use Planning in the Department of City and Regional Planning at the University of North Carolina, Chapel Hill, served as the Frederick J. Clark Visiting Scholar. Dr. BenDor's research utilizes computer and spatial modeling, including system dynamics modeling and spatial analysis, to better understand the impacts that human activities and development can have on sensitive

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ecological and environmental systems. While at IWR, Dr. BenDor's research focused on the effects of Corps of Engineers land purchases for environmental restoration purposes, including a review of the Mississippi Coastal Improvement Program and post-Hurricane Katrina recovery plans.

### HEC "Leo R. Beard" Visiting Scholar Program

The Hydrologic Engineering Center (CEIWR-HEC) has a formally established professional development and exchange activity, referred to as the "Leo R. Beard Visiting Scholar Program". Mr. Beard was the founding Director of CEIWR-HEC and he had strong ties to scholars in the profession. As part of this program, hydrologic and hydraulic professionals are invited to CEIWR-HEC to address critical issues or problems in the discipline. Faculty from a number of universities, engineers from other agencies and members of the private sector have participated in the program. The experience and the exchange of ideas between CEIWR-HEC and the Visiting Scholars have proven to be intellectually satisfying and productive for both CEIWR-HEC and the visitors themselves. Unfortunately, CEIWR-HEC did not host a Visiting Scholar in 2012.

### Other Visiting Scholars Programs

FY 2012 was the ninth year of the Universities Council on Water Resources fellowship, a program established in partnership with the Universities Council on Water Resources (UCOWR).

FY 2012 marked the fifth year of the Institute's utilization of two new post-doctoral Fellows programs: the National Research Council (NRC) Research Associateship and the American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellows program. IWR underwent a rigorous certification process by independent reviewers in order to qualify for these visiting scholars and post-doctoral fellows programs.

Dr. Aleix Serrat-Capdevila, Research Assistant Professor at the Department of Hydrology and Water Resources, University of Arizona, who joined the Institute as a NRC Research Associate for the period 2010-2011 continued to support the Institute during FY 2012. Dr. Serrat-Capdevila's research and work will support the International Center for Integrated Water Resource Management (ICIWaRM) and the Center of Expertise on Conflict Resolution and Public Participation.

Previous IWR visiting scholars are listed below.

- Maass-White Visiting Scholars: Dr. Daniel (Pete) Loucks, Cornell University (2002-2003); Dr. Peter Rogers, Harvard University (2003-2004); Dr. Leonard Shabman, Resources for the Future, (2004-2006); Dr. Gerald Galloway, University of Maryland (2006-2007); Dr. Yacov Haimen, University of Virginia (2007-2008); Dr. Kenneth Strzepek, University of Colorado (2009-2010).
- Frederick J. Clarke Visiting Scholar: Dr. Martin Doyle, University of North Carolina (2009-2010); Dr. G. Mathias Kondolf, University of California (Berkeley), (2010-2011).
- Leo R. Beard Visiting Scholar: Mr. William A. Thomas, founder and president of Mobile Boundary Hydraulics (2004-2005); Dr. Jery Stedinger, Cornell University (2005-2006); Dr. David W. Watkins, Jr., Michigan Technological University (2008); Dr. Eric Larson, University of California at Davis (2009-2010).
- UCOWR Fellow: Dr. Bruce Hooper, Southern Illinois University (2004-2005); Dr. Paul Kirshen, Tufts University (2007-2009).
- IWR NRC Research Associate: Dr. Peter Rogers, Colorado State University (2006-2007); Dr. Jason Giovannettone, Duke University (2006-2007, at HEC); Dr. Stacy Langsdale, University of British Columbia (2007-2009); Dr. Michael Deegan, University of Albany (2008-2009); Dr. Guillermo Mendoza, Cornell University (2009-2010); Dr. Aleix Serrat-Capdevila, University of Arizona (2010-2011).
- IWR NRC Research Associate Faculty Fellow: Dr. Charles J. Vörösmarty, City College of New York (2010-2011)
- AAAS Fellow: Dr. Alexey Voinov, University of Vermont, (2006-2007).

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In February 2012, Dr. Leonard Shabman, IWR Visiting Scholar, Former Maass-White Visiting Scholar (2004-2006), and Resident Scholar at the Resources for the Future, and Mr. Paul Scodari, Senior Economist at the Institute, published a research paper entitled ["Toward Integrated Water Resources Management: A Conceptual Framework for U.S. Army Corps of Engineers Water and Related Land Resources Implementation Studies"](#), IWR Publication 2012-VSP-01.

## DAM AND LEVEE SAFETY

### Dam Safety Program

During FY 2012, the Risk Management Center (CEIWR-RMC) continued to support the USACE Dam Safety program. HQUSACE published Engineer Regulation [ER 1110-2-1156](#), "*Engineering and Design: Safety of Dams Policy and Procedures*" to transition USACE to a nationally-led and managed dam safety program. The RMC is instrumental towards implementing the guiding principles of that regulation. To support this effort the RMC continued or completed the following activities.

- Worked with the USACE St. Louis District and Kansas City District offices to expand a programs group to manage the funding priorities and funds used by HQUSACE to manage non-routine dam safety activities. This group successfully supported the execution of more than 65 dam safety studies as well as training and methodology development.
- Four Issue Evaluation Studies.
- Helped support the establishment of the regional Dam Safety Production Centers and the Dam Safety Modification Mandatory Center of Expertise (DSMMCX).
- Selected and began training eight regional risk assessment cadres. As part of that effort, the RMC trained more than 200 individuals to complete Potential Failure Mode Assessments.
- Established and implemented standardized P2 Work Breakdown Structure (WBS) guidelines for all Construction General (CG) studies to allow for consistent monitoring of expenditures across all Engineering Reporting Organization Codes (EROCs).
- With the Bureau of Reclamation and the Federal Energy Regulatory Commission, the RMC hosted monthly webinars describing case histories of dam and levee failures to help risk assessment teams gain historical perspectives. These webinars were available to Corps dam safety staff.
- Led training efforts for dam safety and risk management throughout FY 2012. More than 80 USACE staff attended Periodic Assessment training and Best Practices in Dam Safety Risk Analysis training which is jointly taught between USACE, the Bureau of Reclamation, and the Federal Energy Regulatory Commission (FERC).
- Supported 12 staff from various Districts across the Corps on developmental assignments to the RMC. They are on 6-month to 2-year assignments to learn more about risk assessment and risk management.
- Representing USACE, and working with the Bureau of Reclamation, the Federal Energy Regulatory Commission, the Tennessee Valley Authority (TVA), and the Federal Emergency Management Agency (FEMA) continued discussions to unify the various dam safety policies, procedures, and guidelines. The Interagency Committee on Dam Safety (ICODS) Joint Federal Risk Management Workgroup held three meetings in 2012. The working group sent the draft risk management guidelines document to ICODS for review and approval.
- Developed, implemented, and continued various efforts to increase the quality and consistency of dam safety products. This included work with various Agency Technical Review (ATR) teams to support their reviews of

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dam safety products and continued efforts to augment internal reviews with national experts in dam safety specifically related to risk analysis.

- Reviewed more than 50 Interim Risk Reduction Measure Plans (IRRMP) on the behalf of HQUSACE.
- Supported Districts transitioning from the previous Periodic Inspection (PI) process for dams to the new Periodic Assessment (PA) process. In FY 2012, the Risk Management Center funded the new PA's for 14 Projects.
- Continued to provide at least two dedicated senior technical specialists to each dam safety construction project, projects that were in Planning, Engineering, and Design (PED), and critical Dam Safety Modification Studies. This was part of HQUSACE's overall effort to provide more consistent and recurring guidance and advice for projects moving through the non-routine dam safety processes. This significant activity was instrumental in ensuring safe activities were accomplished at USACE's high risk structures and that cost effective solutions were planned or implemented. Along with the Quality, Control and Consistency (QCC) reviews, this led to more than \$700 Million in cost savings versus originally-planned activities.
- Funded and directed the activities of the Mapping, Modeling, and Consequence (MMC) production center. More than 30 inundation and consequence studies were completed in FY 2012. The RMC also chaired the steering committee for the MMC.

### **Levee Safety Program**

During FY 2012, the Risk Management Center continued to support the USACE Levee Safety program in a number of ways. HQUSACE is currently leading the development of a comprehensive levee safety policy document and RMC has been heavily involved with the development of that policy. The RMC has also accomplished the following activities.

- With the MMC, continued to lead the development of the National Levee Database with HQUSACE and the Cold Regions Research and Engineering Laboratory (CRREL).
- Worked on a variety of vegetation issues associated with levees. This included managing all Agency Technical Reviews (ATRs) for vegetation variance requests and reviewing a number of research and development efforts related to vegetation's effects on the safety of dams and levees.
- Piloted methodology to assess risks posed by levee systems in 2012. This work is being done in conjunction with the team developing the new levee safety policy and the Planning Community of Practice. The RMC worked on ten levee systems in various stages of completion to demonstrate the procedures for risk assessments that consider life safety.
- Continued to lead the development of the Levee Screening Tool (LST) with HQUSACE and the Cold Regions Research and Engineering Laboratory (CRREL). 292 levee systems were screened using the LST in 2012.
- Funded 166 Periodic Inspections at Corps levee systems. Of these, 76 levee system PI's were completed in 2012.
- Helped HQUSACE create and support the Levee Safety Community of Practice including the annual meeting held in September.
- Led training of more than 250 District staff that are tasked with using the Levee Screening Tool to evaluate the risks posed by the Corps' levee systems.

### **National Inventory of Dams**

During FY 2012, the Risk Management Center administered the National Inventory of Dams (NID) program for HQUSACE. The RMC funds the Army Geospatial Center (AGC) to manage the technical aspects of the program as well as maintain the NID web site. The NID includes all high and significant hazard potential classification dams and low hazard potential classification dams which meet specific height and reservoir storage requirements.

### **Asset Management**

The RMC supported the HQUSACE Asset Management team during FY 2012 with development of a notable product, the Maintenance Management Improvement Plan, as an outcome. Maintenance Management examines the critical components and systems on USACE projects and develops a maintenance strategy tailored around required levels of service. This work will continue into FY 2013 and 2014 and is expected to transform into reliability centered maintenance as a means to maximize investments in the operational phase of a project's life cycle.

## **WATER RESOURCES METHODS AND MODELS**

Two major focus areas of the Institute's research are: (1) the identification and evaluation of engineering, economic, social, institutional and environmental issues; and (2) the development, transfer and application of improved analytical techniques, models and information systems to address those issues. The goal is to produce state-of-the-art multi-purpose planning and hydrologic engineering methods and models to support investment decisions. This is accomplished by programs in research, planning analysis, training and technical assistance.

### **Planning Models Improvement Program**

The USACE Planning Models Improvement Program (PMIP) was established in 2003 to assess the state of planning models used by Corps personnel and to recommend improvements to existing models to ensure that analytical methods and tools used to develop informed decisions on investments in the Nation's water resources infrastructure and natural environment are of the highest quality.

The main objective of the PMIP is to carry out a process to review, improve and validate analytical tools and models for USACE Civil Works business programs. In compliance with Engineer Circular (EC) 1105-2-412, "Assuring Quality of Planning Models" and its predecessor Engineer Circular (EC 1105-2-407, "Planning Models Improvement Program: Model Certification"), IWR has established a model certification program and is actively pursuing the certification of existing and new models.

During FY 2012, the HarborSym Deepening Model, a simulation model for the evaluation of deepening of navigation channels was certified by HQUSACE and the Deep Draft Navigation Planning Center of Expertise as a National model suitable for use in the economic analysis of proposed navigation channel improvements at coastal harbors.

A certification package for the Ecosystem Functions Model (HEC-EFM) developed by the Hydrologic Engineering Center was submitted to the USACE National Ecosystem Planning Center of Expertise and is awaiting approval from HQUSACE. The Ecosystem Functions Model is designed to help study teams determine ecosystem responses to changes in the flow regime of a river or connected wetland. HEC-EFM analyses involve: 1) statistical analyses of relationships between hydrology and ecology; 2) hydraulic modeling; and 3) use of Geographic Information Systems (GIS) to display results and other relevant spatial data. Through this process, study teams will be able to visualize and define existing ecologic conditions, highlight promising restoration sites, and assess and rank alternatives according to predicted changes in different aspects of the ecosystem.

A third model, the Regional Economic System (RECONS), was certified as a national model by HQUSACE for estimating the employment impacts and associated secondary economic impacts associated with USACE Civil Works projects. RECONS is the only USACE certified Regional Economic Development (RED) model for agency wide use.

IWR continues to actively participate in nationwide model certification efforts, providing input on policy and processes and as a member of the HQUSACE Model Certification Panel.

### Guidance Update and Maintenance Program

During FY 2012, four Economic Guidance Memoranda (EGM) were published: EGM 12-01, *Federal Interest Rates for Corps of Engineers Projects*; EGM 12-02, *Current Normalized Rates*; EGM 12-03, *Unit Day Values for Recreation*; and EGM 12-04, *Current State and County Income Index data, Current Eligibility Factor Formula (Ability to Pay)*. Also, substantial progress was also made in updating Engineer Regulation 1105-2-100, the Planning Guidance Notebook, a draft of which is under review at HQUSACE.

In the engineering area, the Risk Management Center led the revision of 12 dam safety-related Engineer Manuals (EM) and Engineer Regulations (ER) updates. Three of the most critical manuals are expected to be completed in early 2013.

#### **“U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels” Study**

During FY 2012, the Institute was responsible for developing a report as directed by Congress in Public Law 112-74, the Consolidated Appropriations Act of 2012, in December 2011. This act required USACE, within 180 days of its passage, to submit to the Senate and House Appropriations Committees a “report on how the Congress should address the critical need for additional port and inland waterways modernization to accommodate post-Panamax vessels.”

The report entitled [“U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels”](#) identifies capacity maintenance and expansion issues associated with the deployment of post-Panamax vessels to trade routes serving U.S. ports. This identification was accomplished through an evaluation of the future demand for capacity in terms of freight forecasts and vessel size expectations, and an evaluation of the current capacity of the nation’s coastal ports and inland waterways.

The report addressed the factors Congress identified with chapters on: Discussion of Demand for Future Capacity; Current Capacity; Evaluating Capacity Maintenance and Expansion; Environmental Impacts of Capacity Expansion; Financing Options for Funding U.S. Port and Inland Waterway Infrastructure Needs; and Additional Considerations. The report served as a technical report and did not necessarily reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program or the policy perspective of higher review levels within the Executive Branch.

The report made the following observations and findings.

- U.S. and world trade are expected to continue to grow, with imports growing more than fourfold, and exports expected to grow more than sevenfold over the next 30 years.
- U.S. population is expected to grow by almost 100 million over the next 30 years, with most of the growth projected to take place in the southern and western regions of the nation.
- Post-Panamax size vessels currently call at U.S. ports and will dominate the world fleet in the future. By 2030, post-Panamax vessels will account for 62% of the capacity of the world’s container fleet. These vessels will call in increasing numbers at U.S. ports that can accommodate them.
- Along the Southeastern and Gulf coasts there may be opportunities for economically justified port expansion projects to accommodate post-Panamax vessels. This is indicated by an evaluation of population growth trends, trade forecasts and an examination of the current port capacities. Investment opportunities at specific ports will need to be individually studied.
- The potential transportation cost savings of using post-Panamax size vessels to ship agricultural products to Asia, through the Panama Canal may lead to an increase in grain traffic on the Mississippi River for export at Gulf ports. An analysis indicated the current Mississippi River port capacity is adequate to meet potential demand if the waterways serving the agricultural export market are maintained.
- A need for lock capacity expansion is not indicated.

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- Despite the uncertainty in market responses to the deployment of post-Panamax vessels and the expansion of the Panama Canal, individual investment opportunities for port expansion can be identified using established decision making under uncertainty techniques. Adaptive management techniques can also be used to address uncertainty issues. Preliminary estimates indicate the total investment opportunities may be in the \$3.0 - \$5.0 billion range.
- Environmental mitigation costs associated with port expansion can be significant and will play an important role in investment decisions.
- The primary challenge with the current process to deliver navigation improvements is to ensure adequate and timely funding to take advantage of potential opportunities. A notional list of financing options is presented in the report to initiate discussion of possible paths to meet this challenge. It is anticipated that a variety of options may be desirable, and in all cases individual project characteristics, including economic merits, would need to be considered in selecting the optimal financing mechanisms.
- Maintaining the capacity of the nation's major ports and waterways and expanding port capacity when, where, and in a way that best serves the nation will require leadership at all levels of government, and partnership with ports and the private sector. The main challenges are to continue to maintain the key features of our current infrastructure, to identify when and where to expand coastal port capacity, and to determine how to finance its development.

### **Navigation Systems Research Program**

For more than a century, the USACE has played a key role in maintaining a robust national economy by ensuring that farmers, manufacturers and businesses can easily transport goods via the Nation's rivers and out to sea via coastal ports. The Navigation Systems Research Program supports the navigation mission of the Corps by developing state-of-the-art, credible, independently verified economic models, tools and techniques used by Corps planners in informing investment decision making at all levels of the agency. The knowledge and tools developed by the research program are based on reviews of economic transportation and market theory, current best practices both within and outside of the Corps, data needs and availability, and peer recommendations.

In FY 2012, the Navigation System Research Program gained model certification for the HarborSym Suite of Tools by HQUSACE and the Deep Draft Navigation Planning Center of Expertise. HarborSym is a discrete event Monte Carlo simulation model designed to be a general-purpose tool for use by Corps planners. HarborSym was developed with a "data-driven" architecture and approach, in which the factors that tailor a general-purpose model to a specific situation and study are stored in a database and populated by the user. The model measures the economic effects of modifications to deep draft harbors as overall reductions in transit times and associated changes in total vessel operating costs. The latest HarborSym release is designed to assist analysts in evaluating channel widening and deepening projects. HarborSym Deepening is oriented toward general cargo, bulk, container, and other commodity and vessel movements with simplified loading and transit behaviors. The simulation results can be used in a comparative analysis of alternative harbor improvements and to support a benefit-cost analysis of proposed navigation improvements.

Other analytical tools in the HarborSym Suite are IWR Tide Tool, W-DAPP (Waterborne Data Analyzer and Pre-Processor), AIS-DAPP (Automated Information System – Data Analyzer and Pre-Processor), and the Bulk and Container Loading Tools.

### **Environmental Sustainability**

The Environmental Sustainability project continued to concentrate on refinement of the Biodiversity Security Index (BSI) and completion of publication drafts. A draft of technical guidance for use of the BSI in Corps project planning was completed and submitted for review. After the document completes the review process, it will be published as an IWR report. An ERDC technical report comparing the BSI with other metrics was revised in response to review and is expected to be submitted to ERDC for publication in their technical report series. Another ERDC technical report on evaluation of the BSI for ranking feasibility studies awaits final review. An IWR report on a framework for achieving environmental sustainability in the Corps has been completed and submitted for

publication. Two USACE reports on sustainability concepts and principles (to be published in a series on Campaign Plan accomplishments) have been in final review and are awaiting publication.

### **IWR Planning Suite**

The [IWR Planning Suite](#) is a water resources investment decision support tool originally built for the formulation and evaluation of ecosystem restoration alternative plans; however, it is now more widely used by all USACE business lines. The Planning Suite has the following features: plan generator; cost-effectiveness and incremental cost analysis; calculation of annual average non-monetary benefits; calculation of average annual equivalent costs and benefits; multi-criteria decision analysis (MCDA module); and an Uncertainty module. The model's latest addition, the Uncertainty module, is intended to provide users with opportunities to assign probability distributions to monetary and non-monetary costs and benefits, and to implement Monte-Carlo analysis to yield risk-informed cost-effectiveness and incremental cost analyses. The module is expected to allow users to characterize variability or uncertainty in potential project costs and effects and to identify which alternatives are most likely to be cost effective over the widest range of anticipated conditions and/or identified variability or uncertainties in costs and benefits. There are currently two USACE Planning Certified versions of the model: Version 1.0.11 and Version 2.0.6. In addition to automating computations, the software facilitates synthesis of standard charts and tables required for study-related reports.

During FY 2012, a beta version of the Uncertainty Module was completed. Also, a thorough internal review of the model was completed on all modules. Revisions to the MCDA module were also being made based upon a review conducted in FY 2011. This review was conducted in accordance with EC 1105-2-412 and carried out by independent external experts. The "Multi-Criteria Decision Analysis" module is intended to increase the transparency of any exploratory analyses pursued by study teams authorized to pursue formulation of multi-purpose alternatives. A contract to advance the alpha/beta test version of the Uncertainty and Risk module was executed. Additionally, a contract was issued in FY 2012 to replace and improve the database and user interface in FY 2013. During FY 2012, the Planning Suite was demonstrated and used at several PROSPECT training classes. Additionally, the IWR Planning Suite development team provided technical assistance to field planners during application of the Planning Suite.

### **Water Infrastructure Systems Data Manager**

The Water Infrastructure System Data Manager (WISDM) is a web-based utility being developed and fielded by the Institute to facilitate geospatial analyses and decision support nationwide and across all USACE Civil Works business lines (ecosystem restoration, flood risk management and coastal storm damage reduction, hydropower, navigation, regulatory, recreation management, and emergency management). WISDM connects users with information residing in databases within and outside the Corps, and provides techniques for visually illustrating and summarizing multiple types of data important to Corps decision-makers at multiple reporting scales (Nationwide, Division, District, watershed).

The Corps is partnering with the U.S. Forest Service and the University of Redlands (California) to integrate the strengths of Ecosystem Management Decision Support (EMDS) software to enable landscape scale evaluations of potential actions based on management priorities. The Institute has improved WISDM by incorporating a Web based program that supports multi-factor analysis of large geospatial data sets. This allows the user to view different overlays, at different scales, using different data sets in near real time to facilitate rapid analysis and comparison of possible outcomes.

WISDM facilitates and expedites efforts to deliver knowledge based decision support, ecological analyses, and assessments of asset/resource-stressor relationships at any geographic scale, under alternative future conditions, including alternative climate change scenarios.

The primary goal of this effort is to provide decision makers with the means to quickly and transparently evaluate, communicate, balance, and prioritize information relevant to the Corps capacity to satisfy water resource needs. WISDM is being field tested and is being used in the Watershed Budget Pilot projects being evaluated as part of the FY 2014 budget Engineer Circular.

## Regulatory Support

IWR supports the [Regulatory Sub-Community of Practice](#) (CoP) through policy analysis and training. In FY 2012, IWR continued its support for the HQUSACE implementation of the 2008 Mitigation Rule (“Compensatory Mitigation for Losses of Aquatic Resources: Final Rule, *Federal Register*, April 10, 2008, p. 19594). IWR provided to HQ two new handbooks: “*Long Term Management of Compensatory Mitigation Projects*”; and “*Compensatory Mitigation Site Protection Instrument Handbook for the Corps Regulatory Program*”. An overview of these two draft handbooks along with the Financial Assurance Handbook ([Implementing Financial Assurance for Mitigation Project Success](#)) was presented at the National Regulatory Conference in Sacramento, California in August 2012. IWR also provided the final draft white paper on the watershed approach in August 2012. IWR staff continued to conduct the Corps Regulatory Mitigation Workshops focusing on rule implementation. IWR also developed a draft handbook on implementing the watershed approach for compensatory mitigation.

In April 2012, IWR staff served as an instructor at the National Conservation Banking Course held in Shepherdstown, West Virginia and a similar course sponsored by U.S. Fish and Wildlife Service (USFWS) held in Austin, TX. Conservation Banking entails preservation, restoration, or enhancement of habitat for listed or at risk species as offsets for impacts permitted under the Endangered Species Act, the Migratory Bird Treaty Act, or the Bald or Golden Eagle Protection Acts. Sessions were taught on In-lieu fee programs, real estate protection, financial assurances, compliance and oversight, Joint Section 404/Endangered Species Act Banking and Regulatory In-lieu Fee and Bank Information Tracking System (RIBITS).

During May 2012, IWR personnel participated in the 15<sup>th</sup> National Mitigation and Ecosystem Banking Conference, led a half-day workshop on mitigation banking, and facilitated several pre-conference regulatory workshops, including two sessions on RIBITS. IWR also presented a paper jointly with USFWS National Conservation Banking Coordinator. IWR continued its major role in teaching the interagency course entitled “Mitigation Banking Interagency Review Team Training” in June 2012 by providing four instructors.

In February 2012, IWR provided instruction and technical support for a Regulatory Mitigation workshop in Fairfield, California sponsored by HQUSACE and South Pacific Division. A second Regulatory Mitigation Workshop was held in St. Paul, Minnesota in July 2012 and was sponsored by HQUSACE and the St. Paul District. IWR presented sessions on Mitigation Rule Overview, Ecological Performance Standards, Financial Assurances, real estate protection, Long Term Management and Watershed Approaches to Mitigation Site Selection. A total of 80 Corps regulatory staff from 18 District offices attended the workshops.

In August 2012, IWR provided instruction and technical support for a workshop in St. Paul, Minnesota sponsored by the U.S. Environmental Protection Agency, Region 5 office. The workshop focused on streamlining and synchronizing the mitigation bank development and oversight processes of the St. Paul District and the Minnesota Bureau of Water and Soil Resources. IWR led sessions on the mitigation rule, site selection and design, real estate protection, financial assurances. The workshop was attended by members of the Minnesota Interagency Review Team and agency leads and led to identification of methods to better coordinate both the state and federal mitigation banking programs.

In September 2012, IWR participated in a symposium on mitigation banking at the Land Trust Alliance (LTA) Rally in Salt Lake City, Utah. The symposium was sponsored by LTA, The Conservation Fund, Environmental Law Institute, and The Nature Conservancy and attended by land trust staff associated with land conservation and protection. A primer on mitigation banking and a session on compensatory mitigation and real estate protection were taught by IWR staff.

Throughout the year IWR provided technical assistance to Districts in addressing aspects of compensatory mitigation including review of draft bank and In-Lieu Fee instruments (8 districts), financial assurances (5 districts), site protection documents (2 districts) as well as other mitigation, banking, and ILF program issues (15 districts). Districts supported included Buffalo, Detroit, Honolulu, Huntington, Jacksonville, Los Angeles, Louisville, Memphis, Mobile, Nashville, New England, Norfolk, Omaha, Portland, Sacramento, Savannah, St. Louis, and Seattle.

IWR oversaw the management and maintenance of the Corps regulatory database — ORM 2.0 — the second version of the OMBIL (Operations and Maintenance Business Information Link) Regulatory Module. In addition, IWR continued to actively manage the Regulatory In-lieu Fee and Bank Information Tracking System (RIBITS), a compensatory mitigation bank data program, including providing training and district support. Important information regarding mitigation banks and in-lieu fee programs from a majority of USACE District offices is now available on-line in RIBITS. In addition, information on Endangered Species Conservation Banks from the USFWS was added to the database. IWR provided training and support to the USFWS and Environmental Protection Agency according to an Interagency Agreement between those agencies. IWR helped draft, finalize, and implement interagency agreements with National Oceanic and Atmospheric Administration and Federal Highways Administration on the use of RIBITS.

IWR reviewed three Association of State Wetland Managers (ASWM) reports and submitted them to HQ for final review. The three reports included Programmatic General Permits, Nationwide Permits, and In-Lieu Fee banking. During FY 2012 IWR, in coordination with ERDC, provided support for technical and scientific initiatives such as the publication of regional supplements to the 1987 Corps Wetlands Delineation Manual, and a draft National Wetlands Plant List.

IWR oversaw the development of a cumulative effects analysis (CEA) prototype using GIS data for the Appalachia region associated with surface mining activities. Regional CEA tools and corresponding manuals were developed for southern West Virginia and Eastern Kentucky and are currently being used by regulators from the Huntington, Louisville, and Nashville District offices. IWR provided training workshops in October 2011 to regulators in West Virginia and Kentucky and the final CEA handbook for eastern Kentucky in December 2011. Regional CEA tools are being developed for Texas, Virginia, and Washington. IWR also provided a draft version of the National Tool to HQUSACE and to three Districts (Los Angeles, Baltimore and Wilmington) for pilot review in September 2013.

IWR supported the EPA economic analysis for proposed Clean Water Act (CWA) Waters of the US jurisdiction guidance by providing information on potential costs to permit applicants associated with the proposed guidance, including compensatory mitigation costs. IWR also collaborated with EPA on development of the cost analysis for an upcoming proposed CWA Waters of the U.S. jurisdiction rule.

### **Transportation Systems**

The Transportation Systems program supports HQUSACE and USACE district offices in accomplishing navigation project planning and evaluation responsibilities through the provision of: (1) uniform and consistent maritime transportation data concerning costs of operation and replacement of foreign flag and domestic commercial vessels; and (2) comprehensive statistics on the composition and physical parameters of the world deep draft fleet and the domestic shallow draft inland fleet. Macro-level world trade and cargo flow forecasts are also provided.

During FY 2012, activities in support of the Transportation Systems program included: issuing new contracts for updating vessel operating costs for both the deep and shallow draft fleets with an increase in statistical samples and the number of ship types covered compared to previous years; updating world trade and commodity flow forecasts through 2028; distribution of updated materials and statistics from various maritime industry data subscriptions; renewal of new multi-year contracts for transportation, trade and economic forecasts from Informa Economics, Inc. and IHS Global Insight; continued work on the development of cruise ship, Great Lakes and oceangoing barge vessel operating costs; and a containership trade model.

Based on a recent peer review of the methodology used in developing deep draft vessel operating costs, the Institute is now overseeing compilation of additional data components contained within deep draft vessel operating costs, including bunkering and ballast costs. Additionally, funding was secured to proceed with customization of IHS Global Insight's "Trade Navigator" software to provide disaggregation of trade forecasts by commodity and vessel type down to the individual port level, which will be accomplished in FY 2013.

The Institute worked closely with the Deep Draft and Inland Navigation Planning Centers of Expertise in initiating a Port Industry Practices Study and developing distance and commodity flow tables for the Great Lakes region, expected to be completed in 2013.

### **Flood Damage Data Collection Program**

The Flood Damage Data Collection program is intended to produce generic relationships for computing expected annual flood losses and tools for the collection and management of floodplain inventory data. In FY 2012, the Institute completed an expert elicitation process to define the mechanisms and parameters that are the primary causes of flood damage to roads and a critique of that process. Work was also initiated on a model to estimate the impacts of flood induced transportation delays and rerouting. A draft report on the use of expert elicitation in flood risk management studies was completed and favorably reviewed through the Flood Risk Management Center of Expertise. Work continued on a newly redirected work plan to create a structure valuation web service for a redesign of IWR-GeoFIT (Geospatial Floodplain Inventory Tool). In addition, IWR performed a statistical analysis of the clean-up and relocation costs associated with flooding. The program also secured the services of a university professor who is evaluating the various systems and methodologies applied to inventorying floodplain data, aimed at helping the Corps to implement [SMART Planning](#) and “3 by 3 by 3” Feasibility Studies as part of the USACE Civil Works Transformation.

### **Flood and Coastal Storm Damage Reduction Research**

The Flood and Coastal Storm Damage Reduction Research (FCSDR) program is a collaborative effort between the USACE Engineer Research and Development Center (ERDC) and the Institute. CEIWR-HEC is the lead office within the Institute with regards to the FCSDR program. The FCSDR program supports the development of methods and tools to improve the analysis and modeling of flood damage and flood damage reduction techniques, including risk and uncertainty. In addition, since the System-Wide Water Resources Research Program (SWWRP) was discontinued in FY 2011, FCSDR also funded improvements to the HEC-RAS and HEC-HMS software packages. Funds from FCSDR also supported the development of HEC-WAT (Watershed Analysis Tool), including the FRA (Flood Risk Analysis) compute option within HEC-WAT, HEC-FDA (Flood Damage Analysis), and HEC-FIA (Flood Impact Analysis). Details on HEC-WAT with the FRA compute option are described in the section of this report titled "Technical Advancements in HEC Software", along with details on HEC-HMS, HEC-FIA, HEC-RAS, and HEC-FDA. Additional information on all of CEIWR-HEC's software is provided on the [CEIWR-HEC website](http://www.hec.usace.army.mil), <http://www.hec.usace.army.mil>.

- **IWR-HEC H&H and Risk and Uncertainty.** HEC-WAT with FRA is the next generation of the HEC-FDA software. The software is being constructed to include event-based sampling, the ability to do scenario analysis, and structure-by-structure, cost, non-structural, and agricultural damage analyses; all being performed in the context of a systems approach. Loss-of-life estimates have become a priority since Hurricane Katrina, and these are being incorporated into the FRA computations as well. The tool will accommodate many of the recommendations that the Corps concurred with from the National Research Council report "[Risk Analysis and Uncertainty in Flood Damage Reduction Studies](#)" (published by the National Academy of Sciences in 2000). It will also aid in implementing the Chief of Engineers' Actions for Change initiative. The initial application of the FRA compute option has been on the Columbia River System as part of the Columbia River Treaty (CRT) study.
- **HEC-RAS:** In FY 2012, HEC-RAS improvements included the initiation of parameter sampling, urban hydraulics, reservoir flushing and unsteady sediment computations.
- **HEC-HMS:** In FY 2012, HEC-HMS improvements included the initiation of watershed parameter sampling and surface erosion capabilities.

Details on these products are available on the HEC website, [www.hec.usace.army.mil](http://www.hec.usace.army.mil).

### **Ecosystem Management and Restoration Research**

The Ecosystem Management and Restoration Research Program (EMRRP) is the USACE's tactical research and development response to the demand for new and expanding technologies to address the need for ecosystem assessment, restoration, and management activities at the project level. Technologies developed under the EMRRP build upon a sound understanding of ecosystem functions, which lead to sustainable stewardship of USACE resources. The EMRRP provides funds for the development of the HEC-EFM (Ecosystems Function Model) software and its spatial accessory HEC-GeoEFM. EFM and GeoEFM are designed to help study teams determine

ecosystem responses to changes in the flow regime of a river or connected wetlands. Using these technologies, study teams are able to visualize and define existing ecologic conditions, highlight promising restoration sites, and assess and rank alternatives according to predicted changes in different aspects of the ecosystem. The initial public release of GeoEFM occurred in June 2011, and HEC-EFM Version 3.0 and its statistical accessory HEC-EFM Plotter Versions 1.1 are scheduled for release at the beginning of FY 2013. The EMMRP program also provided funding for the inclusion of additional water quality capabilities in HEC-RAS. More information is available on the CEIWR-HEC [website](http://www.hec.usace.army.mil), <http://www.hec.usace.army.mil>.

The “Incorporating Ecosystem Goods and Services into Corps Planning and Environmental Benefits Evaluation” work unit is somewhat unique within the EMRRP program, in that the research involved intersects the fields of science, policy, and economics. As such, leadership and responsibility for the project spans both ERDC’s Environmental Laboratory (focusing on science aspects) and the Institute for Water Resources (focusing on policy and economics aspects). The purpose of the project is to investigate the viability of using Ecosystem Goods and Services (EGS) in USACE Planning studies, and includes the following activities:

- Review of policies and practices used by other federal agencies;
- Evaluate experiences of Corps planners and academicians working in the EGS field; and,
- Provide EGS tools and methods to advance Corps capabilities to capture the full range of relevant benefits and losses relative to Corps projects.

In FY 2012, a Principles and Best Practices Technical Note and Technical Report were drafted and sent out for review. The final publications are scheduled for released in early 2013. A Policy Review and Analysis report was also drafted, and is currently undergoing final revisions for publication. Finally, an EGS Tools and Models web-based catalog was developed that describes the variety of EGS tools, and potential for use by Corps planners.

The Ecosystem Goods and Services team is working with District personnel to develop queries for the catalog, as well as obtaining input into the development of an EGS framework for planning. In addition, the team continues to work with partners from other agencies and organizations who are also striving to develop methodologies for the use of ecosystem services in decision-making.

### **Planning Methodologies**

National Economic Development Manuals: The Institute is continuing to update the National Economic Development (NED) Manuals series, originally published between 1987 and 1991. These manuals are important basic reference documents for economists and others involved in the planning and analysis of Federal water resource projects. The manuals discuss the principles and concepts associated with NED benefits and provide detailed procedures to measure and calculate benefits. The updated manuals will be exclusively web-based to increase accessibility for field personnel, facilitate the maintenance and update of the manuals, improve the efficiency and effectiveness of providing up-to-date information to the field, and be responsive to a diverse audience.

In December 2011, IWR published an appendix to the Deep Draft Navigation NED Procedures Manual, also known separately as a Guide to Deep Draft Vessel Operating Costs (DDVOCs). This appendix/guide provides more details on the DDVOCs and explains the procedures and data sources currently used to develop them. The DDVOCs are developed for a variety of vessel types and sizes and are applied specifically to studies involving waterborne transportation cost savings.

The [Coastal Storm Risk Management Manual](#) was approved for publication and was published in FY 2012. Additionally, the NED manuals website design was improved and expanded in FY 2012 to include a web-based version of the Coastal Storm Risk Management Manual.

Without Project Condition Handbook: This handbook provides the planner with easy-to-follow descriptions and methods of defining the without project condition(s). The without project condition forms the basis of comparison of every alternative and is key in all evaluation and selection tasks. An error in the without project condition(s) will be reflected in the evaluation of every plan and it will carry through the decision-making process. The handbook also provides a detailed look at scenario-based planning as a means of addressing future uncertainties. The [“Guide to Constructing the Without Project Scenario \(Condition\)”](#) was published in May 2012 and is available at the IWR website as IWR publication, [2012-R-03](#).

Multi-Objective Planning Manual: In response to [ER 1105-2-100](#) (“Planning Guidance Notebook”), EC 1105-2-404 (“Planning Civil Works Projects under the Environmental Operating Principles”) and EC 1105-2-409 (“Planning in a Collaborative Environment”), the Corps has been increasingly encouraged to formulate projects with multiple objectives. Since few Districts have performed true multi-objective planning, IWR is developing this manual to educate planners on how to perform this more complex type of water resources decision making. The Manual has been finalized and is awaiting publication in FY 2013.

Social Vulnerability Analysis: In FY 2011, a handbook entitled “[Social Vulnerability Analysis Methods for Corps Planning](#)” (IWR Report 11-R-07) was published. The handbook presents two methods for identifying socially vulnerable groups. It illustrates how social vulnerability, the drivers of vulnerability, and their spatial distribution in flood hazard zones can be used in the planning process. Such information assists in identifying problems and opportunities, developing planning objectives, creating and evaluating management measures, and evaluating project alternatives. This handbook provides field analysts with the framework and tools they need to perform a social vulnerability analysis and develop a social vulnerability index (SOVI).

To further assist the field in applying SOVI, four cases studies are underway: Tulsa levees (SWT); Westside Creek (SWF); Passaic River (NAD) and coastal Georgia (in cooperation with the University of Georgia). An Other Social Effects (OSE) training module has been completed and is being beta tested in selected PROSPECT training courses. An OSE questionnaire for OMB approval; Other Social Effects Primer and a paper on using OSE in Alternatives Analysis are also in development.

### **Technical Advancements in CEIWR-HEC Software**

During FY 2012 CEIWR-HEC continued to enhance many software products and released those discussed below.

- HEC-ResPRM, Prescriptive Reservoir Model, Version 1.0 - Provisional. HEC-ResPRM is a reservoir system operations optimization software package developed to assist planners, operators, and managers with reservoir operations planning and decision-making. HEC-ResPRM uses network flow optimization to suggest an idea of the best outcome that can be expected for the system based on any particular prioritization of the system objectives and given inflow time-series. HEC-ResPRM runs on a monthly time step and can be used alone or in conjunction with simulation software such as HEC-ResSim (Reservoir System Simulation) to analyze and improve reservoir operations. HEC-ResPRM can be used to maximize benefits to a variety of goals, demonstrate a best case scenario for given priorities, or visualize the interplay among conflicting interests in the watershed. The software is also a useful tool for communicating with stakeholders – allowing them to view tradeoffs between different system objectives.

HEC-ResPRM Version 1.0 is a provisional release pending Planning Model Improvement Program certification through the Planning Center of Expertise for Water Management and Reallocation Studies. The certification process should be completed by the summer of 2013. Until that time, HEC-ResPRM cannot be used to calculate information that will impact a Benefit Cost Ratio for a USACE planning study.

- HEC-RPT, Regime Prescription Tool, Version 2.0. HEC-RPT is designed to facilitate entry, viewing, and documentation of flow recommendations in real-time, public settings. HEC-RPT seeks to improve: 1) communications in group settings by allowing real-time recording and plotting of the recommendations as they are developed; and 2) the recommendations produced by making hydrologic information more immediately accessible to scientists, engineers, and water managers during the formulation process. HEC-RPT 2.0 includes improved software behaviors and new features for: 1) drawing flow bands, or ranges of acceptability, to describe flow recommendations; and 2) volume tracking, which allows users to compare the volumes of water required to meet a set of flow recommendations with the corresponding volumes of water associated with an imported flow regime.
- HEC-FIA, Flood Impact Analysis, Version 2.2 (Provisional). HEC-FIA analyzes the consequences of a flood event and can calculate damage to structures and contents, losses to agriculture, and estimates of potential life loss. The analysis period can be the duration of a single flood event or a longer period of record. HEC-FIA calculates agricultural damage, urban damage, and benefits. It can be used after an event or annually and

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summarizes the results in a report. HEC-FIA can also look at dam failure events and evaluate the consequences to support risk assessments for dams. HEC-FIA uses simplified LIFESim to evaluate the impact to human life.

HEC-FIA 2.2 is a provisional release undergoing certification through the Flood Risk Management Planning Center of Expertise. The certification process should be completed by the summer of 2013. Until that time, HEC-FIA cannot be used to calculate information that will impact a Benefit Cost Ratio for a USACE planning study.

More information about these software packages and other CEIWR-HEC software can be found on the CEIWR-HEC's [website](#).

Additional software development work at CEIWR-HEC during FY 2012 is discussed below.

- HEC-RAS, River Analysis Systems Version 4.2. The next major release of HEC-RAS will be Version 4.2 and is scheduled to be released during FY 2013. Version 4.2 of HEC-RAS will include several new features:
  - Automated Manning's n value calibration;
  - New hydraulic outlet features for an HEC-RAS inline structure (i.e., culverts, rating curves, time series outlet);
  - Linkages between HEC-RAS and the two-dimensional Adaptive Hydraulics Modeling (ADH) software from ERDC (Engineer Research and Development Center);
  - Improved sediment transport capabilities and additional functionality;
  - Advanced rules capability for pump stations;
  - RAS Mapper Capabilities - RAS Mapper provides the modeler with detailed mapping tools to visualize the results of a simulation without leaving HEC-RAS and going to ArcGIS® (ESRI, Inc.). As time progresses, RAS Mapper will eventually replace the capabilities of HEC-GeoRAS;
  - Design of parameter sampling using a Monte Carlo Analysis;
  - Additional water quality computational capabilities; and
  - Additional sediment capabilities including unsteady sediment routing and reservoir flushing capabilities.

The development team has also continued careful and systematic testing of the software since the last release. The results of that testing in combination with reports from users has allowed the identification and repair of various problems.

In addition to the above items, two-dimensional capabilities are being added to HEC-RAS. This capability most likely will not be completed in time to include in Version 4.2 but will be ready for Beta use later in FY 2013. The capability will allow the user to model two-dimensional spreading in storage areas and in channel reaches.

- HEC-HMS, Hydrologic Modeling System, Version 4.0. The next major release of HEC-HMS will be Version 4.0 and is scheduled to be released during the spring of 2013. Two different surface erosion methods will be added to the sub-basin module. The reach will gain erosion, deposition, and sediment transport methods. The reservoir will add several sediment settling methods. Nutrient water quality components will be added to the reach and reservoir elements. The meteorological model will gain an energy balance snowmelt method with supporting methods for shortwave and long wave radiation. Finally, a major new simulation tool to support real-time forecasting operations will be added. Zone configuration and computation points will facilitate calibration and parameter adjustment in large models. The map interface is also updated with new features. Additionally, uncertainty capabilities are currently being added to HEC-HMS but will not be available in Version 4.0.
- HEC-FDA, Flood Damage Reduction Analysis, Versions 1.4, and 2.0. The next major release of HEC-FDA will be Version 1.4 and it is scheduled to be released in spring 2013. Version 1.4 contains a new computational engine and includes the same GIS structure inventory capabilities that are available in the HEC-FIA software. Version 1.4 has been completed but is undergoing testing that ensures results between Versions 1.2.5 and 1.4 are the same. This testing will provide validation for the software certification process.

Development of Version 2.0 of HEC-FDA is also underway. This version will include a new graphical user interface (GUI) but the same computational functions as Version 1.4. Replacement of the GUI in HEC-FDA will allow HEC-FDA to be integrated into HEC-WAT. The scheduled release for Version 2.0 is at the beginning of FY 2014.

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- HEC-EFM, Ecosystem Functions Model, Versions 3.0. The next major release of HEC-EFM will be Version 3.0, scheduled for release at the beginning of FY 2013. New features contained in Version 3.0 are the ability to handle missing data; additional reports pertaining to the availability of data; expansion of the indices which will allow HEC-EFM to be used both as an ecological assessment tool and as a calculator for other water related performance measures; addition of more ecological value (ecovalue) output; and additional information pertaining to the timing of habitat availability. HEC-EFM modifications included improvements to the graphical user interface and style sheets, and a fix was made to the computation of the percentage of time or years in which water shortages (negative flows) occurred.

Continuing work includes the creation of HEC-EFMSim which is a new software tool that uses spatial and temporal data sets to predict changes in ecological communities. It allows modelers to test the effects of land management practices, water management decisions, water quality concerns, and any other spatial and temporal variable of interest. This work is intended to simulate ecosystems for large spatial areas and long periods of record and is significantly expanding the computational abilities of CEIWR-HEC ecological software. During FY 2012, work continued on building the HEC-EFMSim software, with a Beta release of the software being made available to testers sometime in FY 2013.

- HEC-EFM Plotter, Version 1.1. The next major release of HEC-EFM Plotter will be Version 1.1, scheduled for the beginning of FY 2013. New features contained in Version 1.1 are viewing seasonal ecological values (ecovalues), ecovalue shifts, and information pertaining to the timing of habitat availability.
- HEC-WAT, Watershed Analysis Tool, Version 1.0 (not yet released) The Watershed Analysis Tool (HEC-WAT) software was created to help USACE study teams conduct watershed and water resources studies in an integrated, comprehensive and systems based approach. HEC-WAT helps a study team perform the necessary hydrologic, hydraulic, environmental, and planning analyses by integrating the software that is commonly applied by the multi-disciplinary study team. Software such as HEC-HMS, HEC-SSP, HEC-RAS, HEC-ResSim, HEC-DSSVue, HEC-FIA, HEC-EFM, GSSHA (Gridded Surface Subsurface Hydrologic Analysis; ERDC), ADH, HEC-GeoRAS, and HEC-GeoHMS are currently implemented within HEC-WAT thus allowing a study team to perform many of the necessary hydrologic, hydraulic, consequence, and planning analyses all orchestrated from a single interface. A beta version of HEC-WAT was released in FY 2008 and is available for use and testing. Official release of this software is expected in 2013.

On the heels of the initial HEC-WAT release is an enhanced capability that will address the need for performing water resources studies in a systems context while using risk analysis. For over two decades, USACE has required all USACE planning studies to follow certain processes. However, within USACE there is very little guidance and few tools to support the requirements. Because of these limitations, CEIWR-HEC began researching and creating a tool that would perform risk analysis in a systems approach. HEC-WAT fit the part for creating comprehensive watershed studies, and already had the available software that was needed, so the decision was made to add a flood risk compute option to HEC-WAT. This new option, FRA (Flood Risk Analysis), is a computation option from the HEC-WAT software that allows a user to perform plan formulation or system performance analyses while incorporating risk analysis.

The FRA compute option includes sampling and solution techniques, uncertainty definitions, and system-wide component fragility and performance interactions/relationships for these complex riverine systems. The HEC-WAT with the FRA compute option performs system-wide benefit analyses while assessing risks in complex interdependent systems. The FRA option performs Monte Carlo analyses, during which sampling of uncertainties about hydrologic, reservoir, hydraulic, geo-technical and economic parameters occur. The FRA process will also incorporate social and environmental consequences in the risk analysis. With the FRA compute option, HEC-WAT can provide effective risk communication and be used as a tool for levee assessment and certification.

Accomplishments for the flood risk option during FY 2012 included updating the reporting of results for the FRA compute option; modification to the forecast uncertainty algorithm that is being used for the Columbia River Treaty Review (CRT); implementation of skipping models (i.e., HEC-FIA, HEC-RAS) during an FRA compute (user defines the criteria on why a model would be skipped); and a requirements document for adding Life Cycle Cost Analysis (LCCA) to the FRA compute option. The initial test of the distributed computing algorithm of the

FRA compute option was also completed. The test involved a watershed of CRT that included the sampling of hydrologic and forecast data, and the reservoir modeling sequence that has been identified for the watershed (2 Upper Rule Curve (URC) models, 2 Energy Content Curve (ECC) models, 3 HEC-ResSim models (2 flood control & 1 power)). The distributed computing run completed in roughly 48 hours (this includes computations as well as the merging/copying of data) and included one "master node" and ten "compute nodes". Each compute node ran one realization; this compute was for 5,000 events, 100 lifecycles, and ten realizations. The distributed computing "cloud" was a server at HEC and all nodes were run using virtual machines (VMs) on that server.

- HEC-FIA, Flood Impact Analysis, Version 3.0. The next major release of HEC-FIA will be Version 3.0, scheduled for fall 2013. Major improvements to HEC-FIA Version 3.0 include: consequence calculations that include uncertainty about parameters pertaining to economic and loss of life; the ability to calculate loss of life for any time of day; and the inclusion of depth times velocity grids to determine building survivorship. Additional improvements will allow the HEC-FIA software to connect to the Corps Water Management System (CWMS) and HEC-WAT frameworks.
- HEC-RTS, Real-Time Simulation (not yet released). HEC-RTS includes the data visualization and modeling capabilities of the CWMS (Corps Water Management System) software. HEC-RTS is a comprehensive hydrologic modeling system for short-term decision support of water control operations in real time. The software provides support for operational decision making by forecast simulation modeling using any combination of the following models. Rainfall-runoff modeling with HEC-HMS based on gaged or radar-based precipitation, Quantitative Precipitation Forecasts (QPF) and other future precipitation scenarios provides forecasts of uncontrolled flows into and downstream of reservoirs. Simulation of reservoir operations with either HEC-ResSim or CADSWES's RiverWare provides operational decision information for the engineer. The river hydraulics program HEC-RAS computes river stages and water surface profiles for these scenarios. An inundation boundary and depth map of water in the flood plain can be calculated from the HEC-RAS results using ArcInfo® (ESRI, Inc.). The economic and consequence impacts of different flow alternatives are computed by HEC-FIA. The user-configurable sequence of modeling software allows engineers to evaluate operational decisions for reservoirs and other control structures, and view and compare hydraulic and economic impacts for various "what if?" scenarios. The Version 3.0 release of HEC-RTS is scheduled for release in FY 2014.
- HEC-DSSVue, HEC Data Storage System Visual Utility Engine, Version 7.0. The next major release of HEC-DSSVue will be Version 7.0, scheduled for FY 2014. Major improvements include: unlimited file size; 64-bit addressing; faster creation of catalogs and sorting capability; case insensitive pathnames; automatic data compression of DSS files; allow pathname aliases; various improvements to time series data; provide backwards compatibility to older versions of HEC-DSSVue; and better messaging and diagnostics.

## INTEGRATED CIVIL WORKS SYSTEMS

Performance based budgeting, performance measurement and program assessments are increasingly important. In response, the Institute has created a corporate data warehouse of financial and navigation infrastructure inventory data, lock characteristics, navigation project profiles, OMBIL outputs, waterborne commerce, lock performance, hydropower, recreation, water supply, National Recreation Reservation System and environmental stewardship data. Data from these sources is linked, integrated and combined to generate performance measures, which are then used in the budget process.

### **Operations and Maintenance Business Information Link (OMBIL)**

The Operations and Maintenance Business Information Link (OMBIL) Plus, a centralized performance management information system, encompasses the USACE Civil Works business lines of navigation, hydropower, recreation, environmental compliance, environmental stewardship, water supply and regulatory. The OMBIL decision support system distributes data to support a variety of Corps management initiatives, performance-based budgeting and Federal and public data requirements.

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In support of the Civil Works business performance measurements, the Navigation Data Center (NDC) extracts expenditure data from the USACE Financial Management System (CEFMS) and combines it with business output data to generate efficiency and effectiveness measurements, including submissions to the Office of Management and Budget. NDC data supports and is a source of information and data used in the Corps "Value to the Nation" publications and the Federal government's recreation access site: <http://www.recreation.gov>. Navigation data is also integrated with CorpsMap, providing an intranet web-based GIS interface. All of NDC's publicly available navigation and water transportation data is available at [www.ndc.iwr.usace.army.mil](http://www.ndc.iwr.usace.army.mil).

There is a proposal underway to link the database element of OMBIL Plus with the geospatial functionality of CorpsMap to provide a much improved data management system. The new system will be called the Civil Works Business Intelligence (CWBI) to reflect its applicability across all Corps business lines.

### **Operations and Maintenance Business Information Link Regulatory Module (ORM)**

ORM 2.0 is a web-based geospatial database application for tracking and managing all aspects of the Corps regulatory process, and was developed by IWR in 2008. ORM 2.0 provides the foundation for watershed based decision making in the Corps regulatory program.

IWR continues to provide support for the basic program and recommend updates that improve usability and increases functionality. Recent improvements include addition of geospatial layers that improved cumulative impact assessment and linkages to existing databases, primarily those associated with surface mining in West Virginia.

### **Corps Water Management System**

The Corps Water Management System (CWMS) is a comprehensive data acquisition and hydrologic modeling system developed by CEIWR-HEC for short-term decision support of water control operations in real time. CWMS supports field-level decision making within the USACE water management mission. The software includes data acquisition, validation, transformation and management; forecasting, simulation and decision support analysis through real-time modeling; and information dissemination.

The first version of CWMS was released by CEIWR-HEC in 2002. Since then, CWMS has been updated at roughly annual intervals at the thirty-six USACE offices with water management responsibilities. Improvements to the system continue via a field-prioritized betterments program. A major milestone was the development and deployment of CWMS Version 2.0, released in FY 2010. This version allowed the field to make major revisions to the basic database structures, allowed water control users more direct access to their data and enabled them to make more effective use of the features inherent in the commercial Oracle® database at the center of CWMS.

Version 2.1 was released in July 2012 and is the current production system being used by USACE offices. Improvements incorporated into CWMS Version 2.1 include the CWMS Computational Processor (CCP), which provides users with math functions within the Oracle® database and will replace the existing system for validation/transformation.

Current work on CWMS includes a Version 2.2 release planned for FY 2013 and a Version 3.0 release planned in FY 2014. Work for Version 2.2 will include the capability for CWMS to work with a water management sub-network configuration. This sub-network configuration is a DoD IA (Department of Defense, Information Assurance) requirement. Version 3.0 work will be a major release and will include new report generation capabilities and access to native model features. These capabilities will be accessed through the CAVI-NMI (Control and Visualization Interface - Native Model Interface). The CAVI-NMI represents a paradigm shift from Version 2.1 in that the modeler will have more flexibility to adjust models for forecasting. Other work under the aegis of CWMS includes eGIS, CorpsMap and the effort to standup a national database and Continuing Operations Plan (COOP) design.

In addition to software development, CEIWR-HEC continues to be actively engaged with ACE-IT (U.S. Army Corps of Engineers - Information Technology) and the CWMS management team in standard hardware platform design and service requirements for CWMS and other water control programs. This platform is known as the Water Management Enterprise Architecture (WMeA) and includes data servers, storage devices, switches, and data ports.

This effort has produced a more uniform and easily supported implementation of water control data and modeling systems throughout USACE and supports uniform access to water control data nationwide through access to roll-up databases at USACE enterprise processing centers. The next major effort is to secure funding for a WMeA implementation project. Several field offices have already purchased equipment based on the WMeA design. The intent of the implementation project is to provide the field a standard template for setting up and configuring this equipment which would allow for efficiencies gains.

Information about CWMS and other CEIWR-HEC software is available on the CEIWR-HEC [website](#).

**CWMS National Implementation Plan:** In FY 2012, CEIWR-HEC received approval and funding to begin to execute the CWMS (Corps Water Management System) National Implementation Plan. The impetus for the plan was the need for a consistent standardized decision support tool for real-time forecasting with the capability to evaluate in real-time the economic, life-loss and hydrologic impacts of what-if scenarios from a system context. CWMS provides such capability.

The benefits of the CWMS National Implementation Plan include providing the necessary resources to incorporate the complete suite of tools and models necessary for the collection, validation and storage of real-time hydrometeorological data and for the construct of the hydrologic and hydraulic simulation models to forecast flow and stage and to propose optimal reservoir operation across all authorized purposes. This effort would implement CWMS for the 213 watersheds for which the Corps has water management responsibility. This work also dovetails into efforts for CorpsMap, eGIS (Enterprise Geospatial Information Systems) and the National Water Management Database initiatives. All of these enable strong upward reporting capability of real time status, forecasting, and potential hydrologic, loss-of-life and economic impacts. A model library will be built which will house models, data and supporting documentation that can be used for this project and supports planning transformation as well.

Activities in FY 2012 were: completion of an FY 2013 PMP for the National Implementation Plan; a nationwide data call for the 213 basins; improvements to the Corps Computation Processor (CCP); development of Standard Operating Procedures (SOP's) for each activity (CAVI (Control and Visualization Interface) integration, HEC-HMS, HEC-ResSim, HEC-RAS, HEC-FIA); pilot implementations with the MMC (Modeling, Mapping, and Consequence Center) for the Kanawha and Neuse Basins; identification of additional modelers for each discipline; creation of an electronic status map to display status and progress of nationwide implementation effort; completion of the American River CWMS ARRA implementation; use of HEC-FIA modeling to develop new structure inventories techniques; support of CWMS PM activities; creation of CWMS National Implementation Plan Fact Sheet; and general coordination.

### **Integrated Water Resources Science and Services (IWRSS)**

Integrated Water Resources Science and Services (IWRSS) is a new business model for interagency collaboration. It brings a consortium of federal agencies with complementary water resources missions together to share resources to help solve the nation's water resources issues. Initiated through an Interagency [Memorandum of Understanding](#) (MOU), IWRSS's overarching objective is to enable and demonstrate a broad, interactive national water resources information system to serve as a reliable and authoritative means for adaptive water related planning, preparedness and response activities. The goals are to: integrate information delivery and simplify access to this data; increase accuracy and timeliness of water information; and provide summit-to-the-sea high resolution water resources information and forecasts.

Currently the collaboration is with three federal agencies, USGS, NOAA, and USACE. Other federal agencies are expected to join the consortium in the near future. Two initial charters have been written to support and help define the IWRSS effort. The first charter is the National Flood Inundation Mapping (NFIM), and the second is the System Interoperability and Data Synchronization (SIDSRT). Interagency teams have been identified and charged with addressing the tasks described in the charters. In addition, a complimentary effort, the "Building Strong Collaborative Relationships for a Sustainable Water Resources Future" initiative is to build a Federal Support Toolbox for Integrated Water Resources Management (IWRM).

CEIWR-HEC contributes to the IWRSS effort through: attending various IWRSS meetings; identifying models, parameters and other information that can be shared amongst agencies; providing information on work that has

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already been completed which prevents duplication of effort; sharing information between agencies to expand the knowledge base; sharing tools that could be used jointly; data exchange between agencies; and working on a national water model. CEIWR-HEC staff are also directly supporting IWRSS by serving as USACE representatives on the Charter Implementation team. Finally, another member of the CEIWR-HEC staff is an integral member of the National Water Model team.

## WATER RESOURCES TRAINING AND EDUCATION

The Institute has always been a leader in innovation within the USACE family. IWR has developed techniques and approaches for economic analysis, risk analysis, planning methodologies, public involvement, conflict dispute resolution, water conservation and other topic areas. HEC, through the development of hydraulic, hydrologic and planning analysis methods and models, has built a reputation recognized throughout the world in the fields of hydraulics and hydrology. Over the course of their existence, both IWR and HEC have made considerable effort to build appropriate training vehicles for instruction in the use of the various tools they have developed. As a result, each office routinely offers eight to twelve courses per year through the Proponent-Sponsored Engineer Corps Training (PROSPECT) program and/or through other training venues, such as workshops and seminars.

### PROSPECT Program and Specialty Workshops

During FY 2012 IWR continued to support technology transfer and capacity building throughout the Corps through its engagement with the USACE PROSPECT program. The National Capital Region office and the Hydrologic Engineering Center presented twenty three week-long courses (ten led by the IWR-NCR and thirteen by HEC). The courses covered a wide range of Civil Works water resources topics including plan formulation; collaborative planning; ecosystem restoration; flood risk management; hydrologic and hydraulic engineering; public involvement and team planning; public involvement and communications; environmental considerations in water resources planning; and regulatory issues. Specialty workshops often use pieces of the PROSPECT training courses but generally, workshops are built specifically for the requesting office and often included topics outside of the normal PROSPECT training course curriculum.

Under the auspices of the PROSPECT program, CEIWR-HEC conducted the ecosystem-oriented training course "Water and the Watershed" and a full menu of hydrologic and hydraulic (H&H) engineering and planning analysis topics, including courses on: H&H for Dam Safety Studies; Risk Analysis for Flood Risk Management Projects (two sessions); Hydrologic Engineering Applications for GIS; Steady Flow with HEC-RAS; Unsteady Flow Analysis Using HEC-RAS; Hydrologic Modeling with HEC-HMS; Reservoir System Analysis with HEC-ResSim; CWMS Modeling for Real-Time Water Management; Water Data Management with HEC-DSSVue; Hydrologic Analysis for Ecosystem Restoration; and Flood Frequency Analysis. HEC also introduced a new course titled "Consequence Estimation with HEC-FIA" which helps address the growing need for training in support of dam and levee safety studies, project performance calculations, and other consequence analyses. On average, twenty-five students participated in each class. The participants were mostly from USACE offices but students from other Federal Agencies, State and Local agencies, the private sector and the academic community also participated. A list of CEIWR-HEC offered PROSPECT training courses is available at the CEIWR-HEC website ([http://www.hec.usace.army.mil/training/course\\_list.html](http://www.hec.usace.army.mil/training/course_list.html)).

In addition to the PROSPECT training program, CEIWR-HEC conducts specialized training classes for a variety of clients. CEIWR-HEC's support to the U.S. Pacific Command's (PACOM) assistance to the Mekong River Commission continued in FY 2012 with a week-long HEC-RAS workshop in Phnom Penh, Cambodia. The workshop provided lectures and hands-on activities covering steady and unsteady flow hydraulic modeling, along with overviews of mapping capabilities, sediment modeling, and flood damage calculation tools. CEIWR-HEC also conducted an HEC-EFM workshop in Austin for the Texas Water Development Board (TWDB), pursuant to a Memorandum of Agreement (MOA) signed by the Assistant Secretary of the Army (Civil Works). The training assisted engineering analysis of environmental flows required by recent changes in state regulatory goals.

CEIWR-HEC also conducted training courses for District offices on HEC-DSSVue in Jacksonville; Steady Flow Modeling with HEC-RAS in Raleigh; HEC-HMS in Anchorage; HEC-ResSim in Portland and Omaha; and a special working session regarding HEC-RTS in Nashville.

### **Planning Excellence Program**

Throughout FY 2012, IWR provided managerial and technical support to the Planning Community of Practice (CoP) in the execution of the Planning Excellence Program. This included the management of the Planning Associates (PA) program and conduct of the three-week "Washington DC Experience" module for the FY 2012 class. The goal of the PA program is to develop planning leaders who can manage complex studies that lead to quality decision documents and who will provide water resources technical and professional leadership in the future.

IWR, in coordination with HQUSACE, is responsible for the implementation of the program, including setting up the criteria for selection of candidates, development and delivery of training sessions, and financial management and logistical support of the program.

IWR also provided support to the local delivery of four of the seven Planning Core Curriculum courses by the Corps Major Subordinate Commands (MSCs). These four courses provide the basic, full-performance training needed by entry level planners across the USACE as the means to accelerate their progress to the journeyman stage of their career development. These courses include: Environmental Considerations; Economic Analysis; Plan Formulation; and Public Involvement and Team Planning. IWR also supports to the local delivery of the Risk Analysis - Water Resources Planning and Management course.

### **Water Resources Training and Education Program**

The Water Resources Training and Education Program, previously known as the Advanced Degree Program, has been revamped to offer prospective students access to information on a much broader range of training options. The previous program was focused on five universities that had developed Master's degree programs specifically tailored for the Corps' planning community. That model was developed in the midst of constrained Major Subordinate Commands training budgets and when centralized incentive programs were being curtailed. That singular form of training proved to be unsustainable. A new, different strategy is being devised. The range of advanced degree options in the diverse water resources field has grown significantly in recent years, with more institutions and specialized training options available. Students interested in advancing their water resources education still have access to information based on thematic, geographic, and distance learning availability. These offerings will continue to be available through <http://www.waterresourceseducation.us/>. However, graduate level training opportunities for professionals will most likely continue to be limited in the foreseeable future. Prolonged budget constraints and workforce demands will limit the professionals' ability to pursue individualized training. Short course and certification options now hold the most promise for prospective students, and many of these are available online. More institutions are developing such tailored water resources classes that do not necessarily lend themselves to graduate study and are being developed with the professional workforce in mind. The next step in the developmental process, therefore, will be to focus on the range of short courses and certification programs that are under development in various institutions. This project, which provides new opportunities in advanced water resources education, is being performed in direct support of the USACE Civil Works Strategic Plan Goal 5 "Build and sustain a high quality, highly dedicated workforce" and USACE Campaign Goal 4 "Prepare for Tomorrow".

## **REIMBURSABLE TECHNICAL ASSISTANCE**

During FY 2012 the Institute performed a wide array of reimbursable work for: USACE field offices: USACE Headquarters Civil Works; the Engineering Research and Development Center (ERDC); combatant commands of the U.S. Army; the Federal Emergency Management Agency (FEMA); the International Joint Commission (IJC); the U.S. Agency for International Development (USAID); the National Weather Service (NWS); the U.S. Geological Survey (USGS); the Natural Resources Conservation Service (NRCS); the U.S. Environmental Protection Agency (EPA); and other Federal agencies. Also, through the Thomas Amendment Agreement (Section

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211 of the Water Resources Development Act of 2000, Public Law 106-541), IWR provided technical support to the Lower Colorado River Authority, Texas and the Tampa Bay Water Authority, Florida.

Projects for USACE clients included navigation systems economic evaluation, technical advice and guidance on plan formulation, incremental cost and cost effectiveness analysis, risk analysis, watershed and reservoir system modeling, water quality, river hydraulics, wetlands hydrology, water control management, regional statistical analysis, flood risk management, flood warning response systems, GIS applications in hydrology and hydraulics, groundwater modeling, and water supply in support of interagency investigations.

CEIWR-HEC worked on a variety of projects including:

- hydraulic modeling and risk analysis; helping the Lower Colorado River Authority implement CWMS for their water management needs;
- contributing to the revision of Bulletin 17B;
- updating levee certification guidance;
- working with the USACE Screening Portfolio Risk Assessment teams evaluating the safety of the Nation's dams;
- assisting the Sacramento District and the South Pacific Division perform a risk analysis of the Sacramento River from a systems context;
- working with the Sacramento District on the Sacramento River Bank Protection Project;
- working with Honolulu District on the Kaneioulouma Haiku, Kauai project;
- working with Southwest Division districts on enhancement of HEC-HMS forecasting abilities within CWMS;
- working with New York District on Passaic River modeling;
- working with Nashville District on modeling in the greater Nashville area;
- working with the Mobile District to update the Alabama-Coosa-Tallapoosa (ACT) and Apalachicola-Chattahoochee-Flint (ACF) water control manuals;
- providing technical support to the New England District regarding reservoir system and ecosystems function modeling for the Connecticut River Restoration Project;
- providing technical support to the Mississippi Valley Division as part of the Value Engineering Review Team for the Louisiana Coastal Authority Mississippi River Diversion project;
- providing HEC-ResSim, HEC-HMS, and HEC-RAS training to the water management staff of the Omaha District;
- providing technical support to the Sonoma County Water Agency (SCWA) on linking HEC-RAS with ModFlow so that the interaction of groundwater and surface water could be modeled by SCWA;
- providing technical support to the San Francisco District, USGS, NWS, and SCWA on developing a revised Hydrologic Indexing methodology for the operation of reservoirs in the Russian River basin;
- providing HEC-FIA training to the staff of Districts affected by the 2011 floods in the Greater Mississippi Basin to perform post flood damage assessments according to OPORD 2011-50;
- providing technical support to the Nashville District and NWS on HEC-RTS (Real-Time Simulation) modeling of the Cumberland River above Cheatham Dam and below J. Percy Priest dam;
- providing technical support to the St. Paul District and CEIWR-RMC on an application of HEC-WAT for an area in St. Paul, Minnesota along the Mississippi River for levee safety;
- providing technical support to the Fort Worth District and the Southwestern Division on the assumptions used in the development of the Trinity River project in Dallas, Texas;
- providing HEC-ResSim training for staff at Portland and Omaha Districts, HEC-HMS training for staff at Alaska District, HEC-RAS sediment training for staff at Wilmington District (Raleigh, NC), and HEC-DSSVue training for staff at Jacksonville District;
- collaborating with the Northwestern Division, Seattle District and Portland Districts and Bonneville Power Administration on the Columbia River Treaty (CRT) 2014/2024 study;
- assisting Little Rock, Kansas City, and Omaha Districts with HEC-FIA modeling;
- assisting Detroit District with HEC-EFM modeling for Knowlton Creek; and
- assisting New Orleans District with complex HEC-FDA modeling of the Morganza Flood Risk Management project.

CEIWR-HEC continued its agreement with the Sonoma County Water Agency. This agreement will allow CEIWR-HEC to add specific enhancements to the software that provides capabilities for all of USACE. CEIWR-HEC entered into an agreement with the Texas Water Development Board, and conducted training in Austin regarding the use of HEC-EFM to analyze environment flows. CEIWR-HEC continued its reimbursable technical support for HEC-RAS and HEC-FDA to NRCS.

## **CIVIL WORKS PROGRAM AND PROJECT INFORMATION**

The Institute develops, maintains, and provides a full range of international, national and USACE project and program data and information for decision support for the USACE, other federal government agencies, the private sector, and the public on key Civil Works activities. National water resources database concept development, design, implementation, operation and maintenance activities are provided through a combination of in-house and private sector systems analysts, statisticians, engineers and scientists who work in close coordination with USACE users. Also, IWR acquires external data from other federal agencies and private sector sources, which is used by the Corps for integrated analysis and benchmarking. These data are used within the Corps for program management, budget development and justification, OMB Program Assessment Rating Tool, numerical models and real time management at the project level. Major initiatives within the past year have been the development and creation of performance measures for the Corps business lines to reflect the efficiency and effectiveness of the programs.

### **Navigation and Civil Works Decision Support Center**

The Navigation and Civil Works Decision Support Center (NDC), located at the National Capital Region headquarters of IWR is the central manager of navigation, hydropower, recreation, environmental stewardship, water supply and regulatory program data for the USACE, and provides management and analysis of these data in support of all Civil Works. These data directly support the USACE annual Civil Works performance-based budgeting program. NDC is responsible for national level executive oversight and management, including the development of Federal and USACE Engineer Regulations (ER's) and Code of Federal Regulations pertaining to Corps navigation data reporting requirements by industry and the associated enforcement of those regulations. The Office of Management and Budget (OMB), acting on legislative mandates, recognizes USACE, acting through NDC, as the Federal collection agent for waterborne commerce, vessel activities and waterway infrastructure data and statistics. Going beyond the data itself, NDC analyses and organizes information in new and innovative ways in direct support of USACE Headquarters, the Major Subordinate Commands, and the District offices.

NDC accomplishes its objectives of supplying timely and accurate data through the following activities: assessing user requirements; developing, designing, operating and maintaining systems to collect, process and store data and information; developing and disseminating data, information and statistical products; training providers and users of project and program information and data; and maintaining knowledge of the latest developments in the area of technical and content interoperability.

As a national statistical center, NDC coordinates extensively with other Federal statistical agencies and data users, representing the U.S. government in the development of international data and information standards and protocols and in the negotiation of data exchanges. NDC actively participates in corporate information integration and coordination within the USACE and plays a lead role in developing, coordinating and disseminating water resources information for performance measurement and management purposes. It leads the development of strategic communication with both internal communities of practice and external water resources interests, stakeholders and communities, building new methods to analyze and present data.

### **Waterborne Commerce and Vessel Statistics**

Under the authority of the Rivers and Harbors Act of 1922, as amended and codified in 33 U.S.C. 555, the USACE is to collect, process, distribute and archive U.S. waterborne commercial vessel trip and cargo data. These data and statistics are used to analyze the feasibility of new water transportation projects and activities; to set priorities for new investment and rehabilitation; and for management of the operation and maintenance of existing projects.

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Under Federal law, vessel operating companies must report domestic waterborne commercial vessel movements directly to the USACE. The types of vessels include, but are not exclusively limited to: dry cargo ships and tankers; barges (loaded and empty); towboats (with or without barges in tow); tugboats; crew boats and supply boats to and from offshore locations; newly constructed vessels from shipyards to the point of delivery; ferries and other passenger vessels; and vessels remaining idle during the monthly reporting period.

Harbor Maintenance Tax information, including the name of the shipper of the commodity and the shipper's Internal Revenue Service number or Social Security number, is also reported for the cargo movements into or out of ports that are subject to the provisions of section 1402 of the Water Resources Development Act of 1986 (Pub. L. 99-662). U.S. foreign waterborne import, export and in-transit cargo and vessel movement data is provided to the Corps by the U.S. Customs and Border Protection, the U.S. Bureau of the Census, and the Port Import Export Reporting Service.

Vessel movement data acquired by the Waterborne Commerce Statistics Center is primarily for the use of the USACE and other governmental agencies. Since 2004, data have been incorporated into the USACE budget preparation process, providing the navigation project outputs and performance measures used to rank and justify operation and maintenance funding requests. Summary statistics, which do not disclose vessel movements of individual companies, are also released to private companies and to the general public.

### **Harbor Maintenance Tax Data Collection**

During the 103<sup>rd</sup> Congress legislation was enacted which allows the U.S. Customs and Border Protection Service (CBP), USACE and the U.S. Department of Commerce to receive funding for expenses incurred in the administration of the Harbor Maintenance Tax. In FY 2012, USACE collected domestic shipper information required for auditing Harbor Maintenance Tax collections, tracked Corps navigation related Operation and Maintenance (O&M) expenditures, prepared the annual Harbor Maintenance Trust Fund report to Congress, coordinated with the CBP on data collection and enforcement issues, and addressed and evaluated possible alternatives to the Harbor Maintenance Tax (HMT).

Validation of Domestic Data In light of the past variations in the level of domestic collections and concerns expressed by the World Trade Organization that the U.S. has not fully collected fees due from domestic shippers, the Corps' Waterborne Commerce Statistic Center (WCSC) has made it a priority to ensure full compliance on the domestic side. In FY 2012, the Corps continued to work with the CBP to improve the collection and analysis of domestic HMT receipts and to develop a system to collect and validate shipper information required by the CBP for auditing domestic HMT collections. The goal of this effort is to increase the accuracy and completeness of domestic shipping information in order to improve the Federal government's ability to verify the level of compliance. Additionally, WCSC worked with the Internal Revenue Service (IRS) to develop a methodology to detect unreported movements of cargo subject to the HMT.

Improved Delineation of Foreign Vessel and Cargo Movements: The Corps has improved the accuracy of the delineation of ports where moves are subject to the Harbor Maintenance Tax and the facilities contained in these ports. With the transfer of the U.S. Foreign Waterborne Transportation Statistics Program from the U.S. Census to the Corps on October 1, 1998, the WCSC is now involved in the identification of foreign cargo movements subject to the HMT. The Corps, in partnership with the CBP, has improved the geographic accuracy of data for foreign vessel and cargo movements in U.S. ports, and has improved the process that matches the cargo to the vessel moves. In 2012, IWR analysts began leveraging the U.S. Coast Guard Automated Identification System (AIS) services to identify missing domestic carrier reports, with intent to expand the effort to collaborate with the U.S. Treasury to identify uncollected revenues for the Harbor Maintenance Trust Fund. Further, an effort was chartered to correlate Vessel Management system (VMS) and AIS data in a production environment to improve the reported dock information provided by CBP.

### **International Trade Data System**

During FY 2012, the NDC continued its involvement in the development of the International Trade Data System (ITDS). ITDS is a multi-agency technology initiative administrated by the e-Customs Partnership, a public-private

partnership led by U.S. Customs and Border Protection (CBP). Both the public and private sectors have steering committees and numerous sub-committees. The objective of this initiative is to provide a secure, single source interface for the collection, input, analysis, and proper dissemination of international trade and transportation statistics. USACE is one of over 20 government agencies working with the trade and transportation community to implement this initiative.

In FY 2012 IWR worked with ITDS to develop a draft Memorandum of Understanding between participating agencies that will allow the sharing of international trade information at the transaction level. IWR technical staff continued to work with ITDS to harmonize requirements for carrier and shipper information and eliminate duplicative reporting requirements.

### **E-Navigation Initiatives**

E-Navigation (E-Nav) initiatives are those promoting efficiency, safety, security, and reliability in our Nation's waterways through seamless transfer of data and information among the navigation community. IWR supports several of these E-Nav initiatives.

- River Information Services (RIS): RIS will provide management, coordination and oversight for the development of the various E-Nav initiatives in which USACE participates. The Federal Notice to Mariners project was enhanced in scope to include a spatial component through coordination with the National Geospatial Intelligence Agency (NGA). Federal notices containing the spatial component are scheduled to be available in FY 2013.
- Lock Operations Management Application (LOMA): IWR technical experts worked with ERDC to integrate their Navigation Infrastructure Inventory lock and chamber information into the LOMA application. Experts also continued to work with the U.S. Coast Guard to improve the Automated Information System data used by LOMA.
- Federal-Industry Logistics Standardization (FILS): Work on Accredited Standards Committee X12-approved documents for transfer of information between the leading barge companies and USACE and other participating agencies began in FY 2012. Message specifications and constructs were developed, and subsequently reviewed and approved by the FILS committee. Message constructs are scheduled to be in use during FY 2013, allowing the start of standard electronic message flow between USACE and industry partners.
- Federal Initiative for Navigation Data Enhancement (FINDE): In FY 2012 the FINDE project team established a charter signed by agency proponents to promote interagency data sharing and leverage expertise, data, and services. The signatory agencies were the Internal Revenue Service, USACE, and the U. S. Coast Guard. IWR analysts were able to leverage U.S.C Coast Guard services to identify several million tons of unreported cargo. Improving the accuracy of data sets were used for decision support.
- Inland Electronic Navigation Charts (IENC): IWR technical experts continued to work with the Army Geospatial Center (AGC) to harmonize navigation points of interest and data elements common to both AGC's IENC's and NDC's dock and facility inventory. IWR technical experts also provided AGC pertinent information for prioritization of the maintenance of chart information.
- Lock Performance Management System (LPMS): The LPMS team continued their development of a tool that captures real time vessel (Automated Identification System "AIS") information at Corps locks so as to reduce the burden on the lock operators and to improve their capability to safely operate locks and results in improved safety and vessel traffic management. Additionally, the team developed several web services critical for management of other federal programs, and for consumption by the public navigation community.

### **Navigation Infrastructure Inventory**

The Institute collects navigation infrastructure information in support of the USACE Federal Central Collection Agency responsibility for documenting the Nation's commercial port infrastructure served by Federal channels. Data for approximately 31,300 individual navigation points of interest (NPIs) are published on the Internet. Dock data are updated as each port facility is contacted and characteristics are verified. New update and survey procedures are being developed to increase the frequency of update and to allow individual facility operators and port authorities to update their own facility information in the database. In FY 2012, bridges over charted

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waterways were added to the inventory and synchronized with the Corps' Inland Electronic Navigation Charts (IENC's). Due to the dynamic and continuous update of the NPIs, the hard-copy Port Series reports are no longer being published. Instead, an NPI search tool has been designed which will facilitate retrieval of information for specific NPIs.

Navigation infrastructure inventory information is used to identify industries served by the Federal channels and is part of the budgetary process of prioritizing projects. The U.S. Coast Guard (USCG) is another prime user of the information in the execution of its homeland security mission. In FY 2008 the Federal - Industry Logistics Standardization (FILS) group was established, comprised of representatives of the USACE, the Internal Revenue Service, the U.S. Coast Guard, U.S. Customs and Border Protection, and the barge and towing industry. Through the collaborative efforts of the FILS working group, a definitive list of NPIs with unique identification codes and accurate geo-location has been completed that both the public and private sector can use when communicating with each other. A list of NPIs is located on the USACE NDC website: <http://www.navigationdatacenter.us/ports/ports.asp>.

### **Lock Performance and Characteristics**

The lock performance database provides USACE access to individual lock near-real-time information as well as summary and performance statistics. The data are entered into the database by the lock operator as the vessel is locking through the chamber. A national data warehouse provides all USACE users direct access to current and historical data and summaries. The data is used by the USACE for budget formulation, tactical and strategic operation and maintenance of the navigation lock system, and OMB navigation system performance measures. The data are also important to other agencies, such as the U.S. Coast Guard and the Tennessee Valley Authority (TVA), in the execution of their missions. The data are also used by agencies such as the U.S. Department of Agriculture to update grain movements to keep their users informed, especially during critical drought or flood events. All locks in the New Orleans District now use the U.S. Coast Guard required vessel Automated Information System (AIS) signal to visualize on a map the location and identification information of all vessels in the vicinity of the lock and to automatically record selected timing events directly into the lock database as the vessel moves through the locking process. These features reduce data entry demands, improve data accuracy, and allow the operator to better plan local maintenance and his locking sequences. An approved public web site at <http://corpslocks.usace.army.mil> provides real time data to industry and the public as well as a data web service.

Lock characteristics data and the physical descriptions of all the USACE owned and operated locks are updated as information changes. Lock characteristics and performance information are available on the USACE [Navigation Data Center's](#) public web site. The lock performance and characteristics databases are feeder systems to the OMBIL decision support system. The lock data are used to supply the OMB required performance data of lock unavailability due to mechanical problems.

### **Dredging Statistics**

This web-based ORACLE database is successful in supplying information on all USACE performed and contracted dredging to the USACE, industry and private users. Data entry and report generation is accomplished via the USACE intranet and enables all USACE members to access the central system information. The database contains information on dredging location, equipment used, quantity removed, government estimate and winning bid and bidder. National briefings with Corps and industry representatives employ the data from this central system and the database is used to generate specific reports such as the Small Business Report for dredging contracts. Biweekly reports are posted on the public web site to inform the industry and public of Corps and contracted dredging activities. These reports are available in downloadable spreadsheet format providing more functionality for report users. Standard reports and summaries plus customized queries and reports are quickly generated to meet Corps and user needs. Use of the information has resulted in improved bidding competition and more efficient utilization of dredging equipment. The dredging database is a feeder system to the OMBIL decision support system.

### **Recreation**

Recreation data associated with the Corps' 4250 recreation areas are collected and maintained within the OMBIL database. This includes: recreation areas, visitor centers, facilities, and amenities; outputs including a count of the

number of visitors and visitor hours; and activities including citations and interpretive contacts. These data are combined with revenues and expenditures to produce performance measures that assist the Corps in making management decisions regarding the Recreation program. This data is also furnished to public websites such as Value to the Nation, [www.vtn.iwr.usace.army.mil](http://www.vtn.iwr.usace.army.mil), CorpsLakes, <http://corpslakes.usace.army.mil/visitors> and the federal interagency recreation website [www.recreation.gov](http://www.recreation.gov). In FY 2012, OMBIL continued to focus on improving the accuracy of the visitation data and the inventory of recreation projects, and also initiated a nationwide effort to better define the project site area (recreation area) list. OMBIL also supported the budget process by continuing to supply data to the RECreation Budget Evaluation SysTem (Rec-BEST), Recreation Self Assessment Tool, and RecStatus project information and benchmarking report, developed by IWR/ERDC.

A new regional economic development model was developed in FY 2010 named RECONS (Regional Economic System). This modeling tool automates calculations and generates estimates of the employment impact and other economic measures such as income generated and sales associated with USACE's Civil Work program spending, as well as economic impacts of recreation visitor spending at Corps lakes. The latest economic impact information for all recreation projects has been estimated using RECONS and posted on the Value to the Nation website.

IWR, in collaboration with ERDC, has provided additional technical support to USACE Recreation Business line activities. The activities that were accomplished in FY 2012 include: a continuation of a nationwide visitation estimation survey; continued support of the Performance Based Budget Development for Recreation Business Line; continued estimation of the Regional Economic Impacts associated with recreation visitation at Corps facilities; GIS mapping applications using the Google Map platform to inventory all Corps managed recreation areas and facilities; updating of the Google Earth application for all Corps recreation projects and providing polygon maps for all 4,200 recreation areas; and other miscellaneous technical support to USACE Natural Resources Management activities. Lastly, in FY 2012 IWR continued to provide technical support for individual public survey submissions on recreation planning and recreation management.

### **Environmental Stewardship**

The USACE Environmental Stewardship program has the largest business line footprint, with over 12 million acres of land and water at 470 projects. To improve efficiency and management of forest, fish, wildlife and cultural resources on Corps property, IWR increased support in improved business processes, budget efficiencies and performance tracking. The IWR Business Line Manager for Environmental Stewardship supported HQUSACE, including development of the FY 2014 Budget, Environmental Stewardship regulation and policy updates; and served as program lead to the USACE Stewardship Advisory Team (SAT). The IWR Environmental Stewardship Business Line Manager was also selected to co-lead a project development team on biological opinion work within the Corps.

In 2012, the Navigation Data Center completed a modernization effort with the Environmental Stewardship OMBIL database and entry forms creating a wizard to ensure more complete and accurate data for inventory of resources and performance tracking. It also included the improvement and continuation of the Environmental Stewardship Budget Evaluation System (ES BEST) and annual work plan which serve as the primary tools for the field to build the Environmental Stewardship budget.

In FY 2012 a prototype environmental decision tool was developed under contract with Michigan State University to pull national GIS spatial database information comprised of environmental threats and significant resources. The decision tool provides a more objective and comprehensive view and rankings of decision criteria across all Corps Environmental Stewardship projects.

### **Hydropower**

Hydropower data from the 75 Corps power plants is collected and maintained within the OMBIL database. For those power plants in the Northwestern Division that have automated control systems (Generic Data Acquisition and Control System or "GDACS"), electronic upload of generation data is in place. Data such as power generation statistics, unit availability, and revenue generated enable the Corps hydropower program to assess its performance, make budgeting decisions and furnish the Office of Management and Budget with program performance information. In FY 2012, hydropower performance measures for the FY 2014 budget process were supplied by OMBIL hydropower data. The OMBIL Operations and Maintenance team has made revisions to data entry forms in

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order to capture the amplification code records for unplanned (forced) outages of type U1 for all units. These data are required to be reported on a national level to the North American Electric Reliability Corporation, NERC.

### **Water Supply**

The Institute serves as the HQUSACE national program manager for the Water Supply business program. In this capacity, the annual budget and the five-year development plan associated with USACE Water Supply budget is developed in coordination with the Major Subordinate Commands (MSCs) and the strategic plan. It is necessary to develop and provide annual budget guidance to the MSCs, collect their data, prioritize it in conjunction with the seven other business lines and eight program areas, and present the data to the senior leaders of Civil Works, the Assistant Secretary of the Army (Civil Works) and a panel of water supply examiners from the Office of Management and Budget. The annual program must then be modified and adjusted as necessary based on OMB comments and directives.

Included within the USACE annual budget is a line item in the Operations and Maintenance Remaining Items account for a program entitled "National Portfolio Assessment for Reallocations." The responsibility to develop and monitor this program falls under the Water Supply business line program. This item is intended to develop a portfolio of projects suitable for reallocations and to explore new methods of paying for reallocation studies. In FY 2010 this program was expanded to include a "Sustainable Rivers" increment. As a result of all the data collected to develop the portfolio of projects for reallocation together with a combined "Water Management" survey, the National Portfolio Assessment study was modified to an assessment of data effort. Under this effort IWR has reviewed, collected data and/or provided reports on water management, water quality, climate change, sedimentation issues, and the Sustainable Rivers Program as well as keeping the water supply needs for reallocations up to date. Current plans call for a first draft Reservoir Management report to be available at the end of FY 2013. This report will have sections on municipal, industrial and irrigation water supply, water management, water quality, sedimentation, and drought contingency plans and surveys.

The IWR Water Supply business line manager is also responsible for the development and maintenance of the USACE database of Municipal and Industrial (M&I) water supply projects. IWR has developed a Water Supply module in the Operations and Maintenance Business Information Link (OMBIL) system. Once developed and loaded with all the contractual data, this system will enable a continual update of water supply data, similar to some of the other business lines. The most recent data available is current as of March 1, 2012. This database is a combination of the new OMBIL data, where loaded, and the old 2005 data from those districts which have not completed the loading process. This current database shows that there are 134 Corps multipurpose projects which contain storage space for M&I water supply. These projects are located in 25 states and in 23 of the 38 Corps districts. In these projects the Corps has 335 repayment agreements representing some 9.8 million acre-feet of storage space and an investment cost of \$1.5 billion of which about \$831 million has been repaid with interest to the U.S. Treasury. The storage space is capable of providing about 6.5 billion gallons of water per day for use by municipalities and industrial firms which have signed repayment agreements. This yield is capable of providing the indoor household needs of approximately 97 million people and represents about three percent of the Nation's off stream municipal and industrial water supply needs. The [2011 M&I Water Supply Database Report](#) was published as IWR Report 2012-R-02 (dated April 2012).

In 2012 an initiative was undertaken to expand the M&I module of OMBIL to include irrigation. Preliminary data show there are 38 projects in our Western states with storage available for irrigation. In these reservoirs there are currently 533 agreements between the Bureau of Reclamation and the local irrigators. This module is projected to be complete in the 2<sup>nd</sup> quarter of FY 2013.

### **Optimization Tools for Navigation**

The Optimization Tools for Navigation program supports multiple initiatives concerning methods and analyses to minimize costs or enhance efficiencies for asset evaluation and management of the Corps' navigation Operation and Maintenance (O&M) program. Related initiatives include support for enhanced development and field testing of the Channel Analysis Design Evaluation Tool (CADET) in partnership with the USACE Engineer Research and Development Center (ERDC) as technical scope and review lead and the Naval Surface Warfare Center (NAVSEA-

Carderock Division) as prime technical developer. Support for CADET in 2013 will involve initiation of efforts to develop a vessel lines library.

Also supported is the development of a centralized system for benefit evaluation of the O&M program for deep draft harbors (the National Navigation Operation and Maintenance Performance Evaluation and Assessment System, also referred to as “NNOMPEAS”) and investigations and research conducted in concert with the U.S. Naval Academy and technical experts (secured via contractual services) to better quantify critical inputs for navigation analysis. Enhancements will be added to NNOMPEAS to support data extraction for planning studies or assessments.

Work completed in FY 2012 included completion of the CADET core programming initiative, completion of a first-phase geographic information system (GIS) interface for NNOMPEAS, data expansion of NNOMPEAS to include nearly 75 high-throughput ports with multiple years of data (2004 through 2010), and further modifications to the RMS data collection system to capture detailed dredging information by location and cost for inclusion in NNOMPEAS and other systems. Work scheduled for FY 2013 includes continued schematic mapping of coastal deep draft channel projects, adding data for more than 50 additional harbors, and deploying RMS dredging data collection at the Corps district level.

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The Institute formed the International Water Resources program in 2006 as a means to better coordinate the various international initiatives that are under its purview. These initiatives fall into three categories: global water resources strategies; international partnerships; and technical and advisory support. These initiatives and the major projects that fall under them are discussed below.

### International Joint Commission Related Activities

One example of the Institute’s technical and advisory support activities is its support of the International Joint Commission (IJC), an independent [binational](#) organization established by the [United States](#) and [Canada](#) under the [Boundary Waters Treaty](#) of 1909. The two countries created the IJC because they recognized that each country is affected by the other's actions in lake and river systems along its common border. The two countries cooperate to manage these waters wisely and to protect them for the benefit of today's citizens and future generations.

During FY 2012, members of the staff of the Institute were instrumental in the completion of two IJC studies, the International Upper Great Lakes Study and the International Lake of the Woods and Rainy River Watershed Study.

#### International Upper Great Lakes Study

Throughout FY 2012, the Institute continued to play a major role in directing and managing the completion and final report-writing activities and ministerial, agency and Congressional briefings of the final recommendations of the [International Upper Great Lakes Study](#). The Study was initiated in 2007, focusing on the *Lake Superior Regulation Plan* and the potential erosion problems associated with the St. Clair River channel. Drs. Eugene Stakhiv and Anthony Eberhardt served as the U.S. co-Director and co-Manager of the IUGLS Study, respectively. IWR directed all U.S. contributions to the study, as was the case with the previous related IJC Great Lakes Study, the *International Lake Ontario-St. Lawrence River Study*, which was completed in 2006.

During FY 2012, the study team’s focus was on developing an alternative to replace the existing Plan 1977-A, the outflow regulation plan used by the International Lake Superior Board of Control since 1990. The study team included over 100 engineers and scientists from USACE, Michigan State University, the Great Lakes Office of Environment Canada and the University of Waterloo-Ontario. ‘Shared vision planning’, a planning process devised at IWR during the National Drought Management Study (1989-93) was used to guide the Study Board in their selection of the best alternative regulation plan during numerous decision workshops. The recommended alternative, *Lake Superior Regulation Plan 2012*, provides modest environmental and economic improvements over Plan 1977-A, but is especially ‘robust’ during extreme dry climatic conditions that may occur in the future. The

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robustness of this plan was tested under numerous hydrologic futures including those developed by the Intergovernmental Panel on Climate Change (IPCC) and stochastically generated supplies simulating 50,000 years of wet and dry scenarios.

Realizing the limitations of any regulation plan for Lake Superior, the uppermost lake in the Great Lakes system, the Board also investigated options for multi-lake regulation. Investigations considered the placement of control structures on the St. Clair and Niagara Rivers, as well as structures and channel modifications in the St. Lawrence River. It was found that extreme hydrologic conditions could be ameliorated with these additional structural changes. However, the costs were estimated to be in the multi-billion dollar range, and it would take decades to complete the necessary suite of economic and environmental studies required prior to construction. The timing for implementation triggered by a shift in the climate regime is unknown and, as such, further consideration of multi-lake regulation was not recommended by the Study Board at this time. Instead, the Board recommended that a long-term adaptive management strategy be pursued. Part of this strategy would be the establishment of a permanent Great Lakes Levels Advisory Board which would monitor Great Lakes hydrology, maintain the models developed during the Study and provide guidance to the IJC's existing control boards. Membership and support of the new Board could come from agencies such as the Corps, NOAA, USGS, Environment Canada and state and provincial offices with jurisdictions and interests in Great Lakes water levels and their impacts. Extensive public meetings were held in July and August 2011 at locations around the Great Lakes to receive input on the tentatively proposed plan, as well as, on the adaptive management strategy. Thousands of individuals attended these public meetings.

The Study was successfully completed on March 31, 2012, with the final report and documentation provided to the IJC Commissioners prior to that date. Throughout the study, the American Society of Civil Engineers – Environmental and Water Resources Institute (ASCE-EWRI) and the Canadian Water Resources Association (CAWRA) were involved as independent peer reviewers of the numerous foundational various technical reports, providing timely guidance and critiques for requisite adjustments in the modeling and analyses that were being undertaken by the numerous universities and government research centers engaged in the study. An information management strategy has been developed to ensure that the Study's extensive data and models remain available after the completion of the study, and all the documents appear on the Study website: <http://www.iugls.org/>.

### International Lake of the Woods and Rainy River Watershed

In July 2010, the IJC created the International Lake of the Woods and Rainy River Watershed Task Force (Task Force) to examine and report on matters raised by the U.S. and Canadian governments. Ms. Elizabeth Bourget of the Institute served on the Task Force. The Task Force reviewed the ways that the countries work together to manage water quality, water quantity and related issues in the watershed, and recommended governance mechanisms to help address future needs.

In July 2011, the Task Force issued its final report entitled "*Bi-national Management of Lake of the Woods and Rainy River Watershed*" (*Task Force Report*) to the IJC. Public hearings were then held and the IJC received comments on the Task Force report. On January 30, 2012, the IJC submitted its report entitled "*Report to the Governments of the United States and Canada on Bi-national Water Management of the Lake of the Woods and Rainy River Watershed*" to the U.S. and Canadian governments constituting a final response to the governments' requests. The IJC report commended the Task Force for its work and included the Task Force final report as an annex to its report.

The IJC recommended a governance model for a new International Lake of the Woods and Rainy River Watershed Board. The governance model would apply cooperative research and decision making and enhance local participation and support mechanisms to address priority issues such as nutrient enrichment, harmful algal blooms, aquatic invasive species, the contamination of ground and surface water, climate change indicators and the development of adaptation measures.

In September 2012, the Institute assisted the IJC by providing an initial draft of a directive for the proposed International Lake of the Woods and Rainy River Watershed Board. The proposed Board incorporates the responsibilities assigned to two existing IJC boards in the watershed and implements recommendations made in the IJC's 2012 report, as supported by U.S. and Canadian Governments letters dated June 20, 2012 and July 25, 2012, respectively.

### **International Capacity Development Program**

During FY 2012, in partnership with the USACE Pacific Ocean Division (USACE-POD), the Institute managed and executed the International Capacity Development Program to execute the U.S. Pacific Command (USPACOM) and U.S. Army Pacific (USARPAC) goals and support the HQUSACE Civil-Military Emergency Preparedness program.

In support of USPACOM and USARPAC and many pertinent Embassies, members of the Institute engaged and collaborated with various humanitarian assistance and disaster relief stakeholders in the Pacific Ocean region to develop strategies to achieve theater security cooperation objectives. Such engagements required civil-military integration on events, workshops, exercises and activities that increased capability, shared best practices, and promoted benefits to the civilian population. The FY 2012 engagements are discussed below.

- Earthquake Response Plan for Tribhuvan International Airport (Nepal). In support of USACE-POD and the Nepal Civil Aviation Authority (CAAN), USACE completed a draft earthquake emergency response plan for Tribhuvan International Airport (TIA) in Kathmandu, Nepal. The plan, which was prepared by a team of experts from USACE, the Federal Aviation Administration and the University of British Columbia, included earthquake emergency procedures for the airport, an emergency land use operations map, surface liquefaction potential map, and rapid runway repair procedures. The draft emergency response plan also included recommendations to the Nepal Civil Aviation Authority on how the airfield can regain operations as soon as possible after an earthquake occurs.
- HEC-RAS Workshop for Mekong River Commission. CEIWR-HEC staff participated in an HEC-RAS (River Analysis System) training workshop at the office of the Mekong River Commission Secretariat in Phnom Penh, Cambodia. Funding for the workshop management and instructors was provided by the U.S. Pacific Command. Management of the workshop was handled by the USACE POD. Funding for the workshop participants was provided by the Hydropower Initiative office of the Mekong River Commission. Of the 33 participants in attendance at the workshop, there were four participants each from Cambodia, Laos, Thailand and Vietnam. The remaining participants were from the Secretariat office of the Mekong River Commission. The workshop was designed to provide hydraulic engineers and modeling practitioners with skills using HEC-RAS Software for Steady Flow, Unsteady Flow, and Dam Failure Analysis. The skills shared and learned during the workshop will allow civilian personnel to use these skills in modeling the Mekong River and tributaries within their respective areas of responsibility. The workshop consisted of lectures and hands-on practical HEC-RAS modeling exercises. The initial workshop exercise incorporated actual geometric data from a portion of the Mekong River.
- Pacific Resilience Disaster Response Exercise and Exchange 2012. In support of USACE-POD, U.S. Army Pacific (USARPAC) and the Bangladesh Armed Forces Division, a member of the staff of the Institute served as a lead developer and planner for the third annual Pacific Resilience Disaster Response Exercise and Exchange (DREE), which was held in September 2012 in Dhaka, Bangladesh. The event focused on earthquake preparedness and response, and featured both a Table-Top Exercise and a Field Training Exercise. Both exercises were designed to validate the Government of Bangladesh's Standing Order on Disasters, examine medical response, urban search and rescue capability, and validate the processes for receiving and disseminating foreign humanitarian assistance. The field training exercise was the first of its kind between USARPAC and the Bangladesh Armed Forces Division. During the DREE more than 180 people, representing more than 70 military and civilian organizations participated in the two-day table top exercise, analyzing and planning how to deal with various scenarios that may occur in the wake of a major disaster. Following the table top exercise, over 1,250 people participated in a city-wide field training exercise, reacting to real world scenarios ranging from search and rescue to evacuation of casualties to local hospitals. The Pacific Resilience DREE also facilitated the U.S. Embassy to exercise its Emergency Action Plan, and the USAID Office of Foreign Disaster Assistance and Contingency Command Post Humanitarian Assistance Service Team to coordinate need assessments for priority mission assignments in Dhaka.
- Asia-Pacific Resilience and Sustainability Workshop. In support of USACE-POD and USPACOM, Institute staff facilitated and led various sessions of the Asia-Pacific Resilience and Sustainability Workshop, held in August 2012 in Honolulu, HI. A member of the staff of USACE-POD participated in the meetings of the Asia-Pacific Resilience and Sustainability Network council held during the workshop, and USACE has been officially added as

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a member of the Asia Pacific Disaster Risk Reduction and Resilience Network (APDR3). The conference included technical sessions on education, public health, and development and identified opportunities to collaborate in these focus areas with the nations of Japan, Vietnam, the Philippines, and Indonesia.

The objectives of the workshop included:

- Determining the roles and functions of government, financial donors, academia, members of civil society, regional institutional/key stakeholders, and the private sector in order to develop an understanding of how to implement “Whole society” approaches to resilience and sustainability;
  - Developing a framework for collaboration among educational institutions in Japan, Vietnam, the Philippines, Indonesia and the United States that enables degree granting institutions the ability to generate regional capacity. One such model is the Asia-Pacific Institute for Resilience and Sustainability at the University of Hawaii;
  - Defining a key set of principles for collaboration amongst applied research laboratories which focus on resilience and sustainability; and
  - Identifying an institutional and operational model that aligns social development with capacity building and resiliency across the Asia-Pacific region.
- Pacific Environmental Security Forum 2013. IWR staff supported USPACOM J4 (Logistics, Engineering and Security Assistance) in the execution of the Pacific Environmental Security Forum Planning Conference held in Sydney, Australia in August 2012. The planning conference was hosted by the Australian Department of Defense and discussed four critical environmental security themes in the region including environmental sustainability, disaster management, water security, and emerging technologies in climate change adaptation. The Pacific Environmental Security Forum 2013 is scheduled to take place in Sydney, Australia on in April 2013 and will include representatives from 18 Asian and Pacific Rim nations.

In support of the HQUSACE Civil Military Emergency Preparedness (CMEP) program and under the auspices of the U.S. Africa Command (AFRICOM), IWR staff was invited to participate in two regional environmental and water security workshops in Africa, as discussed below. Both of these engagements were sponsored by the Defense Environmental International Cooperation (DEIC) program within AFRICOM.

- South African Environmental Security (EnSec) Symposium. This symposium was held in August 2012 in Windhoek, Namibia. IWR staff gave a presentation on the USACE CMEP program as an example of an approach that might assist nations in southern Africa address disaster risk management and water resource development issues. A second presentation focused on the physical, economic, social and health effects of extreme weather events and increasing climate variability. More than 45 participants from Namibia, South Africa, Lesotho, Swaziland, Botswana, Malawi, and Zambia Ministries of Defense attended, as well as staff from the United Nations and various non-governmental organizations.
- Central Africa Environmental Security (EnSec) Symposium. Similarly, IWR staff participated in this symposium held in September 2012 in Libreville, Gabon. IWR staff gave a presentation on the USACE CMEP methodology as an approach to successfully exchange information with other disaster managers as part of building the capacity to manage all hazards disasters. A second presentation focused on the effects of extreme weather events and more variable climate both as disasters themselves and as phenomena that can complicate the response to other types of disasters. Symposium attendees included representatives from Gabon, Angola, the Congo Brazzaville, the Congo Kinshasa, and the United Nations.

During FY 2012 members of the Institute were engaged in other strategic initiatives within the context of the International Capacity Development Program, as discussed below.

- In support of the geographic Combat Commands, a member of the Institute worked with the USACE Construction Engineering Research Laboratory, the Engineering Research and Development Center, the Office of the Assistant Secretary of the Army (Installation, Energy and Environment), and the Office of the Secretary of Defense (Policy) to develop an approach to include the effects of more extreme weather and increased climate variability on the disaster planning process of partner nations. “Enhancing Disaster Preparedness with Multiple Stressor Scenarios” will help strengthen the planning process in nations and within regions, raising the threshold at which international assistance will be required in the form of Humanitarian Assistance and Disaster Response. A whole

of society approach is being taken, recognizing that more resilient, sustainable, and adaptive approaches to the full cycle of disaster management require all sectors of government and of society. The project further recognizes the U.S. strategic interest in more robust governments less likely to be pushed into failing or failed state status as the result of large and/or complex disasters.

- IWR staff worked with USACE-POD and other individuals to develop a Strategic Framework for the Institute's support to USACE-POD, USARPAC, PACOM, and the nations of the Asia-Pacific region. The intent of the framework is to develop an ongoing approach to integrate water resource management and development where needs are identified in the Asia-Pacific region, and the expertise of USACE-POD, can be supplemented by IWR staff, drawing on a broad range of water management related expertise.
- In support of the 2012 Environmental Security in Africa Dialogue meeting held at the Army War College in July 2012, members of the Institute prepared a strategy paper focused on water and its implications for stability and security within the African continent. The Environmental Security in Africa Dialogue meeting was convened by the U.S. Department of Defense, in cooperation with the Department of State, the U.S. Agency for International Development (USAID) and the Africa Center for Strategic Studies (part of the National Defense University). The two-day dialogue particularly focused on water and its implications for stability and security within the continent. On the first day, presentations served to set the context in which the discussions would take place and frame the issues that the dialogue had been convened to deal with. These included the physical location and access of water, issues of governance, the building of infrastructure capacity, the increasingly urban context of Africa, and transnational agreements over the distribution of water itself. These issues were carried into the second day, when breakout sessions were held, allowing the attendees to bring their expertise to bear against the issues themselves.

### **World Water Council and the 6<sup>th</sup> World Water Forum**

The World Water Council (WWC) is an international association of over 400 public and private organizations involved in water-related activities. Established in 1996, the WWC includes the principal United Nations water agencies and international banks as its founding organizations. The main activity of the WWC is hosting the [World Water Forum](#), which is held every three years. As the main international event on water, it seeks to enable multi-stakeholder participation and dialogue to influence water policy making on a global scale, thus assuring better living standards for people all over the world and a more responsible social behavior towards water issues in line with the pursuit of sustainable development.

During FY 2012, Dr. Delli Priscoli was elected to the Board of Governors of the World Water Council and serves as a representative on the WWC Executive Bureau. Mr. Steven L. Stockton, HQUSACE Director of Civil Works, who served on the WWC Board of Governors from 2006 to 2011, now serves as alternate member of the Board of Governors.

Dr. Delli Priscoli also serves as the Editor in Chief of the peer reviewed [Water Policy](#), the official journal of the World Water Council.

Other ongoing WWC activities involve close liaison with the U.S. State Department, in particular, the Bureau of Near Eastern Affairs and the Bureau of Oceans and International Environmental and Scientific Affairs, on the dialogues and content of the WWF, so as to assist U.S. interests.

During FY 2012, IWR's engagement with the WWC included participating in organizational and thematic meetings leading up to the 6<sup>th</sup> World Water Forum (WWF6), which took place in March 2012 in Marseilles, France. More than 173 countries were represented at WWF6.

The theme of WWF6 was "*Time for Solutions*", and the event focused on identifying and developing solutions to water issues and creating a worldwide platform for solutions. A website, [www.solutionsforwater.org](http://www.solutionsforwater.org), hosts the solutions identified.

WWF6 included 10 High Level Panels and 3 Special Focus Sessions, which brought together dozens of ministers, heads of non-governmental organizations, Presidents of research institutes, and eminent scholars to discuss some of the

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most complex challenges water resources managers today. Among the issues discussed at some of the High Level Panels were:

- Global Water Governance;
- Water and Food Security;
- The Future of World's Water Beyond 2025;
- Water Infrastructure for Development in Large Countries;
- Water Scarcity in Arid Areas;
- Water and Disasters; and
- Water, Food and Energy Nexus.

Among the Special Focus Sessions was a discussion of "Water In the American West: 150 Years of Adaptive Strategies", which included a panel of senior U.S. Government officials including the Honorable Ms. Jo-Ellen Darcy, Assistant Secretary of the Army (Civil Works), and which was moderated by Dr Jerry Delli Priscoli of the Institute. The panel discussion examined the U.S. approach to water resources development and the evolution of 150 years of solutions to using water in arid areas to generate socio/economic growth.

Dr. Delli Priscoli moderated another panel on the role of multi-purpose water infrastructure in socio-economic development which included water ministers from China and Brazil, and representatives from the USACE, the World Bank, and non-governmental organizations.

The staff of the International Center for Integrated Water Resources Management, including its Director, Mr. Robert A. Pietrowsky; its Associate Director, Mr. William Logan; and its Technical Director, Dr. Eugene Stakhiv were heavily engaged in the activities at WWF6. In addition to organizing and leading technical sessions on a diverse array of subjects including integrated water resources management, disaster risk reduction, balancing multiple uses of water as part of an integrated water resources strategy, and coping with uncertainty related to climate and global change as part of an integrated water resources management strategy, ICIWaRM staff participated in the following keynote events.

- ICIWaRM Director, Mr. Robert A. Pietrowsky represented USACE and ICIWaRM at an event marking the official release of the [4<sup>th</sup> edition of World Water Development Report](#) (WWDR4). USACE and ICIWaRM staff and partners provided technical input to the WWDR4.
- ICIWaRM Director, Mr. Robert A. Pietrowsky represented USACE and ICIWaRM at the inaugural meeting of the core working group for the preparation of the 5<sup>th</sup> edition of the World Water Development Report.
- Dr. Eugene Stakhiv met with the UNESCO Integrated River Basin Management (IRBM) Steering Committee to discuss two reports on IRBM that ICIWaRM is completing as part of the UNESCO series on IRBM.
- ICIWaRM staff held a technical meeting with the Japanese Ministry of Land, Infrastructure and Transportation and the International Center for Water Hazards and Risk Management (ICHARM).
- ICIWaRM staff held a meeting with its other partner entities in attendance at the WWF6, including Colorado State University, Florida International University, Oregon State University, the American Water Resources Association, and the American Society of Civil Engineers (Environment and Water Resources Institute).

PIANC (the World Association for Waterborne Transport Infrastructure) was also engaged at WWF6. IWR Director Mr. Robert A. Pietrowsky and PIANC USA Secretary Anne Cann participated in a Preparatory Workshop and a WWF side event "Inland Waterway Transport in Times of Globalization". These activities, along with a tour of the Port of Marseille, were organized by the Central Commission for the Navigation of the Rhine (CCNR). The purpose of the sessions was to bring together stakeholders in river navigation from around the world to discuss common issues and problems and create a global framework and network to pool knowledge and experience, thus advancing inland waterways as a sustainable form of transport.

PIANC also held a side event "Inland Waterways—a Sustainable Transport Solution" at which the Honorable Jo-Ellen Darcy presented an introduction to the U.S. inland waterway system and made a compelling case that, compared to other modes of transport, waterways are more sustainable economically, environmentally and socially.

### **International Center for Integrated Water Resources Management (ICIWaRM) and UNESCO Related Activities**

#### Background and Mission

As part of a whole-of-government approach, the Institute supports the U.S. Department of State, Bureau of International Organization Affairs and U.S. Mission to UNESCO in several broad areas.

Much of the activity of both governmental and non-governmental entities is organized by the [U.S. National Commission for UNESCO \(USNC-UNESCO\)](#), a Federal Advisory Committee to the Department of State, and the [U.S. National Committee for the International Hydrological Program \(USNC-IHP\)](#), located within the USNC-UNESCO. The [International Hydrological Program \(IHP\)](#) is UNESCO's international scientific cooperative program in water research, water resources management, education, and capacity-building. The USNC-UNESCO established the USNC-IHP in 2006 to support UNESCO's IHP activities.

The [International Center for Integrated Water Resources Management \(ICIWaRM\)](#) was established by the Institute in 2007 in collaboration with U.S. institutions and organizations sharing an interest in the advancement of the science and practice of integrated water resources management (IWRM) around the globe. It was formalized as a UNESCO Category 2 Water Center in October 2009 with the [signing](#) of an agreement between the U.S. Government and UNESCO. The designation greatly facilitates ICIWaRM's ability to engage the UNESCO water family, serving as a focal point for increasing U.S. contributions to IHP.

The mission of ICIWaRM is to advance the science and practice of integrated water resources management to address water security and other water related challenges, including disaster risk management, by regional and global action, through new knowledge, innovative technologies, collaborative interdisciplinary scientific research, networking training and capacity building,

The Center's expertise in water security and IWRM is to be applied via partnerships with USACE MSCs and DOD Combatant Commands (COCOMs), the U.S. Department of State, the United Nations, and other U.S. and international institutions and non-governmental organizations to address water and natural resources planning, water policy and governance, water management, trans-boundary water conflict mitigation, and other water related challenges within the United States and around the world.

The Center also provides assistance to HQUSACE, the Department of the Army, and the Department of Defense, working in partnership with USACE MSCs and DOD COCOMs, thus strengthening theater security cooperation by facilitating civilian and military collaborations, emphasizing multi-national force capacity development on the life cycle planning of the humanitarian response and consequence management across all forms of extreme water events and other natural and technological disasters.

As a center working in partnership with UNESCO, ICIWaRM serves as a U.S. Government expertise center for technology transfer, integrating new ideas, science and technology developed both in the U.S. and through the various IHP programs and initiatives, with current "best management practices" for IWRM in order to achieve the objectives associated with the 7th phase of the IHP program (2008-2013), the U.N. Millennium Development Goals and the USACE Campaign Plan, particularly as related to water resources systems, collaborative approaches and environmental sustainability, consistent with U.S. Government goals for international water resources.

ICIWaRM's activities are led and, in part, conducted by IWR's main office in Alexandria, Virginia, along with IWR's Hydrologic Engineering Center in Davis, California. However, much of the Center's work is accomplished by its [partners](#), which include U.S. academic institutions, non-governmental organizations (NGOs), other U.S. Government federal agencies, and international organizations. Its initial emphasis is on Africa, Latin America and the Caribbean.

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### Partnerships with Other UNESCO Centers

In support of its activities, the USACE and/or ICIWaRM have eight Memoranda of Understanding (MOU) with UNESCO or various program offices and selected water centers. These include: an umbrella agreement with [UNESCO](#) signed in 2002; an MOU with [UNESCO-IHE](#), Institute for Water Education, located in Delft, The Netherlands, also signed in 2002; an MOU with the [Water Center for Arid and Semi-Arid Zones in Latin America and the Caribbean](#) (CAZALAC), located in La Serena, Chile, signed in 2006; an MOU with the [International Center for Water Hazard and Risk Management](#) (ICHARM), located in Tsukuba, Japan, signed in 2006; an MOU with the [Water Center for the Humid Tropics of Latin American and the Caribbean](#) (CATHALAC), located in Ciudad de Panama, signed in 2007; an MOU with [UNESCO-International Hydrologic Programme](#) (IHP), signed in 2009 (which established the International Center for Integrated Water Resources Management at IWR); and an MOU with the Center for the Sustainable Management of Water Resources in the Caribbean Island States (CEHICA) which is hosted by the [Instituto Nacional de Recursos Hidraulicos](#), located in Santo Domingo, the Dominican Republic, signed in June 2011.

In June 2012, during the biennial meeting of the IHP's Intergovernmental Council, Mr. Robert A. Pietrowsky, Director of the Institute and Director of ICIWaRM, and Mr. W. Ian Ball, Dean of the [Graduate School of Natural Resources Law, Policy and Management at the University of Dundee](#), located in Dundee, Scotland, signed the most recent MOU for collaboration on water resources issues. The signing took place at UNESCO Headquarters in Paris, France. The agreement will facilitate collaboration between ICIWaRM and the University of Dundee's UNESCO [Hydrology for the Environment, Life and Policy \(HELP\) Centre for Water Law, Policy and Science](#).

### Leadership in UNESCO Sponsored Activities

During FY 2012, Mr. Robert A. Pietrowsky, Director of the Institute, continued his service as a member of the Governing Board of UNESCO-IHE. Mr. Pietrowsky also served as one of six permanent Federal agency members of the U.S. National Committee for the International Hydrological Programme, and has been a member of the U.S. Government delegation to UNESCO at the IHP Intergovernmental Council (IGC) meetings in 2004, 2006, 2008, 2010 and 2012.

During FY 2012, Dr. Eugene Stakhiv continued to serve as chairperson of the Advisory Board of ICHARM as well as serving on the Steering Committee of the Global Water Partnership (GWP).

### Projects in support of UNESCO sponsored activities

#### UNESCO's "IWRM Guidelines at the River Basin Level" Series

During FY 2012, Dr. Eugene Stakhiv continued to co-chair a UNESCO Sponsored Steering Committee for the UNESCO publication series "[IWRM Guidelines at a River Basin Level](#)." The translation of the IWRM Guideline series into Spanish was completed in November 2011. The translation of Part 1 (Principles), Part 2.1 (Guidelines for IWRM Coordination), Part 2.2 (Flood Management), and Part 2.3 (Invitation to IWRM for Irrigation Practitioners) of the series was a collaborative effort of ICIWaRM, the Inter-American Development Bank and UNESCO's Regional Office of Science and Technology for Latin America and the Caribbean.

#### Development of a New Tool for Regional Frequency Analysis (ICI-RAFT)

During FY 2012, the staff continued development of the ICIWARM-Regional Analysis of Frequency Tool (ICI-RAFT), a tool for use in estimating rainfall frequency. ICI-RAFT is the result of work performed in order to aid developing countries in water resource management in terms of climate change adaptation with a focus on extreme events and to contribute to the development of non-proprietary analytical tools. It was developed with software that allows the user to estimate the intensity of a rainfall event of a particular frequency for a range of months each year.

ICI-RAFT performs Regional Frequency Analysis (RFA) of rainfall data using the method of L-moments. RFA is based on the assumption that if the frequencies of rainfall events are similar at several nearby locations within a "region", a statistical analysis of all observations at all sites within the "region" will result in a more accurate frequency distribution at each location compared to limiting the analysis to the individual at-site data. RFA is preferred over using only individual sites due to the fact that it helps to alleviate the issue of insufficient rainfall data

at a particular site. Insufficient data does not allow the user to make accurate estimates of rainfall intensity at that location; this is especially true in arid and semi-arid regions where rain gauges sites are few and far between and where the measurements taken at those sites where rain gauges do exist may contain numerous and/or long periods of missing data.

An important feature that has been added to ICI-RAFT allows the user to analyze and compare rainfall data measured during years when a particular global climate index, such as the Southern Oscillation Index (SOI) or the Madden-Julian Oscillation (MJO), is in a positive phase versus a negative phase. Such an analysis will allow a user to determine the impact of climate variability on a region and possibly be able to predict whether a particular region will have greater- or less-than average rainfall during a particular month or range of months.

#### Understanding Rising Lake Levels in the Dominican Republic

In September 2011, Dr. Will Logan led a four-person, interagency team in the Dominican Republic to provide direct support to the [Instituto Nacional de Recursos Hidraulicos](#) (CEHICA) and its host organization, INDRHI (National Institute for Hydraulic Resources), in investigating rising lake levels at Lake Enriquillo. The rising lake levels threaten agriculture, trade, transportation and towns. The team provided INDRHI with guidance as to likely contributing causes of the lake-level rise.

In FY 2012 ICIWaRM submitted a written report on the September 2011 mission to assist the Water Ministry and embedded UNESCO category 2 center CEHICA in investigating rising lake levels at Lake Enriquillo in the western Dominican Republic, and in building local capacity to adapt to and mitigate the rise.

#### Participating in the Rwanda Integrated Water Security Program (RIWSP)

During FY 2012, ICIWaRM staff began work with the Rwanda Integrated Water Security Program — a USAID-funded consortium led by Florida International University and including UNESCO's Category 1 Water Center IHE. In March 2012, Dr. Will Logan gave a presentation at Rwanda's World Water Day event and met with various Rwandan government and USAID officials to initiate contact. Subsequently, ICIWaRM staff spent three weeks in Rwanda assisting the Deputy Minister for Water in incorporating water management issues into a broader Rwandan government planning document, and began work to design a framework for decentralization of water management in Rwanda as part of the national effort to apply integrated water resources management principles at all levels of government.

#### Water Evaluation and Planning (WEAP) System Workshop in Amman, Jordan

During FY 2012, ICIWaRM helped fund a training course for the Ministry of Water and Irrigation in the Hashemite Kingdom of Jordan to use the Water Evaluation and Planning (WEAP) System. The course took place in Amman and was designed to help participants to assess the current water supply and demand situation in Jordan and to evaluate various policy and management interventions. The course was given by the Stockholm Environment Institute, in collaboration with UNESCO-IHP.

#### Contributions to the World Water Assessment Program (WWAP)

During FY 2012, IWR continued to provide extensive support to the [World Water Assessment Program](#) (WWAP), the flagship program of UN-Water. Hosted and led by UNESCO, WWAP coordinates the work of 28 UN-Water members and partners in the World Water Development Report (WWDR). This triennial UN Water report provides an authoritative picture of the state, use and management of the world's freshwater resources. IWR contributed to the 4th (2012) Edition of the WWDR, "Managing Water under Uncertainty and Risk", in multiple ways. These included participation in the initial core group for the report, performing multiple reviews during the report preparation process, and continued development of consistent indicator sets for "Total Actual Renewable Water Resources", or TARWR.

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IWR facilitated the work of Dr. Gerald Galloway of the University of Maryland, who served as co-chair of the WWAP Expert Group on Policy Relevance, and Dr. Charles Vorosmarty of the City College of New York, whose work focused on developing consistent sets of indicators for actual renewable water resources.

### Developing Applications of Satellite Based Precipitation Estimates in Africa

During FY 2012, ICIWaRM developed its Africa Water Initiative. This is an attempt to coordinate and integrate a number of related projects in Africa, primarily led either by ICIWaRM or other US-based organizations in the public or private sector. Africa Water Initiative activities are discussed below.

- Through a continuing collaboration between the University of Arizona (a core academic partner of ICIWaRM) and the International Senegal Basin Authority (Organisation pour la Mise en Valeur du Fleuve Senegal), ICIWaRM is continuing the development of a near real-time streamflow forecasting system using satellite precipitation measurements in the International Senegal River Basin.
- A National Science Foundation-funded Planning Visit proposal to establish a new research collaboration between The University of Arizona and [AGRHYMET](#) (a regional center in Niamey, Niger), to improve the spatio-temporal characterization of precipitation in the African Monsoon Region. The primary objectives of the AGRHYMET Regional Centre are to contribute to achieving food security and increased agricultural production in the CILSS member States and to improve natural resource management in the Sahelian region by providing training and information to development stakeholders and partners in agroecology taken as a whole (agroclimatology, hydrology, crop protection). AGRHYMET is a regional institute specialized in the science and techniques applied to agricultural development, rural development and natural resource management.
- An Assessment of Satellite Precipitation Products and their use in Hydrologic Applications (IWR and University of Arizona);
- Development of an [Africa Drought Monitor](#) (Princeton University and UNESCO-IHP);
- A four-year grant from [SERVIR-Africa](#) to assist in developing various products related to water and climate (University of Arizona);
- A near real-time satellite precipitation product [PERSIANN](#) for application to floods and droughts (University of California, Irvine). This is one of the major tools developed and highlighted with the assistance of the semi-arid regions program ICIWaRM leads for UNESCO G-WADI ([www.g-wadi.org](http://www.g-wadi.org)).

The regional frequency analysis tool ICI-RAFT, discussed earlier, and ICIWaRM's work in support of the Rwanda Integrated Water Security Program are also being integrated into the Africa Water Initiative.

### Support of UNESCO's North America HELP Basin Network

UNESCO's Hydrology for the Environment, Life and Policy (HELP) program has various participating basins in North America. Broadly, ICIWaRM sponsored work on the publication "*Science and Practice of Integrated River Basin Management: Lessons from North and Central American UNESCO-HELP Basins*" (in press).

More specifically, IWR has supported IWRM and climate change adaptation in the Iowa-Cedar River Basin, which has considerable involvement of USACE on several fronts. One is a pilot project in the watershed through the Responses to Climate Change program to answer the question, "How do we incorporate climate change considerations into reservoir operating policies that will be robust and adaptive to potential climate changes?" Another related pilot project involves IWR's Conflict Resolution and Public Participation Center of Expertise and has included a series of five stakeholder dialogue workshops to increase understanding of, and give definition to, climate change and/or land-use related problems, adaptation strategies, trade-offs and uncertainties, and planning for the future.

IWR also funded participation of a representative of the Iowa-Cedar River Basin group at the November 2011 [UNESCO HELP International Symposium "Building Knowledge Bridges for a Sustainable Water Future"](#).

Water Resources Adaptation Options to Climate Change Uncertainty in Ukraine

During FY 2012, ICIWaRM provided continued in-kind support to the IWR/Ukrainian Academy of Sciences project “Formulating and Evaluating Water Resources Adaptation Options to Climate Change Uncertainty in the Carpathian Region”. The project receives funding from the Civilian Research Defense Fund (CRDF). In particular, testing and modification of the University of Washington’s distributed hydrological model DHSVM, for hindcasting 1960-1990 floods in Carpathian watersheds and then for future flood estimations, has been completed. As part of the collaboration, IWR hosted a delegation of Ukrainian scientists in December 2011.

Support of Technical Secretariat for UNESCO G-WADI

During FY 2012, ICIWaRM continued to serve as the technical secretariat for its global network [Water and Development Information for Arid Lands](#) or G-WADI. The program aims to strengthen global capacity to manage water resources in arid and semi-arid regions by building an effective global community. It integrates contributions from networks, organizations, individuals and UNESCO Category 2 centers. The G-WADI network features knowledge bases and products such as near real-time global satellite estimates of precipitation. As Technical Secretariat, ICIWaRM staff attends all G-WADI related meetings, including a Regional Training Workshop on Drought Monitoring, which took place in early 2012, at the offices of AGRHYMET in Niamey, Niger.

ICIWaRM Support of Lower Mekong River Basin Scenario Planning Workshop

In support of the U.S. Government’s [Lower Mekong Initiative](#), USACE, through the POD, was requested by the U.S. Agency for International Development (USAID) Regional Development Mission for Asia (RDMA) to support the capacity of the Mekong River Commission (MRC) for Strategic Scenario Planning in the Lower Mekong Basin.

Through its partnership with the Institute, USACE-POD requested IWR technical assistance in developing a Regional Strategic Scenario Planning workshop. Dr. Guillermo Mendoza of ICIWaRM developed a one week workshop on strategic scenario planning to be conducted in Vientiane, Laos followed by four days of field visits in Laos, Vietnam, Cambodia, and Thailand. The workshop was held in June 2012. More than fifty participants from the four Lower Mekong countries (Laos, Vietnam, Cambodia, and Thailand) attended, representing National Mekong Committees, academia, other government agencies, and the MRC secretariat.

The objectives of the engagement with the Mekong River Commission are: (1) to build the awareness and capacity of MRC staff and Lower Mekong Basin decision makers, especially those involved in overseeing the update and assessment of the basin development scenarios and the subsequent updating of the Integrated Water Resource Management-based Basin Development Strategy; and (2) to identify key sustainability issues to balance the predominantly economic emphasis in analyzing related risks and uncertainties. Potential issues affecting the Lower Mekong River region include biodiversity conservation; valuation of ecosystem services including fisheries, forests and wetlands; food security; and climate change.

Outcomes of the workshop and subsequent meetings are aimed at pilot scenario formulation and assessment approaches, building capacity for probabilistic risk assessment to internalize the cost of extreme events, strengthening techniques for public consultations and conflict management; support of the implementation of the 2012-2015 Basin Action Plan, Regional Action Plan and National Indicative Plans; and to promote collaborative technical capacity enhancement through the LMI Mekong-Mississippi River Commission engagement.

Support to Thailand National Mekong Commission

In September 2012, Dr. Guillermo Mendoza participated in a scoping mission on a sub-watershed of the Mekong River in Northeast Thailand. IWR/ICIWaRM is partnering with USAID, the Mekong River Commission secretariat, the Thailand National Mekong Commission and River Basin Council to initiate a pilot IWRM initiative meant to develop local capacity in shared vision planning focusing on the Nam Kam river basin in northeast Thailand. Dr. Mendoza visited Bangkok and Sakon Nakhon where he met with representatives from the Royal Irrigation District, the energy generation authority of Thailand, local elected leaders, the fishery department and university leaders to discuss the structure and opportunities for an initial workshop to be conducted in November 2012. The scoping

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mission was funded by USACE Headquarters through its International and Interagency Service program, and the workshop will be funded by USAID. Mr. James Ligh of USACE-POD has led the development of this strategic initiative.

### UN Secretary General's Advisory Board on Water and Sanitation/High Level Expert Panel on Water and Disaster

Given the impact of climate change, action is needed to prevent, prepare for, and manage water-related disasters. The UN Secretary General's Advisory Board on Water and Sanitation/High Level Expert Panel on Water and Disaster (HLEP) is composed of UN organizations, governments, non-governmental organizations, and academicians who are examining existing recommendations to determine ways to improve the probability of their implementation. One of the key objectives of the Expert Panel is to increase the level of awareness and preparedness to reduce loss of life and livelihoods by water-related disasters. During 2012, ICIWaRM staff members continued to collaborate on implementation of the [UN Secretary General's Advisory Board on Water and Sanitation/High-Level Expert Panel on Water and Disaster](#) (UNSGAB/HLEP) action plan.

### **Support to the Government of Japan and the World Bank in Response to the Great East Japan Earthquake and Tsunami**

IWR provided timely support to USACE Civil Works in its role as international advisor to the Government of Japan and the World Bank in documenting lessons learned from the Great East Japan Earthquake and tsunami. IWR reviewed and commented on a World Bank publication entitled "[The Great East Japan Earthquake: Learning from Mega Disasters.](#)" "Learning from Mega Disasters" is a knowledge-sharing project sponsored by the [Government of Japan](#) and the [World Bank](#). The project is collecting and analyzing information, data, and evaluations performed by academic and research institutions, nongovernmental organizations, government agencies, and the private sector. The objective is to share Japan's knowledge on [disaster risk management](#) (DRM) and post-disaster reconstruction with countries vulnerable to disasters. It is hoped that these findings will encourage countries to mainstream DRM in their development policies and planning.

### **Global Water Partnership**

Another organization with which the Institute has a signed MOU is the [Global Water Partnership](#) (GWP), founded in 1996 by the World Bank, the United Nations Development Programme, and the Swedish International Development Cooperation Agency (MOU signed October 2007). The mission of the GWP is to support the sustainable development and management of water resources. GWP has over 2,600 partner organizations in 153 countries, including government agencies, public institutions, private companies, professional organizations, multilateral development agencies and others concerned with water issues. ICIWaRM staff serves on the GWP Steering Committee.

In March 2012, Dr. Ania Grobicki, Executive Secretary of the GWP, visited the Institute to discuss advancing the partnership. While at IWR, Dr. Grobicki gave a lecture on the mission of the GWP and its current programs underway in the world's developing nations.

### **U.S. Water Partnership**

In March 2012, at an event held in conjunction with World Water Day, the Honorable Hillary Clinton, U.S. Secretary of State announced the establishment of the [U.S. Water Partnership](#) (USWP), a public-private partnership aimed at leveraging the vast capabilities of U.S. expertise, knowledge and resources in the field of water resources and applying these capabilities to water challenges around the globe, especially in the developing world. In her [remarks](#), Secretary Clinton recognized the talents and capabilities of the USACE and the International Center for Integrated Water Resources Management (ICIWaRM).

With its focus on water resources issues in the developing world, the USWP is a natural partner of the Institute's international programs. Beginning soon after the formation of the USWP, IWR was the first government institution to contribute in-kind services. The Institute provided a senior expert on a part-time basis to assist and provide strategic advice to USWP as it was developing its plans, strategies and programs. In particular, IWR/ICIWaRM assisted the USWP Secretariat in developing key start-up operational, thematic and content strategies, in particular

regarding IWRM. It also provided advice and assistance on developing USWP's web portal and on generating "signature initiatives".

### **Alliance for Global Water Adaptation**

Led by Conservation International, the World Bank, the Inter-American Development Bank, and other partners including U.S. Government agencies, non-governmental organizations, and the private sector, the [Alliance for Global Water Adaptation](#) (AGWA) seeks to advance a practical approach to decision making under uncertainty for water resources management. ICIWaRM leads the hydrology and climate working group and was also named one of the leads on the framework design for other three groups: engineering and ecology; governance; and economics and finance.

Dr. Guillermo Mendoza delivered a keynote address at the [2012 Hydro-Predict Conference](#) held in Vienna, Austria. The theme of the conference was "Predictions for Hydrology, Ecology, and Water Resources Management: Water Resources and Changing Global Environment." The subject of Dr. Mendoza's presentation was "Guidance Model for Resilient Water Resources Planning and Design." Dr. Mendoza presented an evaluation framework with case study examples on methods for technical collaborations with other organizations using a risk based and bottom-up approach for watershed planning and design. The presentation included a discussion of practical working tools that are useful for water-related projects adapting to climate change at different stages, also taking into account the information gaps and institutional/governance challenges of many developing countries. Participants expressed enthusiasm in the USACE approach which not only encompasses the hydrological aspects of project planning, but also the full suite of engineering, economic, and financial considerations consistent with an integrated water resources management (IWRM) framework.

### **Dutch Rijkswaterstaat Exchange**

During FY 2012, the USACE and Dutch Rijkswaterstaat (RWS) cooperative partnership continued to thrive. The two organizations are working in close cooperation and in alignment with the [Memorandum of Agreement](#) that was signed in May 2004. In a broad sense, this partnership aims to promote and facilitate collaborative efforts that benefit the range of water management activities for which both organizations are responsible. The USACE and RWS cooperate in applied research, policy analysis, model development and peer reviews.

During FY 2012, the Dutch program management of the MOA transitioned from Marco Hoffman to Hans Pietersen with Dr. Paul Bourget continuing in that role for USACE. The transition was smooth with areas of interest realigned and redefined in response to changing organizational needs and emerging emphasis areas.

The Executive Steering Committee (ESC) met in May 2012 in The Hague. The purpose of this annual meeting is to bring senior representatives from both organizations together to discuss progress and agree upon the future direction of the MOA. Mr. Jan Hendrick Dronkers, RWS Director General, hosted the meeting with The Honorable Jo-Ellen Darcy, Assistant Secretary of the Army (Civil Works) and Major General Michael J. Walsh, USACE Deputy Commanding General for Civil and Emergency Operations. Several staff members from both organizations were also in attendance. Primary areas of discussion related to a proposed realignment of MOA activities, the Levee Safety Program, and the Dutch "Room for the River" program.

At the request of RWS, Ms Darcy and MG Walsh conducted a "Master Class" at Delft University following the ESC meeting. The class is held periodically at the university as a means for students and professionals to interact with high-level officials. Ms. Darcy and MG Walsh delivered talks focused on their recent experiences, which generated a great deal of discussion. The Dutch were very pleased with the results.

Based on feedback from the ESC, the Program Managers drafted the FY 2013 Action Plan to focus on three primary areas of interest during the upcoming year: safety; institutional; and water management. The safety grouping would encompass levee safety, multi-lateral approaches to flood risk management, geo-risk management, the safety-chain (seamless approaches to hazard and disaster management), and the I-Storm network. The institutional grouping would focus primarily on life-cycle project management and asset management. And the water management grouping would cover navigation and integrated water resources management.

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One of the most successful areas of exchange in the agreement is the Levee Safety Program. The two organizations completed their second technical staff exchange during this period with Mr. Jason Needham, CEIWR-HEC, detailed to The Hague for an extended period in FY 2012. The primary role of this position is to act as a technical liaison between RWS and USACE mostly with the modeling initiatives underway in both organizations. Several workshops were conducted, focused on Tolerable Risk Guidelines, the Levee Safety Tool, and Levee Information Management Systems. RWS also conducted a review of USACE's report on Vegetation on Levees. Regular partnership meetings were held in October 2011 and May 2012, with each focused on a particular item and ending with a Strength, Weaknesses, Opportunities, and Threats (SWOT) analysis. Considerable effort was also made in applying the Dutch risk assessment tools (FLORIS) to the USACE levee system.

In June 2012, a Dutch delegation visited the Red River of the North where they were exposed to experiences in that particular basin as well as the Mississippi and Missouri basins. The delegation then traveled to Sacramento, California where they focused on the Sacramento/San Joaquin experience. While visiting the Red River of the North, the delegation actively participated in the 12<sup>th</sup> Annual International Legislators Forum, a panel discussion led by the Red River Basin Commission, and a meeting with a representative from the Mississippi Valley Division. In addition, they toured the region and were exposed to projects that have been underway since the 1997 flood. In California, a round table discussion was held with representatives from a variety of sectors and extensive field trips were conducted. The delegation came away with a heightened appreciation of the U.S. challenges associated with floodplain management, along with the various approaches underway to address them.

Geo-risk management in terms of the MOA largely related to the "Geo-Impuls" project managed by RWS. Geo-Impuls covers a variety of infrastructure, including roads, bridges, tunnels, levees, locks, sluices and confined disposal facilities. These projects are designed to reduce geotechnical failures in the Netherlands by 50% by 2015. In relation to this initiative, a technical meeting on levee seepage and internal erosion was organized between RWS, USACE and Deltares in May 2012, focusing on knowledge exchange. At the ESC, it was proposed that as a structured follow-up the USACE Risk Management Center and RWS would prepare an inventory of Geo-Risk Management methods and tools used in infrastructure projects in the U.S. and the Netherlands building on the Geo-Impuls project. The output will be a guideline of best practices that will be available in September 2014.

In 2011, USACE agreed to join the Storm Surge Barrier group, which is an international community of practice focused on the development, operation and maintenance of large-scale barriers. The name was subsequently changed to [I-Storm](#) in FY 2012. In association with this effort, Ms. Durham-Aquilera, USACE Director of Contingency Operations and Office of Homeland Security, gave a keynote lecture on October 3, 2011 at the 25<sup>th</sup> anniversary celebration of the Eastern Scheldt Storm Surge Barrier. A meeting was also held in May 2012 in New Orleans with representatives from RWS, USACE, the United Kingdom and the Southeast Louisiana Flood Protection Authority on matters related to the Operation and Maintenance of the Hurricane and Storm Damage Risk Reduction System (HSDRRS). USACE also participated in a peer review of the Ramspol Barrier in the Netherlands.

The Dutch are also interested in hearing USACE views on the "vertical integration" of our projects, which is a Dutch term for addressing the policies related to large-scale complex projects. The Dutch would like to participate in an informal meeting between the two organizations to discuss the means by which complex projects are managed within the two organizations – from political decisions that guide them to assigning project teams that direct them. This meeting has been difficult to convene due to schedule conflicts, so it was decided at the ESC to conduct an exploratory meeting via a conference call in FY 2013.

Additionally, the manuscript for "*Bridging the Pond (Key Decisions in Water Management: A Dutch-U.S. Retrospective)*" is still under review, with an anticipated publication date in 2013. The book explores how water management evolved within the two countries over the course of the last two hundred years.

### **Japanese Ministry of Land, Infrastructure, Transport, and Tourism**

USACE participates in an ongoing technical exchange program with the Water and Disaster Management Bureau (formerly the River Bureau) of the Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT). The program is governed by an Implementing Arrangement (IA) under the "*Agreement between the Government of the United States of America and the Government of Japan on Cooperation in Research and Development in Science*

*and Technology*", signed in Toronto, Canada on June 20, 1988, as amended and extended. The IA was signed by the USACE Chief of Engineers at the Third World Water Forum in Kyoto, Japan in March 2003, and renewed for an additional five-year term on 26 February 2008. The IA named the Chief of Hydrology and Hydraulics at the St. Louis District as the Technical Program Officer (TPO), responsible for the technical exchange on behalf of the USACE and named the Director of Civil Works as the oversight authority for the exchange. Since then, the national project management oversight authority has been delegated to CEIWR and within the Institute to CEIWR-HEC.

To date, the collaboration has consisted of annual technical exchange meetings alternating between sites in the U.S. and Japan and facilitation of requests for information between USACE and the Water and Disaster Management Bureau. During FY 2012, CEIWR-HEC staff made preparations to host a meeting with MLIT at Portland, Oregon. The meeting took place in the last week of November 2012, in FY 2013.

The Implementing Arrangement that is the legal basis for the technical exchange program expires on 18 March 2013. IWR staff are working with the Interagency and International Services office at USACE Headquarters to renew the agreement for another five-year term.

### **Hydrologic Engineering Center International Technical Reimbursable Activities**

In FY 2012, CEIWR-HEC was involved in a wide range of international activities including work in Cambodia, the Netherlands, and Thailand. Technical experts presented on HEC software and tools at conferences in Morocco, Spain, and Taiwan. CEIWR-HEC also hosted visitors from Japan, Russia, and South Korea. In addition, CEIWR-HEC technical experts provided support to U.S. Pacific Command (USPACOM) and UNESCO.

#### **Support to U.S. Pacific Command (USPACOM):**

During FY 2012, CEIWR-HEC staff participated in several activities in the PACOM region.

- Served on a USACE Headquarters assessment team that helped support floodwater removal and drainage in Bangkok, Thailand (November 2011). The objective was to reach an understanding of the flooding situation (sources and sequence) and identify opportunities for flood risk management actions to protect the airport and other locations from future floods.
- Participated in a Shared Vision Planning workshop in Bangkok, Thailand (June 2012). During the workshop, participants collaboratively built knowledge to support the implementation of the Integrated Water Resource Management (IWRM) based Basin Development Strategy. The subsequent update and broadening of the existing basin-wide development scenario was accomplished through the implementation of the Shared Vision Planning Strategy.
- Provided a week long HEC-RAS training class to members of the Mekong River Commission; attendees were from Cambodia, Vietnam, Laos, and Thailand.
- Mr. Christopher Dunn, Director, CEIWR-HEC, and other staff participated in the International Conference on Climate Change in Taipei, Taiwan. On this trip they were able to meet with the Taiwan Water Resources Agency (WRA). The WRA and CEIWR-HEC are currently in the process of developing an MOU (Memorandum of Understanding) for collaborative work.

Iraq. During FY 2012, CEIWR-HEC staff provided technical assistance on the construction and use of the reservoir simulation software HEC-ResSim through four workshops that were conducted in Italy and Jordan. The focus was use of an HEC-ResSim model that was initially developed for the Tigris and Euphrates basin through Iraq for real-time forecasting and water management operation. Training included updating the model and lessons on the new features available in the HEC-ResSim software.

Columbia River Treaty. CEIWR-HEC is a participating study team member for the Columbia River Treaty (CRT) 2014/2024 Study. The CRT is an agreement between the United States and Canada. The purpose of the CRT, which became effective in 1964, is to provide flood control and power benefits to U.S. and Canadian regions. CEIWR-HEC supports the study project development team, including: the Hydrology and Hydraulics, Plan Formulation and

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Integration sub-teams; provides technical and policy guidance, coordination and development of the HEC-WAT and HEC-ResSim software features specific to CRT; and provides overall risk assessment methods to the CRT team.

During FY 2012, technology transfer by the CRT project development team to the USACE Northwestern Division office of the HEC-WAT model of the Columbia River Basin was completed. The transfer was accomplished by a CENWP (USACE Portland District) engineer being detailed to CEIWR-HEC for four months.

Work also began on building the HEC-WAT model for CRT that includes the FRA compute option. Toward the end of FY 2012, the full sequence of models (i.e., hydrologic sampling, fragility curve sampling, forecasting sampling, HEC-ResSim models, ECC models, URC models, HEC-RAS models, HEC-FIA models) was completed, and initial simulations had begun. Future work includes running eight alternatives (5,000 events) and then three selected alternatives (50,000 events) will be run. This work is anticipated to be finished by the end of FY 2013.

International Visitors to CEIWR-HEC. During FY 2012, CEIWR-HEC hosted several international visitors.

- A visiting engineer from Seoul, Korea for a period of nine months. He worked at CEIWR-HEC in the capacity of a reservoir systems model developer.
- The Federal Service for Hydrometeorology and Environmental Monitoring of Russia (Roshydromet), in cooperation with the World Bank, and within the frame of its (Roshydromet) reorganization coordinated with CEIWR-HEC to send one specialist-hydrologist, Dr Alexey Romanov from Hydrometcenter of Russia with the main objective of learning about the HEC-HMS (Version 3.5) and HEC-RAS (Version 4.1) software packages.
- Members of the Japan Ministry of Land, Infrastructure and Tourism (MLIT) visited CEIWR-HEC. Through a combined WMO and MLIT effort, the MLIT members are preparing a new publication as a part of the Integrated Flood Management Tool Series. The MLIT members wanted to meet with USACE personnel to discuss how flood management is performed by USACE. Discussion centered on USACE processes in regards to flood risk management.

Technical Exchange: During FY 2012, technical exchange on the international level occurred with the organizations.

- HEC and RMC staff visited Deltares of the Netherlands. The exchanges and discussions centered on software being developed by both parties on risk assessment methodologies and tools. Also, there was discussion on how bedform transport should be accounted for in levee safety programs.
- HEC and RMC staff went to Utrecht, Netherlands to meet with the developers of the VNK2 model. The meetings facilitated discussion of similarities and differences between American and Dutch methodologies for quantifying flood risk for dynamic systems.
- HEC staff attended a study workshop hosted by the Flood Risk Management Research Consortium and held at the University of London. The workshop brought together leading researchers from around the world involved in developing the concepts and methods underlying asset management and provided a forum to discuss emerging concepts and methods that will support operational asset management in the future.

### **PIANC – The World Association for Waterborne Transport Infrastructure**

When it was founded in 1885, PIANC was the Permanent International Association of Navigation Congresses. Over the years, the Association has changed its name several times, but has retained the PIANC acronym. PIANC's current name is The World Association for Waterborne Transport Infrastructure. It is an international association composed of governments, private sector companies, academics, and individual professionals that work to advance the sustainable development of maritime and inland navigation. As a non-political and non-profit organization, PIANC brings together the best international experts on technical, economic, and environmental issues pertaining to waterborne transport infrastructure. International working groups provide guidance to public and private partners through high-quality technical reports on pressing global navigation issues.

## REPORT OF THE SECRETARY OF THE ARMY ON CIVIL WORKS ACTIVITIES FOR FY 2012

The U.S. has been a national member of PIANC since 1902, and USACE provides leadership and secretariat support to PIANC. PIANC USA organizes and holds technical conferences, an Annual Meeting, and participates in the PIANC International Annual General Assembly (AGA).

PIANC USA Management Structure. The United States National Commission constitutes the governing body of the U.S. Section. In 2012 the ex-officio officers of the U.S. National Commission were:

- Chair, The Honorable Jo-Ellen Darcy, Assistant Secretary of the Army (Civil Works);
- President, Major General Michael J. Walsh, USACE Deputy Commanding General for Civil and Emergency Operations; and
- Secretary, Ms. Anne Cann, USACE.

The other eight members of the U. S. National Commission were:

- Mr. James McCarville, Port of Pittsburgh Commission;
- Dr. Robert Engler, Moffatt and Nichol;
- Mr. Dale Miller, Tetra Tech;
- Mr. John Headland, Moffatt and Nichol;
- Mr. Dave Sanford, American Association of Port Authorities;
- Dr. Craig E. Philip, Ingram Barge Company;
- Ms. Helen Brohl, Committee on the Marine Transportation System; and
- Mr. Edward Schmeltz, AECOM.

The U.S. Commission held two meetings in 2012 (in January in Washington, D.C., and in August in Pittsburgh, Pennsylvania).

In 2012, PIANC USA had two members serving on the International Executive Committee (ExCom). Mr. John Headland, Moffatt and Nichol, serves as the Western Hemisphere Vice President, and Mr. Edward Schmeltz, AECOM, is a member per his position as Co-Chair of PIANC's International Cooperation Commission (CoCom).

Annual Meeting. More than fifty people gathered in August 2012 to hear technical presentations at PIANC USA's Annual Meeting in Pittsburgh, Pennsylvania. Mr. Rock Salt, Principal Deputy Assistant Secretary of the Army for Civil Works, Maj. Gen. Michael Walsh, and Col. William Graham, Commander of the Pittsburgh District, provided welcome remarks to the conference attendees. The luncheon keynote speaker, Mr. Carlos Mladinic, former Secretary of the Inter-American Committee on Ports at the Organization of American States (OAS-CIP), spoke about "The Panama Canal Expansion and its Impact on the Americas." Technical sessions focused on navigation issues including: "Panama Canal Expansion: Design and Construction Techniques"; "USACE's Port and Inland Waterways Modernization Strategy"; "Performance Indicators for the Marine Transportation System"; and the "Water Infrastructure Systems Data Manager, a new Decision-Support Tool for USACE Projects." There was also a special session on E-Navigation, led by Mr. Richard Lockwood, the Chair of a new PIANC Technical Working Group on this topic. Contributors to this session included industry, USACE, and U.S. Coast Guard representatives.

Dredging 2012 Conference. The Dredging 2012 Specialty Conference was in October in San Diego, CA, jointly sponsored by PIANC USA and the American Society of Civil Engineers' Institute for Coasts, Oceans, Ports, and Rivers (COPRI). The conference featured over two hundred technical presentations on a wide range of navigation and dredging related topics organized around six technical tracks: Environmental Dredging; Dredged Material Management; Dredging Contracting and Management Innovations; Working with Nature; Regulatory Challenges and Solutions; and Integrating Dredged Material Reuse and Environmental Restoration.

Overall, the conference included more than five hundred attendees drawn from over twenty-five countries, including 145 PIANC "young professionals". More than a dozen students from the U.S. and abroad were sponsored to attend the conference and in return each presented a poster. The conference also included more than fifty sponsors and exhibitors demonstrating the latest products and services in the field. The preconference courses and technical sessions were exceptionally well attended—many with standing-room only, a tribute to the tireless work by PIANC Commissioner Dr. Bob Engler, Moffatt and Nichol, and the outstanding collaborative participation by the conference technical committee, COPRI Waterways Committee and PIANC USA. There were also several networking opportunities for attendees and exhibitors, including two young professional events and an induction ceremony for the Academy of Coastal, Ocean, Port, and Navigation Engineering.

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Best Performing National Section. At the PIANC Annual General Assembly (AGA) held in May 2012 in Valencia, Spain the U.S. Section received the Award for "Best Performing National Section" for 2011. Each year, the PIANC International Secretariat recognizes one country with this distinction. The Honorable Jo-Ellen Darcy accepted the award on behalf of the U.S. delegation.

Newsletter and Website (www.pianc.us). PIANC USA produces a bi-monthly electronic newsletter containing information on the U.S. Section's events, members and partners, as well as industry news of interest to those working in the navigation community. The website and newsletter serve as the main source of communication to the members and others in the industry. Ms. Kelly J. Barnes, USACE, is the editor of the PIANC Bulletin.

Representatives on Commissions. The U.S. Section is represented by Principal and Co-Principal Members of the Commissions managing technical working group activities. 2012 U.S. representatives are listed below.

- Environmental Commission — Dr. Susan Rees, USACE, Mobile District; Dr. Todd Bridges, USACE, ERDC. Young Professional Representative: - Ms. Sandra Brasfield, USACE, ERDC.
- Inland Navigation Commission — Mr. John Clarkson, USACE, Huntington District; Mr. William Ronald Coles, WR Coles and Associates.
- Maritime Navigation Commission — Mr. E. Dan Allen, Moffatt and Nichol.
- Recreational Navigation Commission — Mr. Robert Nathan, Moffatt and Nichol; Mr. Jack C. Cox, HDR. Young Professional Representative: Ms. Jessica McIntyre, Moffatt and Nichol.
- International Cooperation Commission – Ms. Lillian Almodovar, USACE. Mr. Edward Schmeltz, AECOM, serves as the Chair of the Commission.
- Promotion Commission – Mr. Nicholas Pansic, MWH; Ms. Kelly Barnes, USACE.
- Young Professionals Commission – Ms. Jessica McIntyre, Moffatt and Nichol; Mr. Jason Giovannettone, USACE.

Technical Working Group Reports Completed. In 2012, four Working Group Reports were published. The reports are listed below along with the names of the U.S. Representatives.

InCom Report No. 125-2012 3 parts- The Implementation Status of River Information Services (RIS), RIS Related Definitions, Guidelines and Recommendations for River Information Services: Richard C. Lockwood (Chair), USACE; Jeff Fritz, USACE

MarCom Report No. 117-2012 -Use of Hydro/Meteo Information for Port Access and Operations, Majid Yavary, Moffatt and Nichol

MarCom Report No. 116-2012-Safety Aspects Affecting the Berthing Operations of Tankers to Oil and Gas Terminals: Larry Cunningham; Sarah Rollings; Young Professional is Teo Ribakous, Moffatt and Nichol

MarCom Report No. 115-2012 -Criteria for the Un-Loading of Container Vessels, Dan Allen, Moffatt and Nichol

New Technical Working Groups formed. In 2012 four new Working Groups were formed. The groups are listed below along with the names of the U.S. Representatives.

MarCom 162-Recommendations for Increased Durability and Service Life of Marine Concrete Infrastructure: Thomas Spencer (Moffatt and Nichol); Thomas Collins (Collins Engineers); Young Professional is Mr. Vik Iso-Ahola (MWH Americas)

MarCom 164 -Upgrade of Port Terminals by Increasing Dredged Depth: James Beaver, P.E. (ARCADIS U.S., Inc.); John E. Chapman, P.E., P.Eng. (Ocean and Coastal Consultants | COWI); Young Professional is Edward H. Stehmeyer III, P.E. (Collins Engineers, Inc.)

MarCom 165 -Design and Maintenance of Container Terminal Pavements: Ashebir Jacob (Moffatt and Nichol)

EnviCom 163- Management of Ports, Harbors, and Waterways for Fishes and Shellfishes: Dr. Jan Hoover (chair), USACE; Dr. Susan Rees, USACE.